Joyces, Hobarts, Justins, and Duffys Bridges

EPBC 2024/09805 Additional Information Response

Bellingen Shire Council

19 September 2024

→ **The Power of Commitment**

Project name	Hobarts and Justins Bridges Environmental Assessment						
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Qualifications and experience of authors

Table E.1 Qualifications and experience of authors

Team Member	Qualifications	Relevant Experience
Geraldine Squires 	Bachelor of Science (Agriculture/Horticultural Science(Hons)) Certified Environmental Practitioner (CEnvP732) (Impact Assessment Specialist IA10018)	Geraldine is a technical director with 20 years' experience in the field of environmental impact assessment and management. Geraldine has worked on multi-disciplinary projects in the resources, natural resources, and infrastructure and transport sectors. Geraldine has a thorough knowledge and understanding of assessment triggers and Commonwealth, state and local government expectations and requirements. Geraldine has authored and contributed to the delivery of several environmental impact statements (EIS), development approval assessment reports and business cases. Geraldine has been involved in major projects from concept development and options analysis stages and works with technical disciplines to develop delivery strategies that align with environmental assessment and approvals requirements, project timeframes and budget and proponent expectations. Geraldine is an Impact Assessment CenvP in Queensland, demonstrating her commitment to ensuring ethical practice across the industry and to staying current and relevant in her professional practice.
Dr Natalie Clark 	Doctor of Philosophy, University of Queensland, 2008 Honours, University of Queensland, 2004 Bachelor of Science majoring in Zoology and Marine Biology, University of Queensland, 2002	Natalie is the Business Group Leader of GHD's South Queensland Natural Resource Management Group with over 15 years' experience in ecosystem monitoring, impact assessment and environmental management. She has a strong understanding of Commonwealth and state legislative requirements applicable to natural environments and projects. Natalie is the Project Manager for Capricornia Energy Hub Pumped Hydro-electric Energy Storage (PHES) and Transmission Line EIS and has led the ecology surveys, early approvals support, and provided technical advice for the design of aquatic fauna movement passage solutions for the PHES. Natalie was the technical lead for the flora, fauna and fish passage components of the Urannah Water Scheme Project EIS, which included two PHES and a major water storage dam within Eungella. Natalie engaged extensively with Commonwealth and State regulators during this project. Natalie was the fishway scientist and environmental approvals lead for the Rookwood Weir Project over the 12-year period of the Project design and construction. In addition to leading the delivery of the ecology EIS chapters and technical reports, Natalie supported Sunwater with obtaining secondary approvals, and biodiversity offsets. Natalie led the design process for the development of an innovative fishway as well as the first specifically designed turtle ramp in Australia. Other major water infrastructure projects that Natalie has led within the local region include Big Rocks Weir EIS and Burdekin Fall Dam ecology surveys, Fitzroy Barrage and Tartrus Weir environmental assessments.

Team Member	Qualifications	Relevant Experience
Lauren Rolfe 	Bachelor of Environmental Science, CQ University 2008	Lauren is an environmental scientist with eight years' experience in environmental impact assessment and approvals, management and compliance. Lauren specialises in environmental impact assessments, constraints analyses, approvals strategies and approvals applications, and due diligence reporting. She has a strong understanding of Queensland and Commonwealth environmental legislation, impact assessment and approvals processes. Lauren has prepared a range of environmental impact assessment reports and approvals applications for large-scale multi-disciplinary infrastructure projects including the Urannah Project EIS, Gateway Motorway and Bruce Highway Upgrade Project EPBC referral, Greenvale Training Area EPBC referral, Surat Basin CCS Project ESIA, MacIntyre Wind Farm EPBC preliminary documentation, and CopperString 2.0 EIS. Lauren is currently the EIS coordinator for the Capricornia Energy Hub PHES and Transmission Line EIS.
Nicole Fokes 	Bachelor of Environmental Science (Ecological Conservation), Charles Sturt University 2021. Diploma Conservation and Land Management – NSW TAFE 2016.	Nicole is a northern New South Wales ecologist with five years of experience within the environmental sector, with a particular focus on flora and fauna surveys, vegetation and habitat mapping, and environmental approvals, and ecological impact assessments. Nicole has developed strong field identification skills and is experienced in undertaking targeted flora and fauna surveys across a range of Queensland and New South Wales ecosystems. Nicole is skilled in surveys of birds, reptiles, mammals, frogs, and vegetation.
Nadia Kline 	Bachelor of Environmental Science (Ecological Conservation), Charles Sturt University 2021 Diploma of Business, QLD TAFE, 2016 Diploma of Management, QLD TAFE 2016	Nadia is a fauna ecologist with three years of industry experience. Her expertise is in conducting ecological surveys and data analysis, engaging with clients, and delivering environmental assessments to support ecosystem preservation. Nadia has extensive experience with fieldwork in remote areas, managing threatened species plans, and collaborating with stakeholders to ensure effective environmental outcomes. Nadia is skilled in surveys of birds, mammals, reptiles, and frogs.
Elise Odner 	Bachelor of Science – Biology & Environmental Science, USQ 2022 Bachelor of Business, QUT 2019	Elise is a terrestrial ecologist with 1.5 years of experience with a key interest in fauna ecology. Over her time in GHD, Elise has gained experience in both terrestrial and aquatic field and project opportunities in Queensland, New South Wales and Western Australia and has utilised fauna survey methods including active searches, spotlighting, pitfall, funnel, Elliot and cage trapping. The field opportunities that Elise has been involved in include targeted threatened flora and fauna surveys, fauna trapping and translocation, clearing works, water monitoring, habitat assessments and mapping, and environmental audits. Elise has prepared technical ecological reports including, Ecological Assessment Report (EAR), Biodiversity Assessment Report (BAR), Environmental Impact Assessments and Management Plans, Matters of National Significance (MNES) reports, Offset Strategy's, Offset Area Management Plans, Groundwater Dependant Ecological Assessment (GDE), and Condition Catchment Reports.

Abbreviations and acronyms

Abbreviation/acronym	Definition
AHD	Australian Height Datum
BAM	Biodiversity Assessment Method
BC Act	(NSW) *Biodiversity Conservation Act 2016*
BCD	Biodiversity Conservation Division
BDAR	Biodiversity Development Assessment Report
BSC	Bellingen Shire Council
CEMP	Construction Environmental Management Plan
CLM Act	(NSW) *Crown Land Management Act 2016*
The department	The Australian Government agency responsible for administering the EPBC Act
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment
EP & A Act	(NSW) *Environmental Planning and Assessment Act 1979*
EPBC Act	(Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*
EMP	Environmental Management Plan
ERSED	Erosion and sediment – referenced with regard to erosion and sediment control in accordance with the New South Wales Government 'Blue Book' – Managing Urban Stormwater: Soils and Construction (Landcom 2014)
ESCP	Erosion and Sediment Control Plan or ERSED control plan
FM Act	(NSW) *Fisheries Management Act 1994*
LGA	Local government area
Locality	The area within a 5 km radius of the Proposed action footprint
The Minister	The Australian Government Minister administering the EPBC Act, including any delegate thereof
MNES	Matter of national environmental significance
NSW	New South Wales
PCT	Plant Community Type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SIA	Significant Impact Assessment
SIS	Species Impact Statement
TEC	Threatened ecological community
Threatened species	Native species listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent under the EPBC Act (as defined in section 178 of the EPBC Act).

1. Introduction

1.1 Background

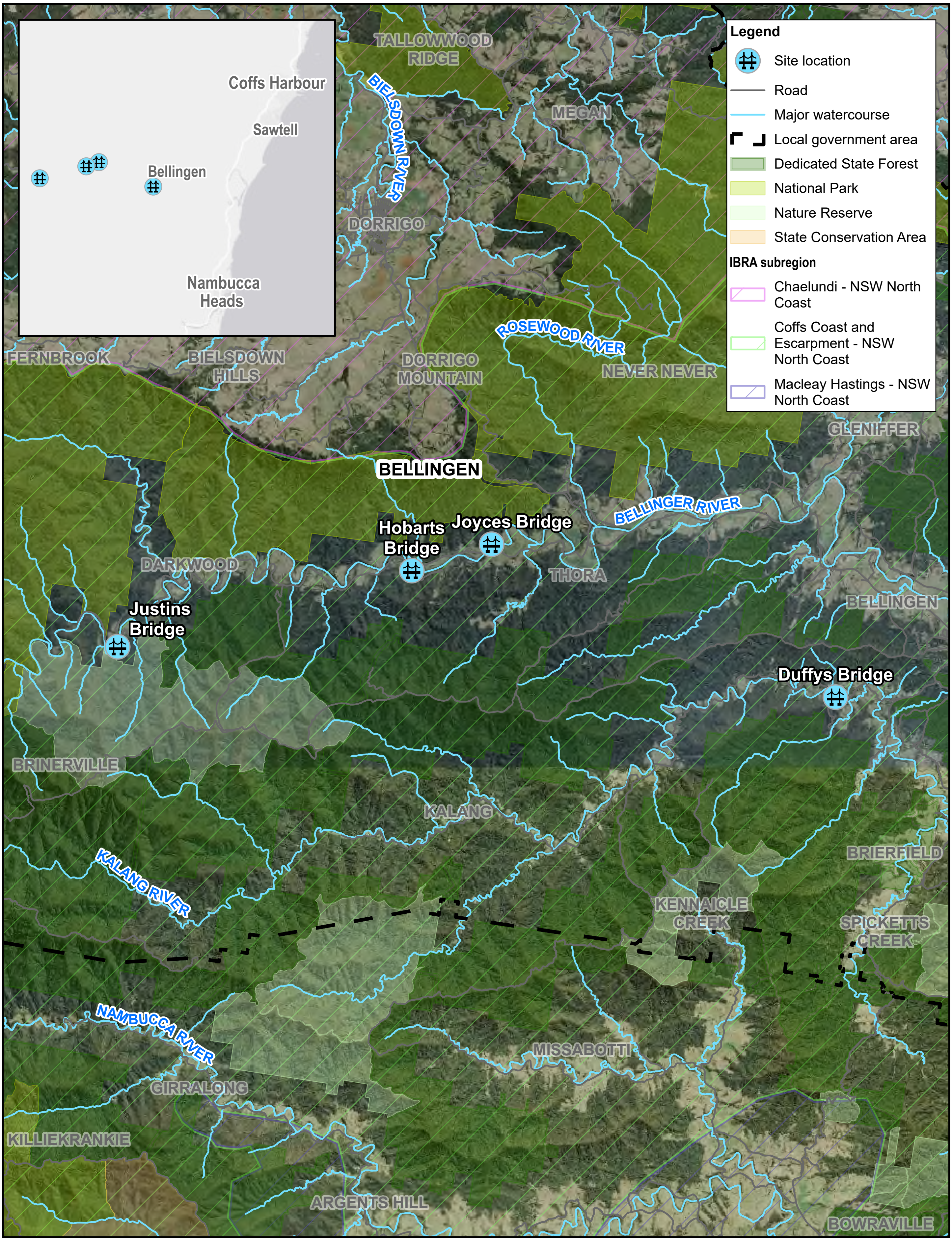
In February 2024, the Bellingen Shire Council (BSC) submitted a referral under *the Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2024/09805) for the proposed Joyces, Hobarts, Justins, and Duffys Bridges upgrades (the proposed action or 'the project'). The project involves the construction of four new concrete bridges to replace four existing dilapidated timber bridges in the BSC local government area (LGA) in the Mid North Coast region of New South Wales, which are:

– Justins Bridge on the Bellinger River
– Joyces Bridge on the Bellinger River
– Hobarts Bridge on the Bellinger River
– Duffys Bridge on the Kalang River

The project location is shown on Figure 1.1.

Subsequently, on 8 July 2024, the proposed action was classified as a controlled action under the EPBC Act due to potential significant impacts on listed threatened species and communities. The Department of Climate Change, Energy, the Environment and Water (DCCEEW) determined the proposed action will be assessed by preliminary documentation. DCCEEW provided a request for additional information (dated 25 July 2024) seeking further assessment of the potential impacts of the controlled action on the following Matters of National Environmental Significance (MNES):

– Bellinger River snapping turtle *(Myuchelys georgesi)* – Critically Endangered.
– Giant barred frog *(Mixophyes iteratus)* – Vulnerable.



Paper Size ISO A4

0 1 2 3 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellinger River
Joyces, Hobarts, Justins, and Duffys Bridges
Preliminary documentation

Project location

Project No.	12611463
Revision No.	0
Date	19/09/2024

FIGURE 1.1

\\ghdnet\ghd\AU\Coffs Harbour\Projects\22\12611463\GIS\Maps\Deliverables\12611463_PrelimDocumentation.aprx - 12611463_001_ProjectLocation
Print date: 19 Sep 2024 - 14:52

Data source: public/NSW_Imagery: © Department of Customer Service 2020
World Light Gray Canvas Base: Esri, HERE, Garmin, USGS. GHD: site locations (2023); NSWSS: roads, watercourse, suburbs (2023); DCCEEW: IBRA (2023); DFSI: reserves (2024); SEED: state forest (2018).
Created by: thunt2

1.2 Purpose of this report

This report has been prepared to respond to the request for further information required by DCCEEW under section 95A of the EPBC Act to adequately assess the impacts of the proposed action and addresses the following sections of the request for further information:

– Overview, including relevant policies
– Format and style
– Description of the proposed action, including maps and diagrams
– Controlling provisions – listed threatened species and communities
– Economic and social matters
– Environmental history of the person proposing to take the action
– Outcomes based conditions
– Conclusion.

This report is supported by the following technical documents and figures provided as appendices:

– Appendix A – EPBC Referral
– Appendix B – MNES Assessment report (submitted as supporting documentation for the EPBC referral)
– Appendix C – Species Impact Statement, prepared in accordance with the requirements of the New South Wales *Environment Planning and Assessment Act 1979* (EP & A Act) and *Biodiversity Conservation Act 2016* (BC Act).
– Appendix D – Joyces Bridge Construction Methodology
– Appendix E – Hobarts Bridge Construction Methodology
– Appendix F – Justins Bridge Construction Methodology
– Appendix G – Duffys Bridge Construction Methodology
– Appendix H – Environmental Management Plan
– Appendix I – Erosion and Sediment Control Plan – Joyces Bridge
– Appendix J – Erosion and Sediment Control Plan – Hobarts Bridge
– Appendix K – Erosion and Sediment Control Plan – Justins Bridge
– Appendix L – Erosion and Sediment Control Plan – Duffys Bridge
– Appendix M – Bellingen Shire Council Environmental Management Policy
– Appendix N – Bellingen Shire Council Integrated Management System Environmental Protection – Statement of Intent.

This report, together with the supporting appendices makes up the 'preliminary documentation'. Table 1.1 summarises the additional information request and cross-references to sections of this report where responses are provided.

Table 1.1 Information requirements and locations

RFI No.	RFI	Where information has been addressed
Overview		
1. Overview	Your preliminary documentation must include all the information provided in your referral documentation (updated or corrected as necessary), as well as the additional information requested in this document.	Referral documentation is included in Appendix A EPBC Referral and Appendix B MNES Assessment Report.
	Your preliminary documentation should enable the Minister (or delegate) and any other interested stakeholders to understand the impacts of the proposed action on relevant protected matters. The preliminary documentation must be able to be read as a stand-alone document.	The preliminary documentation is a standalone document.
	Any assumptions made in the assessment must be clearly explained and justified. The extent to which the limitations, if any, of available information may influence the conclusions of the environmental assessment should be clearly stated.	Section 1.4 outlines overarching limitations of the report. Other assumptions and limitations are outlined where relevant throughout the report.
	Names, roles, and qualifications (where relevant) of all persons involved in preparing the preliminary documentation must be provided.	Table E.1
	If it is necessary to rely on any confidential material, you should consult the department on the handling of that material before submitting your preliminary documentation for publication. The department is aware that there is confidential information associated with the Bellinger River snapping turtle (*Myuchelys georgesi*) stated in the Species Impact Statement (SIS) approved by the NSW Biodiversity and Conservation Division.	Confidential information has been redacted as necessary. NOTE: THIS VERSION FOR ADEQUACY REVIEW IS UNREDACTED FOR DCCEEW
1.1. Relevant policies	The preliminary documentation must refer to all relevant standards, policies and other guidance material published by the department. Any instances where published guidance is not followed must be justified. Where no Commonwealth standards exist, state government and/or industry standards may be useful.	Section 2 outlines legislation applicable to the proposed action Other relevant standards and policies are referenced throughout the report.
Format and style		
Formatting and style checklist	Present in a standard format – the document(s) will be published in hardcopy (e.g., A4 / A3 hardcopies) and electronic formats (e.g., PDF or MS Word files)	Across whole report
	Include all key claims, findings, proposals, and undertakings in the main document	Across whole report
	Include key supporting documents (e.g., referral, survey data, technical reports) as appendices	Appendix A – EPBC Referral Appendix B – MNES Assessment Report Appendix C – Species Impact Statement Appendix D – Joyces Bridge Construction Methodology Appendix E – Hobarts Bridge Construction Methodology

RFI No.	RFI	Where information has been addressed
		Appendix F – Justins Bridge Construction Methodology Appendix G – Duffys Bridge Construction Methodology Appendix H – Environmental Management Plan Appendix I – Erosion and Sediment Control Plan – Joyces Bridge Appendix J – Erosion and Sediment Control Plan – Hobarts Bridge Appendix K – Erosion and Sediment Control Plan – Justins Bridge Appendix L – Erosion and Sediment Control Plan – Duffys Bridge Appendix M – Bellingen Shire Council Environmental Management Policy Appendix N – Bellingen Shire Council Integrated Management System Environmental Protection – Statement of Intent.
	Explain (or avoid) technical jargon and acronyms	Acronyms and abbreviations table on page viii.
	Use maps and/or diagrams where appropriate to support textual information	Across whole report
	Present all maps and diagrams at an appropriate size and scale	Across whole report
	Reference all supporting documentation (including websites) clearly and consistently	Across whole report and Section 8 References
	Ensure that all other supporting documents (e.g., academic studies, regulatory standards) are publicly accessible, with electronic links provided where possible	Across whole report and Section 8 References
Description of the proposed action		
3.1. General	Descriptions of any proposed clearing, earthworks and construction activities or other elements proposed to be taken within the proposed action footprint.	Section 3.2, Section 3.2.2, Section 3.2.3, Section 3.2.4, and Section 3.2.5
	Descriptions of the preconstruction, construction, and operational phases of the proposed action.	Section 3.2, Section 3.2.2, Section 3.2.3, Section 3.2.4, and Section 3.2.5
	The anticipated timing and duration (including start and completion dates) for each known activity, stage, or element of the proposed action.	Section 3.3, Table 3.3, Table 3.4
	Feasible alternatives to the proposed action or elements of the proposed action, and justification for the preferred option.	Section 4.2.9.2.1 and 4.3.9.2.1
	Consultation about the proposed action that is planned or has been completed, including any documented results or responses.	Section 3.5

RFI No.	RFI	Where information has been addressed
	Requirements for assessment and approval under state legislation, including any conditions that apply (or will apply) to the proposed action, in addition to any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action.	Section 2
	Details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action.	Section 2.2
	How the action relates to any other action (of which the proponent is aware) that is being or will be taken in the region.	Section 3.4
3.2. Maps and diagrams	Clearly show the proposed action location within the wider area.	Figure 1.1
	Clearly delineate the construction/clearing footprint boundary, and any wider boundaries (e.g., study area) where relevant.	**Joyces bridge:** Figure 3.1, Figure 3.2, Appendix D Joyces Bridge Construction Methodology **Hobarts bridge:** Figure 3.3, Figure 3.4, Appendix E Hobarts Bridge Construction Methodology **Justins bridge:** Figure 3.5, Figure 3.6, Appendix F Justins Bridge Construction Methodology **Duffys bridge:** Figure 3.7, Figure 3.8, Appendix G Duffys Bridge Construction Methodology
	Clearly show the precise layout of all works to be undertaken individually for each bridge, including: – Building structures or other infrastructure. – Laydown areas within roadside reserves. – Number and location of lot subdivisions where laydown areas will be located on private land and proposed land use. – Rock scour placement. – Road realignments. – Other elements of the action that may have relevant impacts.	**Joyces bridge:** Figure 3.1, Figure 3.2, Appendix D Joyces Bridge Construction Methodology **Hobarts bridge:** Figure 3.3, Figure 3.4, Appendix E Hobarts Bridge Construction Methodology **Justins bridge:** Figure 3.5, Figure 3.6, Appendix F Justins Bridge Construction Methodology **Duffys bridge:** Figure 3.7, Figure 3.8, Appendix G Duffys Bridge Construction Methodology **All bridges**: Section 3.2.1 **Other roads and ancillary works:** Section 3.2.6
	Clearly identify any open spaces and buffer zones, where relevant.	Not relevant for Project.

RFI No.	RFI	Where information has been addressed
	Clearly identify any avoidance areas, retained vegetation (in particular, for matters of national environmental significance (MNES)), and conservation areas, where relevant.	Not relevant for Project.
	Clearly identify any areas adjoining the construction footprint which may be affected by indirect or offsite impacts as a result of the proposed action, where relevant.	Not relevant for Project.
Controlling provisions		
4. Listed threatened species and ecological communities (s18 & s18A)	Additional detailed information is required on the relevant impacts, proposed avoidance, management and mitigation measures, and proposed offsetting measures for each of these species: – Bellinger River snapping turtle (*Myuchelys georgesi*) – Critically Endangered. – Giant barred frog (*Mixophyes iteratus*) – Vulnerable.	**Bellinger River snapping turtle:** Section 4.2 **Giant barred frog:** Section 4.3
4.3.1. Occurrence	Provide the known records of the species within and adjacent to the proposed action area, presented as a map, including: – Records from surveys undertaken for this proposed action. – Any historical database records in and around the proposed action area.	**Bellinger River snapping turtle:** Section 4.2.2, and Figure 4.1. **Giant barred frog:** Section 4.3.2, and Figure 4.3
	Provide the number of individuals of the species occurring in the proposed action area.	**Bellinger River snapping turtle:** Section 4.2.4.1, and Figure 4.1. **Giant barred frog:** Section 4.3.2, and Figure 4.3.
	Detail the survey methodology used for each species	Bellinger River snapping turtle: Section 4.2.2 Giant barred frog: Section 4.3.2
	Provide data on likely population size and extent (including populations that extend beyond the Proposed action footprint), where available.	**Bellinger River snapping turtle:** Section 4.2.2, Section 4.2.5 **Giant barred frog:** Section 4.3.2 and Section 4.3.5
	If relevant, provide information that identifies important populations	**Bellinger River snapping turtle:** Section 4.2.5.2 **Giant barred frog**: Section 4.3.5.2
	Provide information on the extent of habitat for the species in the proposed action area: – Refer to habitat requirements detailed in the species' listing advice, conservation advice, and/or recovery plan.	**Bellinger River snapping turtle:** Section 4.2.4.2 **Giant barred frog:** Section 4.3.4.2
	– Specify the type(s) of habitat available including the plant community type (PCT) (e.g., whether the habitat value is related to foraging, breeding, dispersal, etc.).	
	– Describe the quality of the habitat.	

RFI No.	RFI	Where information has been addressed
	– Describe key habitat features (e.g., logs/snags, deep pools, aquatic vegetation).	
	– The area (ha) of potential habitat for each species within the Proposed action footprint must be provided.	
	– The area (ha) of potential nesting habitat for the Bellinger River snapping turtle and any known nest locations (noting any confidential data points must be discussed with the department).	
	– Any other relevant information describing the species habitat (for example, whether the habitat is considered critical to the survival of the species).	
	Consider occupancy trends relating to season and time of day. Longer term trends including climate change may also be relevant.	**Bellinger River snapping turtle:** Section 4.2.5.3 **Giant barred frog:** Section 4.3.5.3
	Occurrence should be informed by targeted field surveys, completed by suitably qualified experts in accordance with EPBC survey guidelines, endorsed state methodology, or scientific literature. Describe the survey methodology in detail.	**Bellinger River snapping turtle**: Section 4.2.2 **Giant barred frog:** Section 4.3.2
	Surveys should follow appropriate survey standards, e.g.: – The department's survey guidelines, if available for the species. – The NSW Biodiversity Assessment Method (BAM), endorsed by the department. – Best practice survey methodology for the species detailed in scientific literature, where the above are not available for the species. Identify which methodology has been used for each species and provide justification where methodology differs from the standard.	
	Identify where Commonwealth methodologies differ from those required or recommended by State government agencies. Ensuring that Commonwealth survey and identification requirements are incorporated into surveys at the earliest opportunity will reduce the likelihood of additional surveys being required.	
	Maps displaying the survey outcomes overlaid with the proposed action footprint.	**Bellinger River snapping turtle:** Figure 4.2 **Giant barred frog:** Figure 4.4
	If no surveys were undertaken for a species, provide a valid justification.	Not applicable.
	Append survey results to main document.	**Bellinger river snapping turtle**: Section 4.2.4 **Giant barred frog:** Section 4.3.4
	If the proposed action is being assessed under the NSW BAM, append all relevant BAM documentation to the preliminary documentation (i.e., the Biodiversity Development Assessment Report (BDAR).	N/A – Proposed action is not being assessed under the NSW BAM.

RFI No.	RFI	Where information has been addressed
4.3.2. Impact assessment	Identify the nature and extent of the likely short-term and long-term impacts from activities, elements, or stages of the proposed action. When identifying impacts, refer to the significant impact criteria for threatened species and ecological communities in the Matters of National Environmental Significance Significant impact guidelines 1.1, noting that the impact criteria differ among threatened ecological communities and threatened species with different listing statuses.	**Bellinger river snapping turtle**: Section 4.2.10 **Giant barred frog:** Section 4.3.10
	Quantify the area of direct and indirect impacts for each species including the total area of impact in hectares, and the number of individuals impacted, if known.	**Bellinger River snapping turtle:** Section 4.3.10 **Giant barred frog:** Section 4.3.10
	Provide an analysis of the likely impacts and the long-term viability of the species if the proposed action was to proceed, at a: – Local (site level) scale – discuss impacts to connectivity – Regional scale – discuss impacts to connectivity, potential cumulative impacts within the broader region	**Bellinger River snapping turtle:** Section 4.2.8 and Section 4.2.10 **Giant barred frog:** Section 4.3.8 and Section 4.3.10
	Provide details on whether any impacts are likely to be unknown, unpredictable or irreversible and what confidence is placed on the predictions or relevant impacts.	**Bellinger River snapping turtle:** Section 4.2.10, Section 4.2.6, Section 4.2.8 **Giant barred frog:** Section 4.3.6, Section 4.3.7, Section 4.3.10
	Provide justification for any conclusions regarding potential impacts in relation to specific needs and characteristics of each species, including references to conservation advice, listing advice, recovery plans, and any other technical data or information. If these are not applicable, a brief statement to this effect must be included.	**Bellinger River snapping turtle:** Section 4.2.10, Section 4.2.6, Section 4.2.8, Section 4.2.7 **Giant barred frog:** Section 4.3.6, Section 4.3.7, Section 4.3.10, Section 4.3.7
4.3.3. Avoidance, mitigation and management measures	Provide a consolidated list of all avoidance/mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action.	Section 4.4
	For each of the mitigation measures proposed: – Discuss the likely cost effectiveness of proposed measures	Section 4.4
	– Provide an assessment of the predictive effectiveness for each protected matter	Table 4.11
	– Discuss any statutory or policy basis for the measures	Table 4.11
	– Discuss the relationship, if any, with measures identified in the department's conservation advice, recovery plans and threat abatement plans	**Bellinger River snapping turtle:** Section 4.2.7 **Giant barred frog:** Section 4.3.7
	– Discuss the relationship, if any, with measures proposed by state and/or local governments relevant to minimising the impacts of the action on protected matters	Section 4.4 Avoidance and mitigation conclusions
	– Identify the roles and responsibilities associated with implementation	Section 4.4

RFI No.	RFI	Where information has been addressed
	Provide conclusions about the likely residual significant impacts to each threatened species and/or community after proposed avoidance and/or mitigation measures are considered.	Section 4.2.10, Section 4.3.10
	Clearly state and discuss and variables or assumptions made in the assessment.	Assumptions and limitations are outlined where relevant throughout the report.
	Discuss the extent to which limited availability of relevant information has the potential to influence the conclusions of the assessment.	**Bellinger River snapping turtle:** Section 4.2.9.1 **Giant barred frog:** Section 4.3.9.1
	Please provide the following plans where avoidance and mitigation methods are discussed in relation to the impacted species: – Environmental Management Plan (EMP) and associated Erosion and Sediment Control Plan (ESCP)	Appendix H - EMP Appendix I – ERSED Plan – Joyces Bridge Appendix J – ERSED Plan – Hobarts Bridge Appendix K – ERSED Plan – Justins Bridge Appendix L – ERSED Plan – Duffys Bridge.
	– Biodiversity and Conservation Division Approved Species Impact Statement (SIS)	Appendix C SIS Report
4.3.4. Compensation measures (offsets)	a) Details in relation to a proposed offsets package, must include for direct offsets: • The location and size, in hectares, of any offset site(s)	N/A – offsets are not required based on there being no significant residual impact from the proposed action as discussed in the SIAs in Section 4.2.9 and Section 4.3.9.
	b) Maps clearly showing for each offset site: i. The area to be protected ii. The relevant ecological features iii. The landscape context, and iv. The cadastre boundary	
	c) The current and future tenure arrangements (including zoning and ownership) of any proposed offset sites	
	d) Confirmed records of presence (or otherwise) of relevant protected matter(s) on the offset site(s), and	
	e) Detailed information regarding the presence and quality of habitat for relevant protected matter(s) on the offset site. The quality of habitat should be assessed in a manner consistent with the approach outlined in OAG.	
	The offset strategy must: – Directly contribute to the ongoing viability of the relevant protected matters to deliver an overall conservation outcome that improves or maintains the viability of the protected matter in the region, as compared to what is likely to have occurred under the status quo, i.e., if neither the action nor the offset had taken place; and	
	– Compensate for the impacts over the entire duration of the proposed action (should impacts be in perpetuity, the offsets must also be delivered in perpetuity).	

RFI No.	RFI	Where information has been addressed
	– The preliminary documentation must also provide and clearly justify the scores entered into the Offset assessment guide, if applicable.	
Economic and social matters		
5. Economic and social matters	Consideration of negative impacts (e.g., disruption to existing community infrastructure, environmental features, and/or cultural and traditional activities)	Section 5
	Consideration of positive impacts (e.g., increased housing, employment, or social amenity)	Section 5
	Consideration of different scales of impact (e.g., local, regional, and national)	Section 5
	Estimated capital value and ongoing economic value, using specific dollar or other numerical values where relevant	Section 5
	Discussion of relevant public consultation undertaken, including any issues raised in objection or support of the proposed action	Section 5
	Discussion of any contributions (for example, government funding, or 'gifting' of land to the NSW Government under a voluntary planning agreement, as discussed in the referral information)	Section 5
Environmental history of the person proposing to take the action		
6. Environmental history of the person proposing to take the action	The preliminary documentation must provide details of any proceedings under a Commonwealth, state or territory law for the protection of the environment, or the conservation and sustainable use of natural resources, against the person proposing to take the action (or if the person is a corporation, its executive officers). If the person proposing to take the action is a corporation, details of the corporation's environmental policy and planning framework must be provided.	Section 6 Environmental history of the person proposing to take the action
Outcomes based conditions		
7. Outcomes based conditions	Thoroughly document the baseline condition of the relevant impacted matter(s).	Outcomes based conditions have not been included in this report and may be provided as an addendum if required during DCCEEW's adequacy review period for the preliminary documentation.
	Identify conservation objectives (outcomes) for the relevant impacted matters, preferably with reference to any applicable conservation advice, recovery plans and threat abatement plans.	
	Outline how performance against specified objectives will be measured and reported.	
Conclusion		
8. Conclusion	The preliminary documentation must summarise the key impacts on protected matters, proposed avoidance and mitigation measures, and offsets proposed for any unavoidable impacts. Provide an overall conclusion on the environmental acceptability of the proposed action, and whether proposed avoidance, mitigation and offset measures are sufficient to manage the additional impacts to the environment arising from the proposed action. Include a discussion on the consistency of the proposed action with principles of ecologically sustainable development of the EPBC Act.	Section 7 – Conclusion

1.3 Key terms

Key terms used in this document are included in Table 1.2.

Table 1.2 Key terms

Term	Meaning
Proposed action	The activities required for construction of the bridges. This term is used interchangeably with "the project".
Proposed action area or project footprint	The area impacted (footprint) by the construction of each bridge, including temporary areas used for construction.
Study area	Area or areas that were included in desktop searches and field ecology surveys. The study area surrounds each bridge structure, primarily comprising the bridge, roads and road verges, and cleared land (10 km).
Threatened species	Native species listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent under the EPBC Act (as defined in section 178 of the EPBC Act).

1.4 Scope and limitations

This report has been prepared by GHD for Bellingen Shire Council and may only be used and relied on by Bellingen Shire Council for the purpose agreed between GHD and Bellingen Shire Council as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Bellingen Shire Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Bellingen Shire Council and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.4.1 Field survey limitations

Limitations during the field investigation conducted by GHD included the following:

– Call playback was undertaken for frogs in areas where loud cascades/riffles noises were prevalent. This can affect the outcome of this method due to inability to hear species calling over the water.
– It is likely that some species that occur in the proposed action area either permanently, seasonally, or transiently were not detected during the surveys.

2. Planning and approvals framework

2.1 Commonwealth legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's central piece of environmental legislation and is administered by DCCEEW. The EPBC Act provides a legal framework to protect and manage MNES, which include:

– World Heritage properties
– National Heritage properties
– Wetlands of international importance (Ramsar wetlands)
– Listed threatened species and ecological communities
– Migratory species
– Commonwealth marine areas
– The Great Barrier Reef Marine Park
– Nuclear actions (including uranium mining)
– Water resources, in relation to coal seam gas development and large coal mining development

A person who proposes to take an action that is likely to have a significant impact on MNES must refer that action to the minister administering the EPBC Act. An action is defined broadly in the EPBC Act and includes any project, development, undertaking, activity or series of activities, or any alteration of these actions.

The project was referred under the EPBC Act and has been declared a 'controlled action' by DCCEEW for potential significant impacts to the Bellinger River snapping turtle and giant barred frog. A controlled action decision means the proposed action has, or will have, a significant impact on protected matters. A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the intensity, duration, magnitude and extent of the impact, and upon the sensitivity, value and quality of the environment that is impacted. SIAs are undertaken in accordance with the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoE, 2013). A controlled action decision means further assessment of the proposed action is required for the minister to decide whether or not to approve the proposed action. The type of assessment required for the project is assessment by preliminary documentation as outlined in Section 1.2.

2.2 New South Wales legislation

2.2.1 Overview

There are several key pieces of NSW legislation relevant to the project, which are described in the following sections. Additional legislation, standards and policies that may be applicable to the project are included in the EMP in Appendix H.

2.2.2 Biodiversity Conservation Act 2016

The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. Part 7 of the BC Act states the environmental assessment requirements for activities being assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP & A Act). A SIS has been prepared in accordance with Part 7 of the BC Act to assess significant impacts to biodiversity from activities being assessed under the EP & A Act.

2.2.3 Biosecurity Act 2015

The NSW *Biosecurity Act 2015* is established to provide a framework for the prevention, elimination and minimisation of biosecurity risks, including the timely and effective management of pests, diseases and contaminants and other biosecurity matter that threaten terrestrial and aquatic environments. Under the NSW *Biosecurity Act 2015*, there is a general biosecurity duty which states that any person who deals with biosecurity matter and who knows, or ought to know, the biosecurity risk posed or likely to be posed by the biosecurity matter has a duty to ensure that so far as reasonably practicable, the biosecurity risk is prevented ,eliminated or minimised. The Project is subject to biosecurity controls to prevent the introduction and/or spread of biosecurity risks including wees, pests and diseases, notably the Bellinger River virus, which is described further in Section 4.2.1.

2.2.4 Crown Land Management Act 2016

The *Crown Land Management Act 2016* (CLM Act) specifies how Crown lands are managed across NSW. Clause 31 of the CLM Act's subordinate legislation, the *Crown Land Management Regulation 2018,* provides 'prescribed purposes' for which a short-term licence may be granted. The Project will include dredging and reclamation works in a waterway. Under Section 200 of the *Fisheries Management Act 1994* (FM Act), a permit is required for dredging work carried out by a local government authority, unless the works are authorised by the CLM Act. The Proposed actions are not authorised by the CLM Act, therefore a permit under the FM Act is required (see below).

2.2.5 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP & A Act) is the principal planning legislation used to plan and assess development proposals in NSW. The Project is not classified as state-significant infrastructure or state-significant development and can therefore be assessed under Division 5.1 of the EP & A Act. Development approvals are not required for the Project under this legislation; however, BSC has an obligation to assess all likely environmental impacts from the Project. BSC has prepared a Review of Environmental Factors (REF) for each of the proposed bridge works in accordance with Part 5 of the EP & A Act.

The New South Wales Biodiversity Conservation Division (BCD) has an obligation under the EP&A Act to examine and consider, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity. A REF has been undertaken for each of the proposed bridge upgrades in accordance with Part 5 of the EP&A Act, which has been used to determine further requirements for assessments and/or approvals including the requirement for a referral under the EPBC Act.

A REF for each bridge site (Joyces Bridge REF (GHD, 2024a), Hobarts Bridge REF (GHD, 2024b), Justins Bridge REF (GHD, 2024c) and Duffys Bridge REF (GHD, 2024d)) was prepared by GHD on behalf of BSC. The environmental assessment and determination of the projects was undertaken in accordance with Part 5 of the EP&A Act. For these projects, BSC was both the public authority proponent (EP&A Act s5.3) and the determining authority (EP&A Act s5.1).

The purpose of these REF's was to describe the projects at each bridge site, document the likely impacts of the projects on the environment, and to detail mitigation and management measures to be implemented. In all REF's, Assessments of Significance were completed for six species (Table 2.1).

Table 2.1 Species assessed in the Assessment of Significance across each REF

Species	Conservation status		
	EPBC Act	BC Act	FM Act
Bellinger River snapping turtle *(Myuchelys georgesi)*	CE	CE	-
Southern Purple-Spotted Gudgeon *(Mogurnda adspersa)*	-	-	E
Giant barred frog *(Mixophyes iteratus)*	V	V	-
Southern Myotis *(Myotis macropus)*	-	V	-
Tall Knotweed *(Persicaria elatior)*	V	V	-
Horned Pondweed *(Zannichellia palustris)*	-	E	-

Of these species, the Bellinger River snapping turtle was deemed to potentially be significantly affected by the projects, due primarily to the highly susceptible nature of the species to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals. As such a SIS, under Part 5 Division 5.1 of the EP&A Act and Part 7 of the BC Act, was prepared as a precautionary measure to further consider the impacts and potential mitigation of the project on the Bellinger River snapping turtle. In 2023 a SIS was issued to the BCD of the Department of Planning and Environment (DP&E) as part of assessment of these proposed works. The focus of this SIS was an assessment of potential impacts to the Bellinger River snapping turtle (DP&E, 2023). Although the SIA indicated that it was unlikely the project would have a significant impact on the species, a conservative approach to the turtle was undertaken and a revised more detailed SIS was requested. The assessment concluded that the project is unlikely to have a significant impact (GHD, 2024e). Based on the conclusion of this SIS, no BDAR, under the Biodiversity Offsets Scheme was deemed necessary.

Following receipt of the Environment Agency Head's assessment requirements, in line with section 7.21 of the BC Act, the SIS was finalised with all four REF's and formally submitted for approval to the BCD of the DP&E as part of assessment of these proposed works.

Other than the potential impacts on the Bellinger River snapping turtle, which would be managed via the safeguards identified in the SIS, it was concluded that the overall impact on the environment would likely be minimal and an EIS would not be necessary (GHD, 2024e).

Subsequently, BCD advised that a revised SIS was required that addressed potential impacts to other known or potentially present threatened species or communities, or their habitat, listed under the NSW BC Act. The Environment Agency Head's requirements for this SIS identified eight additional species (Table 2.2). These threatened species and communities were addressed throughout the revised SIS (Appendix C).

Table 2.2 Species assessed in the SIS

Species	Conservation status*	
	EPBC Act	BC Act
Bellinger River snapping turtle (*Myuchelys georgesi*)	CE	CE
Grey-headed flying-fox (*Pteropus poliocephalus*)	V	V
Giant barred frog (*Mixophyes iteratus*)	V	V
Southern Myotis (*Myotis macropus*)	-	V
Large Bent-winged Bat (*Miniopterus orianae oceanensis*)	-	V
Little Bent-winged Bat (*Miniopterus australis*)	-	V
Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)	-	V
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	-	V
Superb Fruit-dove (*Ptilinopus superbus*)	-	V
Stephens's Banded Snake (*Hoplocephalus stephensii*)	-	V

*Key: CE – critically endangered, V - Vulnerable

2.2.6 Fisheries Management Act 1994

The FM Act regulates the protection, conservation, and recovery of threatened species (as defined under the FM Act), populations and ecological communities of fish and marine vegetation and fish habitats, as well as promoting the development and sharing of fisheries resources. Under Section 200 of the FM Act, a permit is required for dredging work carried out by a local government authority, unless the works are authorised under the CLM Act.

Dredging includes the removal of material from the waterway and the action of digging within the waterway and its banks. Reclamation is the placement of material into the waterway or onto the waterway bed and banks. The Project will require activities classified as dredging and reclamation (i.e. excavation for abutments, removal of old bridge components and other associated earthworks and construction of new abutments, placement of scour protection and construction of temporary waterway crossing, if required). As the Project is not authorised under the CLM Act, a section200 permit is required

As the Project is within Key Fish Habitat areas mapped under the FM Act, a Section 200 permit is required for dredging and reclamation works, unless the works are authorised under the CLM Act, in which case a Section 199 consultation with NSW Fisheries is required.

2.2.7 Roads Act 1993

The *Roads Act 1993* makes provisions with respect to the roads of NSW. Under Section 138 of the *Roads Act 1993*, consent is required for any works or activities in a public reserve, public road or footpath/nature strip. A Section 138 permit is required for the project for works or activities in a public road.

2.3 Relevant policies

This preliminary documentation references relevant standards, policies, and other guidance materials published by DCCEEW. Any departures from the published guidance must be thoroughly justified. In the absence of Commonwealth standards, state government and/or industry standards must be rigorously evaluated for their applicability. The following policies, standards and guidance materials have been used:

– Matters of National Significance 1.1 Significant Impact Guidelines (DoE, 2013).
– Commonwealth Threatened Species Scientific Committee (2021). Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021).
– Commonwealth Threatened Species Scientific Committee Conservation Advice *Wollumbinia georgesi* (TSSC, 2016).
– Commonwealth Department of Climate Change, Energy, the Environment and Water Conservation Advice for *Myuchelys georgesi* (Bellinger River saw-shelled turtle) (DCCEEW, 2024).
– NSW Department of Planning, Housing and Infrastructure (DPIE) Hygiene guidelines – protocols to protect priority biodiversity areas in NSW from *Phytophthora cinnamomi*, myrtle rust, amphibian chytrid fungus and invasive plants (DPIE, 2020).
– NSW DPIE *About the Bellinger catchment, New South Wales* (DPIE, 2024).
– NSW Department of Planning and Environment (DP&E) *Keeping up with the Bellinger River snapping turtle* (DP&E, 2022).
– NSW Scientific Committee Final determination Bellinger River snapping turtle *Myuchelys georgesi* (NSC, 2016).
– Environmental Management Plan Guidelines (DCCEEW, 2024).

There is currently no recovery plan in place for the Bellinger River snapping turtle. A captive breeding program was established after the disease outbreak with 17 individuals placed into the program. Since 2018, turtle breeding has been successful, and the NSW Government has managed the trial release and monitoring of 179 captive-bred juveniles into the river. One of the release sites is upstream of Justins Bridge and has had 41 captive-bred turtles released there since 2018 (BCD, 2022). Results have been positive with majority of the turtles surviving in good health in the river (NSW DP&E, 2021). Radio transmitters attached to the released turtles are used to assist with monthly monitoring.

The giant barred frog was included in the recovery plan for stream frogs of south-east Queensland 2001-2005 developed by the Queensland state government and adopted under the EPBC Act in 2003. However, the recovery plan has since expired in 2022. The Committee recommended that following expiry of the existing recovery plan, a new national recovery plan for giant barred frog is not required as it would not have a significant conservation benefit above existing mechanisms. The approved conservation advice provides sufficient direction to implement priority actions and mitigate against key threats (TSSC, 2021).

3. Description of the proposed action

BSC is responsible for managing road-related transport infrastructure and providing safe and efficient access for the LGA road network. The current Joyces, Hobarts, Justins, and Duffys bridges are aging timber structures in poor condition that are nearing the end of their serviceable lives. BSC proposes to construct new concrete bridges immediately adjacent to each existing bridge, which will meet the key objectives of improving user safety and network reliability into the future by providing increased flood immunity to residents and a safe and reliable crossing for road users.

Additional objectives of the Project include:

– Meeting customer network needs
– Minimising safety risks to the workforce carrying out the works
– Minimising impacts to road users
– Minimising environmental impacts from the Project

The existing bridges and proposed new works are described in Table 3.1.

Table 3.1 Existing bridge and proposed new bridge design

Existing bridge design	Proposed new works
Justins Bridge	
– Low-level, four span timber bridge with a length of 32 m. – Deck level of approximately 89.7 m Australian Height Datum (AHD).	– Construction of a new single-lane bridge downstream of the existing bridge footprint. – Use of existing bridge during construction of new bridge. – Approximate length of 42.5 m, including 30 m steel girder span over the main channel and additional 12 m concrete girder span to bridge a sediment area on the western side of the channel. – Combination of bored concrete piles where weathered rock is found at the piers and western abutment and rock anchors at the eastern abutment due to shallow high strength rock. – Increase deck level to approximately 91 m AHD to provide improved flood immunity.
Joyces Bridge	
– Low-level, four-span timber bridge with a length of 48 m. – Deck level of approximately 39.1 m AHD.	– Construction of a new bridge downstream of the existing bridge footprint. – Use of existing bridge during construction of new bridge. – Four span concrete structure approximately 49.5 m in length. – Bridge spans of varying lengths including: • 7 m span on the western side to accommodate vehicle turning paths. • 18 m span across the main channel to avoid environmental impact. • 2 x 12 m spans on the eastern side. – Increase deck level to approximately 41.1 m AHD to provide improved flood immunity.

Existing bridge design	Proposed new works
Hobarts Bridge	
– Low-level, five-span timber bridge with a length of 48 m. – Deck level of approximately 44.35 m AHD.	– Construction of a new single-lane bridge downstream of the existing bridge footprint. – Use of existing bridge during construction of new bridge. – Carriageway length of 54.5 m width of 4.2 m widening to 5.78 m at the Darwood side to provide turning path access to the Chrysalis School. – Various abutment and pier foundations including: • Reinforced concrete abutments and bored piles at Abutment A. • Blade pier and bored piles at Pier 1. • Blade piers with rock anchors at Piers 2 and 3. • Reinforced concrete abutment with rock anchors at Abutment B. – Increase deck level to approximately 46.5 m AHD to provide improved flood immunity.
Duffys Bridge	
– Low-level, four-span timber bridge with a length of approximately 44 m and 4 m wide carriageway – Deck level of approximately 19.8 m AHD	– Construction of a new dual-lane bridge downstream of the existing bridge footprint. – Use of existing bridge during construction of new bridge. – Approximate length of 51 m. Overall width of 7.2 m and a carriageway width of 7.1 m. – Reinforced concrete abutment and driven piles. – Increase deck level to approximately 21.5 m AHD to provide improved flood immunity.

3.1 Proposed action area

The proposed action area is located in the Mid North Coast area of NSW within the BSC LGA, approximately 420 km north-northeast of Sydney. The proposed action area consists of four separate sites at the locations described in Table 3.2 and shown in Figure 1.1.

Table 3.2 Location of proposed activities

Project component	Location	Coordinates (GDA 2020)	Watercourse
Justins Bridge	Darkwood Road, Darkwood (approximately 35 km west of Bellingen)	-30.453727, 152.630649	Bellinger River
Joyces Bridge	Darkwood Road, Darkwood (approximately 18 km west of Bellingen)	-30.426143, 152.748049	Bellinger River
Hobarts Bridge	Darkwood Road, Darkwood (approximately 20 km west of Bellingen)	-30.433247, 152.722993	Bellinger River
Duffys Bridge	Kalang Road, Kalang (approximately 4 km south-west of Bellingen)	-30.467859, 152.855866	Kalang River

The proposed action area includes the footprint of the existing bridges, footprints of the new bridges, tie-ins to the approach roads on both sides of the waterways, and ancillary areas required for construction of each bridge. Ancillary areas include a temporary construction compound near each bridge footprint. Construction compounds will be mostly within the existing road corridors with some requirement to use adjacent private property. The location of the compound would be determined by the contractor and would be dependent on the order in which works are undertaken. BSC or the Principal Contractor will seek private lease agreements with private landowners for the purpose of construction compounds to avoid locating compounds on low-lying areas within potential flood zones. Consultation with landowners has occurred; however, formal lease agreements are awaiting project approvals.

The instream and associated bank footprints are estimated to impact a total of 0.41 ha as follows:

– Joyces Bridge - total impact of approximately 0.10 ha
– Hobarts Bridge - total impact of approximately 0.12 ha
– Justins Bridge - total impact of approximately 0.05 ha
– Duffys Bridge - total impact of approximately 0.14 ha

3.2 Proposed action activities

3.2.1 Overview

The proposed action at each of the bridge sites will involve the following general construction activities:

– Vegetation clearing
– Installation of piers and rock anchors
– Construction of bridge substructure
– Construction of abutments and placement of decking units (superstructure)
– Installation of rock scour protection
– Realignment of approach roads
– Finishing of ancillary bridge components at road level (i.e. signages, road sealing, concreting in controlled areas)
– Demolition of existing timber bridges
– Rehabilitation of site

A detailed description of the proposed action activities at each bridge site is included in the following sections.

3.2.2 Joyces Bridge

Joyces Bridge (Plate 3-1) is located on Darkwood Road, crossing the Bellinger River approximately 18 km west of Bellingen. The proposed action involves upgrading the road realignment and removing the existing 48 m four span, timber bridge and installing a new 49.5 m four span, concrete bridge structure on an improved alignment immediately downstream and adjacent to the current footprint. The form of construction will include:

– Foundations will be bored, cast in-situ 600 mm diameter concrete piles.
– Piers one and two will be located in the low-flow section of Bellinger River. Pier three is located on the existing gravel bank outside of the flow channel.
– The substructure will consist of cast in-situ concrete abutments and precast concrete headstocks. Rock scour protection will be placed on the banks surrounding the abutments.
– The super structure is made up of two spans of 12 m precast bridge beams, one longer span of 18 m pre-stressed bridge planks and one shorter 7 m plank span at the western end. The two plank spans will require cast in-situ deck pours. Trafficable bridge width of 4.2 m.
– All spans will use bolt on concrete kerbs. The two plank spans will be cast in-situ deck pours.
– Road approaches will be rebuilt, include 35 m of road works on the eastern side and 60 m on the western side to tie into the existing Darkwood Road.
– The bridge will be raised approximately 1.7-2.0 m in height to increase flood immunity.
– The Proposed action footprint for the proposed activities at this location are approximately 0.11 ha.

The concept design for Joyces Bridge is shown in Figure 3.1. The construction clearing footprint boundary, and the study area boundary is present in Figure 3.2.

A full design and construction methodology report is provided in Appendix D.

Plate 3-1 Joyces Bridge – existing timber structure

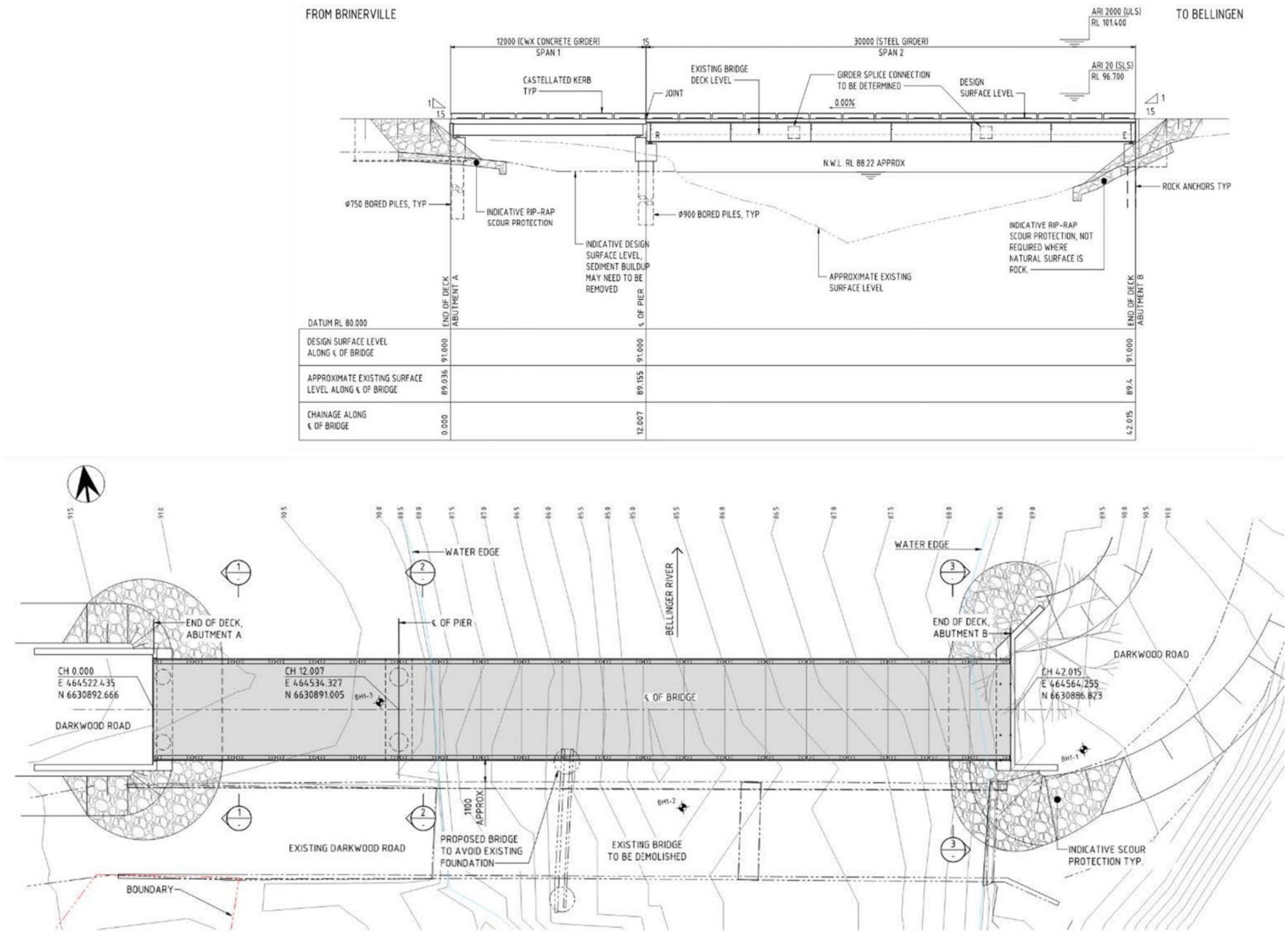
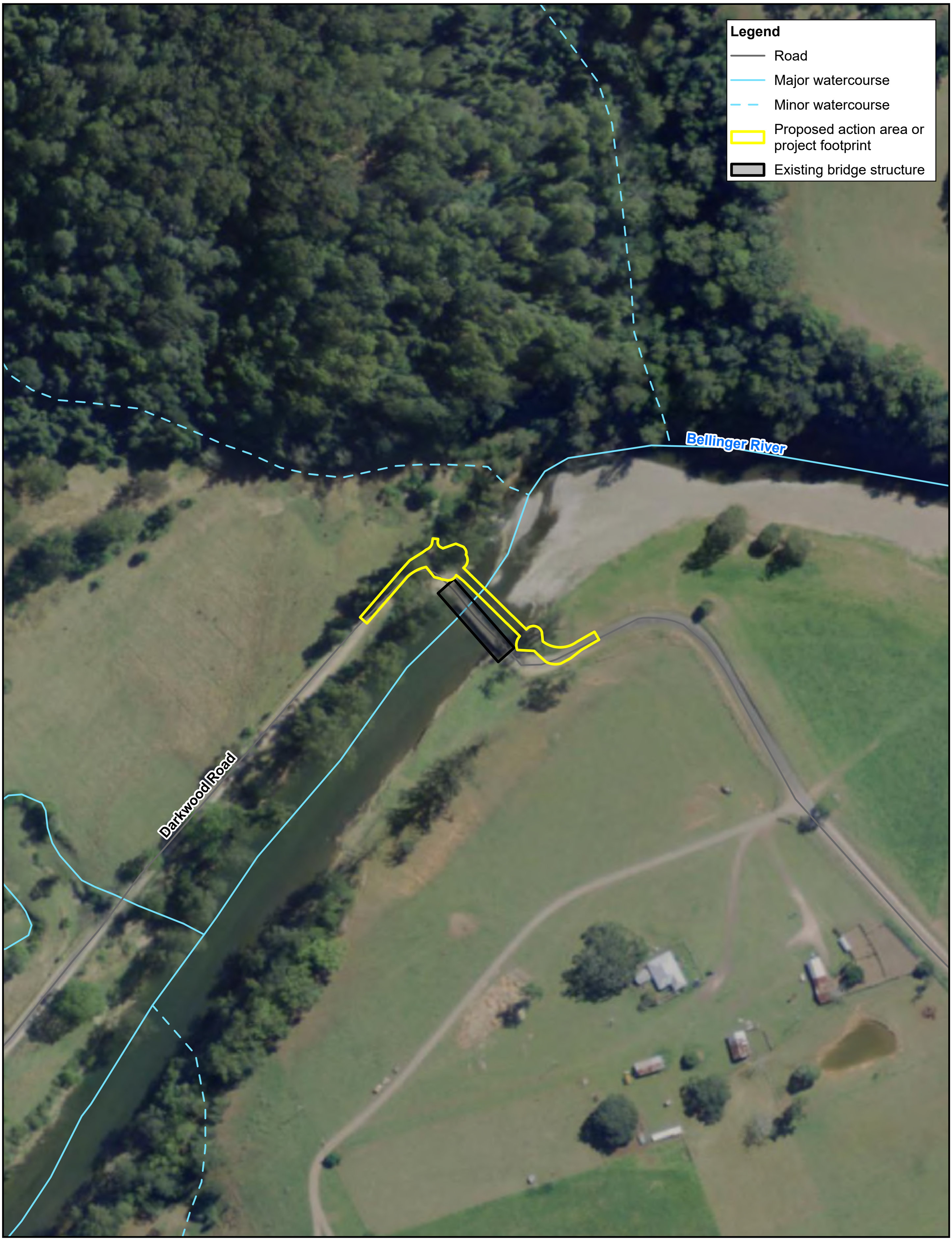


Figure 3.1 Joyces Bridge concept design



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Joyces, Hobarts, Justins, and Duffys Bridges
Preliminary documentation

Joyce's Bridge proposed action footprint and existing bridge structure outline

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FIGURE 3.2

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Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: existing bridge (2023), project footprint (2024); NSWSS: roads, watercourse (2023).
Created by: thunt2

3.2.3 Hobarts Bridge

Hobarts Bridge (Plate 3-2) is located on Darkwood Road, crossing the Bellinger River at Darkwood, approximately 17 km west of Bellingen. The proposed action involves upgrading the road realignment, removing the existing 48 m five span timber bridge and installing a new 54.5 m four span, concrete bridge structure of increased height on an improved alignment immediately upstream and adjacent to the current footprint.

The form of construction will include:

– Foundations will be bored with concrete piles that are cast in-situ 600 mm diameter at Abutment B and Pier 3. Rock anchors will exist for the remainder of the bridge.
– Piers two and three will be located on the edge of the low-flow section of Bellinger River. Pier one is located on the banks outside of the flow channel.
– The substructure will consist of cast in-situ concrete abutments and precast concrete headstocks. Rock scour protection will be placed on the banks surrounding the abutment.
– The super structure is made up of three spans of 12 m precast bridge beams and one longer span of 18 m pre-stressed bridge planks. The plank span will require a cast in-situ deck pour. Trafficable bridge width of 4.2.
– All spans will use bolt on concrete kerbs.
– Road approaches will be rebuilt and include 40 m of road works on the eastern side and 50 m on the western side to tie into the existing Darkwood Road.
– The bridge will be raised approximately 2.0 m in height to increase flood immunity.

The Proposed action footprint for the proposed activities at this location are approximately 0.12 ha. The concept design for Hobarts Bridge is shown in Figure 3.3. The construction clearing footprint boundary, and the Study area boundary is presented in Figure 3.4. A full design and construction methodology report is provided in Appendix E.

Plate 3-2 ***Hobarts Bridge – existing structure***

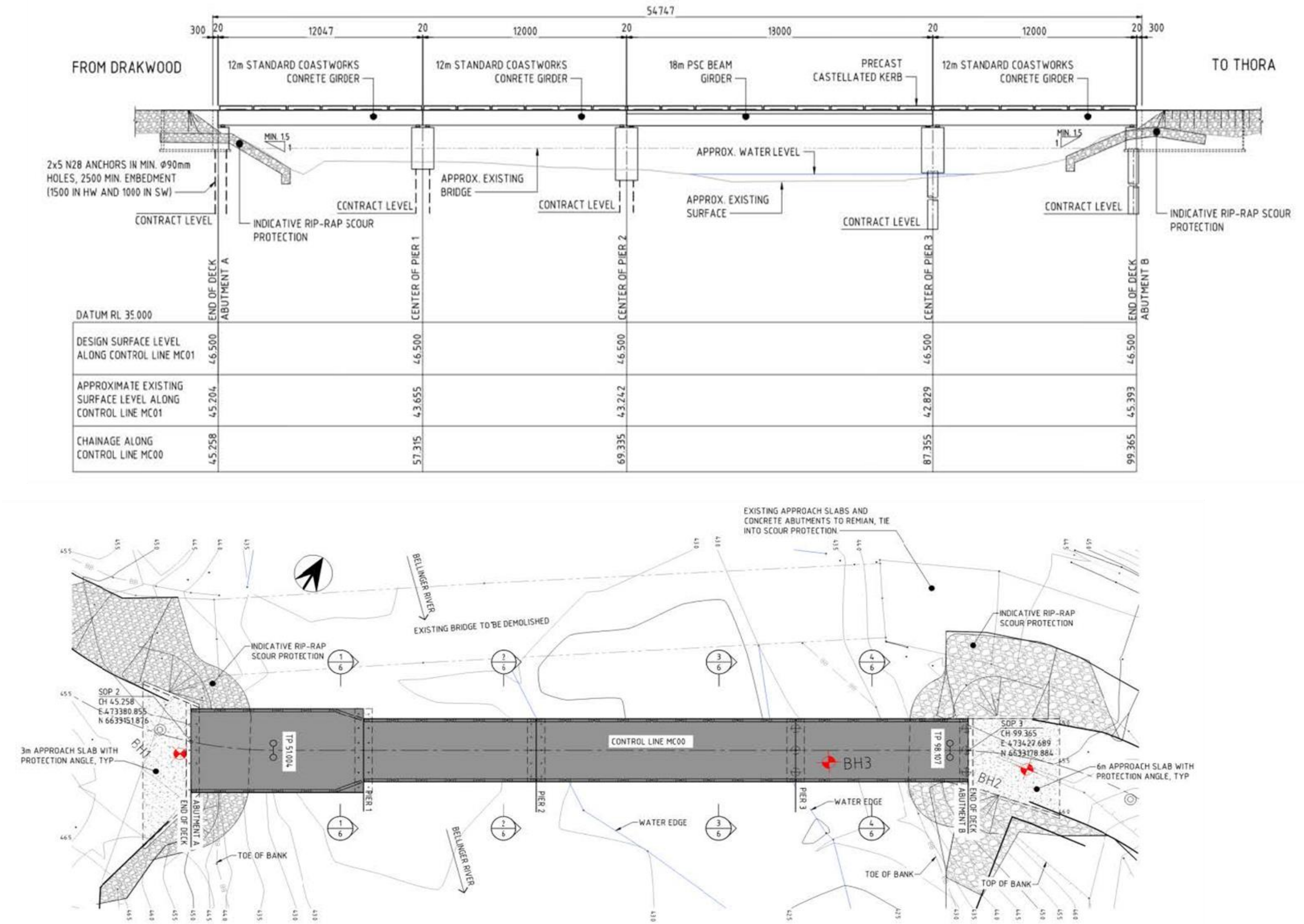
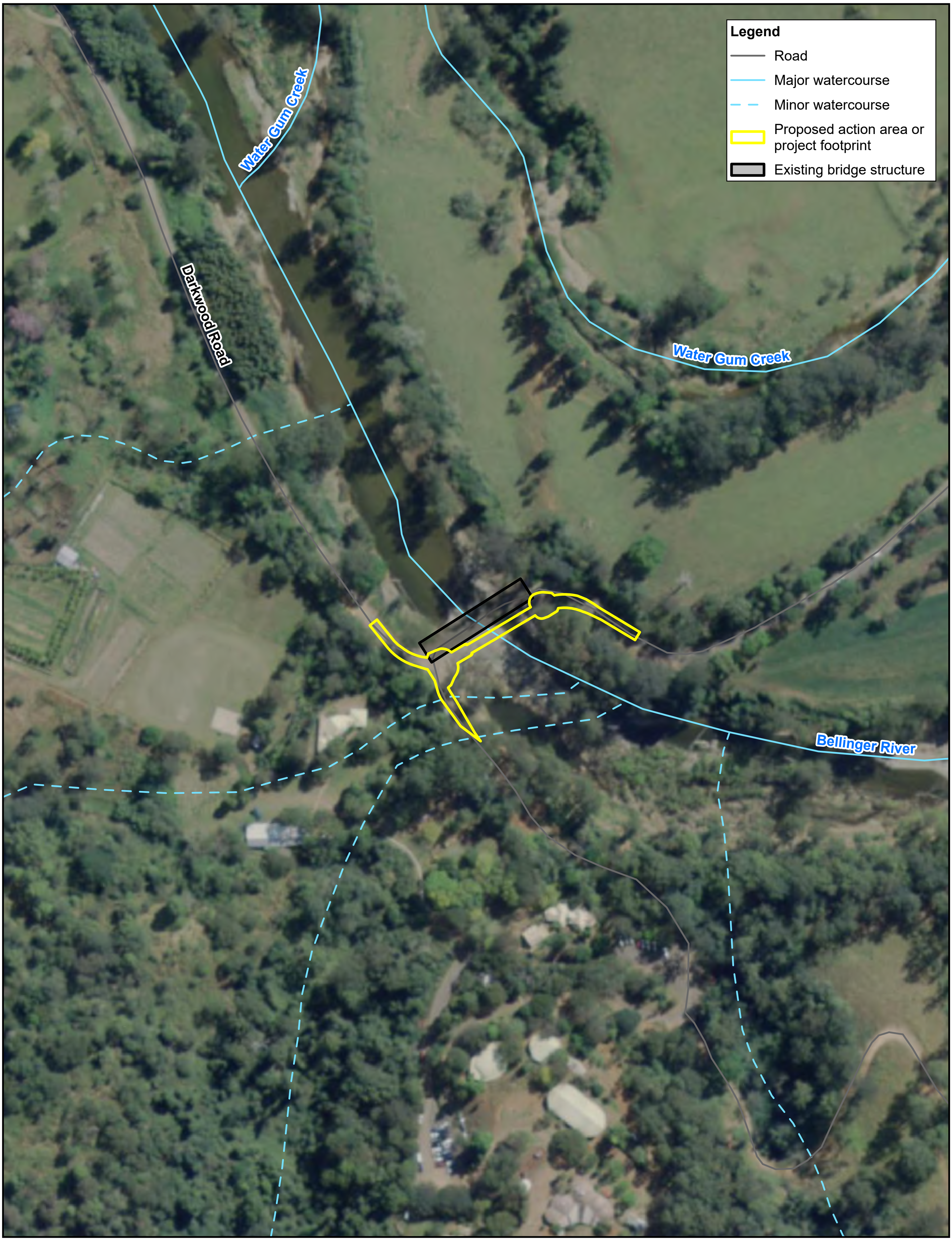


Figure 3.3 ***Hobarts Bridge concept design***



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Hobarts Bridge proposed action footprint and existing bridge structure outline

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FIGURE 3.4

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Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: existing bridge (2023), project footprint (2024); NSWSS: roads, watercourse (2023).
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3.2.4 Justins Bridge

Justins Bridge (Plate 3-3) is located on Darkwood Road, crossing the Bellinger River approximately 26 km west of Bellingen.

The proposed action involves removing the existing 42.5 m four span timber bridge and installing a new 42 m two span, steel/concrete composite bridge structure of increased height on an improved alignment immediately downstream and adjacent to the current footprint. The form of construction will include:

- Foundations will be bored, cast in-situ 600 mm diameter concrete piles for Abutment A and Pier 1, and rock anchors for Abutment B.
- The pier and western abutment (Abutment A) are located on the outer edge of the flow channel. The eastern abutment is located on the bank outside of the flow channel (Abutment B).
- The substructure will consist of cast in-situ concrete abutments and precast concrete in-situ headstocks. Rock scour protection will be placed on the banks surrounding the abutments.
- The super structure is made up of one 12 m bridge beam span and one 30 m spliced steel girder span.
- Trafficable bridge width of 4.5 m.
- All spans will use bolt on concrete kerbs.
- Road approaches will be rebuilt, include 35 m of road works on the eastern side and 60 m on the western side to tie into the existing Darkwood Road.
- The bridge will be raised approximately 1.5 m in height to increase flood immunity.

The proposed action footprint for the proposed activities at this location are approximately 0.05 ha. The concept design for Justins Bridge is shown in Figure 3.5. The construction clearing footprint boundary, and the study area boundary is presented in Figure 3.6. A full design and construction methodology report is provided in Appendix F.

Plate 3-3 Justins Bridge – existing timber structure

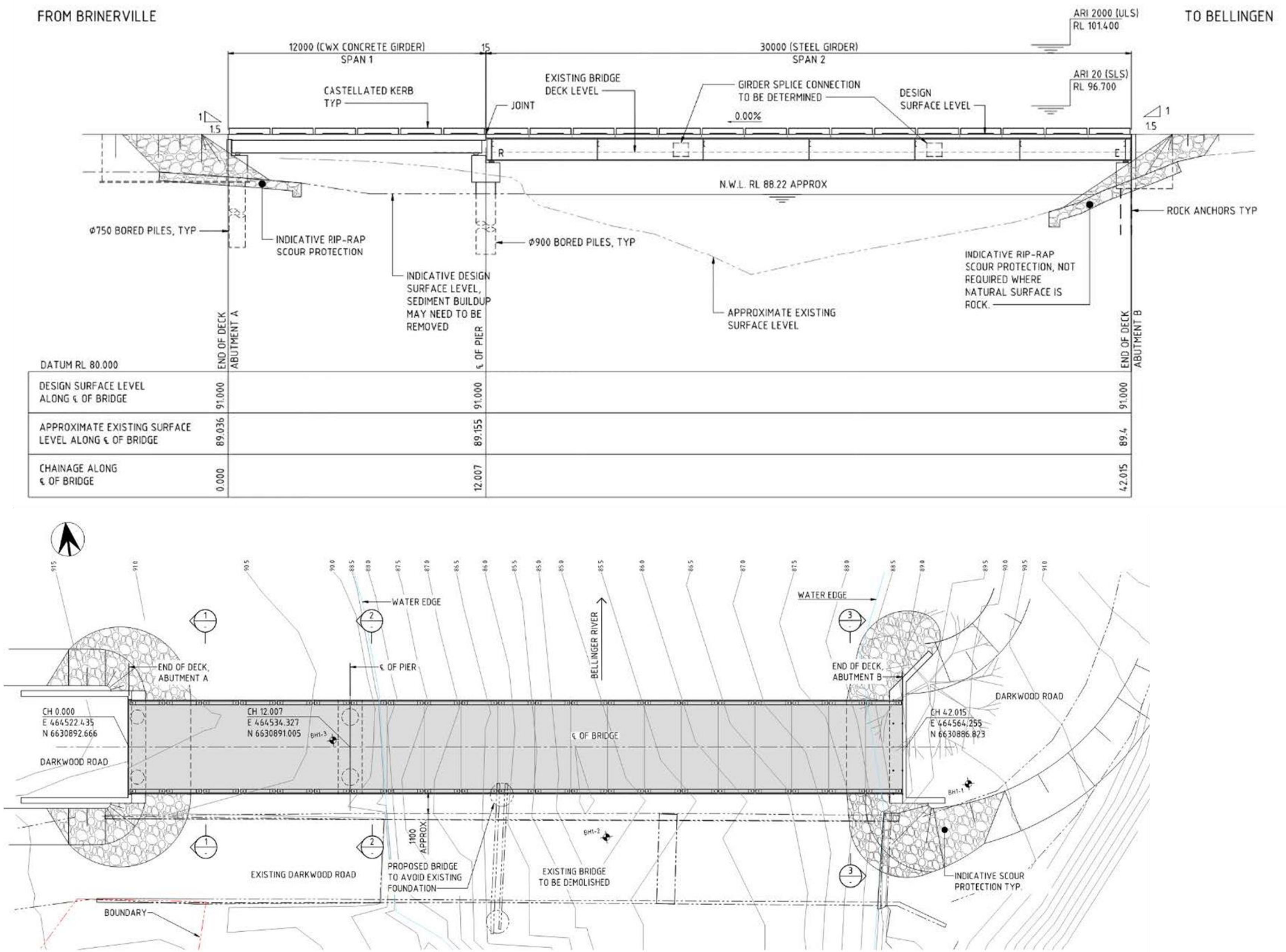

Figure 3.5 Justins Bridge concept design

GHD

Bellingen Shire Council
Bellinger River
Joyces, Hobarts, Justins, and Duffys Bridges
Preliminary documentation

Justins Bridge proposed action footprint and existing bridge structure outline

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FIGURE 3.6

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Created by: thunt2

3.2.5 Duffys Bridge

Duffys Bridge (Plate 3-4) is located on Kalang Road, Kalang, NSW, crossing the Kalang River, and provides local access for the community. BSC intends to replace the existing timber structure due to its current condition. The existing Duffys Bridge is a four-span timber bridge approximately 44 m long with a 4 m wide carriageway. The bridge is a low-level crossing with a deck height at approximately 19.8 m AHD based on previous survey.

The proposed concept bridge design is a 44 m concrete dual lane bridge with an overall bridge width of 7.2 m, providing an approximately 7.1 m carriageway. The bridge deck will have a level of 21.5 m AHD, which is approximately 1.7 m higher than the existing bridge level to provide increased flood immunity to residents. The new bridge is to be constructed downstream of the existing bridge so that access along Kalang Road can be maintained during construction. Typical reinforced concrete abutment and driven piles would be utilised as abutments and piers due to the dense alluvial gravel deposits potentially creating early refusal for driven piles.

The proposed action involves removing the existing 44 m four span timber bridge and installing a new dual lane 51 m (3x17 m) three span, concrete bridge structure of increased height on an improved alignment immediately downstream and adjacent to the current footprint. The form of construction will include:

– Foundations driven steel piles, for abutments and piers.
– The abutments are located on the bank outside of the flow channel.
– Pier 2 is located outside of the low-flow channel.
– Pier 1 is located on the edge of the low-flow channel and bank toe.
– The substructure will consist of cast in-situ concrete abutments, in-situ pile caps, in-situ pier columns and in-situ pier headstocks.
– Rock scour protection will be placed on the banks surrounding the abutments.
– The super structure is made up of three spans of 17 m pre-stressed concrete planks.
– Trafficable bridge width of 7.2 m.
– All spans will use traffic barriers.
– Road approaches will be rebuilt, include approximately 50 m of road works on the to tie into the existing Kalang Road on both sides of the bridge.
– The bridge will be raised approximately 1.5 m in height to increase flood immunity.

The proposed action footprint for the proposed activities at this location are approximately 0.14 ha. The concept design for Duffys Bridge is shown in Figure 3.7. The construction clearing footprint boundary, and the study area boundary is presented in Figure 3.8. The construction methodology and mitigation measures will be consistent with best practice similar to that detailed within the attached construction methodology reports. A full design and construction methodology report is provided in Appendix G.

Plate 3-4 Duffys Bridge – existing timber structure

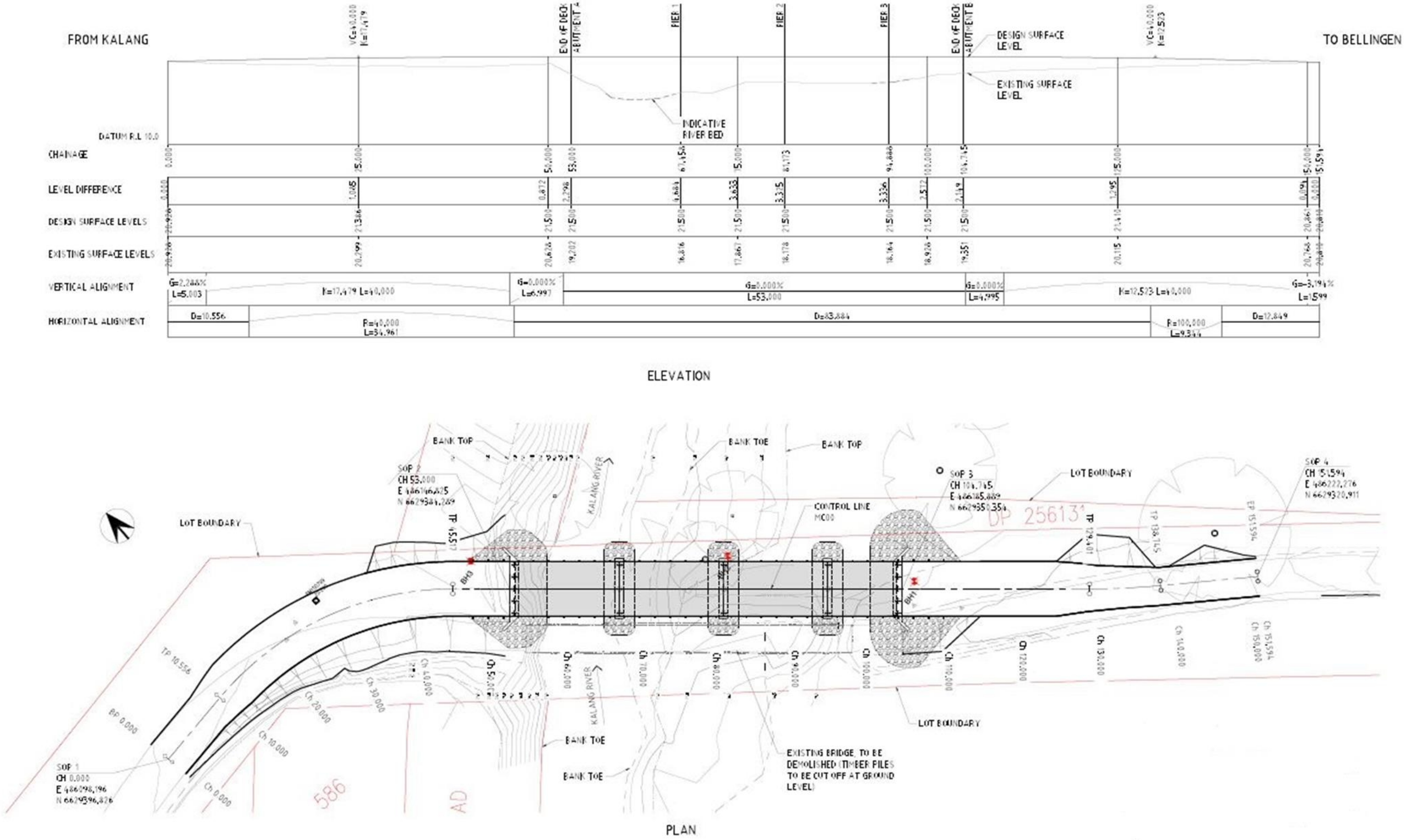


Figure 3.7 Duffys Bridge concept design

Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Bellingen Shire Council
Bellinger River
Joyces, Hobarts, Justins, and Duffys Bridges
Preliminary documentation

Duffys Bridge proposed action footprint and existing bridge structure outline

Project No. 12611463
Revision No. 0
Date 19/09/2024

Sheet 4 of 4

FIGURE 3.8

\\ghdnet\ghd\AU\Coffs Harbour\Projects\22\12611463\GIS\Maps\Deliverables\12611463_PrelimDocumentation.aprx - 12611463_002_BridgeStructures
Print date: 19 Sep 2024 - 14:53

Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: existing bridge (2023), project footprint (2024); NSWSS: roads, watercourse (2023).
Created by: thunt2

3.2.6 Ancillary works

Temporary construction compounds are anticipated to be established nearby to each of proposed action footprints and would be likely to consist of the following:

- Small site shed.
- Equipment laydown area.
- Waste receptacles.
- Construction material.

The compound area would not be established under the dripline of any existing trees. Due to the rural nature of the Projects, high human activity is not expected within the area.

Refuelling, fuel decanting and vehicle maintenance work, if required, would take place in a designated sealed and bunded area within the construction compound area or offsite.

The Project would require a range of construction plant and equipment. The following is an indicative list of equipment that would be required for the project:

- Heavy vehicles associated with earthwork activities and construction including excavator, backhoe, skid steer, tipper, spreaders, roller and delivery trucks, etc.
- Machinery required for the works would include an excavator mounted drilling rig, small excavator, mobile shotcrete plant, small mobile crane, and various hand tools.

3.3 Timing

Works across all four bridge and will occur concurrently. Descriptions and indicative timing of the preconstruction, construction, and operational phases of the proposed action are provided in Table 3.3.

The construction schedule has been designed to avoid high and medium risk works during key threatened fauna breeding seasons as outlined in Table 3.4. In summary, the construction schedule will include:

- High-risk works – Vegetation clearing / earthworks on riverbank, installation of piers and rock anchors, and instream substructure works. All work to be outside the full breeding season of the Bellinger River snapping turtle (including courtship, incubation and hatching - July to February inclusive) and outside key breeding of the giant barred frog (November and February). Therefore, works are allowable from March – June inclusive (4 months).
- Medium risk works – Construction of abutments outside of waterway low-flow channel, construction of superstructure and road approaches. All construction works to be outside nesting season of the Bellinger River snapping turtle (October to January inclusive) and outside key breeding of the giant barred frog (November and February). Therefore, works are allowable from March-September inclusive (7 months).
- Low risk works - Finishing works comprising construction of roads and ancillary bridge components at road level only including barriers signage, road sealing, and concreting. No works on embankments or instream. These works are allowable during any period.

All high-risk works will be completed within the dry season and/or a period of low rainfall and minimal flow. This period will minimise the risk of erosion, run-off and transport of sediment downstream during flooding events. High-risk works include instream works for piling access and approaches, as well as works to construct the bridge substructure.

Construction works are expected to be carried out over an approximate 10-month period (between February and October 2025) for the complete works program at Justins, Hobarts and Joyces bridges. The program at Duffys Bridge runs primarily for the same period but to accommodate works occurring outside of the Bellingen snapping turtle and giant barred frog key breeding seasons, demolition of the existing timber bridge is deferred to April 2026.

Table 3.3 Descriptions of the phases of the proposed action at each bridge site

Construction phase	Activity	Timing	Duration
Joyces Bridge			
Construction Phase 1 – Preliminary works	Set up site compound, laydown and stockpile areas outside of flood zones and roads	February – April 2025	55 days
	– Install erosion and sediment (ERSED) controls in accordance with the ESCP. This will include sediment fencing and floating hydrocarbon booms.	February 2025	10 days
	– Clearing and grubbing surface vegetation and topsoil, stockpiling topsoil.	March 2025	14 days
	– Install access ramps to the waterways to exposed gravel/rock bars. These are mostly within the proposed bridge and scour rock footprints for each site.	March/April 2025	20 days
Construction Phase 1 – Installation of Piers	Install 9 x 600 mm piles (three per headstock) with three concrete headstocks into the bed of the Bellinger River.	Work permitted March to June 2025	4 months
	Remove piling access works.		
Construction Phase 2 – Substructure Construction	Using prefabricated wing walls and casting the 950 mm wide abutments in place, each with 2 x 600 mm piles bored into bedrock.		
Construction Phase 3 – Superstructure Construction	Install scour rock around abutments to the toe of the bank keyed into high banks upstream and downstream.	Work permitted March to September 2025	7 months
	Construction of bridge deck structures - place beams and girders, place or pour concrete decks, backfill to abutments, stitch pour where applicable.		
Construction Phase 4 – Road Construction	Reshape road approaches to bridges.	October/November 2025	10 days
Construction Phase 5 – Demolition of Existing Bridges and Rehabilitation	Remove all decking and girders, partially remove abutments to improve tie-in, leaving existing piers, concrete headstocks and majority of abutments to minimise disturbance to bed and banks.	April to September	6 months
	Finalise scour rock placement.		
	Rehabilitate site, including plantings and temporary erosion and sediment controls to remain for three months or until stable.		
Operational Phase	Maintenance works including: – Vegetation control (e.g., mowing, herbicide treatments, weed removals and grass slashing). – Line marking, pavement repairs and road resurfacing. – Maintenance of drainage structures and stormwater quality devices, including removal of sediment and debris. – Repair and replacement of road furniture including guardrails, signs, barriers, fencing and guide markers. – Structure maintenance including bridges.	N/A	N/A
Decommissioning	Decommissioning will be in accordance with the relevant legislation at the time of decommissioning.	N/A	N/A

Construction phase	Activity	Timing	Duration
Hobarts Bridge			
Phase 1 – Preliminary works	Set up site compound, laydown and stockpile areas outside of flood zones and roads.	February – April 2025	55 days
	– Install erosion and sediment controls in accordance with the ERSED Control Plan.	February 2025	10 days
	– Clearing and grubbing surface vegetation and topsoil, stockpiling topsoil.	March 2025	14 days
	– Install access ramps to the waterways to exposed gravel/rock bars. These are mostly within the proposed bridge and scour rock footprints for each site.	March/April 2025	20 days
Phase 1 – Installation of Piers	Install three concrete blade piers 1,300 mm wide x 4,655 – 6,240 mm long, each anchored into the bed of the Bellinger River by 3 x 600 mm bored piles or N28 anchors.	Work permitted March to June	4 months
	Remove piling access works.	July 2025	10 days
Phase 2 – Substructure Construction	Using prefabricated wing walls and casting the 1,200 mm high abutment in place, with 3 x 600 mm embedded piles bored into bedrock.		
Phase 3 – Superstructure Construction	Install scour rock around abutments to the toe of the bank keyed into high banks upstream and downstream.	Work permitted March to September	7 months
	Construction of bridge deck structures - place beams and girders, place or pour concrete decks, backfill to abutments, stitch pour where applicable.	July/August 2025	20 days
Phase 4 – Road Construction	Reshape road approaches to bridges.	August/September 2025	15 days
Phase 5 – Demolition of Existing Bridges and Rehabilitation	Remove decking, girders and headstocks outside of the low flow area (of those constructed of timber) but leaving existing abutments and concrete piers to minimise disturbance to bed and banks.	Works permitted April to September	6 months
	Finalise scour rock placement.	September 2025	10 days
	Rehabilitate site, including plantings and temporary erosion and sediment controls to remain for three months or until stable.	September 2025	10 days
Operational Phase	Maintenance works including: – Vegetation control (e.g., mowing, herbicide treatments, weed removals and grass slashing). – Line marking, pavement repairs and road resurfacing. – Maintenance of drainage structures and stormwater quality devices, including removal of sediment and debris. – Repair and replacement of road furniture including guardrails, signs, barriers, fencing and guide markers. Structure maintenance including bridges.	N/A	N/A
Decommissioning	Decommissioning will be in accordance with the relevant legislation at the time of decommissioning.	N/A	N/A

Construction phase	Activity	Timing	Duration
Justins Bridge			
Phase 1 – Preliminary works	Set up site compound, laydown and stockpile areas outside of flood zones and roads.	February – March 2025	55 days
	– Install ERSED controls in accordance with the ERSED Control Plan. This will include sediment fencing and floating hydrocarbon booms.	February 2025	10 days
	– Clearing and grubbing surface vegetation and topsoil, stockpiling topsoil.	March 2025	15 days
	– Install access ramps to the waterways to exposed gravel/rock bars. These are mostly within the proposed bridge and scour rock footprints for each site. Access to Justins Bridge site on the eastern side will be from the existing road shoulder.	March/April 2025	20 days
Phase 1 – Installation of Piers	Install two rows of 3 x 600 mm bored piles into the bed of the Bellinger River with a concrete headstock cast in situ.	Work permitted March to June	4 months
	Remove piling access works.	April/May 2025	20 days
Phase 2 – Substructure Construction	Using prefabricated wing walls and casting the 1,000 mm wide, 900 mm deep abutments in place, with 2 x 600 mm piles bored into bedrock or rock anchors.		
Phase 3 – Superstructure Construction	Install scour rock around abutments to the toe of the bank keyed into high banks upstream and downstream.	Work permitted March to September	7 months
	Construction of bridge deck structures - place beams and girders, place or pour concrete decks, backfill to abutments, stitch pour where applicable	June/July 2025	10 days
Phase 4 – Road Construction	Reshape road approaches to bridges.	July/August 2025	15 days
Phase 5 – Demolition of Existing Bridges and Rehabilitation	Remove all decking and girders, remove timber headstocks and steel components, cut off timber piles to bed level, leaving concrete piers and headstocks over the water and removing existing abutments.	Work permitted April to September	6 months
	Finalise scour rock placement.	August 2025	10 days
	Rehabilitate site, including plantings and temporary erosion and sediment controls to remain for three months or until stable.	August 2025	10 days
Operational Phase	Maintenance works including: – Vegetation control (e.g., mowing, herbicide treatments, weed removals and grass slashing). – Line marking, pavement repairs and road resurfacing. – Maintenance of drainage structures and stormwater quality devices, including removal of sediment and debris. – Repair and replacement of road furniture including guardrails, signs, barriers, fencing and guide markers. Structure maintenance including bridges.	N/A	N/A
Decommissioning	Decommissioning will be in accordance with the relevant legislation at the time of decommissioning.	N/A	N/A

Construction phase	Activity	Timing	Duration
Duffys Bridge			
Phase 1 – Preliminary works	Set up site compound, laydown and stockpile areas outside of flood zones and roads.	February – April 2025	60 days
	– Install erosion and sediment (ERSED) controls in accordance with the ERSED Control Plan.	February 2025	10 days
	– Clearing and grubbing surface vegetation and topsoil, stockpiling topsoil.	March 2025	3 days
	– Install access ramps to the waterways to exposed gravel/rock bars. These are mostly within the proposed bridge and scour rock footprints for each site.	March/April 2025	20 days
Phase 1 – Installation of Piers	Pier 1 and 2 – install two rows of five driven piles (10 per pile cap) into the bed of the Kalang River with two concrete headstocks cast in situ.	Works permitted between March and June	4 months
	Remove piling access works.	April – August 2025	72 days
Phase 2 – Substructure Construction	Casting in situ abutments, wing walls, pile caps, columns and headstocks in place, with five driven piles per abutment. No anchors are to be used.		
Phase 3 – Superstructure Construction	Install scour rock around abutments to the toe of the bank keyed into high banks upstream and downstream.	Works permitted between March and September	7 months
	Construction of bridge deck structures - place beams and girders, place or pour concrete decks, backfill to abutments, stitch pour where applicable.	August/September 2025	38 days
Phase 4 – Road Construction	Reshape road approaches to bridges.	September/October 2025	19 days
Phase 5 – Demolition of Existing Bridges and Rehabilitation	Remove the deck, cutting the existing timber piers to bed level, but leaving the abutments to minimise disturbance to bed and banks.	Works permitted between April and September	6 months
	Finalise scour rock placement.	April 2026	15 days
	Rehabilitate site, including plantings and temporary erosion and sediment controls to remain for three months or until stable.	April 2026	15 days
Operational Phase	Maintenance works including: – Vegetation control (e.g., mowing, herbicide treatments, weed removals and grass slashing). – Line marking, pavement repairs and road resurfacing. – Maintenance of drainage structures and stormwater quality devices, including removal of sediment and debris. – Repair and replacement of road furniture including guardrails, signs, barriers, fencing and guide markers. Structure maintenance including bridges.	N/A	N/A
Decommissioning	Decommissioning will be in accordance with the relevant legislation at the time of decommissioning.	N/A	N/A

Table 3.4 Construction schedule avoidance of threatened fauna breeding seasons

Species	Description of Breeding	Breeding period*											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bellinger River snapping turtle	Females can be gravid (with eggs) from September/October to December with an incubation time of 60 day. Full breeding season including courtship/mating extends from July to February inclusive.												
Giant barred frog	Breeding season occurs from spring to autumn with peak periods in November and February.												
Construction Activity	**Description of Works**	**Construction Schedule***											
		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
High Risk	Instream work - vegetation clearing/earthworks on riverbank, installation of piers and rock anchors, instream substructure works.												
Medium Risk	Embankment and superstructure work - Construction of abutments outside of waterway low-flow channel, construction of superstructure and road approaches.												
Low Risk	Finishing works - Construction of roads and ancillary bridge components at road level only including barriers signage, road sealing, concreting.												
High Risk	Demolition - Demolition of existing timber bridges.												

*Key:

Peak breeding season		Works not permitted	
Breeding season (non-peak)		Works permitted	
Non-breeding season			

3.4 Related actions

The proposed action is not related to any other actions that are being or will be taken in the region, that the proponent is aware of.

3.5 Consultation

The project forms part of BSC's Bridge Renewal Program with information on the nature, timing and location of works as well as the environmental assessment and approvals processes described and discussed on the BSC website.

A referral was submitted on 13 February 2024 (EPBC referral number: EPBC 2024/09805) to the Commonwealth DCCEEW in accordance with section 68 of the EPBC Act for the Ministers decision whether or not the action is a controlled action for the purposes of the EPBC Act, requiring further assessment and approval. On 8 July 2024 the project was determined to be a controlled action under section 75 of the EPBC Act. The proposed action is to be assessed by preliminary documentation (this report) under Section 95(1) of the EPBC Act.

Separately, the project was assessed under Part 5 Division 5.1 of the EP&A Act and Part 7 of the BC Act. BSC undertook engagement and consultation with the former NSW Department of Planning and Environment (now DPHI) and BCD (within NSW DCCEEW), respectively. As part of the assessment for the proposed works a Draft SIS was issued to BCD and made available for public review and comment between 20 August 2024 and 20 September 2024. The Draft SIS is included in Appendix C.

Subject to receipt of approvals, BSC will undertake engagement with relevant stakeholders, including relevant Aboriginal parties in accordance with BSC practices and policies.

Under the requirements of Clauses 2.10- 2.17 of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (the 'T&I SEPP') and pursuant to Clause 2.13 (2) (h), the State Emergency Service has been notified.

4. Listed threatened species

4.1 Overview

An ecological assessment has been undertaken for the Project, which included a desktop review of government records and environmental mapping layers, a review of previous studies undertaken for the Project, and field surveys. The methodology for the ecological assessment is detailed in Section 4.2.2 and Section 4.3.2.

The desktop searches identified the potential presence of several threatened ecological communities (TECs), threatened flora and fauna species, and migratory species within the proposed action area. An assessment was conducted to attribute a 'likelihood of occurrence' to TECs, threatened flora and fauna, and migratory species that have been previously recorded or are predicted to occur within the proposed action area.

The likelihood of occurrence assessment found that all flora species identified in the desktop searches are unlikely to occur. No threatened flora species were identified within the proposed action area during field surveys.

The likelihood of occurrence assessment found several fauna species that were confirmed present or likely to occur, which include the Bellinger River snapping turtle and the giant barred frog identified as being impacted by the proposed action and discussed further in Section 4.2 and Section 4.3, respectively.

The existing flora and fauna are described in Appendix B MNES Report and Appendix C SIS Report.

4.2 Bellinger River snapping turtle

4.2.1 Conservation status and species profile

The Bellinger River snapping turtle is listed as critically endangered under the EPBC Act (DCCEEW, 2023) and the NSW BC Act.

The Bellinger River snapping turtle is only known from the Bellinger River catchment, on the north coast of NSW. The species range is small, within the catchment it is restricted to the Bellinger River, lower Rosewood River and Never Never River, and potentially in the Kalang River. This species was recently heavily impacted by a disease outbreak of the Bellinger River virus (a nidovirus variant), resulting in an associated mortality event (Zhang et al., 2018). Due to the impact of the disease, the Bellinger River snapping turtle is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment, and the health/survival of individuals. Best practice techniques have been selected for avoidance, mitigation and management of potential impacts. The methods proposed are known to be effective at protecting aquatic environment and species. Monitoring will be conducted throughout the construction works to assess actual risks against those expected and allow for adaptive management if required. Given the susceptibility of the species to disease and the risk that any impact on the species can have on the viability of the population, measures will be implemented to support the active protection of the species throughout construction. Based on the avoidance and mitigation measures proposed, the project is not expected to exacerbate the effects of the Bellinger River virus on the Bellinger River snapping turtle.

The Bellinger River snapping turtle follows a type III survivorship meaning the species has very high mortality early in life with fatalities in the population reducing with age; the result is a population with a higher number of large adults (Blamires et al., 2005). Consequently, the Bellinger River snapping turtle population is sensitive to changes in adult survivorship. There is limited information available on the nesting and breeding patterns of the Bellinger River snapping turtle; however, it has been recognised that females can be gravid (with eggs) from September/October to December (Cann et al., 2015; NSW Scientific Committee (NSC), 2016; TSSC, 2016). The full breeding season of the species extends from July to February inclusive, which includes courtship and an egg incubation period of a 60-72-days. Based on the few nesting sites studied, eggs are thought to be laid in excavations on sandy riverbanks typically within 10 m of the water's edge in heavily vegetated areas (Blamires et al., 2005). The species lays approximately 1-2 clutches per year with individual egg weight ranging between 4 to 6.1 grams (g) (Cann et al., 2015). The clutch size averages between 10 – 25 eggs (Blamires et al., 2005; TSSC, 2016; Coggers, 2014).

4.2.2 Known records

There is limited historical species records for the Bellinger River snapping turtle within public databases. In the last five years between 2018 and 2022, the Bellinger River snapping turtle has been recorded during 48 different survey events undertaken in the Bellinger River catchment by the NSW BCD (BCD, 2022). Public records were highest in 2018, with 23 sightings, while in 2019, turtle records significantly decreased to only three sightings (ALA, 2023); however, this is based on citizen science and anecdotal records rather than a reflection of targeted survey efforts and not indicative of the population as a whole.

Due to its conservation status, records of the Bellinger River snapping turtle are generalised and are presented in a repeated grid pattern in ALA (2024). While the specific locations of the historical records are not provided, it can be determined that the species occurs within the Bellingen region, and within the Proposed action footprint and based on BCD surveys.

Figure 4.1 presents the historical occurrences of Bellinger River snapping turtle across the broader locality of the proposed action areas (OEH, 2024).

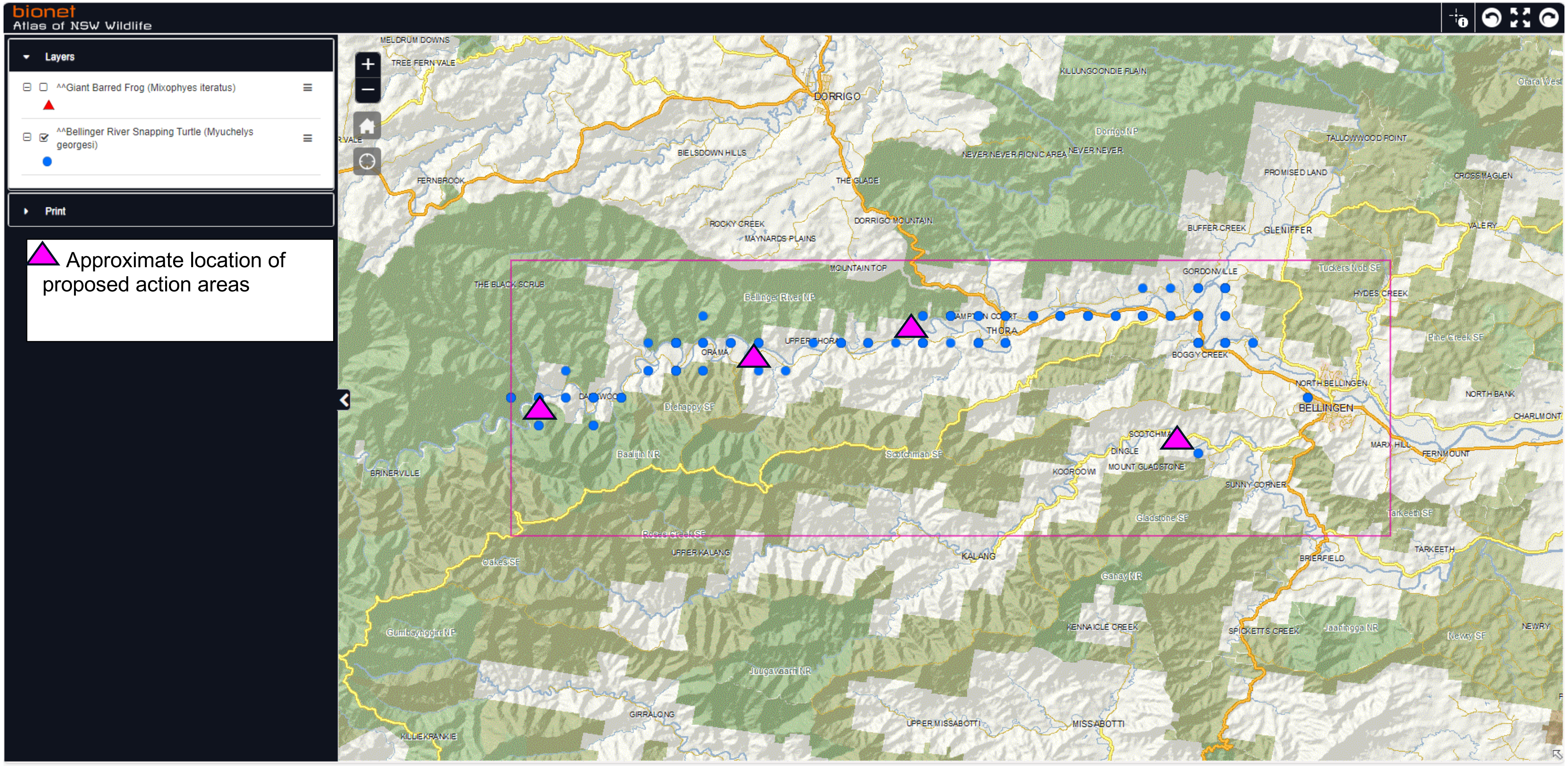


Figure 4.1 BioNet species sightings search results for Bellinger River snapping turtle in broad locality of the proposed action areas (BioNet 2024)

4.2.3 Survey methods

No targeted survey was undertaken for the Bellinger River snapping turtle. Surveys for Bellinger River snapping turtle have been undertaken in the Bellinger River since 2015 by the NSW BCD of the DP&E (2022). The surveys conducted by the BCD were part of the NSW Saving our Species program as only a small number of individuals have been confirmed present in recent years (NSW DP&E, 2022). Therefore, additional targeted surveys were not required, and the species was assumed likely to occur at all sites.

An ecological assessment was undertaken for the Project, which included a desktop review of government records and environmental mapping layers, a review of previous studies undertaken for the Project, and field surveys. Field surveys of the Proposed action footprints were conducted in July and in November to December 2023 to identify and assess threatened species impact for flora and fauna from the proposed remediation works on Joyces, Hobarts, Justins, and Duffys Bridges. During the surveys, opportunistic observations and habitat assessments were utilised for the Bellinger River snapping turtle. The criteria used to map predicated Bellinger River snapping turtle habitat was based on the habitat description as per Commonwealth *Conservation Advice Wollumbinia georgesi Bellinger River snapping turtle* (TSSC, 2016): *species has preference for moderate to deep pools with a rocky substrate*. A summary of the survey effort for fauna surveys across all sites is outlined in Table 4.1 and there were no access limitations during the field surveys. An overview of the survey effort for the Bellinger River snapping turtle is outlined in Table 4.2.

Table 4.1 Overview of total survey effort within the proposed action area

Field survey dates	Company	Team & scope	Fauna survey effort
12 July 2023	Idyll Spaces Environmental Consultants	1 ecologist Flora and fauna habitat survey	Opportunistic observations Aural and visual surveys Habitat assessments Diurnal bird surveys
27 November – 1 December 2023	GHD	2 ecologists Targeted fauna survey	Targeted fauna searches Aural and visual surveys Anabat detectors Remote cameras Diurnal bird surveys Habitat assessments Opportunistic observations Spotlight area searches

Table 4.2 Overview of the Bellinger River snapping turtle survey guidelines and effort within the proposed action area

MNES	Commonwealth guidelines	NSW Guidelines	Survey effort
Bellinger River snapping turtle	No survey guidelines.	No targeted survey required. Survey method guidelines available under the Threatened reptiles BAM survey guide (DP&E, 2022)	Opportunistic observations Habitat assessments *Note: The species population size is extremely limited, the NSW Government regularly undertakes surveys as part of the NSW Government's Saving our Species program, and only a small number have been confirmed present in recent years (NSW DP&E, 2022). Targeted surveys were therefore not conducted, and the species was assumed likely to occur at all sites.*

4.2.4 Survey results

4.2.4.1 Records

As discussed in Section 4.2.3, surveys for Bellinger River snapping turtle have been undertaken in the Bellinger River since 2015 by the New South Wales Biodiversity and Conservation Division (BCD) of the Department of Planning and Environment (DPE 2022). BCD estimates there are approximately 200 wild Bellinger River snapping turtle within 60 – 70 km of the Bellingen River (DPE 2022). There is an active captive-bred program where immature turtles are released into the river. DPE believe that there is a Bellinger River snapping turtle population persisting in the Kalang River, albeit it small (DPE 2022). Since 2018, 179 captive-bred immature Bellinger River snapping turtle have been released into Bellinger River, with one of the release sites being upstream of Justins Bridge. The location, health and movement of some of these turtles are monitored by DPE through radio tracking (DPE 2022). Two wild Bellinger River snapping turtle have been caught directly upstream of Justins Bridge within the proposed action area, the most recent being in 2020 (DPE 2022). NSW BCD has advised they are unsure how many wild or captive-bred turtles occur near the bridge sites near the Proposed action footprint as they can be cryptic and difficult to locate (DPE 2022).

No records of the Bellinger River snapping turtle were recorded during the surveys between the 27 November – 1 December 2023.

4.2.4.2 Habitat

Suitable habitat for the Bellinger River snapping turtle was confirmed present within permanent watercourses within the proposed action area at Joyces Bridge, Hobarts Bridge, Justins Bridge and Duffys Bridge.

There are no PCTs associated with preferred habitat for the Bellinger River snapping turtle. The preferred habitat of the Bellinger River snapping turtle listed in the species conservation advice is moderate to deep pools with rock substrates (TSSC, 2016). Their habitat is patchily distributed within their distribution; however, the species can disperse up- and downstream during standard river flow and flood conditions (Blamires and Spencer, 2013; Cann et al., 2015; NSW Scientific Committee (NSC), 2016; TSSC, 2016). The Bellinger River snapping turtle rarely disperses overland as the species is primarily aquatic; however, the turtle has been observed to utilise fallen trees on the river and the bank to bask (Cann et al., 2015; NSW Scientific Committee (NSC), 2016). *Wollumbinia* species are classed as dietary specialists (Spencer et al., 2014), predominantly consuming macroinvertebrates, with some intake of terrestrial fruit and aquatic vegetation such as V*allisneria sp.)* (Allanson and Georges, 1999).

There is limited information available on the nesting habitat of the Bellinger River snapping turtle; however, based on the few nesting sites studied, eggs are thought to be laid in excavations on sandy riverbanks typically within 10 m of the water's edge in heavily vegetated areas (Blamires et al., 2005).

High quality habitat for the Bellinger River snapping turtle was confirmed present within permanent watercourses within the Proposed action footprints at Joyces Bridge, Hobarts Bridge, Justins Bridge and Duffys Bridge. This habitat was considered to be suitable habitat for foraging and nesting for the species.

There is no formal definition of habitat critical to the survival of the species for the Bellinger River snapping turtle, as such, the Commonwealth Significant impact guidelines 1.1. (DoE, 2013) definition applies. Based on the species restricted distribution, habitat across the Study area is considered habitat critical to the survival of the species on the basis that the habitat is necessary for:

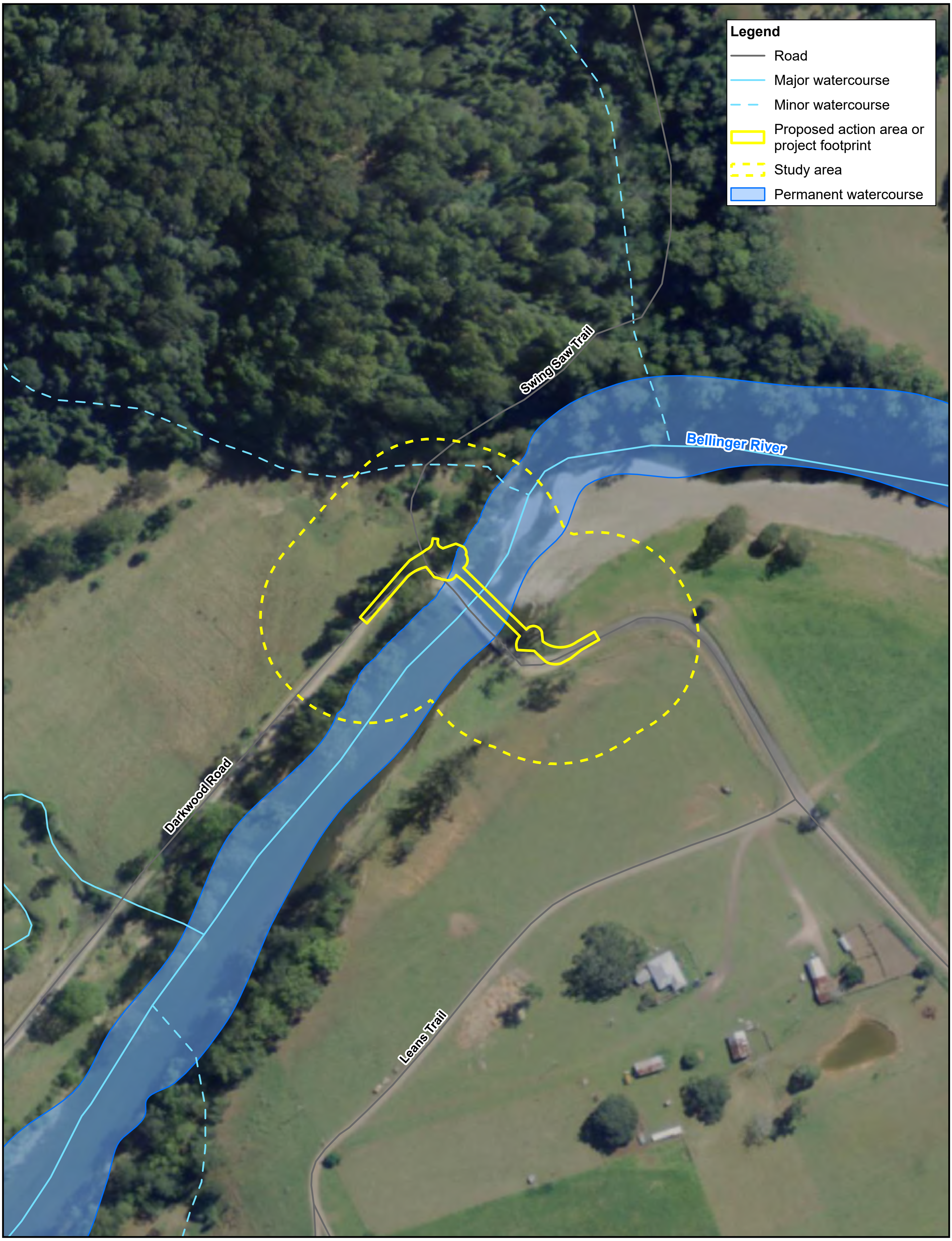
– Foraging, breeding and dispersal
– Long-term maintenance of the species
– Maintaining genetic diversity
– The recovery of the species

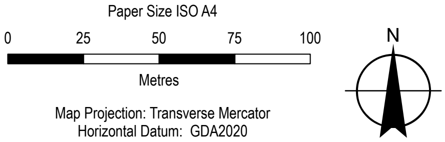
All permanent watercourse habitat within the proposed action area were mapped as predicted habitat for the Bellinger River snapping turtle. The area of potential habitat for the species within the proposed action footprint is estimated to be a total of 0.064 ha of high quality habitat.

Site specific habitat features and for the Bellinger River snapping turtle occurring within the proposed action area are described in Table 4.3.

Table 4.3 Key habitat features for Bellinger River snapping turtle at each bridge

Bridge	Key habitat features
Justins Bridge	Long stretch of riverbank suitable for nesting habitat (>8 m), benthic substrate, consolidated and unconsolidated rock, with gravel sediment suitable for foraging. At least two river snags for foraging and basking. Potential Bellinger River snapping turtle nesting habitat occurs within the proposed action area. This habitat is considered to be high quality.
Joyces Bridge	Long stretch of riverbank suitable for nesting habitat (>16 m), benthic substrate, consolidated and unconsolidated rock, with gravel sediment suitable for foraging. Aquatic vegetation, including several small clumps of *Vallisneria sp.* downstream, are present for foraging. Multiple river snags for foraging and basking. This habitat is considered to be high quality.
Hobarts Bridge	Long stretch of riverbank suitable for nesting habitat (>15 m), benthic substrate, consolidated and unconsolidated rock, with gravel sediment suitable for foraging. Aquatic vegetation for foraging. Multiple river snags for foraging and basking. This habitat is considered to be high quality.
Duffys Bridge	Long stretch of riverbank suitable for nesting habitat (>19 m), benthic substrate, consolidated and unconsolidated rock, with gravel sediment suitable for foraging. Aquatic vegetation for foraging. Multiple river snags for foraging and basking. This habitat is considered to be high quality.





Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellinger River
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Preliminary documentation

Joyce's Bridge Bellinger River Snapping Turtle survey results and habitat

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FIGURE 4.2

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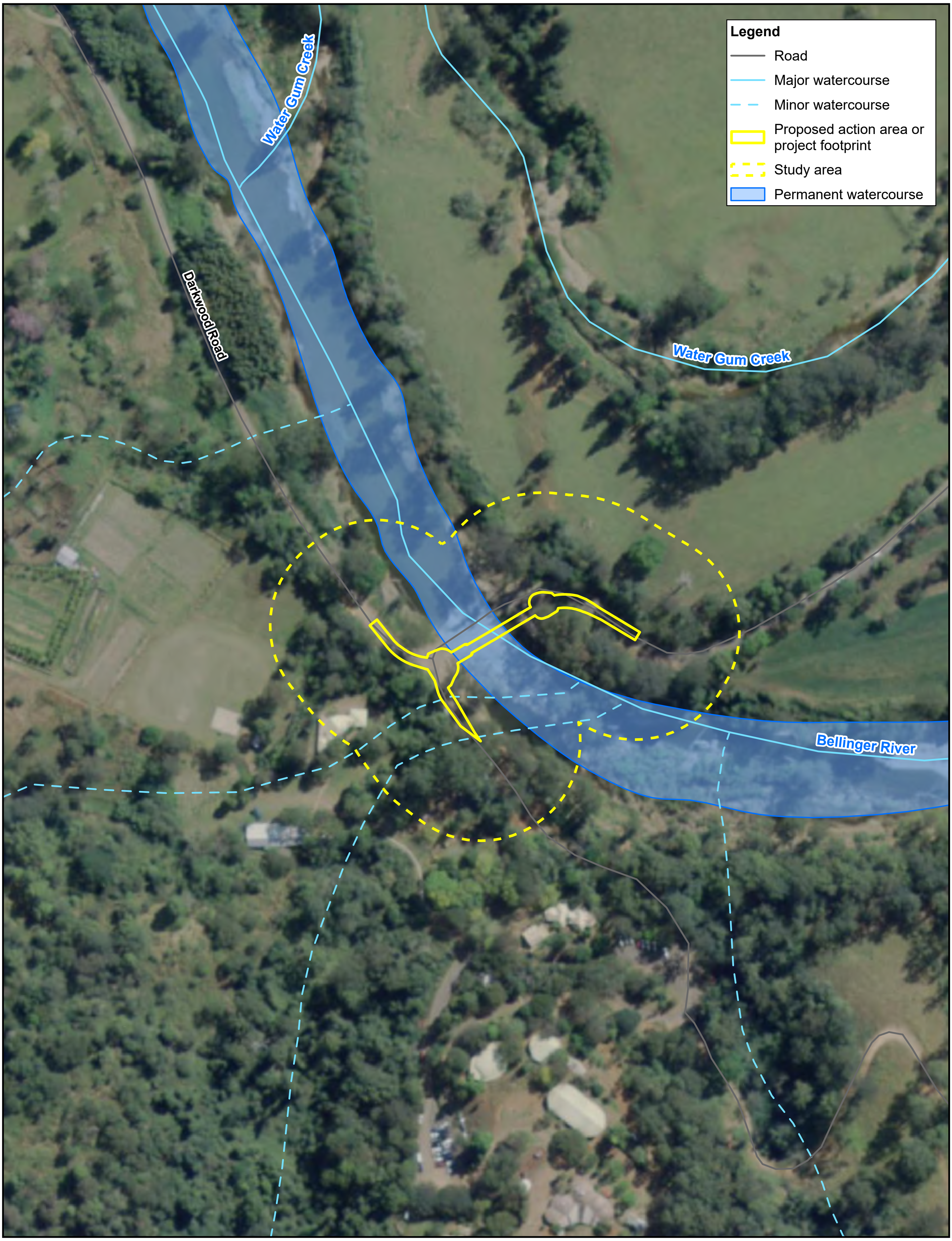

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Hobarts Bridge Bellinger River Snapping Turtle survey results and habitat

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Date 19/09/2024

Sheet 2 of 4

FIGURE 4.2

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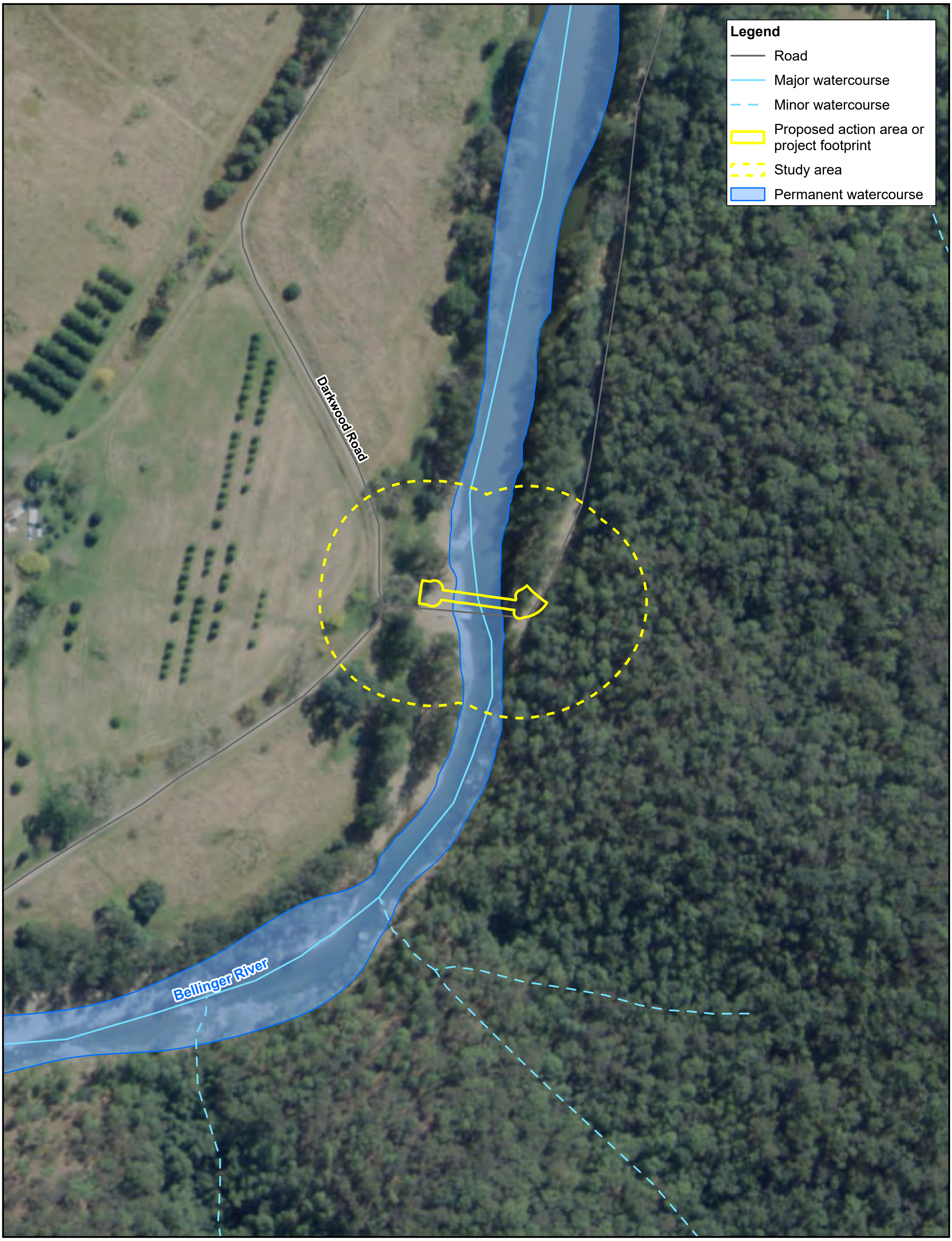

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Preliminary documentation

Justins Bridge Bellinger River Snapping Turtle survey results and habitat

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FIGURE 4.2

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Duffys Bridge Bellinger River Snapping Turtle survey results and habitat

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Date 19/09/2024

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FIGURE 4.2

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4.2.5 Population

4.2.5.1 Population size and extent

BCD estimates there are approximately 200 wild Bellinger River snapping turtle within a 60 – 70 km stretch of the Bellingen River (DP&E, 2022). DP&E believe that there is also a small Bellinger River snapping turtle population persisting in the Kalang River (DP&E, 2022). There is an active captive-breeding program where immature turtles are released into the river. Since 2018, 179 captive-bred immature Bellinger River snapping turtle have been released into the Bellinger River. The location, health and movement of some of these turtles are monitored by DP&E through radio tracking (DP&E, 2022). NSW BCD has advised they are unsure how many wild or captive-bred turtles occur near the proposed action area as they can be cryptic and difficult to locate (DP&E, 2022).

4.2.5.2 Important populations

The Bellinger River snapping turtle is endemic to the Bellinger River catchment in the coastal north of NSW. Within the catchment, bordering the Bellinger River and Dorigo National Parks, the species is restricted to Bellinger River, Kalang River, and the lower parts of Rosewood River and Never Never River (Blamires et al., 2005; NSW Scientific Committee (NSC), 2016).

There is no formal definition of important populations for the Bellinger River snapping turtle. The concept of ‘important populations’ is generally not applicable to critically endangered listed species as the Commonwealth Significant Impact Assessment (SIA) considers the impacts of the Project on the whole of the ‘population’. Bellinger River snapping turtle Therefore, the Commonwealth Significant impact guidelines 1.1 (DoE, 2013) definition of an important population applies.

With the species constrained distribution, the population within the Study area is considered important on the basis that they are key source population for breeding or dispersal and are necessary for maintaining genetic diversity.

4.2.5.3 Occupancy trends

The Bellinger River snapping turtle exhibits distinct seasonal and daily occurrence patterns. Seasonally, these turtles are notably more active during the warmer months, with their breeding season extending from late spring to early summer (Blamires et al., 2005). During cooler periods, particularly in winter, they may enter a state of reduced activity or brumation (Chessman et al., 2002). Freshwater turtles are primarily diurnal, with increased activity and basking observed in the morning and early afternoon. They tend to forage more actively during daylight hours, although their activity decreases during cooler parts of the day and night. These behavioural patterns are influenced by environmental factors such as temperature and water levels, which significantly affect their daily and seasonal routines (Coleman & Deeth, 2022). Climate change poses several threats to the Bellinger River snapping turtle, including altered temperature regimes that may affect its reproductive success and metabolic rates. Changes in rainfall patterns can impact the availability and quality of aquatic habitats, such as breeding pools and foraging areas (Cann et al., 2015; NSW Scientific Committee (NSC), 2016; TSSC, 2016). Increased frequency of extreme weather events and rising temperatures may also exacerbate habitat degradation and disrupt the turtle’s life cycle, ultimately threatening its survival (Ali et al., 2018).

4.2.6 Key threatening processes

The Bellinger River snapping turtle population have suffered declines due to the following threats, as detailed in the Commonwealth conservation advice for the species (TSSC, 2016):

- Disease and the Bellinger River snapping turtle mortality event
- Limited distribution and specific habitat requirements
- Predation by lace monitors (*Varanus varius*) and foxes (*Vulpes vulpes*)
- Alteration to water quality
- Hybridisation with the Murray River turtle (*Emydura macquarii*)

The species' main threat has been a disease outbreak that caused mass mortality in 2015 and resulted in a substantial decline in the Bellinger River snapping turtle population and distribution (Zhang et al., 2018). Four hundred and thirty-three individuals are confirmed to have died following the outbreak (New South Wales Scientific Committee (NSC), 2016), although the actual number is unknown and likely much higher as a majority of the infected individuals were found on shore close to the river. According to Chessman et al., (2020), an unknown virus now recognised as the 'Bellinger River virus', was responsible for the high mortality rate of the species and lead to the species being listed as critically endangered under the EPBC Act (DCCEEW, 2023).

Infected individuals display symptoms of blindness resulting from growths around the eye (also known as septicaemic cutaneous ulcerative disease) with a 100% mortality rate. No other animals, including the Murray River Turtle (*Emydura macquarii*), appeared to be affected. Nucleic acid sequencing of the virus isolate has identified the entire genome and indicates that this is a novel nidovirus (Zhang et al., 2018). While sources of the outbreak are unknown and difficult to determine with certainty, river conditions in the lead up to the event were reported to be 'extremely low flow rates' with rainfall well below average. A severe heat episode also occurred in early December 2014 resulting in elevated water temperatures (Moloney et al., 2015).

Prior to the outbreak, the turtle was considered 'locally abundant'. It is estimated that the population size was previously in the order of 2500 individuals. After the spread of the disease, it is now unclear how many turtles remain within the population. Targeted surveys of the species over five years has indicated a large decrease in recorded sightings. New estimates show the population size is likely to be less than 100 – 200 animals present in the wild (Zhang et al., 2018; ALA, 2023). Approximately 60 km of the Bellinger River is known to be affected by the disease, representing 100 percent of the known range of the species in Bellinger River (TSSC, 2016). Survival of the species may be dependent on captive breeding programs due to the very small number of mature adults that have survived in the wild (Chessman et al., 2020).

Prior to the disease outbreak and the species being listed as critically endangered, the species main threats consisted of specific habitat requirements, predation, alteration to the quality of water, and competition with the Murray River Turtle (a native species introduced to the catchment) (TSSC, 2016). Interspecific competition and hybridisation are known to occur with Murray River Turtle particularly in the Kalang River and is a threat to the Bellinger River snapping turtle. Alongside the continuation of the disease, these interactions with the Murray River Turtle are identified as a significant threat that could lead to further declines in the species population (Chessman et al., 2020). Additional threatening processes impacting the species including habitat modification from developments, pollution, other diseases, and predators (Cann et al., 2015; Chessman et al., 2020).

The introduced red fox (*Vulpes vulpes*) is a major contributor to the predation of nests and nesting females. Blamires et al. (2005) reported a turtle nest predation rate of 72% from foxes and goannas (*Varanus varius*) along the Bellinger River. As there are limited numbers of the species remaining, studies have projected the importance of conservation management plans that protect the species where risks of impact occur from habitat degradation, disturbances and increased threat of predators (Cann et al., 2015).

Due to the impact of the disease, the species is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals.

4.2.7 Recovery plans

There is currently no recovery plan in place for the Bellinger River snapping turtle. A captive breeding program was established after the disease outbreak with 17 individuals placed into the program. Since 2018, turtle breeding has been successful, and the NSW Government has managed the trial release and monitoring of 179 captive-bred juveniles into the river. One of the release sites is upstream of Justins Bridge and has had 41 captive-bred turtles released there since 2018 (BCD 2022). Results have been positive with majority of the turtles surviving in good health in the river (NSW DPE 2021). Radio transmitters attached to the released turtles are used to assist with monthly monitoring.

4.2.8 Potential impacts

Potential impacts from the project are largely associated with the construction phase and include loss and degradation of habitat (including water quality), injury and/or mortality, noise and vibration disturbance, temporary restriction of instream connectivity and exacerbation of infectious disease as discussed in sections below. Effective measures to avoid, mitigate and manage impacts are described in Section 4.2.9 with an updated significant impact assessment presented in Section 4.2.10. A project-specific EMP has been developed accordance DCCEEW's Environmental Management Plan Guidelines (2024). Any unexpected incidents during construction that have the potential to cause harm to MNES will be managed in accordance with the EMP for the proposed action. Where an impact is identified, consultation will be undertaken with DCCEEW and assessment of the need to implement compensation measures completed.

Impacts during the operational phase of the project are expected to be negligible as the new bridges will be inert pieces of infrastructure within the waterways. While some ongoing maintenance works are required during operations, they are largely restricted to the super-structure and road approaches such that potential operational impacts will be negligible, and benefits realised will include:

– The new bridges have a design life of 100 years and will require less frequent maintenance and repair, reducing disturbance and disruption to riverine and in-stream habitat.
– Improved trafficability will reduce the likelihood of vehicle collisions and release of contaminants to the environment.
– Traffic noise and vibration impacts will be reduced with the replacement of the existing timber structures with new concrete structures.
– Riparian vegetation will be rehabilitated, and instream connectivity maintained such that the potential injury and/or mortality impacts as a result of the project are negligible and aquatic fauna movement is facilitated.

4.2.8.1 Loss and degradation of habitat

4.2.8.1.1 Habitat loss due to disturbance to riverbed and banks

The proposed action is likely to have direct impact on habitat for the Bellinger River snapping turtle through habitat loss and disturbance to the riverbed and banks at all sites. The potential disturbance of habitat at each bridge site is as follows:

– At Joyces Bridge, approximately 16 m of riverbank is planned to be disturbed on the left bank of the river from high bank to toe. Approximately 16 m of high bank on the right bank of the river will be disturbed in addition to the gravel bar that forms the lower bank. Direct impacts to aquatic vegetation will be limited to disturbance of several small clumps of *Vallisneria sp.* downstream of the existing bridge with a total area of approximately 1- 2 m^2. Disturbance to the benthic substrate will be limited to footprints of the bridge piers, which is comprised of consolidated and unconsolidated rock, gravel, and associated sediment expected to be affected. Piers one and two have been relocated from within the low-flow channel to the outside margins, minimising instream activities and impact to aquatic habitat. Snag removal within the Proposed action footprint is unlikely to be required and therefore will not impact habitat resources for the species.
– At Justins Bridge, approximately 8 m of riverbank is to be disturbed on both sides of the river from high bank to toe. No piers will be located within the low-flow channel and therefore disturbance to the benthic substrate, consolidated and unconsolidated rock, and gravel sediment will be minimal.
– At Hobarts Bridge, approximately 12 m of riverbank is to be disturbed on the left bank of the river from high bank to toe. Approximately 15 m of the high bank on the right bank of the river will be disturbed in addition to the gravel bar that forms the lower bank. Direct impacts to aquatic vegetation are unlikely to occur Disturbance to the benthic substrate will be limited to footprints of the bridge piers, which comprises consolidated and unconsolidated rock, and gravel sediment. Piers two and three for Hobarts Bridge have been relocated from within the low-flow channel to the outside margins minimising instream activities. Snag removal within the Proposed action footprint is unlikely to be required and therefore will not impact habitat resources for the species.

– At Duffys Bridge, approximately 15 m of riverbank is to be disturbed on the left bank of the river from the high bank. A total of 19 m of high bank on the right bank will be disturbed. Direct impacts to aquatic vegetation will be limited (total area <1 m^2).

The timber components of the existing bridges will be removed but concrete piers will remain. Minor disturbance may occur during this process. It is proposed that one or two large snags may be removed to facilitate access and piling works. These snags will be relocated to adjacent habitat such that no loss of resources for the turtle occur.

All works nominated as being of a high environmental risk will be completed within the dry season and/or a period of low rainfall and minimal flow. This approach will minimise the risk of erosion, run-off and transport of sediment downstream. The timing of construction works within the low-flow channel and riverbanks has also been designed to avoid breeding periods for the Bellinger River snapping turtle.

A summary of the total impact to the Bellinger River snapping turtle habitat is outlined in Table 4.4.

Table 4.4 Bellinger River snapping turtle habitat loss

Habitat type	Hobarts Bridge	Duffys Bridge	Joyces Bridge	Justins Bridge	Total
General Bellinger River snapping turtle habitat	0.015 ha	0.014 ha	0.024 ha	0.012 ha	**0.064 ha**

Despite the cryptic nature of the Bellinger River snapping turtle and limited historical record of the species within the Bellinger River catchment, there is a high level of confidence that the proposed action will have a low level of impact to potential turtle habitat. A conservative approach has been applied such that all bank and instream habitat within the footprints have been assumed as Bellinger River snapping turtle habitat and therefore the loss of habitat values represent maximum impact. Any potential impacts to Bellinger River snapping turtle habitat are likely to be reversible through the implementation of mitigation measures outlined in Section 4.2.9.

4.2.8.1.2 Water quality impacts

The proposed action may have an indirect impact on the Bellinger River snapping turtle as a result of changes to water quality through increased sedimentation, erosion and turbidity or indirect impacts to food availability and foraging resources within the immediate and/or downstream area.

Project construction works have the potential to mobilise sediments in association with vegetation clearing, earthworks and installation of bridge substructures. The banks within the proposed action area have a high potential for erosion once ground cover is removed. Release of sediments into aquatic habitats can result in altered water chemistry (including increased turbidity, decreased oxygen levels, reduced light penetration or exposure of contaminants trapped in the sediment), changes in channel morphology (including filling of pools), alteration of substrate composition and smothering of habitat resources (Wood and Armitage, 1997). For the proposed activities, these impacts may have a temporary and localised effect on the turtle by reducing habitat value (e.g. number of refuges, microhabitats and food availability) within the immediate and/or downstream area and influencing health and physiology. Degradation of potential nesting habitat downstream of the footprint from increased sediments and may reduce the suitability of the sites for turtle nesting. Exposure to contaminants may cause other physiological effects and may lead to individuals being more susceptible to the Bellinger River virus.

Suspended sediments created during turbidity plumes may hinder the exchange of gases (such as oxygen and carbon dioxide) that occurs during cloacal respiration. This impact is considered to be temporary and is unlikely to interrupt overall respiratory processes significantly. Suspended sediments may also impact on visibility and the turtle's ability to capture prey while foraging; however, this is also anticipated to be short in duration.

Bridge construction activities within and above Bellinger River have the potential to result in the introduction of wastes and hazardous materials, such as fuels and lubricants. Key risk activities include construction of *in-situ* concrete elements (e.g. spillage of concrete and curing compounds). In severe cases, chemical pollution of the aquatic environment can result in long-term habitat degradation and widespread mortality of species.

The potential sensitivity of the Bellinger River snapping turtle to water quality degradation is understand and avoidance and mitigation measures have been developed accordingly.

4.2.8.2 Injury/mortality

Aquatic habitats within the proposed action area consists of pool-riffle and pool-run habitats. The Bellinger River snapping turtle may experience direct injury or mortality if individuals are present within the areas of disturbance at the time of works.

Key construction activities that have potential to cause turtle injury and/or mortality include short-term (approximately six-month duration) and temporary activities, including clearing and earthworks within the riverbanks and the installation of rock bags within the low-flow channel. The Bellinger River snapping turtle may experience direct injury or mortality if individuals are present within the areas of disturbance at the time of works.

Spencer et al. (2014) found that when disturbed, 50% of the time turtles remain motionless while 50% of the time they attempted to flee. In addition, the Bellinger River snapping turtle is often found partly buried in sand, silt or leaves and are usually found in the deepest part of the waterhole. These factors potentially decrease the detectability of the species within the proposed action area.

Injury or mortality may also occur due to changes in water quality (Section 4.2.8.1.2).

The introduced red fox (*Vulpes vulpes*) is a major contributor to the predation of nests and nesting females. Blamires et al. (2005) reported a turtle nest predation rate of 72% from foxes and goannas (*Varanus varius*) along the Bellinger River. The introduction of human activity and opportunistic food sources has the potential to attract these pest species to the work areas.

The mitigation measures proposed to avoid/mitigate potential injury/mortality are known to be effective and no residual impacts are expected.

4.2.8.3 Noise, vibration and light disturbance

Construction activities within the proposed action area have the potential to result in the temporary disturbance of fauna as a result of noise and vibration disturbance. During the construction period, noise and vibration levels will increase due to the use of construction machinery for vegetation clearing, earthworks, installation of the bridge piles and rock anchors, and bridge/road assembly. Aquatic fauna such as turtles use sound to navigate, communicate and forage effectively and, as such, many species are sensitive to anthropogenic noise. Artificially generated noise may impact on fauna in the following ways (McCauley et al. 2003):

– Disturbance, leading to behavioural changes or displacement from biologically important habitat areas (such as breeding, feeding, nesting and nursery sites).
– Masking or interference with other biologically important sounds such as communication.
– Physical injury to hearing or other organs.
– Indirectly by inducing behavioural and physiological changes in predator or prey species.

Construction related noise and vibration associated with the bridge replacements is expected to cause short-term, localised and minor disturbance only. Fauna behavioural changes that may occur include habitat avoidance and evasive movement. This could result in movement of individuals away from the area.

Installation of the bridge piers and rock anchoring will pose the greatest risk of noise and vibration disturbance to turtles; however, these activities have been designed to utilise best practise construction methodology and occur over a minimal 1-2 week period. Specifically, an air rock anchor machine and excavator mounted bored piling machine have been selected as the preferred methodology. The use of an air rock anchor will funnel noise into the underground hole and minimise the sound emitted into the environment. In addition, the bored piling machine will produce sound pressure levels substantially lower than those emitted from pile driving.

Construction work is limited to daylight hours and no permanent lighting will be installed. Where lighting of site compounds is required for security purposes, the lighting installed is directional and the compounds are set back from the river banks. Through avoidance, lighting impacts on Bellinger River turtle are not applicable.

As the effectiveness of the noise and vibration mitigation measures are known, it is considered that the risk of potential impact to the Bellinger River snapping turtles can be effectively managed.

4.2.8.4 Temporary restriction of instream connectivity

The design of the bridges has considered the movement requirements of the species and will not result in a barrier to turtle passage. Construction works have been designed to avoid physical restriction of aquatic fauna movement. The low-flow channel will remain open to flow and turtle movement throughout the duration of the works. A temporary non-physical barrier to turtle movement may occur during construction as a result of disturbance. Turtles may be reluctant to move through the footprints due to noise, vibration and/or people and machinery activity levels. Construction works will be restricted to daylight hours to allow periods of non-disturbance at night and works within the river channel will be prioritised and best practice construction methods selected to minimise the duration of disturbance. All instream works are scheduled to occur outside of turtle nesting season and therefore distribution to nesting migrations will be avoided.

4.2.8.5 Exacerbation of infectious disease

After the outbreak of the Bellinger River virus in 2015, the species is considered highly suspectable to impacts on habitat conditions, nesting and recruitment and the health and survival of individuals. Unmitigated, the loss or degradation of habitat (including water quality), injury and/or mortality of individuals and restriction of instream connectivity because of the project's construction activities has the potential to exacerbate the species' susceptibility to the Bellinger River virus.

As such, a precautionary approach has been taken for the Project with regards to the design of the bridge structures and the proposed construction methodology, equipment and program.

Best practice techniques have been selected for avoidance, mitigation and management of potential impacts. The methods proposed are known to be effective at protecting aquatic environment and species. Monitoring will be conducted throughout the construction works to assess actual risks against those expected and allow for adaptive management if required. Based on the avoidance and mitigation measures proposed, the Project is not expected to exacerbate the effects of the Bellinger River virus on the Bellinger River snapping turtle.

4.2.9 Avoidance, mitigation and management measures

4.2.9.1 Overview

Extensive consultation has been undertaken with the NSW BCD to develop avoidance and mitigation measures for potential impacts to the Bellinger River snapping turtle as a result of the project. The proposed avoidance, mitigation and management measures are included in the project-specific EMP (Appendix H) and align with the conservation advice for the Bellinger River snapping turtle conservation and management priorities in regard to habitat loss, disturbance and modifications, and disease.

Where relevant information may be limited (e.g., nesting and breeding patterns of the Bellinger River snapping turtle), a conservative approach has been taken to develop avoidance and mitigation measures (e.g., high risk construction activities will not be undertaken during peak breeding season or non-peak breeding season). This approach is not considered to significantly influence the conclusion of the assessment.

4.2.9.2 Avoidance measures

4.2.9.2.1 Feasible alternatives

The existing Joyces, Hobarts, Justins and Duffys bridges are aging timber structures that are nearing the end of their useful lives and require replacement to provide a safe and reliable crossing point for local traffic and emergency vehicles. The 'do nothing' option is not acceptable to BSC or the community, as the current bridge structures at each site pose a risk to road users, due to their age and structural design. The bridges are essential to maintaining safe access to remote communities within the BSC LGA. The existing bridges may incur further deterioration if no action is taken.

Alternative bridge designs, construction methodologies and materials were considered during concept design development. Cost-benefit analyses have also been undertaken for each of the bridges. Geotechnical investigations identified the most suitable foundation options for each bridge which determined the design for each bridge, as discussed further in Section 4.2.9.2.2. The proposed bridge replacement works were considered the preferred options for each site, as they are considered to improve road safety whilst minimising environmental impacts to Bellinger River snapping turtles and their habitat.

There are no feasible alternative locations for the new bridges as crossings over the Bellinger and Kalang rivers are required to provide access and connectivity through Darkwood Road and Kalang Road, respectively. New greenfield locations would result in additional road connections and overall increase the impact on the environment compared to collocation and tie-in to the existing road network. The new bridges are proposed to be constructed immediately downstream of the existing bridges, to minimise the proposed action area, including works required to tie-in to the road approaches, and so that the existing bridges can be used for access during the construction period.

4.2.9.2.2 Bridge design

The design phase has considered avoidance of impacts to potential habitat for the Bellinger River snapping turtle through the selection of optimal bridge locations and improved bridge designs. The design does not include any culverts. Bridge piers have been designed to be placed outside the low-flow channels.

At all sites, the new bridges will be located on an elevated, improved alignment adjacent to the existing timber bridge structures. This approach will allow continued access for residents during construction, avoiding the need for instream temporary crossings and potential disturbance to Bellinger River snapping turtle habitat. Bridge spans for each of the bridges have been increased as far as practicable, taking into account the restricted access on Darkwood and Kalang Roads, to reduce the instream works and avoid disturbance to the low-flow channels.

The bridge piles have been relocated to be positioned outside the margins of the low-flow channels. These measures will substantially reduce the risk of degradation to Bellinger River snapping turtle habitat and disturbance to individuals from noise and vibration, as well as potential impacts to hydrology and aquatic fauna movement following construction.

The most suitable foundations for each bridge and design criteria adopted to avoid impacts to Bellinger River snapping turtle habitat are:

– Joyces Bridge:
  - Bored concrete piles due to shallow weathered rock grading to high strength. Rock anchors could be adopted at abutment A; however, it is envisaged that a piled foundation would ensure a working platform out of the normal water levels to aid construction (GHD, 2024a). Bored piles are also preferable as they emit lower noise and vibration levels compared to driven piles.
  - Piers 1 and 2 have been relocated from within the low-flow channel to the outside of the margins of the watercourse.
  - The bridge height will be raised by approximately 2 m to increase flood immunity.

– Hobarts Bridge:
  - Due to the high strength shallow rock within the stream and on the western abutment, rock anchors are recommended for the foundation system. On the eastern side of the bridge, highly weathered and moderately weathered rock was encountered and bored piles are recommended for the foundation system (GHD, 2024b). Bored piles are also preferable to reduce noise and vibration impacts to the Bellinger River snapping turtle.
  - Piers for Hobarts Bridge have been removed from the channel with pier 1 relocated to the water’s edge margin.
  - Piers two and three for Hobarts Bridge have been relocated from within the low-flow channel to the outside margins.
  - The bridge height will be raised by approximately 2 m to increase flood immunity.

– Justins Bridge:
  - The most suitable and cost-effective foundation option for Justins Bridge is bored concrete piles socketed into the weathered rock and bearing on the medium strength rock. Driven piles could be used but premature refusal may occur on the dense alluvial gravel layer (GHD, 2024c). Bored piles are also preferable to reduce noise and vibration impacts to the Bellinger River snapping turtle.
  - Piers for Justins Bridge have been removed from the channel with pier 1 relocated to the water's edge margin.
  - The bridge height will be raised by 1.3 m to increase flood immunity.

– Duffys Bridge:
  - The most suitable and cost-effective foundation option is to be bored concrete piles socketed into the weathered rock and bearing on the medium strength rock. Driven piles could be used but premature refusal may occur on the dense alluvial gravel layer (GHD, 2024d). Bored piles are also preferable to reduce noise and vibration impacts to the Bellinger River snapping turtle.
  - Piers for Duffys Bridge have been removed from the channel with pier 1 relocated to the water's edge margin.
  - The bridge height will be raised by 1.7 m to improve flood immunity.

The proposed action area for each of the bridges will generally be restricted to the existing cleared road easement to avoid impacts to habitat. The existing environment within the proposed action area has been subjected to disturbance from historical clearing for the approach roads and includes modified bank morphology and degraded riparian vegetation characteristics at the existing bridge structures.

4.2.9.2.3 Construction methodology and timing

Best practice construction techniques have been specifically selected to avoid direct works within the Bellinger River and Kalang River wherever possible. Where practical, many elements of the bridges will be precast offsite, to avoid impacts associated with onsite concrete works.

Installation of the bridge superstructures will preferentially occur from existing banks, constructed road embankment or bridge spans, rather than working from constructed earth-fill/rock fill pads within the river channels. Where this is not possible, contained rock bags are proposed to be used. These bags allow the placement and removal of rock with minimal impact to the underlying substrate or water quality. This approach will have a significantly lower impact than that associated with the construction of an instream pad whereby the placement of rock and other fill material within the low-flow channel is required. Best practice construction methodology and equipment have also been selected to minimise the risks of noise and vibration disturbance and to protect water quality and potential turtle habitat downstream of the proposed action area.

The use of existing structures and general restriction of works footprint to within previously disturbed areas will avoid direct impacts to potential Bellinger River snapping turtle habitat during construction.

As discussed in Section 3.3, construction works are expected to be carried out over an approximate 10-month period (between February and October 2025) for the complete works program at Justins, Hobarts and Joyces bridges. The program at Duffys Bridge runs primarily for the same period but to accommodate works occurring outside of the Bellingen snapping turtle and giant barred from key breeding seasons, demolition of the existing timber bridge is deferred to April 2026.

The construction schedule will include:

– **High risk works** – Vegetation clearing/earthworks on riverbank, installation of piers and rock anchors, and instream substructure works. Works will be undertaken outside of the full breeding season of the Bellinger River snapping turtle (including courtship, incubation and hatching - July to February inclusive).

– **Medium risk works** – Construction of abutments outside of waterway low-flow channel, and construction of superstructure and road approaches. All medium risk construction works will be outside nesting season of the Bellinger River snapping turtle (October to January inclusive).

– **Low risk works** - Finishing works, comprising construction of roads and ancillary bridge components at road level only including barriers signage, road sealing, and concreting. Low risk works excludes work on embankments or instream. Low risk works will be undertaken during any period.

All high-risk works will be completed within the dry season and/or a period of low rainfall and minimal flow. No direct impacts to breeding are expected to occur to any natural recruitment that continues within the Bellinger River and Kalang River.

4.2.9.3 Mitigation and management measures

4.2.9.3.1 Overview

As described in the project-specific EMP (Appendix H), the mitigation and management measures in the following sections have been adopted to minimise potential impacts to the Bellinger River snapping turtle.

4.2.9.3.2 Loss and degradation of habitat

The following mitigation and management measures have been adopted to minimise the potential for habitat degradation:

– Minimising the proposed action area to the smallest area needed for construction work.
– Locating the bridges immediately adjacent to the existing bridges to reduce disturbance and retain works to within previously disturbed areas as much as possible.
– Minimising instream works and downstream impacts through bridge design and construction methodology such as the use of rock bags, liners and utilising blinding construction to create safe and dry work areas that prevent any discharge of sediment, drilling fluid or concrete into the waterway. This approach avoids the need for an earthfill dam and minimises the need for sediment and erosion controls in the immediate area.
– An assessment to identify the various foundation options available found that the combination of large cobbles and high strength rock at all bridge sites requires bored piles and/or rock anchors. To minimise habitat degradation impacts during piling works, the following mitigation measures apply:
  - A condensed piling program reduced to 1-2 weeks of piling works.
  - Avoidance of instream granular fill construction platforms through the use of rock bags to reduce the risk of introduced sediment and degradation of habitat.
  - Use of pneumatic rock anchor installation using smaller sized machinery with increased efficiency reducing the disturbance footprint.
  - A foundation design (600 mm bored piles) that can be constructed with an excavator mounter auger greatly reducing the piling pad that would be required for access of a conventional piling rig.
– Scheduling the duration of construction works within the low-flow channel to the minimum time necessary and outside the wet season (i.e. October to March)..
– Retaining large woody debris, rocks, and root balls from within the proposed action area for reinstatement to the same site it was removed from following the completion of construction
– Keeping vehicle and machinery movements confined to designated access tracks and enforcing on-site speed limits.
– Providing environmental training to site personnel through a site induction and daily toolbox talks on local habitat, potential risks, and avoidance, mitigation and management requirements.
– Strict hygiene measures will be implemented, including weed-washdowns and inspections of all vehicles, machinery, and equipment prior to entering the proposed action areas to avoid the spread of invasive weeds.
– Rehabilitation and revegetating exposed surfaces and redundant road sections on completion of construction activities. Bank morphology will be restored to existing conditions.

Due to the very small area of habitat that will be directly impacted by the four bridge replacements, and the mitigation measures proposed to minimise habitat degradation, no significant impact to the Bellinger River snapping turtle or their associated habitat is expected to occur.

4.2.9.3.3 Water quality degradation

Mitigation and management measures to minimise the potential for water quality degradation include:

– Stringent wash down procedures for all machinery and materials used for the project in accordance with the Bellinger River virus biosecurity protocol.

- – Monitoring of water quality conditions (visual and in situ recordings) to identify the potential for water quality degradation within the rivers and allow for adaptive management. In situ water quality monitoring will be conducted weekly during works within the low-flow channels. Visual monitoring will be conducted daily while works occur in the channel.
- – Scheduling the duration of construction works during the dry season when rainfall and river flow volumes are low.
- – Preparing and implementing project specific ERSED control plans (Appendix I to Appendix L) in accordance with the NSW Government 'Blue Book' – Managing Urban Stormwater: Soils and Construction (Landcom 2004). The ERSED control plans will be prepared by a suitably qualified person. Key measures include:
  - Installing erosion protection measures in the form of sediment fences or similar where required to minimise the transport of sediment into the rivers.
  - Minimising erosion potential through scour protection treatments at abutments.
  - Minimising vegetation clearing and the area of bare ground required for construction to only that which is necessary.
  - Appropriately managing and protecting stockpiles. Stockpiles will be a maximum of 1.5 m high and will be set back at least 100 m from the river banks.

A site-specific EMP has been developed and included in Appendix H. Management measures to minimise waste entering waterways, include:

- – Site management in accordance with the waste management practices detailed in Managing Urban Stormwater: Soils and Construction (4th edition) (Landcom, 2004), particularly Section 6: Sediment and Waste Control and Section 8.2(a): Empty bins for concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter at least weekly and otherwise as necessary. Dispose of any waste in an approved manner.
- – Waste material, other than vegetation and tree mulch, will not to be left on site once the works have been completed.
- – Working areas will be maintained, kept free of rubbish and cleaned up at the end of each working day.
- – A closed system reverse-cycle circulation system with sediment trap will be used to collect all water and sediment released during drilling for rock anchors.
- – Drilling support fluid will be biodegradable and a vacuum truck will be used to dispose of material at the completion of drilling.
- – Installing rock bags, liners and blinding construction to create bunded work platforms to prevent spills.
- – All auxiliary works activities, including chemical and waste storage, will be located at least 100 m from the river banks.

No significant impact to the Bellinger River snapping turtle through water quality degradation is expected to occur, due to construction scheduling during the dry season, monitoring of water quality, and implementation of best practice controls through an ESCP and EMP.

4.2.9.3.4 Injury/mortality

Mitigation and management measures to minimise the potential for turtle injury and/or mortality include:

- – Conducting pre-clearance surveys:
  - Pre-clearance surveys will be undertaken prior to the commencement of instream construction works by a suitably qualified ecologist/fauna spotter-catcher experienced in undertaking surveys for the Bellinger River snapping turtle to inspect construction footprints for the presence of Bellinger River snapping turtle individuals and relocation, where required.
  - Pre-clearance surveys will be conducted three weeks prior and again one day prior to the start of any construction works within the river channels or banks.
  - Pre-clearance surveys will include survey techniques suitable for the species and will target areas where individuals, including juveniles, may hide such as under rocks, in banks, in water weed, in crevices, in leaf litter, buried under sand, under *Casuarina* sp. root balls, and/or in flood debris.

    - All approvals and permits for Bellinger River snapping turtle pre-clearance surveys will be obtained prior to the start of construction and a procedure developed in consultation with BCD for additional avoidance and mitigation measures to be implemented in the event that Bellinger River snapping turtles are found located within or immediately adjacent (i.e., within 100 m) of the proposed action area.
- Avoiding high and medium risk construction activities within the key breeding seasons of the Bellinger River snapping turtle, as described in Table 3.4 to ensure that there is no direct injury or mortality of turtle.
- A suitably qualified and experienced ecologists / fauna spotter-catcher will be present on site during any high risk works within the river channel or banks that have the potential to cause injury/mortality to the turtle.
- Minimising instream works through bridge design with piers located outside of low flow channels and construction methodology (i.e. rock bags).
- Scheduling the duration of construction works and works within the low-flow channel to the minimum time.
- Keeping vehicle and machinery movements confined to designation access tracks and enforcing on-site speed limits.
- Establishing a biosecurity/hygiene protocol in consultation with DPI&E and to the satisfaction of BCS to prevent the spread of the Bellinger River virus. The protocol will include actions that will be undertaken in the event that an encountered turtle is suspected to be infected with the Bellinger River virus.
- The Bellinger River virus biosecurity/hygiene protocol will be implemented across all work sites for the entire construction period.
- Providing environmental training to construction site personnel through a site induction and daily toolbox talks that include:
    - How to identify a Bellinger River snapping turtle and its habitat, and how to contact the suitably qualified ecologist/fauna spotter-catcher in the event any individuals are observed within the proposed action during the construction period.
    - Discussion of potential risks and avoidance, mitigation and management requirements that apply to the project.
    - How to apply the Bellinger River virus biosecurity hygiene protocol.
- Monitoring of water quality conditions (visual and in situ recordings) to identify the potential for water quality degradation and allow for adaptive management. In situ water quality monitoring will be conducted weekly during works within the low-flow channel. Visual monitoring will be conducted daily while works occur in the channel.
- The Project will implement a site-specific EMP which will include proper disposal of site waste to avoid attracting invasive species such as European foxes, Murray River turtle, or other invasive species.
- Informing BCD of any Bellinger River snapping turtles observed during the works and providing appropriately qualified veterinarian/wildlife carer assistant and/or rehabilitation to any turtles injured or suffering evidence of health concerns.

Due to the avoidance of the nesting season during the construction phase, and the mitigation measures proposed to minimise injury and mortality of the turtle, no significant impact to the Bellinger River snapping turtle is expected to occur.

4.2.9.3.5 Noise, vibration and light disturbance

Mitigation and management measures to minimise the potential for noise, vibration and light disturbance include:

- Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance, including use of bored piles, which reduces the level of noise and vibration emissions compared to driven piles.
- Noise blankets will be wrapped around equipment and used to enclose construction sites and soft starts (gradually ramping up the power or speed of machinery) will be used to manage noise impacts.
- Using an air rock anchor machine and excavator mounted bored piling machine to minimise the noise and vibration generated within the river channel.
- Minimising the duration of rock anchoring and piling to the shortest period possible.

- Using noise dampening devices on machinery wherever practical and requiring that all equipment is maintained and serviced in accordance with manufacturer's instructions to reduce noise levels.
- Requiring soft starts for a period of five minutes so that fauna individuals have a chance to move away from the area before more intense noise and vibrations commence.
- Restricting construction activities to daylight hours to avoid excessive light levels at night.
- Security lighting at site compounds is directional and motion activated, with site compounds set back from the rivers.

Due to the machinery selected for the rock anchoring and bored piling, combined with the short duration of these works and the requirement for pre-clearance surveys within 100 m upstream and downstream of the bridge locations, the construction works are not expected to cause noise, vibration or light disturbance at levels that would significantly impact the Bellinger River snapping turtle.

4.2.9.3.6 Exacerbation of infectious disease

The following measures will be implemented to minimise the exacerbation of infectious disease throughout the Project for the Bellinger River snapping turtle:

- A biosecurity/hygiene protocol is to be established in consultation with DPI and to the satisfaction of BCS to prevent the spread of the Bellinger River virus. The protocol will include actions that will be undertaken in the event that an encountered turtle is suspected to be infected with the Bellinger River virus.
- The Bellinger River virus biosecurity/hygiene protocol will be implemented across all work sites for the entire construction period.
- Environmental training to be delivered to site personnel will include the Bellinger River virus biosecurity/hygiene protocol.
- Monitoring of water quality conditions (visual and in situ recordings) to identify the potential for water quality degradation and allow for adaptive management. In situ water quality monitoring will be conducted weekly during works within the low-flow channel. Visual monitoring will be conducted daily while works occur in the channel.
- BCD will be informed immediately of any Bellinger River snapping turtles observed during the works.

4.2.9.3.7 Temporary restriction of instream connectivity

Construction works have been designed to avoid physical restriction of turtle movement. The low-flow channel will remain open to flow allowing turtle movement throughout the duration of the works. Turtles may be reluctant to move through the footprints due to noise, vibration and/or people/machinery activity levels; therefore, a non-physical barrier to turtle movement may occur during construction works as a result of these disturbances. Construction works will be restricted to daylight hours to allow periods of non-disturbance at night and works within the river channel will be prioritised and best practice construction methods selected to minimise the duration of disturbance. All instream works are scheduled to occur outside of turtle nesting season and therefore distribution to breeding migrations is expected to be minimal.

No significant impact to the Bellinger River snapping turtle is expected to occur due to the Project's avoidance of the use of physical barriers during construction, scheduling of construction during daylight hours and working outside of the nesting season. Additional mitigation measures proposed to minimise restriction of connectivity for the turtle are being employed that will also reduce the risk of potential impacts.

4.2.10 Significant impact assessment

The SIA found the Project is **unlikely to result in a significant residual impact** to the Bellinger River snapping turtle on the basis that suitable avoidance and mitigation measures will be implemented to minimise the residual impacts to the Bellinger River snapping turtle. Offsets are not proposed.

The SIA for the Bellinger River snapping turtle was undertaken in accordance with the Significant Impact Guidelines 1.1 and is presented in Table 4.5.

Table 4.5 Significant impact assessment – Bellinger River snapping turtle

Significant impacts criteria	Assessment	
Lead to a long-term decrease in the size of a population	**Unlikely**	The Bellinger River snapping turtle population within the proposed action area is considered an important population for source and genetic purposes. The Project will impact 0.064 ha of suitable foraging and breeding habitat for the species. While the species has a small distribution, the design and alignment of the bridges have been selected to avoid and minimise direct and indirect impacts to the habitat of the Bellinger River snapping turtle to as low as reasonably possible. Design of the new bridges will span the river and piers will be located outside, or on the margins, of the low-flow channel to avoid permanent direct impact to the aquatic habitat and minimise temporary habitat disturbance during construction. Aquatic habitat loss will be restricted to the immediate footprint of the bridge piers. Two piers will be located on the margins of the low-flow channel at Joyces and Hobarts Bridges, while the low-flow channel will be completely avoided at Justins Bridge and Hobarts Bridge. Temporary impacts to Bellinger River snapping turtle habitat during construction have been minimised through the use of rock bags, liners and blinding construction to create safe and dry work areas that prevent any discharge of sediment, drilling fluid or concrete into the waterway. This approach avoids the need for an earthfill dam and minimises the need for sediment and erosion controls in the immediate area, thereby reducing the impact of adverse effects on the Bellinger River snapping turtle habitat within and downstream of each of the proposed action area. In addition, the alignment of the new bridges utilises existing disturbed areas such that vegetation clearing, and disturbance of riverbanks will be minimal. No substantial changes to the composition or quality of the riparian zone or riverbanks are expected and, as such, changes to foraging and sheltering resources for the Bellinger River snapping turtles are unlikely to occur. Temporary disturbance as a result of noise and vibration from traffic, pier boring, rock anchoring and general construction machinery has been minimised through the selection of an excavator mounted boring machine and air rock anchoring machine. A project specific EMP and ESCPs have been developed (Appendix H to Appendix L). Monitoring against the EMP will occur throughout construction to allow for adaptive management if required. Overall, based on the avoidance, mitigation and management measures proposed for the protection of Bellinger River snapping turtle habitat, the extent of habitat that will be impacted by the project is not expected to lead to a long-term decrease in the size of a population.
Reduce the area of occupancy of the species	**Unlikely**	The Bellinger River snapping turtle occurs only in the Bellinger River catchment, where it is restricted to the Bellinger River, lower parts of the Rosewood River and Never Never River and possibly the Kalang River. While the restricted occupancy of the species renders it more susceptible to impacts affecting the species distribution, the Project will address these potential impacts through the implementation of mitigation measures to avoid and minimise the direct and indirect impacts to the species and its habitat. The design of the bridges has considered the movement requirements of the species and will not result in a barrier to turtle passage. Once operational, the Project will have negligible impact on the species, forming no barrier to movement or further alterations of habitat. The Bellinger River snapping turtle is expected to persist locally through the operation phase of the Project. The impact to suitable habitat will not cause the species to disappear from any 2 km x 2 km area, (i.e. the scale at which area of occupancy is assessed under the EPBC Act (TSSC, 2016) and the IUCN Standards and Petitions Committee, 2022. Accordingly, the Project is not anticipated to reduce the area of occupancy of the species as only 0.064 ha of habitat is anticipated to be impacted across the proposed action area.

Significant impacts criteria	Assessment	
Fragment an existing population into two or more populations	**Unlikely**	The proposed works will not result in the fragmentation or isolation of habitat for the Bellinger River snapping turtle. The proposed works will not result in permanent change to turtle movement between areas of potential habitat for the Bellinger River snapping turtle. Turtle may be reluctant to move through the footprint due to noise, vibration and/or people/machinery activity levels; however, construction will be limited in duration and kept to daytime hours only. Construction works within the river channel will be prioritised to avoid key breeding seasons and best practice construction methods selected to minimise the duration of disturbance. A total of 0.064 ha of suitable habitat will be impacted by the construction phase of the Project but this will not fragment the population into two or more populations. No substantial changes to the composition or quality of the riparian zone or riverbanks are expected and, as such, changes to foraging and sheltering resources for the Bellinger River snapping turtles are unlikely to occur. Impacts to habitat is at a local scale and unlikely to impact habitat or movement to the extent that parts of the population become genetically isolated from one another. Once operational, connectivity will be restored throughout the river and the use of bridges avoids the potential for barriers to movement instream.
Adversely affects habitat critical to the survival of a species	**Unlikely**	All habitat within the Study area is considered habitat critical to the survival of the species, of which the Project will impact 0.064 ha of suitable foraging and breeding habitat. Design of the new bridges will span the river and piers will be located outside, or on the margins, of the low-flow channel to avoid permanent direct impact to the aquatic habitat and minimise temporary habitat disturbance during construction. Aquatic habitat loss will be restricted to the immediate footprint of the bridge piers. The design of the project's footprints includes minimal and temporary in nature disturbances (small site shed, equipment laydown area, waste receptacles, construct material) with instream works to be completed within a 3–4-month timeframe. High and medium risk activities with the potential to impact breeding individuals are limited in duration to periods outside of the breeding and nesting season. Waste management implemented in accordance with the project-specific EMP will ensure that pests are not encouraged to the site to avoid nest predation. The Project is considered unlikely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	**Unlikely**	No gravid females have been caught since targeted surveys started in 2015 and there has been no evidence of any natural recruitment occurring within the population (BCD, 2022). Low levels of recruitment may be occurring; however, currently the viability of the population is dependent on captive breeding. Potential nesting of the Bellinger River snapping turtle has been previously recorded downstream of Justins Bridge and the captive breeding program has a release site for hatchlings upstream of this existing bridge and the new bridge proposed action area. Construction of the four bridges will avoid the nesting season of the species and therefore no direct impacts to breeding are expected to occur to any natural recruitment that may be occurring within the Bellinger River. Given the extremely small population size of the Bellinger River snapping turtle, any reduction in turtle abundance could have the potential to impact the viability of the local population. Risks of the project include direct injury/morality of individuals from works within the river channel, habitat degradation and disturbance, or alteration of water quality. Where possible, strict avoidance and mitigation or management controls will be implemented to protect the species and its habitat. Key actions will include pre-clearance surveys by experienced Bellinger River turtle ecologists to confirm no turtles are present within the footprint of the works. Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance and to protect water quality/habitat conditions within and downstream of the footprints. Additionally, an overarching EMP has been developed for the project to include other measures such as a water quality monitoring program. Overall, given the avoidance of construction work within the nesting season and the measures proposed to protect the species and habitat, the project is not likely to result in any change to the abundance of the Bellinger River snapping turtle or result in any long-term degradation of habitat. As such the project is not likely to disrupt the breeding cycle of a population.

Significant impacts criteria	Assessment	
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**	The Bellinger River snapping turtle occurs within a restricted distribution, within the Bellinger River catchment and the Project will impact 0.064 ha of suitable foraging and breeding habitat. Due to the historic impact of the Bellinger River virus, the species is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals. As such, a precautionary approach has been taken for the project regarding the design of the bridge structures and the proposed construction methodology, equipment and program. Best practice techniques have been selected for avoidance, mitigation and management of potential impacts. Water quality monitoring will be conducted throughout the construction works to assess actual risks against those expected and allow for adaptive management if required. A project specific EMP and ESCP have been developed to outline management requirements during construction. The operation of the Project is not expected to directly impact the species habitat and natural conditions are expected to resume. Overall, based on the avoidance, mitigation and management measures proposed for the protection of Bellinger River snapping turtle habitat, the Project is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat	**Unlikely**	The Commonwealth conservation advice for the Bellinger River snapping turtle lists threats from invasive species as a key threatening process. Most notably, the predation of turtle nests by European foxes is a threat to the species survival with turtle nest predation reported at a rate of 72 percent in the Bellinger River (TSSC, 2016). The recent introduction of the Murray River turtle to the Bellinger River catchment is also a threat to the species through competition and risk of species hybridisation. The Project will implement a site-specific EMP which will include proper disposal of site waste to avoid attracting invasive species. The Project is considered unlikely to result in further establishment or spread of European foxes, Murray River turtle, or other invasive species. Additionally, strict hygiene measures will be implemented, including weed-washdowns and inspections of all vehicles, machinery, and equipment prior to entering the proposed action areas to avoid the spread of invasive weeds. Waste management measures including appropriate storage of waste and removal offsite for disposal will avoid encouraging pest predators to the site.
Introduce disease that may cause the species to decline	**Unlikely**	Disease is a major threat to the population of Bellinger River snapping turtle. In 2015, over an approximate two-month period over 400 individuals were confirmed to have died from the Bellinger River virus disease outbreak, which affected 100 percent of the species distribution and resulted in the reduction of 14 to 27 percent of the species population (TSSC, 2016). The Bellinger River turtle is the only know species to be affected by the multi-factorial syndrome and the susceptibility of the species to the disease was suggested to be as a result of poor river conditions resulting in immunocompromised individuals. There is still little information on to what causes the virus to occur in the Bellinger River. While the Project is not anticipated to introduce the Bellinger River virus or other diseases, the Project has potential to impact water quality that may lead to an outbreak. Therefore, mitigation measures will be implemented to minimise the potential for water quality degradation. These include erosion and sediment control, scheduling construction work during dry season, stringent washdown procedures, site-specific EMP to include a weekly monitoring program of water quality conditions. Based on the avoidance and mitigation measures proposed for the protection of water quality within the Bellinger and Kalang Rivers, construction works are not expected to result in the degradation of habitat the further spread/introduction of disease that may cause the species to decline.

Significant impacts criteria	Assessment	
Interfere with the recovery of the species	**Unlikely**	There is no recovery plan for the Bellinger River snapping turtle. The Commonwealth conservation advice lists conservation actions for the species including the following in-field actions: measures to reduce run-off degrading habitat quality; protection of nests by European foxes; removing Murray River turtles from the Bellinger River; and implementing hygiene protocols for equipment. The Project will implement mitigation measures to manage erosion and sedimentation and the EMP details strict hygiene measures including washdown of machinery during the construction phase. The Project will not result in the further establishment and spread of the European fox or the Murray River turtle. Construction will avoid key breeding season for this species and therefore, the Project is considered unlikely to interfere with the recovery of the Bellinger River snapping turtle.

4.3 Giant barred frog

4.3.1 Conservation status and species profile

The giant barred frog is listed as vulnerable under the EPBC Act and endangered under the BC Act.

The giant barred frog is sparsely distributed from near Hervey Bay in Queensland, south to the Blue Mountains in NSW. The species occurs from elevations between 100-1,000 m above sea level. The Coffs Harbour-Dorrigo catchment is considered a stronghold for the species in NSW. The species inhabits lowland open wet forests (i.e. rainforest and wet sclerophyll forest) near permanent flowing drainages (TSSC, 2021). The species occurs within the narrow strip of vegetation either side of a stream or river where there is deep, damp leaf litter for sheltering and foraging. Occasionally the species occurs within riparian habitats of drier forest or degraded riparian remnants surrounding dams. The giant barred frog breeds from spring to autumn (TSSC, 2021).

4.3.2 Known records

The giant barred frog is an NSW Category 2 Conservation Protected in NSW. Accordingly, records of the giant barred frog are generalised to 10 km by NSW OEH and are presented in a repeated grid pattern in ALA (2024). While the specific locations of the historical records are not provided, it can be determined that the species occurs within the Bellingen region, and within the Proposed action footprint and based on recent surveys, is considered ‘confirmed present’ at each of the four bridges. Figure 4.3 present the desktop results of the giant barred frog in the Study area.

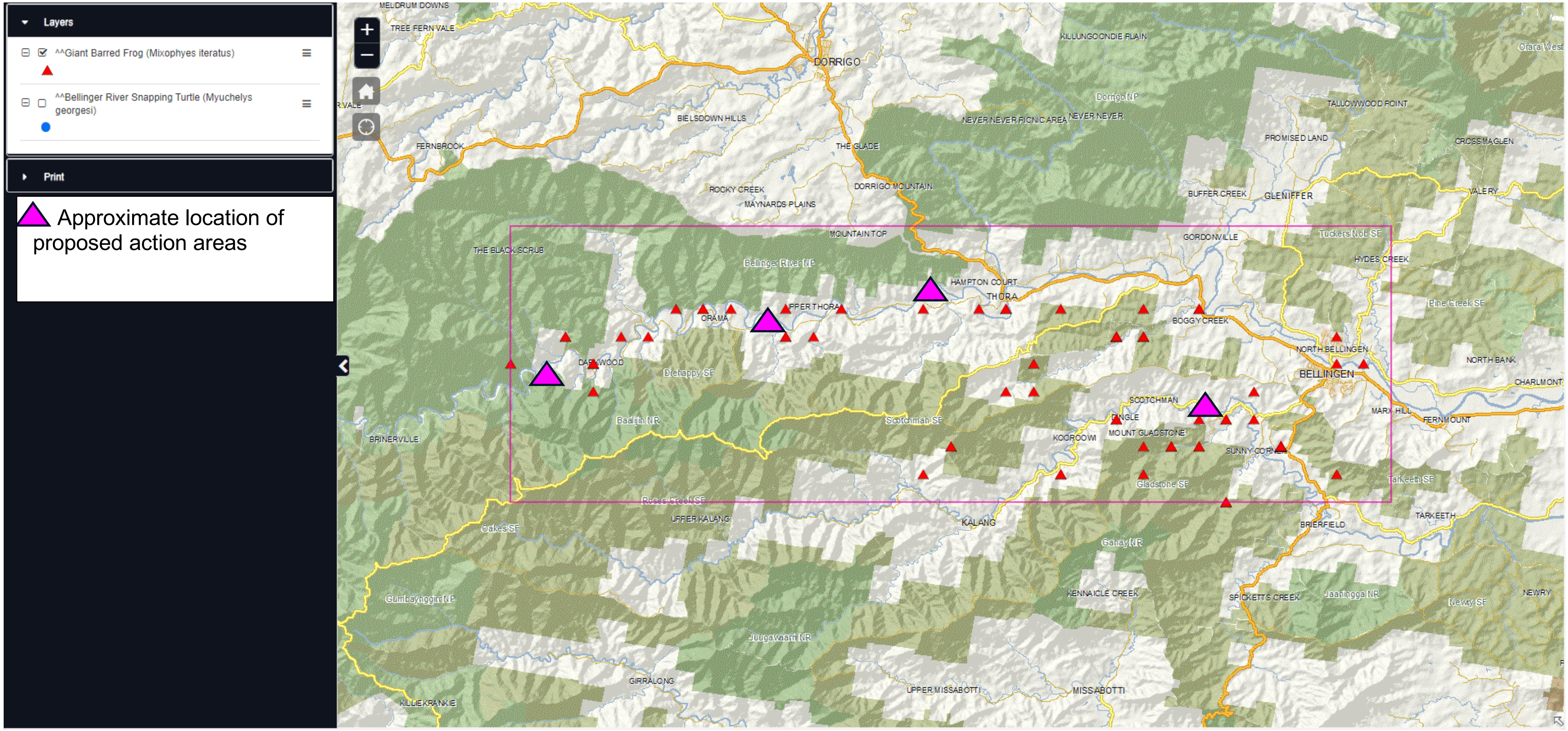


Figure 4.3 *BioNet species sightings search results for giant barred frog in broad locality of the proposed action areas*

4.3.3 Survey methods

Field surveys of the Proposed action footprints were conducted in July and in November to December 2023. This survey was undertaken to identify and assess the impacts to threatened flora and fauna from the proposed remediation works on Joyces, Hobarts, Justins and Duffys Bridges. There were no access limitations during the field surveys and survey effort was undertaken using methods recommended by the Commonwealth guidelines. The BSC was advised that the BAM survey method was not required based on a BDAR not being deemed necessary. Survey effort within the four bridge sites is outlined in Table 4.6 and Table 4.7.

At each location, a one-hour period was spent in the nighttime conducting visual and aural surveys for the target species within suitable habitat identified at each of the watercourse crossings. Visual surveys involved looking for frogs within suitable microhabitats at the shoreline of the waterway, around the base of sedges, rushes and grasses, under leaf litter and in the shallows of off stream standing water. Opportunistic observations of non-target frog and tadpole species were also recorded. Commonwealth methodologies differed from state guidelines, which do not include egg mass or larval surveys, as only presence/absence data was needed.

Call playback was used to target giant barred frog and encourage additional calling activity of common amphibian species. Call playback is regarded as having a low impact on the targeted species, as the individuals are responding to a natural situation (DEWHA, 2010). Call playback involved broadcasting a pre-recorded call of each of the targeted species, through a handheld speaker at each monitoring location. Each species call was broadcast for two minutes and followed by two minutes of silence, listening for a response call from the target species. This technique was used in conjunction with five minutes of active searching during and following call play back. During the field surveys, the number of frogs of each species calling was estimated. It should be noted that this is an unreliable method of assessing abundance but is the best method available in a rapid assessment, provided environmental conditions are suitable for response calling. While useful in assessing the extent of breeding habitat and the presence or absence of the targeted species, this approach is likely to underestimate the extent of habitat used by non-calling or non-breeding individuals.

Table 4.6 Overview of survey effort within the proposed action area

Field survey dates	Company	Team & scope	Fauna survey effort
12 July 2023	Idyll Spaces Environmental Consultants	1 ecologist Flora and fauna habitat survey	Opportunistic observations Aural and visual surveys Habitat assessments Diurnal bird surveys
27 November – 1 December 2023	GHD	2 ecologists Targeted fauna survey	Targeted fauna searches Aural and visual surveys Anabat detectors Remote cameras Diurnal bird surveys Habitat assessments Opportunistic observations Spotlight area searches

Table 4.7 Overview of the giant barred frog survey guidelines and effort within the proposed action area

MNES	Commonwealth guidelines	NSW guidelines	Survey effort
Giant barred frog	**Non-compulsory** Visual encounter surveys Call surveys during the known calling period (September – May) Egg mass surveys Larval surveys (DCCEEW 2024).	**Non-compulsory** A 500-meter transect of suitable breeding habitat using aural-visual methods from October to March, with a total effort of 480 minutes over 4 repeat surveys. (OEH, 2004)	Opportunistic observations Aural and visual surveys Habitat assessments Targeted fauna searches Spotlight area searches

4.3.4 Survey results

4.3.4.1 Records

This species has been recorded within 10 km of the proposed action area and is considered 'likely to occur' at each of the four sites. Habitat for the giant barred frog was found to occur at each of the four bridges.

A total of 19 giant barred frog individuals were found across the four sites, with a minimum of three sightings each night. This species was recorded in a variety of habitats along the Bellinger River and Kalang River, with the consistent habitat niche across each bridge site being heavy leaf litter (refer to Figure 4.4).

- **Justins Bridge** - Giant barred frog (adults only) recorded on all four nights of frog aural/visual surveys on both sides of the river. Giant barred frogs recorded atop leaf litter of river oak (*Casuarina cunninghamiana*) needles. The Bellinger River in this location is likely to also provide breeding habitat for the species.
- **Hobarts Bridge** – One Giant barred frog (metamorph only) recorded on only one nights of frog aural/visual surveys, on the water's edge. The Bellinger River in this location provides occupied breeding habitat for the species. While no adults were detected (likely due high noise levels from rapids and inaccessibility issues to areas around the existing bridge, the location is also likely to provide foraging and refuge habitat for the species.
- **Joyce Bridge** - One giant barred frog (adult only) recorded on one nights of frog aural/visual surveys. Giant barred frogs recorded atop leaf litter of Lantana camara and broad-leaved privet (*Ligustrum lucidum*). The Bellinger River in this location is likely to also provide breeding habitat for the species.
- **Duffys Bridge** - Giant barred frog (adults only) recorded on all four nights of frog aural/visual surveys on both sides of the river. Giant barred frogs recorded atop leaf litter of river oak needles and also in a paddock on the edge of the bridge. The Bellinger River in this location is likely to also provide breeding habitat for the species.

4.3.4.2 Habitat

The giant barred frog is typically found in lowland open wet forests, including rainforests and wet sclerophyll forests, where it is closely associated with permanent flowing streams (TSSC, 2021). This species favours riparian habitats characterized by deep, damp leaf litter which provides essential shelter and foraging opportunities and is utilized throughout the year. Giant barred frog generally occurring at low elevations commonly located within a narrow band of vegetation on either side of a stream or river. It can occasionally inhabit drier forest riparian areas or degraded riparian remnants around dams (TSSC, 2021).

Field surveys have identified good quality habitat for the giant barred frog at each of the four proposed action sites. These sites feature abundant leaf litter, which is ideal for both sheltering and foraging. Additionally, suitable breeding habitats, such as pools in larger streams, were noted. Except for Joyce's Bridge, watercourses exhibited relatively low levels of habitat disturbance.

There are no associated PCTs for the giant barred frog. The criteria used to map predicated giant barred frog habitat was based on the habitat description as per Commonwealth conservation advice for the species (TSSC, 2021). Consistent observations of the giant barred frog across various sites along the Bellinger and Kalang Rivers reveal a preference for habitats with heavy leaf litter consistent with the conservation advice. The habitat mapping for this species aligns with the specific conservation advice criteria, which describes its foraging habitat as being near permanent flowing drainages—ranging from shallow, rocky rainforest streams to slow-moving rivers within lowland wet forests (TSSC, 2021).

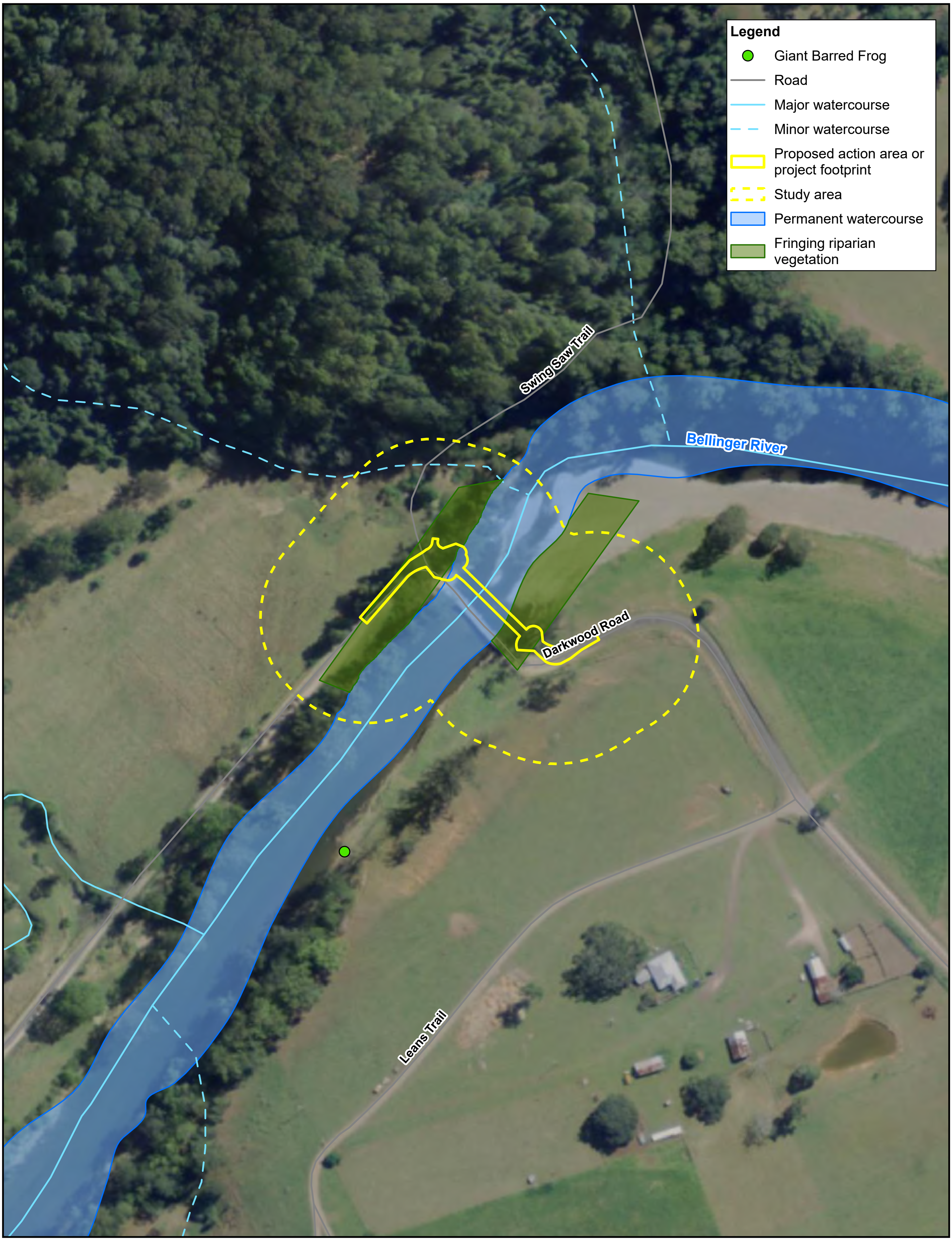
Regarding breeding habitat, the giant barred frog deposits its eggs on overhanging or steeply sloped banks or rocks, with hatched tadpoles dropping into still or slowly flowing pools along the sides of streams. Based on the conservation advice criteria, the permanent watercourses, including their immediate banks, of the Bellinger and Kalang Rivers are considered suitable for the species' breeding needs (TSSC, 2021). Key fauna habitat observations made during field surveys at each site are proved in Table 4.8.

No Critical Habitat, as defined under section 207A of the EPBC Act, has been identified or is included in the Register of Critical Habitat for the giant barred frog. Describing critical habitat for this species is challenging due to large, unsurveyed areas where presence can only be confirmed through field surveys. Without confirmed occupancy, potential habitats are identified based on key habitat attributes necessary for recovery. Given the species' vulnerability to habitat loss, degradation, and fragmentation, all current and future potential habitats are likely critical for the survival of the species.

The area of potential habitat for the giant barred frog within the Proposed action footprint is 0.166 ha. Refer to Figure 4.4 for areas of suitable habitat for the species.

Table 4.8 Key habitat features at each site for giant barred frog

Bridge	Key habitat features
Joyces Bridge	Riparian vegetation identified as breeding habitat for the giant barred frog. Mixed native and non-native ground covers*; Lantana camara* and broad-leaved privet leaf litter suitable for foraging and sheltering. Benthic substrate, consolidated and unconsolidated rock, with gravel sediment provided suitable refugia for tadpoles.
Hobarts Bridge	Riparian vegetation, open vegetation and moist soil is potential habitat for the giant barred frog. Hobarts bridge contains native trees and mixed native and non-native shrubs and slow flowing pools were observed at this site suitable for breeding. Benthic substrate, consolidated and unconsolidated rock, with gravel sediment provided suitable refugia for tadpoles. The Bellinger River in this location provides breeding, foraging and refuge habitat for the species.
Justins Bridge	Riparian vegetation identified as suitable breeding habitat for the giant barred frog. Justins bridge contains mixed native and non-native shrubs and ground covers which is also suitable habitat for the species. giant barred frogs recorded from deep leaf litter of River Oak (*Casuarina cunninghamiana)* needles. Deep slowly flowing pools were observed at this site, suitable for breeding. Benthic substrate, consolidated and unconsolidated rock, with gravel sediment provided suitable refugia for tadpoles. This site is likely to provide foraging, sheltering, dispersal and breeding habitat for the species.
Duffys Bridge	Riparian vegetation; mixed native trees and native and non-native shrubs and ground covers provide potential habitat for breeding, foraging, and sheltering for the giant barred frog. Deep leaf litter of River Oak (*Casuarina cunninghamiana*) suitable for foraging and sheltering. Benthic substrate, consolidated and unconsolidated rock, with gravel sediment provided suitable refugia for tadpoles. Slow flowing pools were observed at this site suitable for breeding.



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellinger River
Joyces, Hobarts, Justins, and Duffys Bridges
Preliminary documentation

Joyce's Bridge Giant Barred Frog survey results and habitat mapping

Project No. 12611463
Revision No. 0
Date 19/09/2024

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FIGURE 4.5

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Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data, habitat type (2024); NSWSS: roads, watercourse (2023).
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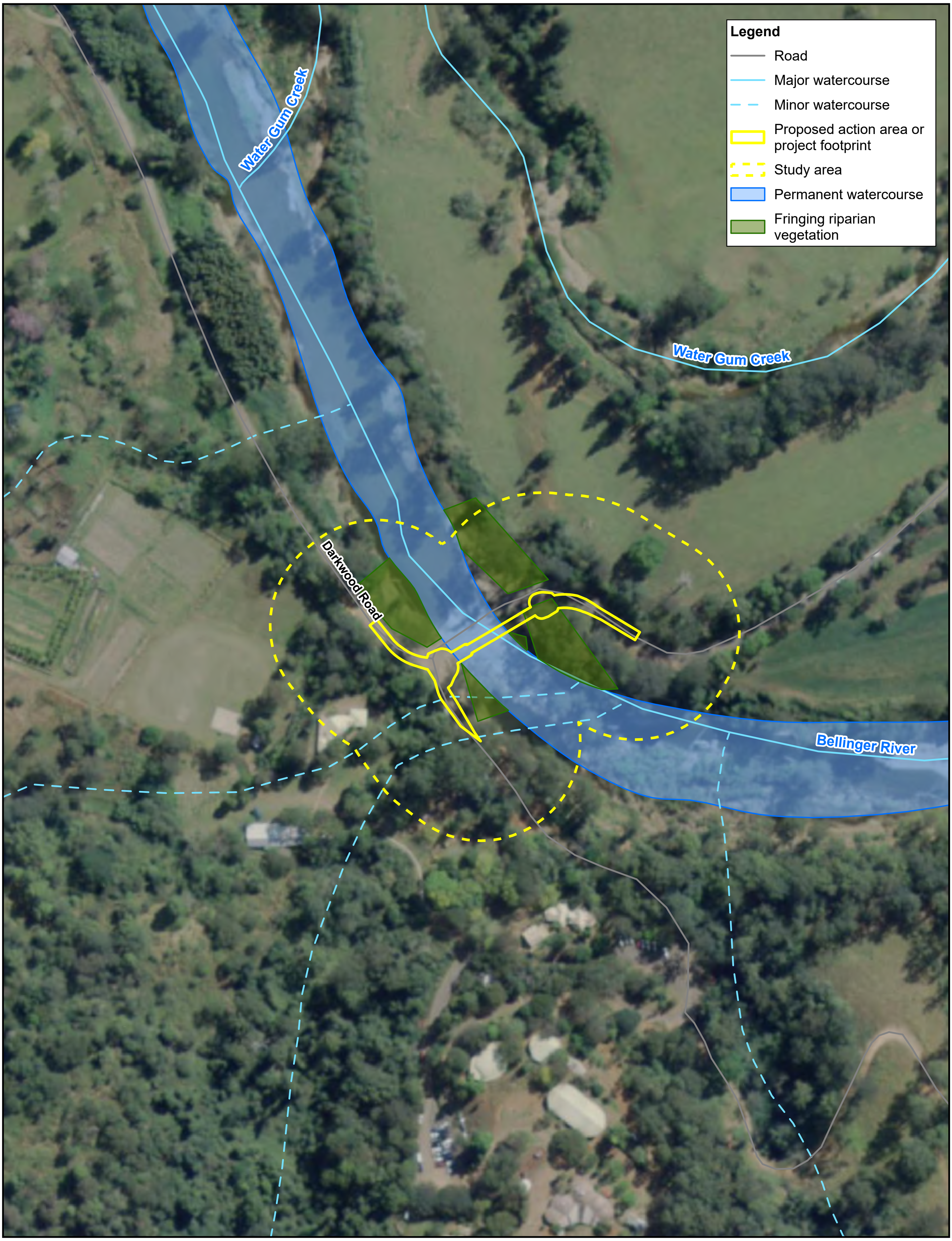

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Bellingen Shire Council
Bellinger River
Joyces, Hobarts, Justins, and Duffys Bridges
Preliminary documentation

Hobarts Bridge Giant Barred Frog survey results and habitat mapping

Project No. **12611463**
Revision No. **0**
Date **19/09/2024**

Sheet 2 of 4

FIGURE 4.5

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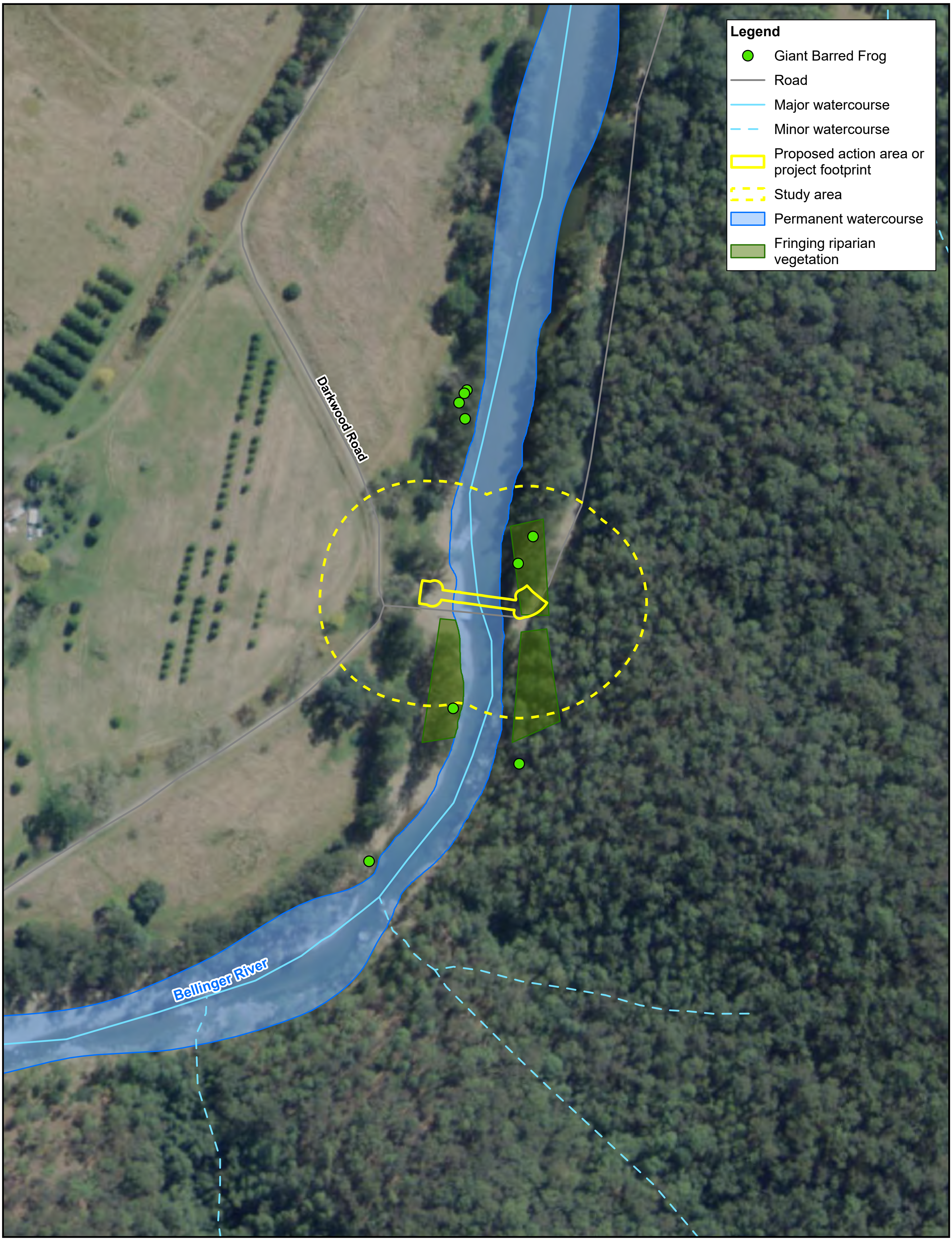

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Joyces, Hobarts, Justins, and Duffys Bridges
Preliminary documentation

Justins Bridge Giant Barred Frog survey results and habitat mapping

Project No. 12611463
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Sheet 3 of 4

FIGURE 4.5

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellingen River
Joyces, Hobarts, Justins, and Duffys Bridges
Preliminary documentation

Duffys Bridge Giant Barred Frog survey results and habitat mapping

Project No. 12611463
Revision No. 0
Date 19/09/2024

Sheet 4 of 4

FIGURE 4.5

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4.3.5 Population

4.3.5.1 Population size and extent

The exact population size of the giant barred frog is not precisely known but it is believed to exceed 10,000 individuals (Hines, 2012; TSSC, 2021). As of November 2019, the Atlas of Living Australia contains 5,702 records of the giant barred frog, with the majority recorded in the past decade (2014-2024) (ALA, 2024). This species is sparsely distributed from Doongul Creek near Hervey Bay, south-east Queensland to Warrimoo in the Blue Mountains, New South Wales (Hines, 2012; TSSC, 2021).

4.3.5.2 Important populations

As there is no formal definition of important populations for the giant barred frog, the Commonwealth Significant impact guidelines 1.1. (DoE, 2013) definition applies: key source populations either for breeding or dispersal; populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species range.

The Coffs Harbour-Dorrigo catchment is considered a stronghold for the species in NSW. This area encompasses the proposed action areas. Accordingly, the giant barred frog population within the proposed action areas are considered an important population on the basis that the is likely a key source population either for breeding or dispersal.

4.3.5.3 Occupancy trends

Seasonal occupancy trends for this species are observed around the breeding season. Breeding occurs from spring to autumn, with peak activity in November and February (TSSC, 2024). Tadpoles are present year-round and likely over-winter in streams (Hero & Fickling, 1996). During the day, the frogs will shelter either under leaf litter or under vegetation where they can escape predators. They tend to move within a 20-meter-wide band on either side of streams and have been recorded moving over 100 meters in a night (Lemckert & Brassill, 2007). In Queensland, individuals have been observed moving up to 268 m along a stream and 50 m away from it (TSSC, 2024). The giant barred frog faces significant risks from climate change, including disrupted breeding cycles, reduced habitat quality, and increased disease risk. Changes in temperature and rainfall can impact breeding pools and exacerbate habitat fragmentation, threatening the species' survival (TSSC, 2024).

4.3.6 Key threatening processes

Threatening process identified in the Conservation Advice (TSSC 2021) for giant barred frog include:

- Habitat loss and fragmentation
- Disease
- Invasive species.

These are consistent with key threatening processes are listed in NSW under the BC Act for the giant barred frog and may be relevant for the Project works (OEH, 2017):

- Clearing of vegetation is a major threat as the species inhabits the lower reaches of streams that have been subject to development pressures including clearing for residential development and agricultural practices.
- Dense, tall weed infestations (in particularly *Lantana camara* and exotic grasses) can decrease the habitat quality and its availability, affecting habitat suitability for the species.
- Water quality reduction and flow pattern alterations can cause tadpoles and embryos to be vulnerable to siltation.
- Insufficient protection of riparian habitat through clearing activities.
- The fungal pathogen *Batrachochytrium dendrobatidis*, is a threat to the species that causes chytridiomycosis, which has the potential to cause population decline.
- Predation from feral pigs consuming eggs, individuals, or disturbing habitat.
- Grazing and movement of domestic livestock causing disturbance in riparian habitat.
- Stochastic event susceptibility and loss of genetic variation.

4.3.7 Recovery plans

The giant barred frog was included in the recovery plan for stream frogs of south-east Queensland 2001-2005 developed by the Queensland state government and adopted under the EPBC Act in 2003. However, the recovery plan has since expired in 2022. The Committee recommended that following expiry of the existing recovery plan, a new national recovery plan for giant barred frog is not required as it would not have a significant conservation benefit above existing mechanisms. The approved conservation advice provides sufficient direction to implement priority actions and mitigate against key threats. The conservation advice identified several key actions for the preservation of the species. These include (TSSC 2021):

Habitat loss, disturbance and modifications

- Minimise human disturbance to the giant barred frog and its habitat. Designate protection zones around known site locations to ensure habitat is not fragmented by roads, timber harvesting or clearing of freehold land. Activities permitted in protection zones should be dictated by further research into the effects of disturbance on the giant barred frog.
- Assess the effectiveness of current forestry management practices in ameliorating disturbance to the habitat of the giant barred frog, and revise management practices if necessary.
- Identify key sites and implement a program ensuring enough suitable habitat is maintained to ensure the species' viability in the wild.
- Identify and conserve landscape characteristics that facilitate movement between subpopulations.
- Educate landowners and managers of the importance of maintaining riparian habitat, and the integration of habitat protection into land management regulations.
- Manage flow regimes to enhance breeding opportunities for the giant barred frog to minimise impacts from any potential stream works (diversions and impoundments) and maintenance works (de-silting of water storages) impinging upon giant barred frog habitat, do not degrade water quality, and do not substantially affect current flow regimes.

Invasive species

- Monitor and control damage to riparian areas by feral pigs. This may require a collaborative strategy with land holders and local government authorities to control numbers and potentially fence key sites, where feasible.
- Use fencing, or other measures where applicable, to reduce the access of domestic stock to stream banks.
- Assess the impact of exotic weeds on habitat suitability for the giant barred frog. If impact is shown to be significant, develop a strategy for control or elimination of the invasive weeds. Note: cutting and pasting/painting methods should be used to control weeds as herbicide formulations can be toxic to frogs and tadpoles, particularly if they contain glyphosate and surfactants.

Disease

- Minimise the spread of *Batrachochytrium dendrobatidis* (Bd):
  - Implementing suitable hygiene protocols.
  - Provide disease identification and prevention protocols (methods of handling, diagnostic keys, etc.) to researchers and land managers for use in the field.

4.3.8 Potential impacts

Potential impacts from the project during the construction phase include loss and degradation of habitat, injury and/or mortality, introduction and spread of invasive weeds and pests and exacerbation of infectious disease as discussed in sections below.

Effective measures to avoid, mitigate and manage impacts are described in Section 4.3.9 with an updated significant impact assessment presented in Section 4.3.10. A project-specific EMP has been developed in accordance with DCCEEW's Environmental Management Plan Guidelines (2024). Any unexpected incidents during construction that have the potential to cause harm to MNES will be managed in accordance with the EMP for the proposed action. Where an impact is identified, consultation will be undertaken with DCCEEW and assessment of the need to implement compensation measures completed.

While some ongoing maintenance works are required during operations, they are largely restricted to the super-structure and road approaches such that operational potential impacts will be negligible, and benefits realised:

- The new bridges have a design life of 100 years and will require less frequent maintenance and repair, reducing disturbance and disruption to riverine and in-stream habitat.
- Improved trafficability will reduce the likelihood of vehicle collisions and release of contaminants to the environment.
- Traffic noise and vibration impacts will be reduced with the replacement of the existing timber structures with new concrete structures.
- Riparian vegetation will be rehabilitated, and instream connectivity maintained such that the potential injury and/or mortality impacts as a result of the project are negligible and aquatic fauna movement is facilitated.

4.3.8.1 Loss and degradation of habitat

Vegetation clearing, substrate disturbance and movement of equipment within the proposed action footprints have the potential to result in habitat loss and degradation. The Project will impact 0.166 ha of suitable habitat for the giant barred frog. The proposed action footprints include the existing road easement, reducing impact to vegetation and habitat that has historically been modified or removed. Some riparian vegetation will be impacted on both the left and right banks at all four bridges. Approximately 8-16 m of riverbank will be disturbed on either side of the banks for each bridge footprint. Removal of vegetation will likely impact on giant barred frog foraging and sheltering habitat; however, impacts will be localized within the proposed action footprint and will not impact foraging and sheltering habitat in areas adjacent to the proposed action areas. The Project design has micro sited bridge piers to reduce the impact to aquatic habitat (i.e. avoiding low-flow channels). A summary of the total impact within the proposed action area is outlined in Table 4.9.

Table 4.9 Giant barred frog habitat loss

Habitat type	Hobarts bridge	Duffys bridge	Joyces bridge	Justins bridge	Total
Giant barred frog habitat	0.025 ha	0.035 ha	0.081 ha	0.025 ha	**0.166 ha**

A change in habitat condition through the alteration of riverbank and riverbank profiles, substrate composition and loss of riparian vegetation can degrade foraging and habitat resources in the immediate area of the bridge construction sites. Vegetation clearing can create favourable conditions for weed growth and has the potential for introduction and spread weeds during construction. This increased risk of weeds has the potential to reduce the abundance of foraging and sheltering habitat available for the giant barred frog. The giant barred frog eggs are stuck to overhanging or steeply sloped banks or rocks where the tadpoles drop into the stream upon hatching. Direct works within the Bellinger and Kalang Rivers will be restricted to two piles located on the outside margins of the low-flow channel at Joyces and Hobarts bridges respectively. Piers are located completely outside the low-flow channel at Justins and Duffys Bridges.

Accordingly, impact to potential instream breeding habitat for the giant barred frog is unlikely to be significant. Riverbank habitat will be impacted during the construction phase; however, this will be remediated with bank morphology to be restored to existing conditions.

4.3.8.2 Injury/mortality

The intensive nature of vegetation clearing has an elevated potential to adversely impact local fauna that shelter in ground habitat (e.g. logs, soil, leaf litter and beneath rocks). Fauna species most at risk include nocturnal species that are likely to be sheltering during the day when clearing activities are underway, and slow-moving species or sedentary species that are less able to flee the clearing zone (e.g. frogs). Increased vehicle movements during the construction phase may also increase the local incidence of fauna injury and mortality through vehicle strike and collision. Additional threats include the entrapment within open excavation areas. Giant barred frog have a heightened risk of injury or mortality during construction due to their localised occurrence, nocturnal behaviour and relatively slow dispersal ability.

Aquatic habitats within the proposed action footprints consists of pool- riffle and pool-run habitats. Metamorphic giant barred frogs may experience direct injury or mortality if individuals are present within the areas of disturbance at the time of works. Key construction activities that have potential to cause injury/mortality include clearing and earthworks within the riverbanks and the installation of rock bags within the low-flow channel. Given the adult giant barred frogs have low dispersal ability (potential to move 100 m per night), the species is susceptible to construction phase impacts. There are no impacts anticipated to occur during operation.

4.3.8.3 Introduction and spread of invasive weeds and pests

Construction activities have the potential to introduce and/or spread invasive weeds and pests throughout the construction area. This can result in disruptions to natural ecosystem functioning by altering the balance of inter-species competition and predation.

Inappropriate waste disposal and provision of water has the capacity to attract higher local concentrations of feral predators, increasing the predation pressures on local wildlife.

An increase in bare ground and open areas, associated with land clearance required for the proposed action footprint, will favour weedy species, particularly lantana and mistflower, which can suppress the regeneration of native species and reduce the available habitat for native species. This can cause significant damage to NSW primary industries and undermine the ecological integrity of bushland remnants by competitively excluding native plant species that provide food, shelter and nesting resources for native wildlife. Additionally, surface water flow has the potential to distribute weed species from construction areas to nearby watercourses, resulting in weeds being distributed further downstream during the wet season.

4.3.8.4 Exacerbation of infectious disease

Chytridiomycosis is a stream-borne virus caused by the amphibian chytrid fungal pathogen *Batrachochytrium dendrobatidis*. Infected frog populations exhibit diverse susceptibility to chytrid, with some species being extremely vulnerable, resulting in mass die-off and extinction (TSSC, 2021). The giant barred frog is known to carry chronic infection of chytrid, it has been suggested that the species abundance has dropped largely as a result of the disease. It is uncertain whether the species is continuing to decline from chytrid. Transmission of chytridiomycosis can be exacerbated by the handling of multiple frogs by researchers. Any action that results in the capture and handling of multiple frogs has the potential to spread the disease within the local frog population. Given the Project is likely to directly impact on habitat for the giant barred frog, there is potential for active management or translocation of frogs that would facilitate disease transmission. However, this can be mitigated by appropriate handling techniques and using suitably qualified ecologists to aid in any required translocations.

4.3.9 Avoidance, mitigation and management measures

4.3.9.1 Overview

The breeding and occupancy trends of the giant barred frog are well understood. Where relevant information may be limited, a conservative approach has been taken to develop avoidance and mitigation measures. This approach is not considered to have a significant influence on the conclusion of the assessment.

4.3.9.2 Avoidance measures

4.3.9.2.1 Feasible alternatives

The existing Joyces, Hobarts, Justins and Duffys bridges are aging, timber structures that are nearing the end of their useful lives and requiring replacement to provide a safe and reliable crossing point for local traffic and emergency vehicles. The ‘do nothing’ option is not acceptable to BSC or the community, as the current bridge structures at each site pose a risk to road users, due to their age and structural design. The bridges are essential to maintaining safe access to remote communities within the BSC LGA. The existing bridges may incur further deterioration if no action is taken.

Alternative bridge designs, construction methodologies and materials were considered during concept design development. Cost-benefit analyses have also been undertaken for each of the bridges. Geotechnical investigations identified the most suitable foundation options for each bridge which determined the design for each bridge, as discussed further in Section 4.3.9.2.2. The proposed bridge replacement works were considered the preferred options for each site, as they are considered to improve road safety whilst minimising environmental impacts to giant barred frogs and their habitat.

There are no feasible alternative locations for the new bridges as crossings over the Bellinger and Kalang rivers are required to provide access and connectivity through Darkwood Road and Kalang Road, respectively. New greenfield locations would result in additional road connections and overall increase the impact on the environment compared to collocation and tie-in to the existing road network. The new bridges are proposed to be constructed immediately downstream of the existing bridges, to minimise the proposed action area, including works required to tie-in to the road approaches, and so that the existing bridges can be used for access during the construction period.

4.3.9.2.2 Bridge design

The design phase has considered avoidance of impacts to potential habitat for the giant barred frog through the selection of optimal bridge locations and improved bridge designs. The design does not include any culverts. Bridge piers have been designed to be placed outside the low-flow channels.

At all sites, the new bridges will be located on an elevated, improved alignment adjacent to the existing timber bridge structures. This approach will allow continued access for residents during construction, avoiding the need for instream temporary crossings and potential disturbance to giant barred frog habitat. Bridge spans for each of the bridges have been increased as far as practicable, taking into account the restricted access on Darkwood and Kalang Roads, to reduce the instream works and avoid disturbance to the low-flow channels.

The bridge piles have been relocated to be positioned outside the margins of the low-flow channels. These measures will substantially reduce the risk of degradation to giant barred frog habitat and disturbance to individuals from noise and vibration, as well as potential impacts to hydrology and aquatic fauna movement following construction.

The most suitable foundations for each bridge and design criteria adopted to avoid impacts to giant barred frog habitat are:

– Joyces Bridge:
  - Bored concrete piles due to shall weathered rock grading to high strength. Rock anchors could be adopted at abutment A; however, it is envisaged that a piled foundation would ensure a working platform out of the normal water levels to aid construction (GHD, 2024a).
  - Piers 1 and 2 have been relocated from within the flow-flow channel to the outside of the margins of the watercourse.
  - The bridge height will be raised by approximately 2 m to increase flood immunity.
– Hobarts Bridge:
  - Due to the high strength shallow rock within the stream and on the western abutment, rock anchors are recommended for the foundation system. On the eastern side of the bridge, highly weathered and moderately weathered rock was encountered and bored piles are recommended for the foundation system (GHD, 2024b).
  - Piers for Hobarts Bridge have been removed from the channel with pier 1 relocated to the water's edge margin.
  - Piers two and three for Hobarts Bridge have been relocated from within the low-flow channel to the outside margins.
  - The bridge height will be raised by approximately 2 m to increase flood immunity.
– Justins Bridge:
  - The most suitable and cost-effective foundation option for Justins Bridge is believed to be bored concrete piles socketed into the weathered rock and bearing on the medium strength rock. Driven piles could be used but premature refusal may occur on the dense alluvial gravel layer (GHD, 2024c).

    - Piers for Justins Bridge have been removed from the channel with pier 1 relocated to the water's edge margin.
    - The bridge height will be raised by 1.3 m to increase flood immunity.
- Duffys Bridge:
    - The most suitable and cost-effective foundation option is to be bored concrete piles socketed into the weathered rock and bearing on the medium strength rock. Driven piles could be used but premature refusal may occur on the dense alluvial gravel layer (GHD, 2024d).
    - Piers for Duffys Bridge have been removed from the channel with pier 1 relocated to the water's edge margin.
    - The bridge height will be raised by 1.7 m to improve flood immunity.

The proposed action area for each of the bridges will generally be restricted to the existing cleared road easement to avoid impacts to habitat. The existing environment within the proposed action area has been subjected to disturbance from historical clearing for the approach roads and includes modified bank morphology and degraded riparian vegetation characteristics at the existing bridge structures.

4.3.9.2.3 Construction methodology and timing

Best practice construction techniques have been specifically selected to avoid direct works within Bellinger River and Kalang River wherever possible. Where practical, many elements of the bridges will be precast offsite, to avoid impacts associated with onsite concrete works.

Installation of the bridge superstructures will preferentially occur from existing banks, constructed road embankment or bridge spans, rather than working from constructed earth-fill/rock fill pads within the river channels. Where this is not possible, contained rock bags are proposed to be used. These bags allow the placement and removal of rock with minimal impact to the underlying substrate or water quality. This approach will have a significantly lower impact than that associated with the construction of an instream pad whereby the placement of rock and other fill material within the low-flow channel is required. Best practice construction methodology and equipment have also been selected to minimise the risks of noise and vibration disturbance and to protect water quality and potential frog habitat downstream of the proposed action area.

The use of existing structures and general restriction of works footprint to within previously disturbed areas will avoid direct impacts to potential giant barred frog habitat during construction.

Construction of the four bridges will avoid the peak breeding season of the giant barred frog (November to February), as described in Table 3.4; therefore, minimising direct impacts to breeding behaviour and habitats. Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance and to protect water quality/habitat conditions within and downstream of the proposed action area. Overall, given the avoidance of construction work within the breeding season and the measures proposed to protect the species and habitat during the non-breeding season, the project is not likely to result in any change to the abundance of the giant barred frog or result in any degradation of habitat.

4.3.9.3 Mitigation and management measures

4.3.9.3.1 Overview

The approved conservation advice for the giant barred frog provides sufficient direction to implement priority actions and mitigate against key threats. The conservation advice identified several key actions for the preservation of the species. These have been incorporated into the following mitigation and avoidance measures (TSSC, 2021).

4.3.9.3.2 Loss and degradation of habitat

Mitigation and management measures to minimise the potential for giant barred frog habitat loss and degradation include:

- Minimising the proposed action footprint to the smallest area needed for construction work.
- Locating the bridges immediately adjacent to the existing bridges to reduce disturbance and retain works to within previously disturbed areas as much as possible.

– Demarcate no-go areas of ecological sensitivity both on-site and in construction plans, including all vegetation not to be cleared. All vegetation to be retained will be clearly demarcated.
– Minimising instream works and downstream impacts through bridge design and construction methodology such as the use of rock bags, liners and utilising blinding construction to create safe and dry work areas that prevent any discharge of sediment, drilling fluid or concrete into the waterway. This approach avoids the need for an earthfill dam and minimises the need for sediment and erosion controls in the immediate area.
– An assessment to identify the various foundation options available found that the combination of large cobbles and high strength rock at all bridge sites requires bored piles and/or rock anchors. To minimise habitat degradation impacts during piling works, the following mitigation measures are proposed:
  - A condensed piling program reduced to 1-2 weeks of piling works.
  - Avoidance of instream granular fill construction platforms through the use of rock bags to reduce the risk of introduced sediment and degradation of habitat.
  - Use of pneumatic rock anchor installation due to the smaller size of the machinery and increased efficiency.
  - A foundation design (600 mm bored piles) that can be constructed with an excavator mounter auger greatly reducing the piling pad that would be required for access of a conventional piling rig.
– Monitoring of water quality conditions (visual and in situ recordings) to identify the potential for water quality degradation within Bellinger River and allow for adaptive management. In situ water quality monitoring will be conducted in accordance with the project-specific EMP, and at least weekly for works within the low flow channel. Visual monitoring will be conducted daily while works occur in the channel.
– Scheduling the duration of construction works within the low-flow channel to the minimum time necessary and outside the wet season (October to March) and the giant barred frog peak breeding season (November to February).
– Retaining large woody debris, rocks, root balls from within the proposed action footprint for reinstatement to the same site it was removed from following the completion of construction.
– Keeping vehicle and machinery movements confined to designated access tracks and enforcing on-site speed limits.
– Providing environmental training to site personnel through a site induction and daily toolbox talks on local habitat, potential risks and avoidance, mitigation and management requirements.
– Rehabilitation and revegetating exposed surfaces and redundant road sections on completion of construction activities. Bank morphology will be restored to existing conditions.

Due to the very small area of habitat that will be directly impacted by the four bridge replacements, and the mitigation measures proposed to minimise habitat loss and degradation, no significant impact to the giant barred frog or their associated habitat is expected to occur.

4.3.9.3.3 Injury/mortality

The following measures will be implemented to minimise the potential for injury or mortality to the giant barred frog during construction:

– Construction of the four bridges will avoid the peak breeding season (November to February) of the species and therefore reduce direct impacts to breeding.
– Enforce on-site speed limits to 40 km/hr to restrict the incidence of vehicle strike.
– Clearly demarcate no-go areas of sensitive vegetation and habitat, including all vegetation and habitat not to be cleared.
– Undertake pre-clearance surveys of construction (clearing) areas to identify and demarcate potential breeding sites for the giant barred frog prior to vegetation removal.

- Engage suitably qualified and experienced fauna spotter-catchers to supervise all clearing activities within areas of high ecological value (i.e. areas of predicted habitat for threatened fauna species, areas with rocky outcrops, riparian vegetation associated with waterways). Suitably qualified and experienced fauna spotter-catchers will undertake nocturnal surveys on suitable nights prior to construction to capture and relocate giant barred frogs prior to construction commencement and will be available to capture and relocate giant barred frogs during construction, if required.
- Educate employees regarding the presence of EPBC Act and BC Act listed species, particularly species with increased risk of injury and mortality, such as the giant barred frog, due to their slow moving and sedentary nature.
- Inspect trenches, excavations and machinery daily for the presence of trapped fauna.
- Minimise the time that excavations are open and place escape poles or structures within excavations to allow fauna to escape. Cover excavations and holes if possible. Place damp hessian sacks in excavations and holes where they cannot be covered to allow trapped fauna to hide under until collected and relocated.
- Minimising instream works through bridge design and construction methodology (i.e. rock bags).
- Identify the closest vet or wildlife carer prior to construction commencing. Relevant contact details are included in the project-specific EMP and circulated during pre-start material to all relevant staff. Develop adverse incident response procedures to detail actions to be taken in the event of wildlife injury or mortality during clearing. This will include procedures for capture and transport of injured wildlife to qualified veterinarian or humane on-site euthanasia and formalisation of arrangements with a local veterinarian to treat and care for wildlife injured during for the construction period.

4.3.9.3.4 Introduction and spread of invasive weeds and pests

The following measures will be implemented to minimise the introduction and spread of introduced species from the Project:

- Implement the project-specific EMP to inform all construction activities that outlines protocols to prevent the introduction of weed and pest species into the area and minimise the spread of declared weeds and pests within the site.
- Undertake prevention and management of pest animal and invasive species in accordance with the NSW *Biosecurity Act 2015*. Likewise, management of declared local pests and invasive species will be undertaken in accordance with North Coast Regional Strategic Weed Management Plan 2023-2027.
- Establish appropriate on-site waste-storage and disposal protocols, with designated waste-storage areas and appropriate (i.e. closed) waste receptacles and frequent waste disposal schedules to minimise attracting feral animals (e.g. foxes, dogs and pigs).
- Include weed and pest management protocols in all site inductions.
- Prohibit employees from bringing domestic animals onto the construction site.
- Enforce strict weed hygiene protocols including weed-washdowns, inspections and weed and seed certifications of all vehicles, machinery and plant prior to entering the construction site. Wash-downs and inspections should also be undertaken regularly for vehicles travelling to different parts of the site to minimise internal spread of weeds within the works area as well as to mitigate the spread of chytrid fungus.
- Establish a designated access track network and restrict all vehicle movements to designated access tracks. Enforce no off-road driving.
- Undertake pre-construction inventory and mapping of all weed-affected areas and identify areas of high risk that should be designated as no-go areas or areas requiring active weed management during and after construction.
- Undertake periodic inspections of weed-affected areas throughout the construction period and implement weed control to weeds of management concern, including declared and environmental weeds.
- Identify and control all declared weed infestations on the construction site throughout construction.
- Monitor treated areas to assess the success of declared pest/weed eradication.
- Rehabilitate and revegetate temporary works areas as soon as possible to minimise the potential for weed establishment.
- Utilise stockpiled topsoil and mulched vegetation during landscaping and revegetation.

– Utilise native species endemic to the region in revegetation to minimise importation of plants.
– Undertake regular post-construction monitoring of rehabilitation areas and high-risk weed areas.

4.3.9.3.5 Exacerbation of infectious disease

The following measures will be implemented to minimise the threat of infectious disease to the giant barred frog from the Project:

– Extra vigilance for vehicles and machinery that have operated within a known vector of chytrid fungus, and in areas of known active outbreaks.
– Implementing safe hygiene protocols when handling frogs. Frog salvage personnel will wear gloves and adopt a “one bag one frog” policy for relocating frogs (i.e. disposable gloves, disposable sample bags, sterile equipment).
– Clean and dry all equipment and wet or muddy footwear before and between visiting frog sites. This may include cleaning vehicle tyres before visiting known high-risk sites where threatened frog species may live.
– Avoid translocating giant barred frog individuals further than necessary if individuals are located within the proposed action footprint to minimise the potential spread of chytrid.
– Carry cleaning utensils and a disinfectant for use between sites.
– Record any chytrid-infected frogs and contact Frogwatch Helpline on 0419 249 728.

4.3.10 Significant impact assessment

The Project is **unlikely to result in a significant impact** on the giant barred frog listed as vulnerable under the EPBC Act and endangered under the BC Act (Table 6.8). Offsets are not proposed.

A significance of impact assessment has been undertaken against the Commonwealth Significant impact guidelines 1.1. (DoE, 2013) and presented in Table 4.10.

Table 4.10 Significant impact assessment - giant barred frog

Significant impacts criteria	Assessment	
Lead to a long-term decrease in the size of an important population of the species	**Unlikely**	The population within the proposed action area is considered an important population. The Coffs Harbour-Dorrigo catchment is considered a stronghold for the species in NSW. The proposed action area has been predominantly located in areas of existing disturbance and road easements. However, the Project will impact a total of 0.17 ha of suitable habitat for the giant barred frog. A change in habitat through the alteration of riverbank and riverbank profiles, substrate composition and loss of riparian vegetation can degrade foraging and habitat resources in the immediate area of the bridge construction sites. Adult giant barred frogs are reliant on riparian vegetation and dense leaf litter for foraging and sheltering habitat, the species requires permanently flowing drainages and overhanging or steeply sloped banks for breeding habitat. The Project will impact foraging, sheltering and breeding habitat. However, tracts of habitat for the species occurs adjacent to the proposed action area along the Bellinger River and Kalang River and provides habitat for the species within the local area. Post-construction rehabilitation and revegetating exposed surfaces and redundant road sections will be undertaken including restoring the bank morphology to existing conditions. Based on the extent of suitable habitat within the local and regional landscape, and that the region is a stronghold for the species, the Project is unlikely to lead to a long-term decrease in the size of an important population. Impacts on the species’ life cycle will be minimized by scheduling construction outside the breeding season (spring to autumn, after rain) (Frog ID, 2024). Pre-clearance surveys by suitably qualified fauna spotter-catchers will avoid injury and mortality impacts. Following these measures will prevent any significant impact on the species’ life cycle or the viability of the local population.

Significant impacts criteria	Assessment	
Reduce the area of occupancy of an important population	**Unlikely**	The population within the proposed action area is considered an important population. The Project will result in a minor direct loss of habitat. While the species uses permanent flowing drainages for breeding habitat, the giant barred frog has potential to use the Bellinger River and Kalang River for breeding. Indirect impacts to areas downstream imposed by sedimentation has the potential to result in water quality degradation. The Project will result in the clearance of riparian vegetation, which provides sheltering and foraging habitat for the species, particularly in areas of deep, damp leaf litter adjacent to streams or rivers. While the Project will result in the loss of habitat, the impact is minor in context with the habitat available in the local and regional landscape. The loss of habitat is unlikely to cause a permanent disappearance of the species from a 2 km x 2 km area (the scale at which area of occupancy is measured under the EPBC Act (TSSC, 2021 and IUCN, 2022) such that there would be a decrease in the area of occupancy of the species.
Fragment an existing important population into two or more populations	**Unlikely**	The Project is located within the central region of the species distribution and is located in the catchment of a known stronghold of giant barred frogs (Bellingen River-Coffs Harbour catchment). Foraging and breeding habitat may be present at each bridge location. Without mitigation, construction could disrupt terrestrial connectivity, potentially displacing the species. The new bridge design will span the river with piers placed outside or on the edges of low-flow channels. To mitigate potential disruptions to riverbanks, which provide habitat, the bridge alignment will use existing disturbed areas, minimizing vegetation impact and preserving riparian zones for the frog's foraging habitat. Thus, habitat removal and disturbance will be minimal and limited to already disturbed areas. The Project will result in the loss of a minimal 0.17 ha of suitable habitat. Potential habitat is widely available in the local and regional landscape, including in protected areas (i.e. within Dorrigo National Park, Bellinger River National Park, New England National Park and numerous reserves). Within that context, the loss of habitat is unlikely to result in the fragmentation of the species at a local or regional level. The proposed work is not expected to fragment or isolate giant barred frog habitat, as it will not permanently alter frog movement. Noise and construction activities might deter the species from the area, but work will be restricted to daylight hours to avoid disturbing active adults at night. Post-construction rehabilitation and revegetating exposed surfaces and redundant road sections will be undertaken including restoring the bank morphology to existing conditions. Avoiding works within the low flow channel will maintain waterway connectivity. Therefore, the Project is unlikely to fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	**Unlikely**	The proposed action area is located adjacent to the Bellinger River and Kalang River, with the potential to impact 0.17 ha of suitable foraging, sheltering and breeding habitat. However, further potential habitat occurs adjacent to the proposed action area, along the riparian strip adjacent to the Bellinger and Kalang Rivers and in conservation areas in the regional landscape (i.e. New England National Park, Bellinger River National Park, etc.). The Project is considered unlikely to adversely affect habitat critical to the survival of the species. In addition, post-construction rehabilitation and revegetating exposed surfaces and redundant road sections will be undertaken including restoring the bank morphology to existing conditions.
Disrupt the breeding cycle of an important population	**Unlikely**	The population within the proposed action area is considered an important population. The species uses permanently flowing drainages for breeding habitat. While the instream construction works has the potential to disrupt the breeding cycle of the species, this can be avoided through construction timing outside of peak breeding season between November to February and avoiding in-stream construction during the wet season (October to March). Additionally, the potential for the construction of the bridges to impact breeding habitat quality will be managed through stringent vehicle and machinery washdowns, monitoring of water quality conditions, and construction timing (as outlined in the EMP). The implementation of mitigation measures will be enacted to ensure the project does not affect individuals or breeding habitat quality. These measures are expected to prevent an adverse impact to the breeding of the species to the degree that it would disrupt the breeding cycle of a population.

Significant impacts criteria	Assessment	
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**	The Project will result in a total loss of 0.17 ha of suitable habitat for the giant barred frog. Potential habitat is widely available in the local and regional landscape, including in protected areas as noted above. Within this context, habitat loss resulting from the project is unlikely to have a local or regional impact on giant barred frog habitat. The design of the new bridges will span the river and piers will be located outside or on the margins of the low-flow channels. The construction of the bridges has potential to disrupt the banks of the river which provide habitat for the species. However, the alignment of the new bridges will utilise existing disturbed areas such that vegetation and disturbances of the riverbanks will be minimised. Accordingly, no major changes are expected to the riparian zones, riverbanks or river channel which allows for foraging, sheltering and breeding habitat of the frog to be maintained. Following this, to minimise impacts to the riverbank, a sediment and erosion control plan will be developed to outline management of sediment required during the construction phase. Based on these avoidance and mitigation measures, the context of habitat loss and disturbance are expected to be minimal and will not result in an impact to the species habitat such that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely**	The Commonwealth conservation advice for the giant barred frog list predation by feral cats and habitat degradation by feral pigs and invasive weeds (including mistflower, lantana and exotic grasses) as key threats to the species. The Project will implement a project EMP, which will include mitigation measures to prevent the introduction of weed and pest species into the area and minimise the spread of declared weeds and pests within the site. Likewise, management of declared local pests and invasive species will be undertaken in accordance with North Coast Regional Strategic Weed Management Plan 2023-2027. The Project is considered unlikely to result in an invasive species becoming established in the giant barred frog's habitat.
Introduce disease that may cause the species to decline	**Unlikely**	A key threat to the species is mortality due to chytrid fungus. The giant barred frog is known to carry chronic infection of chytrid. Transmission of chytridiomycosis can be exacerbated by the handling of multiple frogs. Any action that results in the capture and handling of multiple frogs has the potential to spread the disease within the local frog population. Given the Project is likely to directly impact on habitat for the giant barred frog, there is potential for active management or translocation of frogs that would facilitate disease transmission. Mitigation measures to minimise the exacerbation of infectious disease throughout the Project will be implemented (Section 4.3.9.3) including: – Extra vigilance for vehicles and machinery that have operated a known vector of chytrid fungus. – One bag-one frog policy using disposable gloves and bags. – Strict vehicle hygiene protocols. – Avoiding translocating giant barred frog individuals further than necessary if individuals are located within the construction proposed action area to minimise the potential spread of chytrid. The project is expected to manage the potential for the introduction and spread of chytrid, it is unlikely that the species would decline as a result of the Project.
Interfere substantially with the recovery of the species	**Unlikely**	The Commonwealth conservation advice for the species lists conservation actions for the giant barred frog. Field-based actions include: – Control introduced species. – Control weeds and conduct habitat restoration of forest and streambank habitat. – Designate protection zones around known site locations to ensure habitat is not fragmented. – Manage flow regimes to enhance breeding opportunities to ensure that stream works do not impinge on the species habitat, degrade water quality or substantially affect current flow regimes. – Monitor and control damage to riparian areas by feral pigs. – Implement suitable hygiene protocols to protect priority populations from infection of chytrid.

Significant impacts criteria	Assessment	
		The Project will implement a number of mitigation measures to minimise impacts to habitat loss, habitat degradation, injury and mortality and exacerbation of disease to the giant barred frog. These include a project-specific EMP, weed and pest measures, vehicle hygiene measures, vegetation restoration post-construction, bridge design sited outside of the low-flow channel as much as possible, demarcating areas of vegetation outside the clearing zone, minimising instream works, implementation of hygiene measures to protect the giant barred frog from chytrid and the spread of chytrid as a result of the project. Mitigation measures enacted align with the conservation actions listed for the giant barred frog. The Project is considered unlikely to substantially interfere with the recovery of the species.

4.4 Summary of avoidance, mitigation and management measures

The avoidance, mitigation and management measures proposed in Sections 4.2.9 and 4.3.9 for the Bellinger River snapping turtle and giant barred frog, respectively, are summarised in Table 4.11. The summary includes an assessment of the predicted effectiveness of each measure and the responsible party for implementing each measure. All measures are considered to be cost effective for the project and are accounted for in the project budget and secured funding. Any unexpected incidents during construction that have the potential to cause harm to MNES will be managed in accordance with the EMP for the proposed action. Where an impact is identified, consultation will be undertaken with DCCEEW and assessment of the need to implement compensation measures completed.

Table 4.11 Summary of avoidance, mitigation and management measures for the Bellinger River snapping turtle and giant barred frog

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Loss or degradation of habitat			
Minimising the proposed action area to the smallest area needed for construction work.	This measure has been used previously on similar projects (e.g., road and bridge construction projects) and is highly effective in minimising the disturbance footprint for the project. Limited distribution and specific habitat requirements are listed as a key threatening process for the Bellinger River snaping turtle. Similarly, clearing vegetation is a major threat to the giant barred frog. Minimising the proposed action area is an effective measure to avoid this impact	Conservation Advice Wollumbinia georgesi (TSSC, 2016)Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021).	BSC
Locating the bridges immediately adjacent to the existing bridges to reduce disturbance and retain works to within previously disturbed areas as much as possible.	This measure is highly effective in minimising the disturbance footprint for the project. Limited distribution and specific habitat requirements are listed as a key threatening process for the Bellinger River snaping turtle. Similarly, clearing vegetation is a major threat to the giant barred frog. Minimising the proposed action area is an effective measure to avoid this impact	Conservation Advice Wollumbinia georgesi (TSSC, 2016)Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021).	BSC
Minimising instream works and downstream impacts through bridge design and construction methodology such as the use of rock bags, liners and utilising blinding construction to create safe and dry work areas that prevent any discharge of sediment, drilling fluid or concrete into the waterway.	This approach avoids the need for an earthfill dam and minimises the need for sediment and erosion controls in the immediate area. Also minimises the risk of injury/mortality to fauna species. This measure is highly effective in minimising the disturbance footprint and subsequent impacts such as erosion and sedimentation.	Best practice standard commonly used in contemporary construction project.	Construction Contractor
Schedule construction to minimise the active works area needed at any time.	This measure is highly effective in minimising the disturbance footprint for the project. Limited distribution and specific habitat requirements are listed as a key threatening process for the Bellinger River snaping turtle. Similarly, clearing vegetation is a major threat to the giant barred frog. Minimising the active works area is an effective measure to avoid this impact.	Conservation Advice Wollumbinia georgesi (TSSC, 2016)Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021).	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Scheduling the duration of construction works within the low-flow channel to the minimum time necessary and outside the wet season (October to March), the nesting season for the Bellinger River snapping turtle (October to January) and the peak breeding season for the giant barred frog (November to February).	This measure is highly effective in minimising impacts to the aquatic environment during periods when there is likely to be more flow in the low-flow channels. Highly effective in avoiding impacts to Bellinger River snapping turtle and giant barred frog during periods when the species are known to be most active for breeding and nesting.	Conservation Advice Wollumbinia georgesi (TSSC, 2016)Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021). Mitigation measures developed in consultation with BCD in development of the SIS.	BSC Construction contractor
Demaractaion of no-go areas of ecological sensitivity. All vegetation to be retained should be surveyed and clearly demarcated.	This is a commonly used method in contemporary construction projects and is highly effective in avoiding impacts to areas of ecological sensitivity that are to be avoided. Limited distribution and specific habitat requirements are listed as a key threatening process for the Bellinger River snaping turtle. Similarly, clearing vegetation is a major threat to the giant barred frog. Minimising the proposed action area is an effective measure to avoid this impact.	Conservation Advice Wollumbinia georgesi (TSSC, 2016)Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021).	BSC Construction Contractor
Providing environmental training to site personnel through a site induction and daily toolbox talks on local habitat, potential risks, and avoidance, mitigation and management requirements. This will include specific information on the Bellinger River snapping turtle and giant barred frog and their habitat, potential risks and avoidance, mitigation, and management requirements. Environmental training will also include the Bellinger River virus biosecurity/hygiene protocol.	This will ensure awareness of key environmental obligations across the entire workforce and will assist personnel in meeting their environmental obligations. Environmental training as part of broader construction workplace inductions is a common practice in contemporary construction projects that implement best practice standards. Inductions and environmental training is used effectively on a range of other construction projects. Highly effective at educating personnel on rarely encountered species including the Bellinger River snapping turtle and giant barred frog and potential impacts from construction activities.	Environmental management plan guidelines (DCCEEW 2024).	BSC Construction contractor
Retaining large woody debris, rocks, and root balls from within the proposed action area for reinstatement to the same site it was removed from following the completion of construction.	This measure will reduce the impact on potential Bellinger River snapping turtle habitat. High level of effectiveness in minimising areas of permanent habitat loss. Moderately effective in minimising areas of direct impact and/or impacts to behaviours and life cycles.	This is a common practice in contemporary construction projects that implement best practice standards.	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Rehabilitation and revegetating exposed surfaces and redundant road sections on completion of construction activities. Bank morphology will be restored to existing conditions. Rehabilitation of disturbed areas to be undertaken as soon as practicable to minimise exposed surface periods.	This measure will minimise the potential for erosion and sedimentation and thereby mitigate against potential degradation of habitat. This measures will also reduce opportunities for weed establishment, whilst encouraging temporarily disturbed areas to recover as quickly as possible. This measure is moderately effective and minimises areas of direct impact and indirect impacts to behaviours/life cycles.	This is a common practice in contemporary construction projects that implement best practice standards.	Construction contractor
Keeping vehicle and machinery movements confined to designated access tracks and enforcing on-site speed limits.	This is a highly effective measure that minimises the potential impact area and the risk of impacts to fauna and habitat, including dust emissions.	This is a common practice in contemporary construction projects that implement best practice standards.	Construction contractor
Designate appropriate locations for soil stockpiles, rubbish and waste materials on site and safely secure until disposed material.	This is considered effective in reducing adverse impacts on protected species and adjoining habitats that could support MNES species. Moderately effective at reducing the likelihood of habitat degradation and water quality impacts.	This is a common practice in contemporary construction projects that implement best practice standards.	Construction contractor
Injury/mortality to fauna			
Pre-clearance surveys to be conducted by a suitably qualified and experienced spotter-catcher. Nocturnal surveys to be undertaken on suitable nights prior to construction to capture and relocate giant barred frogs prior to construction commencement.	This will assist in minimising direct impact to protected species and is highly effective in avoiding known occurrences and/or habitats for threatened species. Low effectiveness for cryptic or “hard to locate” species such as the Bellinger River snapping turtle.	Pre-clearance surveys are commonly used in best practice construction methodologies to avoid/minimise impacts to fauna.	Construction contractor
Engage a suitably qualified ecologist experienced in undertaking surveys for the Bellinger River snapping turtle and the giant barred frog and/or suitable breeding habitat for these species. Ecologist to be present during any vegetation removal, abutment excavation and/or rock bag placement within the river channel.	Highly effective in avoiding direct impacts to Bellinger River snapping turtle and giant barred frog.	Conservation Advice Wollumbinia georgesi (TSSC, 2016)Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021). Mitigation measures developed in consultation with BCD in development of the SIS.	BSC Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Scheduling the duration of construction works to avoid the nesting season of the Bellinger River snapping turtle and the breeding season of the giant barred frog.	Highly effective in avoiding impacts to Bellinger River snapping turtle and giant barred frog during periods when the species are known to be most active for breeding and nesting.	Conservation Advice Wollumbinia georgesi (TSSC, 2016)Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021). Mitigation measures developed in consultation with BCD in development of the SIS.	BSC Construction contractor
Keeping vehicle and machinery movements confined to designated access tracks and enforcing on-site speed limits.	This is a highly effective measure that minimises the potential impact area and the risk of impacts to fauna and habitat.	This is a common practice in contemporary construction projects that implement best practice standards.	Construction contractor
Monitoring of water quality conditions (visual and in situ recordings) to identify the potential for water quality degradation and allow for adaptive management. In situ water quality monitoring will be conducted weekly during works within the low-flow channel. Visual monitoring will be conducted daily while works occur in the channel.	Low level of effectiveness to avoid impacts to the species but highly effective in providing for ongoing monitoring of the species and adaptive mitigation measures.	This is a common practice in contemporary construction projects that implement best practice standards.	Construction contractor
Identify the closest vet or wildlife carer prior to construction commencing. Relevant contact details to be included in a Construction CEMP and circulated during pre-start material to all relevant staff. Develop adverse incident response procedures to detail actions to be taken in the event of wildlife injury or mortality during clearing. This will include procedures for capture and transport of injured wildlife to qualified veterinarian or humane on-site euthanasia and formalisation of arrangements with a local veterinarian to treat and care for wildlife injured during for the construction period.	Low level of effectiveness to avoid impacts to the species but highly effective in providing for ongoing monitoring of the species and adaptive mitigation measures.	BCD	Construction Contractor BSC
Inform BCD of any Bellinger River snapping turtles observed during the works.	Low level of effectiveness to avoid impacts to the species but highly effective in providing for ongoing monitoring of the species and adaptive mitigation measures.	BCD	Construction Contractor BSC

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Noise, vibration and light disturbance			
Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance, including use of bored piles which reduces the noise and vibration emissions compared to driven piles, and to protect water quality/habitat conditions within and downstream of the footprints.	High level of effectiveness in reducing noise, vibration and light disturbance impacts.	Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance.	Construction contractor
Use of noise blankets and soft starts. Soft starts will be required for a period of five minutes.	These measures will assist in minimising direct impacts to fauna from noise and vibration emissions. Noise blankets have moderate effectiveness at mitigating noise impacts to noise-sensitive fauna. Soft starts are highly effective in allowing fauna the change to move away from the area before more intense noise and vibrations commence.	Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance.	Construction contractor
Using an air rock anchor machine and excavator mounted bored piling machine to minimise the noise and vibration generated within the river channel.	These measures will assist in minimising direct impacts to fauna from noise and vibration emissions.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Minimising the duration of rock anchoring and piling to the shortest period possible.	These measures will assist in minimising direct impacts to fauna from noise and vibration emissions.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Using noise dampening devices on machinery wherever practical and requiring that all equipment is maintained and serviced in accordance with manufacturer's instructions to reduce noise levels.	These measures will assist in minimising direct impacts to fauna from noise and vibration emissions.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Restricting construction activities to daylight hours to avoid excessive light levels at night.	These measures will assist in minimising direct impacts to fauna from noise and vibration emissions.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Service and maintain all plant and equipment to minimise machinery noise as much as possible.	These measures will assist in minimising direct impacts to fauna from noise and vibration emissions.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Water quality impacts			
Development of site-specific EMP with management measures to minimise waste entering the waterways.	Implementation of a EMP is highly effective in minimising environmental impacts.	Best practice standard commonly used in contemporary construction projects.	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Enforcing stringent wash down procedures for all machinery and materials used for the project in accordance with the Bellinger River virus biosecurity protocol.	The Bellinger River virus is a key threatening process to the Bellinger River turtle, having caused a mass mortality of the species in 2015 resulting in a substantial decline in the species' population and distribution. Stringent was down procedures will be incorporated into the biosecurity/hygiene protocol, which is predicted to be highly effective in avoiding the exacerbation of infectious disease from the project.	Conservation Advice Wollumbinia georgesi (TSSC, 2016). Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021). DPI and BCS.	Construction contractor
Monitoring of water quality conditions (visual and in situ recordings) to identify the potential for water quality degradation within the rivers and allow for adaptive management. In situ water quality monitoring will be conducted weekly during works within the low-flow channels. Visual monitoring will be conducted daily while works occur in the channel.	Low level of effectiveness to avoid impacts to the species but highly effective in providing for ongoing monitoring of the species and adaptive mitigation measures.	This is a common practice in contemporary construction projects that implement best practice standards.	Construction contractor
Scheduling the duration of construction works during the dry season when rainfall and river flow volumes are low.	Highly effective in avoiding impacts to Bellinger River snapping turtle and giant barred frog during periods when the species are known to be most active for breeding and nesting.	Conservation Advice Wollumbinia georgesi (TSSC, 2016)Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021). Mitigation measures developed in consultation with BCD for the SIS.	BSC Construction contractor
Preparing and implementing a project specific ERSED control plan in accordance with the principles and guidelines included in Managing Urban Stormwater: Soils and Construction - Volume 1 (Landcom, 2004). The ERSED control plan will be prepared by a suitably qualified person. Erosion and sediment controls would be regularly inspected, particularly following rainfall events, to ensure their ongoing functionality.	Erosion and sediment controls in accordance with the NSW 'Blue Book' ERSED control plans are industry accepted standards. This will assist in minimising indirect impacts on waterways by reducing sediment loss as well as associated water quality impacts that may impact the Bellinger River snapping turtle and/or giant barred frog and their habitats. Moderate level of effectiveness – areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised through design and construction methods.	Managing Urban Stormwater: Soils and Construction - Volume 1 (Landcom, 2004) and Volume 2A of Managing Urban Stormwater: Soils and Construction (EPA 2008).	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Installing erosion protection measures in the form of sediment fences or similar where required to minimise the transport of sediment into the river.	This will assist in minimising indirect impacts on waterways by reducing sediment loss as well as associated water quality impacts that may impact the Bellinger River snapping turtle and/or giant barred frog and their habitats. Moderate level of effectiveness – areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised through design and construction methods.	Managing Urban Stormwater: Soils and Construction - Volume 1 (Landcom, 2004) and Volume 2A of Managing Urban Stormwater: Soils and Construction (EPA 2008). ESCP in accordance with the IECA Best Practice Erosion and Sediment Control Guidelines. The ESCP will be prepared by an experienced Certified Professional in Erosion and Sediment Control.	Construction contractor
Minimising erosion potential through scour protection treatments at abutments.	This will assist in minimising direct impacts on waterways by reducing erosion as well as associated water quality impacts that may impact the Bellinger River snapping turtle and/or giant barred frog and their habitats. Moderate level of effectiveness – areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised through design and construction methods.	Managing Urban Stormwater: Soils and Construction - Volume 1 (Landcom, 2004) and Volume 2A of Managing Urban Stormwater: Soils and Construction (EPA 2008). ESCP in accordance with the IECA Best Practice Erosion and Sediment Control Guidelines. The ESCP will be prepared by an experienced Certified Professional in Erosion and Sediment Control.	Construction contractor
Minimising vegetation clearing and the area of bare ground required for construction to only that which is necessary.	This measure has been used previously on similar projects (e.g., road and bridge construction projects) and is highly effective in minimising the disturbance footprint for the project. Limited distribution and specific habitat requirements are listed as a key threatening process for the Bellinger River snaping turtle. Similarly, clearing vegetation is a major threat to the giant barred frog. Minimising the proposed action area is an effective measure to avoid this impact.	Conservation Advice Wollumbinia georgesi (TSSC, 2016)Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021).	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Appropriately managing and protecting stockpiles. Stockpiles will be a maximum of 1.5 m high and will be set back at least 100 m from the Bellinger River and Kalang River.	This is considered effective in reducing adverse impacts on protected species and adjoining habitats that could support MNES species by providing a separation distance from the waterways. Highly effective at reducing the likelihood of habitat degradation and water quality impacts.	This is a common practice in contemporary construction projects that implement best practice standards.	Construction contractor
Site management will be in accordance with the waste management practices detailed in the Blue Book (Landcom 2004).	This will assist in minimising indirect impacts on waterways by reducing the risk of waste entering the waterways. Moderate level of effectiveness – areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised.	Blue Book (Landcom, 2004)	Construction contractor
Waste material, other than vegetation and tree mulch, will not to be left on site once the works have been completed.	This will assist in minimising indirect impacts on waterways by reducing the risk of waste entering the waterways. Moderate level of effectiveness – areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Working areas will be maintained, kept free of rubbish and cleaned up at the end of each working day.	This will assist in minimising indirect impacts on waterways by reducing the risk of waste entering the waterways. Moderate level of effectiveness – areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
A closed system reverse cycle circulation system with sediment trap will be used to collect all water and sediment released during drilling for rock anchors.	This will assist in minimising indirect impacts on waterways by reducing sediment loss as well as associated water quality impacts that may impact the Bellinger River snapping turtle and/or giant barred frog and their habitats. Moderate level of effectiveness – areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised through design and construction methods.	Managing Urban Stormwater: Soils and Construction - Volume 1 (Landcom, 2004) and Volume 2A of Managing Urban Stormwater: Soils and Construction (EPA 2008). ESCP in accordance with the IECA Best Practice Erosion and Sediment Control Guidelines. The ESCP will be prepared by an experienced Certified Professional in Erosion and Sediment Control.	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Drilling support fluid will be biodegradable and a vacuum truck used to dispose of material at the completion of drilling.	This will assist in minimising indirect impacts on waterways by reducing the risk of contaminants entering the waterways. Moderate level of effectiveness – areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Installing rock bags, liners and blinding construction to create bunded work platforms to prevent spills.	This will assist in minimising indirect impacts on waterways by reducing the risk of contaminants entering the waterways. Moderate level of effectiveness – areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Requiring all auxiliary works activities, including chemical and waste storage, will be located at least 100 m from Bellinger River.	Highly effective at reducing the risk of impacts to waterways by providing a separation distance of high-risk activities.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Exacerbation of infectious disease			
A biosecurity/hygiene protocol is to be established in consultation with DPI and to the satisfaction of BCS to prevent the spread of the Bellinger River virus. The protocol will include actions that will be undertaken in the event that an encountered turtle is suspected to be infected with the Bellinger River virus	The Bellinger River virus is a key threatening process to the Bellinger River turtle, having caused a mass mortality of the species in 2015 resulting in a substantial decline in the species' population and distribution. The biosecurity/hygiene protocol is predicted to be highly effective in avoiding the exacerbation of infectious disease from the project.	Conservation Advice Wollumbinia georgesi (TSSC, 2016). Conservation Advice Mixophyes iteratus giant barred frog (TSSC, 2021). DPI and BCS	Construction contractor
Extra vigilance for vehicles and machinery that have operated within a known vector of chytrid fungus, and in areas of known active outbreaks.	The fungal pathogen *Batrachochytrium dendrobatidis*, is a threat to the giant barred frog that causes chytridiomycosis, which has the potential to cause population decline. The fungus is identified as a key threatening process to the species. Biosecurity protocols for vehicles and machinery are highly effective in reducing the risk of spreading biosecurity matters.	Mixophyes iteratus giant barred frog (TSSC, 2021).	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Implementing safe hygiene protocols when handling frogs. Frog salvage personnel will wear gloves and adopt a “one bag one frog” policy for relocating frogs (i.e. disposable gloves, disposable sample bags, sterile equipment).	The fungal pathogen *Batrachochytrium dendrobatidis*, is a threat to the giant barred frog that causes chytridiomycosis, which has the potential to cause population decline. The fungus is identified as a key threatening process to the species. Biosecurity protocols including safe handling procedures for fauna species are highly effective in reducing the risk of spreading biosecurity matters.	Mixophyes iteratus giant barred frog (TSSC, 2021).	Construction contractor
Clean and dry all equipment and wet or muddy footwear before and between visiting frog sites. This may include cleaning vehicle tyres before visiting known high-risk sites where threatened frog species may live.	The fungal pathogen *Batrachochytrium dendrobatidis*, is a threat to the giant barred frog that causes chytridiomycosis, which has the potential to cause population decline. The fungus is identified as a key threatening process to the species. Biosecurity protocols including cleaning equipment, vehicles and footwear are highly effective in reducing the risk of spreading biosecurity matters.	Mixophyes iteratus giant barred frog (TSSC, 2021).	Construction contractor
Avoid translocating giant barred frog individuals further than necessary if individuals are located within the proposed action footprint to minimise the potential spread of chytrid.	The fungal pathogen *Batrachochytrium dendrobatidis*, is a threat to the giant barred frog that causes chytridiomycosis, which has the potential to cause population decline. The fungus is identified as a key threatening process to the species. Biosecurity protocols including cleaning equipment, vehicles and footwear are highly effective in reducing the risk of spreading biosecurity matters.	Mixophyes iteratus giant barred frog (TSSC, 2021).	Construction contractor
Carry cleaning utensils and a disinfectant for use between sites.	The fungal pathogen *Batrachochytrium dendrobatidis*, is a threat to the giant barred frog that causes chytridiomycosis, which has the potential to cause population decline. The fungus is identified as a key threatening process to the species. Biosecurity protocols including cleaning equipment, vehicles and footwear are highly effective in reducing the risk of spreading biosecurity matters.	Mixophyes iteratus giant barred frog (TSSC, 2021).	Construction contractor
Record any chytrid-infected frogs and contact Frogwatch Helpline on 0419 249 728.	Low level of effectiveness to avoid impacts to the species but highly effective in providing for ongoing monitoring of the species and adaptive mitigation measures.	BCD	Construction Contractor BSC

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Temporary restriction of instream connectivity			
Construction works will be restricted to daylight hours to allow periods of non-disturbance at night.	This will reduce the disturbance to any fauna species that are present.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Prioritising and scheduling the duration of construction works within the river channel to the minimum time.	This will reduce the disturbance to any fauna species that are present.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Best practice construction methods selected to minimise the duration of disturbance.	This will reduce the disturbance to any fauna species that are present.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Scheduling the duration of construction works to avoid the nesting season of the Bellinger River snapping turtle and breeding season of the giant barred frog.	This will reduce the disturbance to any fauna species that are present.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Introduction and spread of invasive weeds and pests			
Weed and pest management protocols to be included in the site-specific CEMP.	This will prevent new infestations of weed species and/or the spread of existing weeds. Highly effective in preventing new infestations and/or spread of existing weeds by ensuring weeds are monitored and managed appropriately. Assists the construction contractor to comply with the general biosecurity duty.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Undertake prevention and management of pest animal and invasive species in accordance with the NSW *Biosecurity Act 2015*. Likewise, management of declared local pests and invasive species will be undertaken in accordance with North Coast Regional Strategic Weed Management Plan 2023-2027.	This will prevent the introduction and/or spread of pest animals and invasive species. Highly effective in preventing introduction and/or spread of pest animals and invasive species. Assists the construction contractor to comply with the general biosecurity duty.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Establish appropriate on-site waste-storage and disposal protocols, with designated waste-storage areas and appropriate (i.e. closed) waste receptacles and frequent waste disposal schedules to minimise attracting feral animals (e.g. foxes, dogs and pigs).	This will prevent the introduction and/or spread of pest animals and invasive species. Highly effective in preventing introduction and/or spread of pest animals and invasive species. Assists the construction contractor to comply with the general biosecurity duty.	Best practice standard commonly used in contemporary construction projects.	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Include weed and pest management protocols in all site inductions.	This will ensure awareness of key environmental obligations across the entire workforce and will assist personnel in meeting their environmental obligations and general biosecurity duty. This induction process has been used effectively on a range of other construction projects. Highly effective at educating personnel on weed and pest management.	Environmental training as part of broader construction workplace inductions is a common practice in contemporary construction projects that implement best practice standards.	Construction contractor
Prohibit employees from bringing domestic animals onto the construction site.	This will prevent the introduction and/or spread of pest animals and invasive species. Highly effective in preventing introduction and/or spread of pest animals and invasive species. Assists the construction contractor to comply with the general biosecurity duty.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Enforce strict weed hygiene protocols including weed-washdowns, inspections and weed and seed certifications of all vehicles, machinery and plant prior to entering the construction site. Wash-downs and inspections should also be undertaken regularly for vehicles travelling to different parts of the site to minimise internal spread of weeds within the works area as well as to mitigate the spread of chytrid fungus.	This will prevent new infestations of weed species and/or the spread of existing weeds. Highly effective in preventing new infestations and/or spread of existing weeds by ensuring weeds are monitored and managed appropriately. Assists the construction contractor to comply with the general biosecurity duty.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Establish a designated access track network and restrict all vehicle movements to designated access tracks. Enforce no off-road driving.	This will prevent new infestations of weed species and/or the spread of existing weeds. Highly effective in preventing new infestations and/or spread of existing weeds by ensuring weeds are monitored and managed appropriately. Assists the construction contractor to comply with the general biosecurity duty.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Undertake pre-construction inventory and mapping of all weed-affected areas and identify areas of high risk that should be designated as no-go areas or areas requiring active weed management during and after construction.	This will prevent new infestations of weed species and/or the spread of existing weeds. Highly effective in preventing new infestations and/or spread of existing weeds by ensuring weeds are monitored and managed appropriately. Assists the construction contractor to comply with the general biosecurity duty.	Best practice standard commonly used in contemporary construction projects.	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Undertake periodic inspections of weed-affected areas throughout the construction period and implement weed control to weeds of management concern, including declared and environmental weeds.	This will prevent new infestations of weed species and/or the spread of existing weeds. Highly effective in preventing new infestations and/or spread of existing weeds by ensuring weeds are monitored and managed appropriately. Assists the construction contractor to comply with the general biosecurity duty.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Identify and control all declared weed infestations on the construction site throughout construction.	This will prevent new infestations of weed species and/or the spread of existing weeds. Highly effective in preventing new infestations and/or spread of existing weeds by ensuring weeds are monitored and managed appropriately. Assists the construction contractor to comply with the general biosecurity duty.	Best practice standard commonly used in contemporary construction projects.	Construction contractor
Monitor treated areas to assess the success of declared pest/weed eradication.	This measure will reduce long-term impacts on MNES and assist in reducing impacts to the ecosystem by encouraging temporarily disturbed areas to recover as quickly as possible. Moderate effectiveness as areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised. This will maximise the change of the rehabilitation process being successful.	This measure is a standard practice for contemporary construction projects.	Construction contractor
Rehabilitate and revegetate temporary works areas as soon as possible to minimise the potential for weed establishment.	This measure will reduce long-term impacts on MNES and assist in reducing impacts to the ecosystem by encouraging temporarily disturbed areas to recover as quickly as possible. Moderate effectiveness as areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised. This will maximise the change of the rehabilitation process being successful.	This measure is a standard practice for contemporary construction projects.	Construction contractor
Utilise stockpiled topsoil and mulched vegetation during landscaping and revegetation.	This measure will reduce long-term impacts on MNES and assist in reducing impacts to the ecosystem by encouraging temporarily disturbed areas to recover as quickly as possible. Moderate effectiveness as areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised. This will maximise the change of the rehabilitation process being successful.	This measure is a standard practice for contemporary construction projects.	Construction contractor

Avoidance, mitigation or management measure (environmental safeguards)	Justification and predictive effectiveness of environmental safeguard	Statutory or policy basis for safeguard	Responsibility
Utilise native species endemic to the region in revegetation to minimise importation of plants.	This measure will reduce long-term impacts on MNES and assist in reducing impacts to the ecosystem by encouraging temporarily disturbed areas to recover as quickly as possible. Moderate effectiveness as areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised. This will maximise the change of the rehabilitation process being successful.	This measure is a standard practice for contemporary construction projects.	Construction contractor
Undertake regular post-construction monitoring of rehabilitation areas and high-risk weed areas.	This measure will reduce long-term impacts on MNES and assist in reducing impacts to the ecosystem by encouraging temporarily disturbed areas to recover as quickly as possible. Moderate effectiveness as areas of direct impact are minimised and/or indirect impacts to behaviours/life cycles are minimised. This will maximise the change of the rehabilitation process being successful.	This measure is a standard practice for contemporary construction projects.	Construction contractor

5. Economic and social matters

Council is responsible for managing road related transport infrastructure and providing safe and efficient access for the Local Government Area's (LGA) road network.

Following the Timber Bridge Assessment Project in 2017 a number of bridges with structural defects were identified, a load limit was required to be placed on those bridges to enable the continued use and longevity of the bridge until a permanent repair can be funded and completed. Joyces, Hobarts, Justins, and Duffys Bridges have all been identified as requiring replacement.

The current Bridge Renewal Program, including the subject bridges, has been significantly accelerated thanks to funding from the following sources:

– NSW Government - Fixing Country Bridges, Fixing Country Roads
– Federal Funding - Bridge Renewal Program
– Bellingen Shire Council – General Fund / SRV's

The major contributor to the current program, being Fixing Country Bridges funding, contributes $28.25M across two rounds to our current total $35M program.

The key objective of the project is to:

– Maintain public and legal access for local residents, tourists and emergency services in the event of an emergency.
– Minimise the environmental impacts from carrying out the works.

Council maintains are webpage in relation to its bridge replacement program and has recently sought community input on the subject bridges during the public exhibition of the SIS.

6. Environmental history of the person proposing to take the action

Over the past three years alone, BSC has constructed over 20 new bridges under various delivery models with an expenditure for bridge construction of over $25 million. Responsible environmental management isa key focus in the planning and delivery of works with the current EPBC referral process highlighting the precautionary approach being undertaken by BSC in the delivery of works in environmentally sensitive locations.

BSC has a satisfactory record of responsible environment management. Additionally, there have been no proceedings under a Commonwealth, state or territory law for the protection of the environment or the conservation and sustainable use of natural resources against BSC.

BSC has an Integrated Management System (Environmental) which is accredited with ISO 14001:2015 Environmental Management Systems (Appendix M). The Integrated Management System sets the standards for the carrying out of environmental impact assessments and the preparation of environmental management plans and is applied to all infrastructure projects when environmental management is required or when environmental triggers are identified.

BSC's Integrated Management System provides details on the assessment of environmental conditions, potential impacts and legislative requirements for maintenance, construction and building projects. The aim of the Integrated Management System is to:

– Identify key internal and external stakeholders and/or issues early in the project planning process.
– Address environmental impacts through mitigation measures and communicate to all relevant stakeholders.
– Monitor environmental performance to identify opportunities for improvement.

BSC's Integrated Management System is accompanied by an Environmental Protection - Statement of Intent, which states BSC's aim for excellence in environmental protection and awareness to achieve local government best practice in its operations (Appendix N).

7. Conclusion

The proposed action is the construction of four new concrete bridges to replace existing timber bridges in the BSC LGA in the NSW Mid North Coast region. The four bridges are:

– Joyces Bridge, located on Darkwood Road, Darkwood, over the Bellinger River.
– Hobarts Bridge located on Darkwood Road, Darkwood, over the Bellinger River.
– Justins Bridge located on Darkwood Road, Darkwood, over the Bellinger River.
– Duffys Bridge located on Kalang Road, Kalang, over the Kalang River.

The proposed activities at each bridge site will generally include:

– Construction of the new bridge, including abutments and pilings. Each bridge will be constructed immediately downstream of the existing bridge.
– Removal of the current bridge structures at each site (noting that the existing bridges will be retained throughout the construction period to enable access across the rivers but will be removed following completion and commissioning of the new bridge structures).
– Installation of rock armour (scour protection).
– Realignment of the road approaches to each new bridge, including patching and resealing where required.
– Rehabilitation and revegetation of the river banks in the area of works.

The proposed action has been declared a controlled action under the EPBC Act due to potential significant impacts to the following threatened species:

– Bellinger River snapping turtle – critically endangered under the EPBC Act.
– Giant barred frog – vulnerable under the EPBC Act.

This report has been prepared in response to an additional information request form DCCEEW and together with the appendices forms the preliminary documentation by which the proposed action will be assessed for approval under the EPBC Act.

The proposed action is estimated to impact a total of 0.41 ha of instream and associated bank footprints as follows:

– Joyces Bridge - total impact of approximately 0.10 ha.
– Hobarts Bridge - total impact of approximately 0.12 ha.
– Justins Bridge - total impact of approximately 0.05 ha.
– Duffys Bridge - total impact of approximately 0.14 ha.

Potential impacts that have been identified for the relevant threatened species include:

– Bellinger River snapping turtle:
  - Habitat loss due to disturbance to riverbed and banks
  - Water quality impacts
  - Injury/mortality to fauna
  - Noise and vibration disturbance
  - Exacerbation of infectious disease
  - Temporary restriction of instream connectivity
  - Disruptions to natural ecosystem functioning
– Giant barred frog:
  - Loss and degradation of habitat
  - Injury/mortality to fauna
  - Introduction and spread of invasive weeds and pests
  - Exacerbation of infectious disease

Several avoidance measures have been implemented in the design of the proposed action, including bridge designs with larger spans to allow piers to be placed outside the low-flow channel. Timing for construction activities is planned to avoid the breeding seasons of the Bellinger River snapping turtle and the giant barred frog. Mitigation measures have been carefully developed to minimise the potential impacts to turtles and frogs, including extensive consultation with the NSW BCD to develop measures to avoid potential impacts to the Bellinger River snapping turtle. These include, but are not limited to:

– Development and implementation of a project-specific EMP.
– Development and implementation of an ESCP.
– Pre-clearance surveys using an experienced and qualified fauna spotter-catcher.
– Minimising instream works and downstream impacts through bridge design and construction methodology.
– Retaining large woody debris, rocks and root balls for reinstatement to the proposal action area following completion of construction.
– Keeping vehicle and machinery movements confined to designated access tracks and enforcing on-site speed limits.
– Use of noise blankets and other noise dampening devices, soft starts, and machinery with lower noise and vibration emissions.
– Establishing a biosecurity/hygiene protocol in consultation with DPI&E and to the satisfaction of BCS to prevent the spread of the Bellinger River virus.
– Stringent wash down conditions for all materials and machinery.
– Monitoring of water quality conditions.
– Providing environmental training to site personnel through a site induction and daily toolbox talks.

Environmental offsets are not anticipated as the proposed action has been assessed as having no significant impact to either the Bellinger River snapping turtle or the giant barred frog through the application of appropriate avoidance, mitigation and management measures.

The proposed action meets the principles of ecologically sustainable development as outlined in Table 7.1.

Table 7.1 Assessment against the Ecologically Sustainable Development Guiding Principles

Guiding Principles	Comments
Guiding Principle 1: Decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations.	The proposed action area incorporates a range of avoidance and physical controls and environmental management and mitigation measures to minimise potential impacts on the environment both short-term and long-term. These have been factored into the Project through the assessment of the social, economic and environmental impacts of the project. Management measures to be implemented in relation to the potential impacts of the project relate to terrestrial and aquatic ecology, biosecurity, water quality, noise and vibration, light pollution, land use and tenure, traffic, waste, and the need to maintain a safe and connected road network.
Guiding Principle 2: if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	During the construction phase, the Project is expected to cause localised losses of habitat predominately due to clearing for the new bridge structures. This will cause temporary disturbance of wildlife through construction noise and vibration. Mitigation measures to prevent environmental degradation and reduce adverse environmental effects on MNES and the surrounding environment will be incorporated into a CEMP and EMP. The CEMP and EMP will outline and describe how the nominated contractor/developer will, during the construction phase and the operational phase, comply with the relevant environmental obligations and legislative requirements, outline how the contractor will minimise environmental risks and achieve environmental outcomes on the project by providing a structured approach to ensure appropriate environmental management measures and controls are implemented.

Guiding Principles	Comments
	In accordance with ESD principles, the project has addressed the conservation of biodiversity and ecological integrity by proposing an environmental management framework designed to conserve ecological values, where practicable, after consideration of potential project impacts. This includes the development and implementation of the following management plans: – EMP – CEMP – CESCP
Guiding Principle 3: the principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The project provides for inter-generational equity by ensuring that the bridge upgrades will provide for safe and reliable transport routes into the future, while minimising impacts on the surrounding environment. Extensive avoidance and mitigation measures have been taken to ensure the health, diversity and productivity of the environment is maintained so that future generations are able to benefit from the same level of environmental health, diversity and productivity as current generations.
Guiding Principle 4: the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.	The Project addresses the conservation of biodiversity and ecological integrity by proposing a comprehensive environmental management framework designed to conserve ecological values and long-term species diversity as far as practicable. This goal will remain at the forefront of decision making and actions in the construction, operation and decommissioning phases of the project. The concept of conservation of biodiversity has been addressed through: – Project infrastructure designed to avoid or minimise impacts on the existing environment. – Construction methodology and timing to avoid or minimise impacts on the existing environment. – Development and implementation of an EMP and ESCP with specific measures to ensure conservation of biodiversity and ecological integrity.
Guiding Principle 5: improved valuation, pricing and incentive mechanisms should be promoted.	This principle requires that environmental factors be included in the valuation of assets and services. This principle reflects the idea that if the real value of natural resources is incorporated into the cost of using those resources, it is more likely that resources will be used in a sustainable manner, adequately managed and not wasted. The project design has sought to use resources in a sustainable manner that would improve valuation and pricing through co-locating the new bridges with the old bridges, reducing the need for additional works required for new road upgrades. In this instance, an upgrade of existing brownfield projects rather than constructing new greenfield projects provides improved value. Additionally the project avoids and/or minimises impacts through the use of design and construction methodology options that have reduced disturbance footprints and indirect impacts.

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Appendices

Appendix A

EPBC Referral (2024/09805)

Joyces, Hobarts, Justins, and Duffys bridges upgrades

Application Number: **02204** Commencement Date: **08/01/2024** Status: **Locked**

1. About the project

1.1 Project details

1.1.1 Project title *

Joyces, Hobarts, Justins, and Duffys bridges upgrades

1.1.2 Project industry type *

Transport - Land

1.1.3 Project industry sub-type

Road

1.1.4 Estimated start date *

01/04/2024

1.1.4 Estimated end date *

30/06/2025

1.2 Proposed Action details

1.2.1 Provide an overview of the proposed action, including all proposed activities. *

Bellingen Shire Council (BSC) is proposing to replace four existing bridges within the BSC local government area in the Mid North Coast region of New South Wales (the proposed action or 'the Project'):

- Justins Bridge on the Bellinger River

- Joyces Bridge on the Bellinger River
- Hobarts Bridge on the Bellinger River
- Duffys Bridge on the Kalang River.

The four bridges are ageing, timber structures that are nearing the end of their serviceable lives. BSC proposes to construct new concrete bridges immediately adjacent to each existing bridge, which will provide increased flood immunity to residents and a safe and reliable crossing for road users. A description of the existing bridges and the proposed new works is provided in Att A-MNES Assessment Report, Section 2.1, pp 5.

Construction works are expected to be carried out over a 14-month period for the complete works program involving all four bridges.

The general activities required for the construction phase of each bridge will include the following:

- Set up site compound, laydown and stockpile areas outside of flood zones and roads
- Clearing and grubbing surface vegetation and topsoil, stockpiling topsoil
- Install erosion and sediment controls. For the Justins and Joyces bridges this will include sediment fencing and floating hydrocarbon booms with drop silt curtains around access pathways
- Install access ramps to the waterways to exposed gravel/rock bars. These are mostly within the proposed bridge and scour rock footprints for each site. Access to the Justins Bridge site on the eastern side will be from the existing road shoulder
- Repeated placement of two tonne rock bags to stabilise crane positions, controls and temporary access ways
- Install low flow aquatic fauna passage pipes under the eastern access track at Joyces Bridge
- Installation of piers:
    - Justins Bridge – install two rows of 3 x 600 mm bored piles into the bed of the Bellinger River with a concrete headstock cast in situ
    - Joyces Bridge – install 9 x 600 mm piles (three per headstock) with three concrete headstocks into the bed of the Bellinger River
    - Hobarts Bridge – install three concrete blade piers 1,300 mm wide x 4,655 – 6,240 mm long, each anchored into the bed of the Bellinger River by 3 x 600 mm bored piles or N28 anchors
    - Duffys Bridge – Pier 1 and 2 - install two rows of five driven piles (10 per pile cap) into the bed of the Kalang River with two concrete headstocks cast in situ
- Remove piling access works
- Construction of new concrete abutments on the high banks:
    - Justins Bridge – using prefabricated wing walls and casting the 1,000 mm wide, 900 mm deep abutments in place, with 2 x 600 mm piles bored into bedrock or rock anchors
    - Joyces Bridge – using prefabricated wing walls and casting the 950 mm wide abutments in place, each with 2 x 600 mm piles bored into bedrock
    - Hobarts Bridge – using prefabricated wing walls and casting the 1,200 mm high abutment in place, with 3 x 600 mm embedded piles bored into bedrock
    - Duffys Bridge – using prefabricated wing walls and casting the 1,200 mm wide, 1,600 – 2,000 mm deep abutments in place, with five driven piles per abutment. No anchors are to be used
- Install scour rock around abutments to the toe of the bank keyed into high banks upstream and downstream
- Construction of bridge deck structures – place beams and girders, place or pour concrete decks, backfill to abutments, stitch pour where applicable
- Reshape road approaches to bridges
- Demolish existing bridges:
    - Justins Bridge – remove all decking and girders, remove timber headstocks and steel components, cut off timber piles to bed level, leaving concrete piers and headstocks over the water and removing existing abutments

  - Joyces Bridge – remove all decking and girders, partially remove abutments to improve tie-in, leaving existing piers, concrete headstocks and majority of abutments to minimise disturbance to bed and banks
  - Hobarts Bridge – remove decking, girders and headstocks outside of the low flow area (of those constructed of timber), but leaving existing abutments and concrete piers to minimise disturbance to bed and banks
  - Duffys – remove the deck, cutting the existing timber piers to bed level, but leaving the abutments to minimise disturbance to bed and banks
- Finalise scour rock placement
- Rehabilitate site, including plantings and temporary erosion and sediment controls to remain for three months or until stable.

Ancillary works for the Project will include the establishment of a temporary construction compound near each project footprint (i.e. each bridge footprint). Construction compounds will be located within the project areas defined in Section 2 of this referral and will be mostly within the existing road corridors with some requirement to use adjacent private property. BSC or the Principal Contractor will seek private lease agreements with private landowners for the purpose of construction compounds to avoid locating compounds on low-lying areas within potential flood zones. Consultation with landowners has occurred however formal lease agreements are awaiting project approvals.

The construction compound is likely to consist of the following:

- Small site shed
- Equipment laydown area
- Waste receptacles
- Construction materials.

The following is an indicative list of construction plant and equipment that may be required for the Project:

- Heavy vehicles associated with earthwork activities and construction including excavator, backhoe, skid steer, tipper, spreaders, roller and delivery trucks
- Machinery including an excavator mounted drilling rig, small excavator, mobile shotcrete plant, small mobile crane, and various hand tools.

Upon completion of the Project, the operational phase activities will largely comprise maintenance works including:

- Vegetation control (e.g., mowing, herbicide treatments, weed removals and grass slashing)
- Line marking, pavement repairs and road resurfacing
- Maintenance of drainage structures and stormwater quality devices, including removal of sediment and debris
- Repair and replacement of road furniture including guardrails, signs, barriers, fencing and guide markers
- Structure maintenance including bridges.

The design life of each bridge structure is 100 years. Decommissioning will be in accordance with the relevant legislation at the time of decommissioning.

The instream and associated bank footprints are estimated to impact a total of 0.41 ha as follows:

- Justins Bridge - total impact of approximately 0.05 ha
- Joyces Bridge - total impact of approximately 0.10 ha
- Hobarts Bridge - total impact of approximately 0.12 ha
- Duffys Bridge - total impact of approximately 0.14 ha.

1.2.2 Is the project action part of a staged development or related to other actions or proposals in the region?

No

1.2.6 What Commonwealth or state legislation, planning frameworks or policy documents are relevant to the proposed action, and how are they relevant? *

Commonwealth legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation and is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The EPBC Act provides a legal framework to protect and manage matters of national environmental significance (MNES), which include:

- World Heritage properties
- National Heritage properties
- Wetlands of international importance (Ramsar wetlands)
- Listed threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- Water resources, in relation to coal seam gas development and large coal mining development.

A person who proposes to take an action that is likely to have a significant impact on MNES must refer that action to the minister administering the EPBC Act. An action is defined broadly in the EPBC Act and includes any project, development ,undertaking, activity or series of activities, or any alteration of these actions. The EPBC Act is relevant to the Project as the proposed action may have an impact on the following MNES:

- Listed threatened species:
  - Bellinger River snapping turtle (*Myuchelys georgesi*) – critically endangered under the EPBC Act
  - Grey-headed flying-fox (*Pteropus poliocephalus*) – vulnerable under the EPBC Act
  - Giant barred frog (*Mixophyes iteratus*) – vulnerable under the EPBC Act
- Migratory species.:
  - Black-faced monarch (*Monarcha melanopsis*) – migratory under the EPBC Act.

Significant impact assessments have been undertaken for each of the above species in accordance with the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DEWHA, 2013).

New South Wales legislation

The primary New South Wales legislation that is relevant to the proposed works includes:

- *Biodiversity Conservation Act 2016* - a Species Impact Statement has been prepared in accordance with Part 7 of the *Biodiversity Conservation Act 2016* to assess significant impacts to biodiversity from activities being assessed under the *Environmental Planning and Assessment Act 1979* (EP & A Act)
- *Environmental Planning and Assessment Act 1979* - this is the principal planning legislation used to plan and assess development proposals in New South Wales. Development approvals are not required for the Project under this legislation; however, BSC has an obligation to assess all likely environmental impacts from the Project. BSC has prepared a Review of Environmental Factors for each of the proposed bridge works in accordance with Part 5 of the EP & A Act

- *Fisheries Management Act 1994* - under section 200 of the *Fisheries Management Act 1994*, a permit is required for dredging and reclamation work carried out by a local government authority, unless the works are authorised under the *Crown Land Management Act 2016.* Dredging includes the removal of material from the waterway and the action of digging within the waterway and its banks. Reclamation is the placement of material into the waterway or onto the waterway bed and banks. The Project will require activities classified as dredging and reclamation (i.e. excavation for abutments, removal of old bridge components and other associated earthworks and construction of new abutments, placement of scour protection and construction of temporary waterway crossing, if required). As the Project is not authorised under the *Crown Land Management Act 2016*, a section 200 permit is required
- *Roads Act 1993* - a permit will be required under Section 138 of the *Roads Act 1993* for works or activities in a public road.

1.2.7 Describe any public consultation that has been, is being or will be undertaken regarding the project area, including with Indigenous stakeholders. Attach any completed consultation documentations, if relevant. *

BSC intends to undertake public consultation with relevant stakeholders including local residents and community, State Emergency Services, and relevant Aboriginal parties.

1.3.1 Identity: Referring party

Privacy Notice:

Personal information means information or an opinion about an identified individual, or an individual who is reasonably identifiable.

By completing and submitting this form, you consent to the collection of all personal information contained in this form. If you are providing the personal information of other individuals in this form, please ensure you have their consent before doing so.

The Department of Climate Change, Energy, the Environment and Water (the department) collects your personal information (as defined by the Privacy Act 1988) through this platform for the purposes of enabling the department to consider your submission and contact you in relation to your submission. If you fail to provide some or all of the personal information requested on this platform (name and email address), the department will be unable to contact you to seek further information (if required) and subsequently may impact the consideration given to your submission.

Personal information may be disclosed to other Australian government agencies, persons or organisations where necessary for the above purposes, provided the disclosure is consistent with relevant laws, in particular the Privacy Act 1988 (Privacy Act). Your personal information will be used and stored in accordance with the Australian Privacy Principles.

See our Privacy Policy to learn more about accessing or correcting personal information or making a complaint.

Alternatively, email us at privacy@awe.gov.au.

☑ **Confirm that you have read and understand this Privacy Notice ***

1.3.1.1 Is Referring party an organisation or business? *

Yes

Referring party organisation details

ABN/ACN	39008488373
Organisation name	GHD PTY LTD
Organisation address	Level 9, 145 Ann Street, Brisbane, Qld, 4000

Referring party details

Name	Lauren Rolfe
Job title	Environmental Scientist
Phone	0733163790
Email	lauren.rolfe@ghd.com
Address	Level 9, 145 Ann Street, Brisbane Qld 4000

1.3.2 Identity: Person proposing to take the action

1.3.2.1 Are the Person proposing to take the action details the same as the Referring party details? *

No

1.3.2.2 Is Person proposing to take the action an organisation or business? *

Yes

Person proposing to take the action organisation details

ABN/ACN	26066993265
Organisation name	BELLINGEN SHIRE COUNCIL
Organisation address	31-33 Hyde Street, Bellingen, NSW, 2454

Person proposing to take the action details

Name	John Fyfe
Job title	Manager Infrastructure Services
Phone	02 6655 7300
Email	jfyfe@bellingen.nsw.gov.au
Address	31-33 Hyde Street, Bellingen, NSW, 2454

1.3.2.14 Are you proposing the action as part of a Joint Venture? *

No

1.3.2.15 Are you proposing the action as part of a Trust? *

No

1.3.2.17 Describe the Person proposing the action's history of responsible environmental management including details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the Person proposing to take the action. *

Over the past three years alone, BSC has constructed over 20 new bridges under various delivery models with an expenditure for bridge construction of over $25 million. Responsible environmental management is a key focus in the planning and delivery of works with the current EPBC referral process highlighting the precautionary approach being undertaken by BSC in the delivery of works in environmentally sensitive locations.

BSC has a satisfactory record of responsible environment management. Additionally, there have been no proceedings under a Commonwealth, state or territory law for the protection of the environment or the conservation and sustainable use of natural resources against BSC.

1.3.2.18 If the person proposing to take the action is a corporation, provide details of the corporation's environmental policy and planning framework

BSC has an Integrated Management System (Environmental) which is accredited with ISO 14001:2015 Environmental Management Systems (refer to Att B BSC Environmental Management Policy). The Integrated Management System sets the standards for the carrying out of environmental impact assessments and the preparation of environmental management plans and is applied to all infrastructure projects when environmental management is required or when environmental triggers are identified.

BSC's Integrated Management System provides details on the assessment of environmental conditions, potential impacts and legislative requirements for maintenance, construction and building projects. The aim of the Integrated Management System is to:

- Identify key internal and external stakeholders and/or issues early in the project planning process.
- Address environmental impacts through mitigation measures and communicate to all relevant stakeholders.
- Monitor environmental performance to identify opportunities for improvement.

BSC's Integrated Management System is accompanied by an Environmental Protection - Statement of Intent, which states BSC's aim for excellence in environmental protection and awareness to achieve local government best practice in its operations (refer to Att C BSC IMS Statement of Intent).

1.3.3 Identity: Proposed designated proponent

1.3.3.1 Are the Proposed designated proponent details the same as the Person proposing to take the action? *

Yes

Proposed designated proponent organisation details

ABN/ACN	26066993265
Organisation name	BELLINGEN SHIRE COUNCIL

Organisation address	31-33 Hyde Street, Bellingen, NSW, 2454

Proposed designated proponent details

Name	John Fyfe
Job title	Manager Infrastructure Services
Phone	02 6655 7300
Email	jfyfe@bellingen.nsw.gov.au
Address	31-33 Hyde Street, Bellingen, NSW, 2454

1.3.4 Identity: Summary of allocation

Confirmed Referring party's identity

The Referring party is the person preparing the information in this referral.

ABN/ACN	39008488373
Organisation name	GHD PTY LTD
Organisation address	Level 9, 145 Ann Street, Brisbane, Qld, 4000
Representative's name	Lauren Rolfe
Representative's job title	Environmental Scientist
Phone	0733163790
Email	lauren.rolfe@ghd.com
Address	Level 9, 145 Ann Street, Brisbane Qld 4000

Confirmed Person proposing to take the action's identity

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	26066993265

Organisation name	BELLINGEN SHIRE COUNCIL
Organisation address	31-33 Hyde Street, Bellingen, NSW, 2454
Representative's name	John Fyfe
Representative's job title	Manager Infrastructure Services
Phone	02 6655 7300
Email	jfyfe@bellingen.nsw.gov.au
Address	31-33 Hyde Street, Bellingen, NSW, 2454

Confirmed Proposed designated proponent's identity

The Person proposing to take the action is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

1.4 Payment details: Payment exemption and fee waiver

1.4.1 Do you qualify for an exemption from fees under EPBC Regulation 5.23 (1) (a)? *

No

1.4.3 Have you applied for or been granted a waiver for full or partial fees under Regulation 5.21A? *

No

1.4.5 Are you going to apply for a waiver of full or partial fees under EPBC Regulation 5.21A?

No

1.4.7 Has the department issued you with a credit note? *

No

1.4.9 Would you like to add a purchase order number to your invoice? *

No

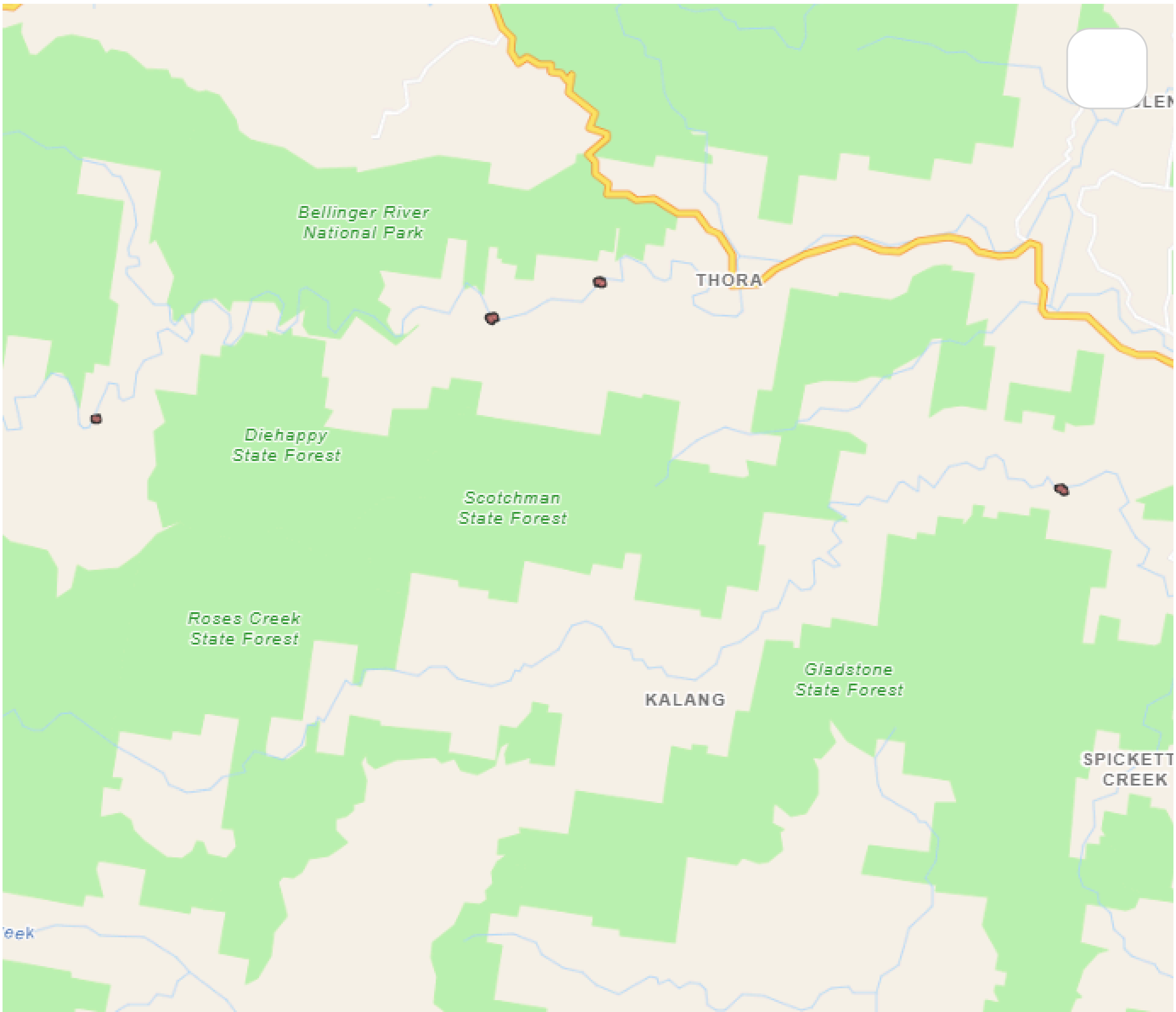
1.4 Payment details: Payment allocation

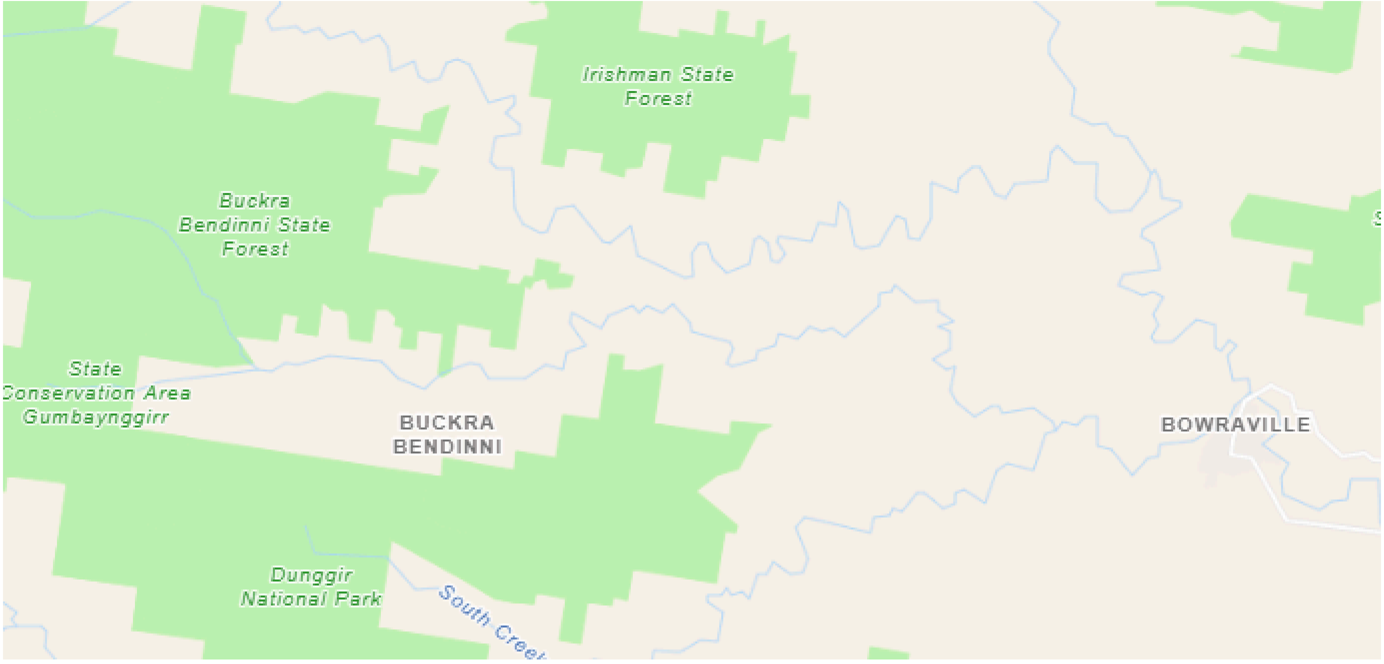
1.4.11 Who would you like to allocate as the entity responsible for payment? *

Proposed designated proponent

2. Location

2.1 Project footprint





Maptaskr © 2024 -30.462067, 152.648300

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Project Area: 9.46 Ha **Disturbance Footprint:** 0.42 Ha

2.2 Footprint details

2.2.1 What is the address of the proposed action? *

Darkwood Road, Darkwood NSW and Kalang Road, Kalang NSW

2.2.2 Where is the primary jurisdiction of the proposed action? *

New South Wales

2.2.3 Is there a secondary jurisdiction for this proposed action? *

No

2.2.5 What is the tenure of the action area relevant to the project area? *

The Justins, Joyces and Hobarts bridges provide access across the Bellinger River via Darkwood Road, which is road reserve tenure under the local government authority of BSC.

Duffys Bridge provides access across the Kalang River via Kalang Road, which is also road reserve tenure under the local government authority of BSC.

The Bellinger River and Kalang River are under the jurisdiction of Crown Lands.

The new bridges will be located within the Local Government Authority road reserves of Bellingen Shire Council.

Additionally, Bellingen Shire Council or the Principal Contractor will seek private lease agreements with private landowners for the purpose of site compounds and laydown areas to minimise the need for site compounds on low lying areas within potential flood zones. Additional tenure is proposed noting although consultation with landowners has occurred, formal lease agreements are awaiting project approvals. Lease agreements will be for the project duration for the land listed below:

- Duffys Bridge - Lot Part 130 DP 755543 ID 5585 - freehold tenure
- Hobarts Bridge - Lot 14 DP 755561 ID 1344 - freehold tenure
- Joyces Bridge - Lot 3 DP 1212570 ID 13292 - freehold tenure
- Justins Bridge - Lot 10 DP 755555 ID 714 - freehold tenure.

3. Existing environment

3.1 Physical description

3.1.1 Describe the current condition of the project area's environment.

Condition

The project area consists of the four bridge locations, which are within the Bellinger River (Justins, Joyces and Hobarts bridges) and the Kalang River (Duffys Bridge). The Bellinger-Kalang River system is within the Bellinger River catchment and is one of the largest drainage systems of the New South Wales east coast and a major river system in the BSC local government area. The Bellinger River catchment is mildly disturbed, with around 85 percent of the catchment remaining forested (generally in the undulating areas of the upper catchment). Around 15 percent of the landscape has been changed, predominantly for cattle grazing (DPIE, 2024). These areas are concentrated along the floodplains of the river and its tributaries and include the project area, where minor to moderate disturbance has occurred for construction of the existing road corridors and bridges.

The existing environment at each bridge site is of high quality with a range of aquatic habitat features, minimal or no bank erosion, good vegetation structure and high water quality.

There are large expanses of high value natural environments surrounding the project area, including the New England National Park, Bellinger River National Park, Diehappy State Forest, Scotchman State Forest, Gladstone State Forest and Baalijin Nature Reserve. The areas surrounding the bridge sites support a range of vegetation communities and habitats.

Project Site Access

The wider project area is near the town of Bellingen, which is located approximately 35 km south-west of Coffs Harbour on the NSW north coast. The distance from each project site to the nearest town is as follows:

- Joyces Bridge is approximately 2.9 km west of the small town of Thora and 35 km west of the town of Bellingen
- Hobarts Bridge is approximately 5.4 km west of Thora and 18 km west of Bellingen
- Justins Bridge is approximately 14.5 km south-west of Thora and 20 km west of Bellingen
- Duffys Bridge is approximately 4 km south-west of Bellingen.

The existing infrastructure in and around each project area will be used to provide access to each bridge site for construction activities, including transportation of materials and equipment. Transportation will occur from Bellingen to Joyces Bridge, Hobarts Bridge and Justins Bridge via Waterfall Way to the township of Thora and then via Darkwood Road to each bridge site. Transportation to Duffys Bridge will be from Bellingen via Bowraville Road and Kalang Road. Access to each site is described further below:

Joyces Bridge

The site is only accessible from the southern boundary via Darkwood Road, which connects to the small town of Thora approximately 2.9 km to the west. Darkwood Road is a two-way, sealed road that provides access to the Thora Sawmill and several small farms between Thora and Joyces Bridge. From Thora, Waterfall Way connects to Bellingen approximately 14 km further west. Waterfall Way is a two-way, sealed road that runs generally alongside the Bellinger River and provides access to several farms between Thora and Bellingen.

Hobarts Bridge

Hobarts Bridge is only accessible from the western boundary via Darkwood Road approximately 2.5 km west of Joyces Bridge. Between Joyces Bridge and Hobarts Bridge, Darkwood Road is a two-way, sealed road providing access to several small farms.

Justins Bridge

Justins Bridge is only accessible from the western boundary via Darkwood Road approximately 9 km west of Hobarts Bridge. Between Hobarts Bridge and Justins Bridge, Darkwood Road is a two-way, sealed road that provides access to several farms, country accommodation cottages and Orama Public School.

Duffys Bridge

Duffys Bridge is only accessible from the southern boundary via Kalang Road, which connects to Bowraville Road approximately 3 km east of Duffys Bridge. Bowraville Road then connects to the town of Bellingen approximately 1.5 km to the north-east. Kalang Road, between Duffys Bridge and Bowraville Road, is a two-way, sealed road that provides access to several farms and rural residential dwellings. Bowraville Road, between Kalang Road and Bellingen, is a two-way, sealed road that provides access to several farms and rural residential dwellings.

All sites are within C4 Environmental Living zone under the BSC planning framework.

3.1.2 Describe any existing or proposed uses for the project area.

The project area is within the Thora and Kalang Valleys where the predominant industry is farming. Road reserves for Kalang Road (which crosses Duffys Bridge) and Darkwood Road (which crosses the Justins, Joyces, and Hobarts bridges) make up the majority of the land used in the project area. The majority of the land in the project area is classified as C4 Environmental Living under the 2010 Bellingen Local Environment Plan (BSC, 2010), with Justins Bridge being classified as C3 Environmental Management. The project area's neighbouring land use is a combination of environmental and agricultural land. The Chrysalis School is a located close to Hobarts Bridge.

3.1.3 Describe any outstanding natural features and/or any other important or unique values that applies to the project area.

The project area is surrounded by (but not within) substantial stretches of highly valued natural ecosystems, such as the Baalijin Nature Reserve, Diehappy State Forest, Scotchman State Forest, Gladstone State Forest, and New England National Park. A variety of plant groups and habitats are supported in the vicinity of the bridge locations.

No protected areas will be impacted by the Project.

The project area is within the Bellinger-Kalang Rivers catchment area, which is an outstanding natural feature supporting a diverse range of flora, frogs, reptiles, mammals and birds, including a number of regionally endemic as well as threatened species.

Bellinger River has a total length of approximately 69 km, beginning in the Dorrigo Plateau in the Great Dividing Range and flowing south-east through an extensive coastal floodplain to Urunga, where it discharges to the Pacific Ocean. The Bellinger River is predominantly freshwater, then it becomes an estuary where saltwater tidal influence mixes with freshwater. (Bellinger Landcare, 2016). The Bellinger River estuary volume is approximately 14,441.6 ML (NSW DPE, 2023). The lower estuary of the Bellinger River is formed where the Kalang River merges with the Bellinger River. Kalang River is a major tributary of the Bellinger River with a length of approximately 77 km. Kalang River meets with Bellinger River through an extensive coastal floodplain to Urunga which flows out to the Pacific Ocean (Bellinger Landcare 2016).

The riparian vegetation adjacent to the project components within the Bellinger and Kalang Rivers is comprised of native *Casuarina cunninghamiana* and a mixture of native and exotic trees, shrubs and groundcover. Hollow-bearing trees occur in mature vegetation.

In accordance with the New South Wales Department of Planning, Industry and Environment (DPIE) (2021) *Guideline for interpreting listing criteria for Areas of Outstanding Biodiversity Value*, the Bellinger River, Kalang River and associated riparian vegetation is considered to meet the criteria and sub-criteria for 'Clause 3.1(2) – persistence of multiple species or at least one threatened species or ecological community':

- Provides resilience during periods of environmental stress that is important for their continued existence
- Sustains adaptive capacity or evolutionary potential
- Supports migration or dispersal of animals and plants
- Is habitat critical to the survival of a threatened species.

Accordingly, the locality is considered to be an area of 'outstanding biodiversity value' for the Bellinger River snapping turtle and the giant barred frog.

3.1.4 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

The project area is in the Thora and Kalang Valleys, which are part of the Bellinger River basin. The altitudes in these valleys range from around 10 m AHD at the Duffys Bridge site, which is the closest to the shore, to 92 m AHD near the Justins and Hobarts bridges, which are located further inland. The Bellinger basin is primarily hilly, with a small amount of flat ground found in the valleys of rivers and creeks. The small floodplain and its surrounding hillsides have been cleared for grazing, farming, and other purposes, while the steep portions of the watershed remain covered in forest.

3.2 Flora and fauna

3.2.1 Describe the flora and fauna within the affected area and attach any investigations of surveys if applicable.

An ecological assessment has been undertaken for the Project, which included a desktop review of government records and environmental mapping layers, a review of previous studies undertaken for the Project, and field surveys. The methodology for the ecological assessment is detailed in Att A-MNES Assessment Report, Section 4, pp 14.

The desktop searches identified the potential presence of several threatened ecological communities (TECs), threatened flora and fauna species, and migratory species within the project area. An assessment was conducted to attribute a 'likelihood of occurrence' to TECs, threatened flora and fauna, and migratory species that have been previously recorded or are predicted to occur within the project area.

Vegetation communities identified at all bridge locations during field surveys were determined to be remnants of the Plant Community Type (PCT) 3020 Northern Hinterland River Oak Sheltered Forest. PCTs are the master community-level typology used in New South Wales planning and assessment tools and vegetation mapping and management programs. PCT 3020 does not correspond with any of the TECs identified in desktop searches. Field surveys confirmed that no TECs are present within the project area.

The likelihood of occurrence assessment found that all flora species identified in the desktop searches are unlikely to occur. No threatened flora species were identified within the project area during field surveys.

The project area is within a hinterland riparian zone where the surrounding vegetation is as follows:

- At Justins Bridge vegetation is dominated by *Casuarina cunninghamiana* (up to 15 m tall). Other terrestrial vegetation is limited to exotic species and isolated tufts of non-woody plants such as mat rush (*Lomandra hystrix*). The project footprint at Justins Bridge is mostly occupied by exotic grasses
- At Joyces Bridge the surrounding vegetation is mostly comprised of exotic weeds and grasses, with isolated individuals of mat rush and occasional stands of *Casuarina cunninghamiana.*
- The vegetation surrounding Hobarts Bridge is dominated by flood-affected juvenile *Casuarina cunninghamiana* (approximately 3 m tall). Mat rush and exotic weeds are present along the banks
- The vegetation around Duffys Bridge has a high density of exotic species, dominated by *Ligustrum sinense, Paspalum mandiocanum* and *Ageratum houstonianum.* The native vegetation present consists of occasional small plants of *Casuarina cunninghamiana.*, *Ficus coronata, Leptospermum brachyandrum*, and mat rush.

The likelihood of occurrence assessment found several fauna species that were confirmed present or likely to occur as follows:

- Bellinger River snapping turtle (*Myuchelys georgesi*) – critically endangered under the EPBC Act – likely to occur at all project footprints
- Grey-headed flying-fox (*Pteropus poliocephalus*) – vulnerable under the EPBC Act – confirmed present at Hobarts Bridge

- Giant barred frog (*Mixophyes iteratus*) – vulnerable under the EPBC Act – likely to occur at all project footprints
- Black-faced monarch (*Monarcha melanopsis*) – migratory under the EPBC Act – confirmed present at Joyces Bridge.

Fauna habitat observations made during field surveys are as follows:

Justins Bridge

- Drinking sites for birds and mammals including the black-faced monarch
- Refuges and breeding habitat for the giant barred frog and other amphibians
- Foraging and roosting habitat and flyway for grey-headed flying-fox and microbat and bird species protected under the New South Wales BC Act
- Foraging habitat for the Bellinger River snapping turtle and other aquatic fauna
- Movement corridors for aquatic and terrestrial fauna
- Roosting sites for arboreal mammals in fringing riparian vegetation.

Joyces Bridge

- Riparian vegetation identified as breeding habitat for the giant barred frog
- Hollows or crevices in the bridge structure which may be used as roosting/breeding habitat by microbats
- Foraging habitat for the Bellinger River snapping turtle and other aquatic fauna

Hobarts Bridge

- Roosting/breeding habitat for microbats
- Foraging habitat for the Bellinger River snapping turtle and other aquatic fauna
- Large hollow log near existing Casuarina on the eastern bank that may provide habitat (outside of the project footprint)
- Open nature of vegetation and moist soil is potential habitat for the Bellinger River snapping turtle and the giant barred frog.

Duffys Bridge

- Potential habitat for breeding and foraging of the giant barred frog
- Foraging habitat for the Bellinger River snapping turtle and other aquatic fauna
- Hollows and crevices in the bridge structure that may be used for roosting/breeding by microbats

The existing flora and fauna is described in Att D-MNES Assessment Report-REDACTED, Section 5.3, p. 24.

3.2.2 Describe the vegetation (including the status of native vegetation and soil) within the project area.

The Bellinger River catchment is slightly disturbed, with around 85 percent of the catchment remaining forested (generally in the undulating areas of the upper catchment). Around 15 percent of the landscape has been changed, predominantly for cattle grazing. These areas are concentrated along the floodplains of the river and its tributaries and include the project area, where minor to moderate disturbance has occurred for construction of the existing road corridors and bridges.

There are large expanses of high value natural environments surrounding the project area, including the New England National Park, Bellinger River National Park, Diehappy State Forest, Scotchman State Forest, Gladstone State Forest and Baalijin Nature Reserve. The areas surrounding the bridge sites support a range of vegetation communities and habitats.

The dominant soil types at each of the bridge sites, as mapped on the Australian Soil Classification data layer is Dermosols (within the watercourses) and Kurosols (outside the watercourses). Dermosol soils are non-cracking clay to clay loam soils that are widespread on mid to upper slope positions of low undulating hills and also located on alluvial flats. Dermosols are usually non-dispersive but may be susceptible to rill and sheet erosion when left exposed to heavy rainfall and/or stream bank erosion when located adjacent to watercourses. Kurosols are acidic texture contrast soils that generally have weak structures in the surface with a firm to hard-setting surface condition and poor initial infiltration resulting in increased run-off and subsequent erosion. Kurosols are sometimes dispersive in the subsoil; dispersive soils having a high erosion risk, particularly for tunnel and gully erosion.

Vegetation and soils are described further in Att A-MNES Assessment Report, Section 5, pp 22.

3.3 Heritage

3.3.1 Describe any Commonwealth heritage places overseas or other places recognised as having heritage values that apply to the project area.

There are no Commonwealth heritage places overseas that are impacted by the Project.

The PMST search identified that Joyces and Justins bridges are within 10 km of the Gondwana Rainforests of Australia, which is listed as a World Heritage Area and a National Heritage place. The project works will not impact the Gondwana Rainforests of Australia as the size and scale of the proposed works is limited to the existing bridge footprints and small adjacent areas to accommodate the new bridge footprints.

There are no places listed on an Commonwealth, New South Wales or local government heritage registers in proximity to the project area.

3.3.2 Describe any Indigenous heritage values that apply to the project area.

There are no locations or sites of previously documented Indigenous importance in the planned works (which include a 50 m buffer), according to a search of the New South Wales Aboriginal Heritage Information Management System.
An unexpected finds procedures will be implemented during construction in the case of an unexpected Indigenous cultural heritage find and all staff members will receive training through inductions on unexpected finds.

3.4 Hydrology

3.4.1 Describe the hydrology characteristics that apply to the project area and attach any hydrological investigations or surveys if applicable. *

The Project is located within the Bellinger-Kalang River system, a large east coast drainage system with a catchment area of around 1,110 square kilometres. The Justins, Joyces, and Hobarts bridges are located along the Bellinger River, which runs approximately 69 kilometres from the Dorrigo Plateau in the Great Dividing Range to Urunga, where it flows into the Pacific Ocean. The Bellinger River estuary has a volume of roughly 14,441.6 megalitres. The Kalang River connects with the Bellinger River, forming the Bellinger River's lower estuary. Duffys Bridge is located in the Kalang River, a large tributary of the Bellinger River with a length of around 77 kilometres.

4. Impacts and mitigation

4.1 Impact details

Potential Matters of National Environmental Significance (MNES) relevant to your proposed action area.

EPBC Act section	Controlling provision	Impacted	Reviewed
S12	World Heritage	No	Yes
S15B	National Heritage	No	Yes
S16	Ramsar Wetland	No	Yes
S18	Threatened Species and Ecological Communities	Yes	Yes
S20	Migratory Species	Yes	Yes
S21	Nuclear	No	Yes

EPBC Act section	Controlling provision	Impacted	Reviewed
S23	Commonwealth Marine Area	No	Yes
S24B	Great Barrier Reef	No	Yes
S24D	Water resource in relation to large coal mining development or coal seam gas	No	Yes
S26	Commonwealth Land	No	Yes
S27B	Commonwealth Heritage Places Overseas	No	Yes
S28	Commonwealth or Commonwealth Agency	No	Yes

4.1.1 World Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	World heritage
No	No	Gondwana Rainforests of Australia

4.1.1.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.1.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The Project is unlikely to have any direct or indirect impacts on the Gondwana Rainforests of Australia as the size and scale of the proposed works are limited to the existing bridge footprints and small adjacent areas to construct the new bridges. The project area is downstream of the Gondwana Rainforests of Australia World Heritage Area and is not hydrologically connected. There will be no indirect impacts through hydrological flows or water quality impacts as there are no downstream impacts to the World Heritage Area.

4.1.2 National Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	National heritage
No	No	Gondwana Rainforests of Australia

4.1.2.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.2.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The Project is unlikely to have a direct and/or indirect impact on the Gondwana Rainforests of Australia as the proposed works are limited to the existing bridge footprints and small adjacent areas to construct the new bridges. The project area is downstream of the Gondwana Rainforests of Australia National Heritage place and is not hydrologically connected. There will be no indirect impacts through hydrological flows or water quality impacts as there are no downstream impacts to the National Heritage place.

4.1.3 Ramsar Wetland

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.3.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.3.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

There are no Ramsar wetlands within or in proximity to the proposed action.

4.1.4 Threatened Species and Ecological Communities

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Threatened species

Direct impact	Indirect impact	Species
No	No	Anthochaera phrygia
No	No	Argynnis hyperbius inconstans
No	No	Arthraxon hispidus
No	No	Asperula asthenes
No	No	Atrichornis rufescens
No	No	Bertya sp. Clouds Creek (M.Fatemi 4)
No	No	Botaurus poiciloptilus
No	No	Calidris acuminata
No	No	Calidris ferruginea
No	No	Callistemon pungens

Direct impact	Indirect impact	Species
No	No	Calyptorhynchus lathami lathami
No	No	Chalinolobus dwyeri
No	No	Chiloglottis anaticeps
No	No	Climacteris picumnus victoriae
No	No	Coeranoscincus reticulatus
No	No	Coleus nitidus
No	No	Cryptostylis hunteriana
No	No	Cynanchum elegans
No	No	Dasyurus maculatus maculatus (SE mainland population)
No	No	Erythrotriorchis radiatus
No	No	Euphrasia arguta
No	No	Falco hypoleucos
No	No	Gallinago hardwickii
No	No	Gingidia rupicola
No	No	Grantiella picta
No	No	Haloragis exalata subsp. velutina
No	No	Harrisoniascincus zia
No	No	Hicksbeachia pinnatifolia
No	No	Hirundapus caudacutus
No	No	Lathamus discolor
No	No	Leichhardtia longiloba
No	No	Litoria subglandulosa
No	No	Macadamia integrifolia
No	No	Melanodryas cucullata cucullata
No	No	Mixophyes balbus
Yes	Yes	Mixophyes iteratus

Direct impact	Indirect impact	Species
Yes	Yes	Myuchelys georgesi
No	No	Neoastelia spectabilis
No	No	Notamacropus parma
No	No	Numenius madagascariensis
No	No	Parsonsia dorrigoensis
No	No	Persicaria elatior
No	No	Petauroides volans
No	No	Petaurus australis australis
No	No	Petrogale penicillata
No	No	Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)
No	No	Philoria sphagnicola
No	No	Phyllodes imperialis smithersi
No	No	Potorous tridactylus tridactylus
No	No	Pseudomys novaehollandiae
No	No	Pseudomys oralis
Yes	Yes	Pteropus poliocephalus
No	No	Rhodamnia rubescens
No	No	Rhodomyrtus psidioides
No	No	Rostratula australis
No	No	Sarcochilus fitzgeraldii
No	No	Stagonopleura guttata
No	No	Syzygium hodgkinsoniae
No	No	Thesium australe
No	No	Turnix melanogaster
No	No	Vincetoxicum woollsii

Ecological communities

Direct impact	Indirect impact	Ecological community
No	No	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community
No	No	Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland
No	No	Dunn's white gum (Eucalyptus dunnii) moist forest in north-east New South Wales and south-east Queensland
No	No	Lowland Rainforest of Subtropical Australia
No	No	New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands
No	No	Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions

4.1.4.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

Yes

4.1.4.2 Briefly describe why your action has a direct and/or indirect impact on these protected matters. *

Potential direct impacts include:

- Loss or degradation of 0.064 ha of Bellinger River snapping turtle (*Myuchelys georgesi*) habitat from instream and associated bank works at each site as follows:
  - 0.012 ha at Justins Bridge
  - 0.024 ha at Joyces Bridge
  - 0.015 ha at Hobarts Bridge
  - 0.014 ha at Duffys Bridge.
- Loss of 0.010 ha of potential grey-headed flying-fox (*Pteropus poliocephalus*) foraging habitat located adjacent to a grey-headed flying-fox camp near Hobarts Bridge. No impact to grey-headed flying-fox habitat is expected at the remaining three bridge locations
- Loss or degradation of 0.166 ha of giant-barred frog (*Mixophyes iteratus*) habitat
- Injury or mortality of fauna as a result of clearing and earthworks activities within the riverbanks and low flow channel.

Potential indirect impacts include:

- Noise, vibration and light disturbance to fauna species
- Water quality degradation impacting Bellinger River snapping turtle habitat
- Temporary restriction of instream connectivity for the Bellinger River snapping turtle - the low flow channel will remain open to flows and turtle movement throughout the duration of the works; however, turtles may be reluctant to move through the construction footprint as a result of disturbance
- Introduction and spread of invasive weeds and pests impacting giant barred frog habitat

- Exacerbation of infectious disease (i.e. Chytridiomycosis) impacting frog populations.

Potential impacts are discussed in detail in Att A-MNES Assessment Report, Section 6.9, pp 28.

4.1.4.4 Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

No

4.1.4.6 Describe why you do not consider this to be a Significant Impact. *

The design phase of the Project has considered avoidance of impacts through the selection of optimal bridge locations and improved bridge designs. The bridges designs at all four locations were modified to extend the bridge spans to relocate the piling footprints outside of the low-flow channels as much as possible with the following design measures adopted:

- Justins Bridge - Piers have been removed completely from the channel with pier 1 relocated to the water edge margin
- Joyces Bridge - Piers 1 and 2 have been relocated from within the low-flow channel to the outside of the margins
- Hobarts Bridge - Piers have been removed completely from the channel with pier 1 relocated to the water edge margin. Piers 2 and 3 have been relocated from within the low-flow channel to the outside margins
- Duffys Bridge - Piers have been removed completely from the channel with pier 1 relocated to the water edge margin.

The alignments chosen for the new bridges are immediately adjacent to the existing bridges to minimise disturbance for the construction of the bridges as well as the tie-in of approach roads. This design measure will minimise impacts to aquatic and terrestrial environments, including the extent of native vegetation clearing.

Extensive consultation has been undertaken with the New South Wales Biodiversity Conservation Division to develop avoidance and mitigation measures for the Project in relation to the Bellinger River snapping turtle.

Significant impact assessments (SIAs) were undertaken for the Bellinger River snapping turtle, grey-headed flying-fox and giant barred frog in accordance with the Significant Impact Guidelines 1.1. The SIAs were completed with consideration of any relevant conservation plans, recovery plans and threat abatement plans for each species, and the findings of the ecology surveys undertaken for the project.

The SIAs found the project is unlikely to have a significant residual impact for all of the species.

SIAs are included in the supporting documentation as follows:

- Bellinger River snapping turtle SIA - Att A-MNES Assessment Report, Section 6.9.1.10, pp 42
- Grey-headed flying-fox SIA - Att A-MNES Assessment Report, Section 6.9.2.11, pp 55
- Giant barred frog SIA - Att A-MNES Assessment Report, Section 6.9.3.10, pp 69.

4.1.4.7 Do you think your proposed action is a controlled action? *

No

4.1.4.9 Please elaborate why you do not think your proposed action is a controlled action. *

The proposed action is not considered to be a controlled action because with the application of avoidance and mitigation measures, the impacts identified will not have any significant residual impact to any MNES.

Whilst the Project will result in the loss/degradation of 0.064 ha of habitat critical to the survival of the Bellinger River snapping turtle, this area is spread across the four bridge sites. The design of the new bridges will span the river and piers will be located outside, or on the margins, of the low flow channel to avoid permanent direct impact to the aquatic habitat and minimise temporary habitat disturbance during construction. Aquatic habitat loss will be restricted to the immediate footprint of the bridge piers. As the design of the project footprints are minimal and temporary in nature, the project is considered unlikely to have a significant residual impact on habitat critical to the survival of the species.

While the restricted occupancy of the Bellinger River snapping turtle renders it more susceptible to impacts affecting the species' occupancy, the proposed works will implement mitigation measures to avoid and minimise the direct and indirect impacts to the species and its habitat (refer to section 4.1.4.10 below). The design of the bridges has considered the movement requirements of the species and will not result in a barrier to turtle passage. Pre-clearance surveys will be undertaken by the New South Wales Biodiversity Conservation Division to confirm no turtles are present within the vicinity of the works at the time of construction.

Best practice construction techniques will be used to minimise the risk of water quality degradation and disturbance to fauna from noise and vibration. This will include the use of an air rock anchor machine and excavator mounted bored piling machine which will limit noise emissions and sound pressure levels. Construction activities that have an increased risk of noise and vibration impacts, such as installing bridge piers and rock anchoring, will be carried out over a minimal one to two week period.

Once operational, the Project will have negligible impact on the species, forming no barrier to movement. The Bellinger River snapping turtle is expected to persist locally through the operation phase of the project.

The Project will result in the direct loss of 0.01 ha of potential foraging habitat for the grey-headed flying-fox, which does not constitute habitat critical to the survival of the species due to the absence of key winter and spring flowering tree species within the project footprint. Construction activities at Hobarts Bridge will occur outside the breeding season for the grey-headed flying-fox (October to December) to avoid any direct and/or indirect impacts on the species' young. Construction laydown areas will not be located in proximity of the flying-fox camp near Hobarts Bridge.

The Project will result in loss or degradation of 0.166 ha of giant-barred frog habitat. Further potential habitat occurs adjacent to the project footprints, along the riparian strip adjacent to the Bellinger and Kalang Rivers and in conservation areas in the regional landscape (i.e. New England National Park, Bellinger River National Park etc). The Project is considered unlikely to adversely affect habitat critical to the survival of the species. Mitigation measures to avoid injury or mortality will be implemented including construction of the Project outside the peak breeding season (November to February), enforcement of vehicle speed limits, establishment of no-go areas of sensitive vegetation and habitat and pre-clearance surveys. Mitigation measures to avoid degradation to adjacent giant-barred frog habitat will also be implemented.

Significant impact assessments (SIAs) have been undertaken for each MNES and are included in the following supporting documentation:

- Bellinger River snapping turtle SIA - Att A-MNES Assessment Report, Section 6.9.1.10, pp 42
- Grey-headed flying-fox SIA - Att A-MNES Assessment Report, Section 6.9.2.11, pp 55
- Giant barred frog SIA - Att A-MNES Assessment Report, Section 6.9.3.10, pp 69.

4.1.4.10 Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

The Project's design phase has considered reducing impacts to surrounding environmental values through the selection of optimal bridge locations and improved bridge designs. The bridge designs for the four bridges were modified to extend the bridge spans to relocate the piling footprints outside of the low flow channels as much as possible in order to avoid impacts to the aquatic environment. Measures to avoid impacts to the Bellinger River snapping turtle, grey-headed flying-fox and giant barred frog include:

- Removal of piers from low flow channels for the four bridges, with some piers being removed completely from the waterway channel and designed to be installed in the water edge margin
- The project footprints will be generally restricted to the existing cleared road easements, reducing the area of impact to habitat and associated runoff. The removal of trees has been restricted to several low-quality foraging trees, none of which are known to be important spring or winter flowering species for the grey-headed flying-fox
- Construction scheduling will avoid the nesting season of the Bellinger River snapping turtle and the peak breeding season of the giant barred frog
- Construction scheduling at Hobarts Bridge will avoid the breeding season for grey-headed flying-fox
- Best practice construction methodology and equipment ass been selected to minimise risk of noise and vibration disturbance and to protected water quality/habitat condition within and downstream of the project footprints.

Additional mitigation measures for each species are included in the supporting documentation as follows:

- Bellinger River snapping turtle - Att A-MNES Assessment Report, Section 6.9.1.7, pp 38
- Grey-headed flying-fox - Att A-MNES Assessment Report, Section 6.9.2.7, pp 52
- Giant barred frog - Att A-MNES Assessment Report, Section 6.9.3.7, pp 66.

4.1.4.11 Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

The Project has been assessed as being unlikely to have a significant residual impact on any MNES therefore offsets are not proposed.

4.1.5 Migratory Species

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Species
No	No	Actitis hypoleucos
No	No	Apus pacificus
No	No	Calidris acuminata
No	No	Calidris ferruginea
No	No	Calidris melanotos
No	No	Cuculus optatus
No	No	Gallinago hardwickii
No	No	Hirundapus caudacutus
Yes	Yes	Monarcha melanopsis
No	No	Motacilla flava
No	No	Myiagra cyanoleuca
No	No	Numenius madagascariensis
No	No	Pandion haliaetus
No	No	Rhipidura rufifrons
No	No	Symposiachrus trivirgatus

4.1.5.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

Yes

4.1.5.2 Briefly describe why your action has a direct and/or indirect impact on these protected matters. *

Direct impacts:

- The proposed works will involve vegetation clearing of a total of approximately 0.36 ha of habitat for the black-faced monarch (*Monarcha melanopsis*) as follows:
  - 0.048 ha at Justins Bridge
  - 0.103 ha at Joyces Bridge
  - 0.114 ha at Hobarts Bridge
  - 0.092 ha at Duffys Bridge.
- Injury and mortality of fauna from collision with construction vehicles and entanglement in site fencing.

Indirect impacts:

- Disturbance to black-faced monarch from noise and vibration
- Introduction and spread of invasive weeds and pests resulting in habitat degradation and increased feral predators
- Habitat degradation through alteration of riverbank profiles, substrate composition and loss of riparian vegetation.

Potential impacts to black-faced monarch are described further in Att A-MNES Assessment Report, Section 6.10.1.6, pp 78.

4.1.5.4 Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

No

4.1.5.6 Describe why you do not consider this to be a Significant Impact. *

An SIA has been undertaken against the commonwealth Significant Impact Guidelines 1.1, which found the Project is unlikely to have a significant impact to the black-faced monarch. The project footprint for the bridges is not within important habitat for the black-faced monarch and is generally restricted to the existing cleared road easement.

The Project is unlikely to substantially modify, destroy, or isolate and area of important habitat for the black-faced monarch and is unlikely to result in any invasive species becoming established in an area of important habitat or seriously disrupt the lifecycle of the species.

The SIA for the black-faced monarch is included in Att A-MNES Assessment Report, Section 6.10.1.10, pp 82.

4.1.5.7 Do you think your proposed action is a controlled action? *

No

4.1.5.9 Please elaborate why you do not think your proposed action is a controlled action. *

The action is not a controlled action because it will not have a significant impact on any MNES.

The project has been assessed against the Significant Impact Guidelines 1.1, which found it is unlikely to have a significant residual impact on any MNES.

4.1.5.10 Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

The Project's design phase has considered options to reduce impacts to surrounding environmental values through the selection of optimal bridge locations and improved bridge designs. The project footprint for the bridges will be generally restricted to include the existing cleared road easement, reducing the area of impact to habitat and minimising degradation of habitat and associated runoff.

Vegetation clearing will be restricted to the smallest area needed for construction of roads, services, access and cut and fill. Laydown areas, site offices and other temporary works will be located in areas already subject to existing disturbance wherever possible. Areas of ecological sensitivity will be demarcated as no-go areas on site and in construction plans, including all vegetation no to be cleared.

A Construction Environmental Management Plan will be developed and implemented, which will include requirements for pre-clearance surveys.

To minimise the potential for injury/mortality to the black-faced monarch on-site speed limits to 40 km/hr will be enforced to reduce the incidence of vehicle strike. The duration of construction works will be scheduled outside the black-faced monarch breeding season (October to March).

Further mitigation measures are included in Att A-MNES Assessment Report, Section 6.10.1.7, pp 79.

4.1.5.11 Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

The proposed action is unlikely to have a significant residual impact on any MNES therefore no offsets are proposed.

4.1.6 Nuclear

4.1.6.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.6.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The Project is unlikely to have a direct and/or indirect impact to nuclear matters as it does not involve any nuclear matters and is not in proximity to any nuclear matters.

4.1.7 Commonwealth Marine Area

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

4.1.7.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.7.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

There are no Commonwealth Marine Areas within or in proximity to the proposed action.

4.1.8 Great Barrier Reef

4.1.8.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.8.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The Project is unlikely to have a direct and/or indirect impact to the Great Barrier Reef as it is a significant distance from the Great Barrier Reef and is only expected to have minor, localised impacts.

4.1.9 Water resource in relation to large coal mining development or coal seam gas

4.1.9.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.9.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed action is unlikely to have a direct and/or indirect impact on water resources in relation to large coal mining development or coal seam gas as the Project does not involve coal mining or coal seam gas and is not in proximity to any water resources relating to these developments.

4.1.10 Commonwealth Land

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

4.1.10.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.10.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

There is no Commonwealth Land within or in proximity to the proposed action.

4.1.11 Commonwealth Heritage Places Overseas

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

4.1.11.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.11.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

There are no Commonwealth Heritage Places Overseas within or in proximity to the proposed action.

4.1.12 Commonwealth or Commonwealth Agency

4.1.12.1 Is the proposed action to be taken by the Commonwealth or a Commonwealth Agency? *

No

4.2 Impact summary

Conclusion on the likelihood of significant impacts

You have indicated that the proposed action will likely have a significant impact on the following Matters of National Environmental Significance:

None

Conclusion on the likelihood of unlikely significant impacts

You have indicated that the proposed action will unlikely have a significant impact on the following Matters of National Environmental Significance:

- World Heritage (S12)
- National Heritage (S15B)
- Ramsar Wetland (S16)
- Threatened Species and Ecological Communities (S18)
- Migratory Species (S20)
- Nuclear (S21)
- Commonwealth Marine Area (S23)

- Great Barrier Reef (S24B)
- Water resource in relation to large coal mining development or coal seam gas (S24D)
- Commonwealth Land (S26)
- Commonwealth Heritage Places Overseas (S27B)
- Commonwealth or Commonwealth Agency (S28)

4.3 Alternatives

4.3.1 Do you have any possible alternatives for your proposed action to be considered as part of your referral? *

No

4.3.8 Describe why alternatives for your proposed action were not possible. *

Alternative bridge designs, construction methodologies and materials were considered during concept design development. Cost-benefit analyses have also been undertaken for the Project. The proposed bridge replacement works were considered the preferred options for each site, as they are considered to improve road safety whilst minimising environmental impacts.

The ‘do nothing’ option is not acceptable to BSC or the local community as the current bridge structures at each site pose a risk to road users, due to their age and structural design. The bridges are essential to maintaining safe access to remote communities within the BSC local government area. Existing bridges may incur further deterioration if no action is taken.

There are no feasible alternative locations for the new bridges as crossings over the Bellinger and Kalang rivers are required to provide access and connectivity through Darkwood Road and Kalang Road. The new bridges are proposed to be constructed immediately downstream of the existing bridges, to minimise the project footprint and so that the existing bridges can be used for access during the construction period.

5. Lodgement

5.1 Attachments

1.2.1 Overview of the proposed action

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	09/02/2024	Yes	High

1.2.6 Commonwealth or state legislation, planning frameworks or policy documents that are relevant to the proposed action

	Type	Name	Date	Sensitivity	Confidence
#1.	Link	Significant Impact Guidelines 1.1 - Matters of National Environmental Significance https://www.dcceew.gov.au/environment/epbc/publi..			High

1.3.2.18 (Person proposing to take the action) If the person proposing to take the action is a corporation, provide details of the corporation's environmental policy and planning framework

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att B BSC Environmental Management Policy.pdf Bellingen Shire Council's environmental management policy section of the Integrated Management System Procedure Manual		No	High
#2.	Document	Att C BSC IMS Statement of Intent.pdf Bellingen Shire Council's statement of intent for environmental protection	02/03/2024	No	High

3.1.1 Current condition of the project area's environment

	Type	Name	Date	Sensitivity	Confidence
#1.	Link	About the Bellinger catchment https://water.dpie.nsw.gov.au/basins-and-catchme..			High

3.1.2 Existing or proposed uses for the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Link	Bellingen Local Environmental Plan (LEP) 2010 https://www.bellingen.nsw.gov.au/Development/Pla..			High

3.1.3 Natural features, important or unique values that applies to the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Link	Bellinger River https://www.environment.nsw.gov.au/topics/water/..			High
#2.	Link	Bellinger River System Landholder Booklet chrome-extension://efaidnbmnnnibpcajpcglclefindm..			High
#3.	Link	Guidelines for interpreting listing criteria for Areas of Outstanding Biodiversity Value			High

https://www.environment.nsw.gov.au/research-and-..

3.2.1 Flora and fauna within the affected area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	08/02/2024	Yes	High
#2.	Document	Att D MNES Assessment Report-REDACTED.pdf Assessment of MNES for the project with sensitive information redacted.	30/05/2024	No	High

3.2.2 Vegetation within the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	08/02/2024	Yes	High

4.1.4.2 (Threatened Species and Ecological Communities) Why your action has a direct and/or indirect impact on the identified protected matters

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	08/02/2024	Yes	High

4.1.4.6 (Threatened Species and Ecological Communities) Why you do not consider the direct and/or indirect impact to be a Significant Impact

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	08/02/2024	Yes	High

4.1.4.9 (Threatened Species and Ecological Communities) Why you do not think your proposed action is a controlled action

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	08/02/2024	Yes	High

4.1.4.10 (Threatened Species and Ecological Communities) Avoidance or mitigation measures proposed for this action

	Type	Name	Date	Sensitivity	Confidence

#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	08/02/2024	Yes	High

4.1.5.2 (Migratory Species) Why your action has a direct and/or indirect impact on the identified protected matters

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	08/02/2024	Yes	High

4.1.5.6 (Migratory Species) Why you do not consider the direct and/or indirect impact to be a Significant Impact

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	08/02/2024	Yes	High

4.1.5.10 (Migratory Species) Avoidance or mitigation measures proposed for this action

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att A-MNES Assesssment Report.pdf Assessment of matters of national environmental significance including significant impact assessments	08/02/2024	Yes	High

5.2 Declarations

Completed Referring party's declaration

The Referring party is the person preparing the information in this referral.

ABN/ACN	39008488373
Organisation name	GHD PTY LTD
Organisation address	Level 9, 145 Ann Street, Brisbane, Qld, 4000
Representative's name	Lauren Rolfe
Representative's job title	Environmental Scientist
Phone	0733163790
Email	lauren.rolfe@ghd.com
Address	Level 9, 145 Ann Street, Brisbane Qld 4000

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ By checking this box, I, **Lauren Rolfe of GHD PTY LTD**, declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

Completed Person proposing to take the action's declaration

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	26066993265
Organisation name	BELLINGEN SHIRE COUNCIL
Organisation address	31-33 Hyde Street, Bellingen, NSW, 2454
Representative's name	John Fyfe
Representative's job title	Manager Infrastructure Services
Phone	02 6655 7300
Email	jfyfe@bellingen.nsw.gov.au
Address	31-33 Hyde Street, Bellingen, NSW, 2454

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ I, **John Fyfe of BELLINGEN SHIRE COUNCIL**, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf or for the benefit of any other person or entity. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

Completed Proposed designated proponent's declaration

The Proposed designated proponent is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ I, **John Fyfe of BELLINGEN SHIRE COUNCIL**, the Proposed designated proponent, consent to the designation of myself as the Proposed designated proponent for the purposes of the action described in this EPBC Act Referral. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

Appendix B

MNES Report

Matters of National Environment Significance Assessment Report

Joyces, Hobarts, Justins, and Duffys Bridges

Bellingen Shire Council

9 February 2024

→ **The Power of Commitment**

Project name	Hobarts and Justins Bridges Environmental Assessment
Document title	Matters of National Environment Significance Assessment Report | Joyces, Hobarts, Justins, and Duffys Bridges
Project number	12611463
File name	12611463_MNES Assessment Report

Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	L. Rolfe	S. Lawer		A. Oliver		09/02/24
.							

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The Power of Commitment

Executive Summary

Bellingen Shire Council is proposing to replace four existing bridges on the Bellinger River and the Kalang River in the New South Wales Mid North Coast region (the Project). The four existing bridges are aging timber structures nearing the end of their serviceable life and will be replaced with concrete structures that will provide increased flood immunity to residents and maintain safety and a reliable crossing for road users.

The four bridges are:

– Justins Bridge – a low-level crossing over the Bellinger River, located on Darkwood Road, Darkwood New South Wales (NSW) at latitude and longitude -30.453727, 152.630649
– Joyces Bridge – a low-level crossing over the Bellinger River, located on Darkwood Road, Darkwood NSW at latitude and longitude -30.426143, 152.748049
– Hobarts Bridge – a low-level crossing over the Bellinger River, located on Darkwood Road, Darkwood NSW at latitude and longitude -30.433247, 152.722993
– Duffys Bridge – a low-level crossing over the Kalang River, located on Kalang Road, Kalang NSW at latitude and longitude -30.467859, 152.855866.

The scope of the work for the Project includes:

– Construction of four new bridges, including bridge abutments and pilings. Each new bridge is to be constructed immediately downstream of the existing bridges.
– Removal of the current bridge structures at each site (note that the current bridges will be retained throughout the construction period to enable access across the rivers but will be removed following completion and commissioning of the new bridge structures).
– Installation of rock armour (scour protection).
– Realignment of the road approaches to each new bridge, including patching and resealing where required.
– Rehabilitation and revegetation of the riverbank in the area of works.

This report has been prepared as supporting documentation for a referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Referrals are made under the EPBC Act where there is potential that a proposed action will have a significant impact on a matter/s of national environmental significance (MNES). The purpose of a referral is to determine whether a proposed action will need formal assessment and approval under the EPBC Act.

MNES that will potentially be impacted by the Project were identified through desktop assessments of publicly available databases and targeted field ecological surveys. An assessment was conducted to attribute a 'likelihood of occurrence' to threatened species and ecological communities and migratory species that have been previously recorded or were predicted to occur within the project area. The following MNES are considered confirmed present or likely to occur within the project area:

– Bellinger River snapping turtle (*Myuchelys georgesi* listed as *Wollumbinia georgesi*)
– Grey-headed flying-fox (*Pteropus poliocephalus*)
– Giant barred frog (*Mixophyes iteratus*)
– Black-faced monarch (*Monarcha melanopsis*)

The Bellinger River snapping turtle is only known from the Bellinger River catchment, on the north coast of New South Wales. The species range is small, within the catchment it is restricted to the Bellinger River, lower Rosewood and Never Never Rivers, and potentially Kalang River. The species was recently heavily impacted by a disease outbreak, resulting in an associated mortality event. Due to the impact of the disease, the Bellinger River snapping turtle is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals.

The construction of the project will result in temporary disturbance to the bed and banks of the waterways and minor permanent disturbance including removal of vegetation to construct the bridge abutments and upgrade the road approaches to each bridge. Additional project activities that may impact MNES include earthworks, topsoil handling and stockpiling, use and storage of hazardous materials and general construction activities causing increased dust, light, noise and vibration. The potential impacts to MNES may include:

– Loss or degradation of habitat
– Injury or mortality to fauna
– Noise and vibration disturbance
– Water quality degradation
– Temporary restriction of instream connectivity
– Introduction and spread of invasive weeds and pests
– Exacerbation of infectious disease.

The Project design has minimised the amount of vegetation clearing to the extent required for the proposed new bridges and realignment of road approaches. The Project will result in direct loss of potential impacts to the areas of habitat shown in Table E.1.

Table E.1 Summary of habitat impacted

Species	Habitat impacted (ha)				
	Justins Bridge	Joyces Bridge	Hobarts Bridge	Duffys Bridge	Total
Bellinger River snapping turtle	0.012	0.024	0.015	0.014	0.064
Grey-headed flying-fox	0.000	0.000	0.010	0.000	0.010
Giant barred frog	0.025	0.081	0.025	0.035	0.166
Black-faced monarch	0.048	0.103	0.114	0.092	0.358

This report includes a significant impact assessment (SIA) for MNES that are known to occur or likely to occur in the project area. The SIAs were undertaken against the criteria in the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DEWHA, 2013).

The best practice construction techniques have been specifically selected to avoid direct works within Bellinger River wherever possible. Techniques selected include:

– Installation of the bridge superstructure will preferentially occur from existing banks, constructed road embankment or bridge spans, rather than working from constructed earth-fill/ rock pads within the river channel.
– Where the above is not possible, working platforms created of contained rock bags are proposed to be used. These bags allow the placement and removal of rock in a manner that causes minimal impact to the existing substrate.
– Restriction of works footprint to within previously disturbed areas wherever possible to avoid direct impacts.

– All works nominated as being of a high environmental risk will be completed within the dry season and/or a period of low rainfall and minimal flow. This will minimise the risk of erosion, run-off and transport of sediment downstream. High risk works include disturbance for piling access, bridge foundation and substructure works, and demolition and removal of foundations and substructure elements of the existing bridges.

The operation phase will have relatively minor, localised impacts on terrestrial ecological values. Ongoing traffic noise and vibration impacts associated with operation of the new bridges are expected to be reduced with the replacement of the existing timber structures with new concrete structures. Risk of mortality due to vehicle collision during operations is considered low. These impacts are expected to be negligible and unlikely to have any impact on the long-term viability of local fauna populations.

Significant residual impacts are those that remain after all efforts to avoid, minimise and mitigate impacts to MNES have been applied. Given the small area of habitat impacts, the best practice management and mitigate measures, and the nominated monitoring and adaptive management approach for the species, the SIAs found that the Project is unlikely to have a significant residual impact on any MNES.

As a result of the Project being unlikely to have a significant residual impact to MNES, it is anticipated that the Commonwealth Minister for the Environment is likely to decide that the Project is 'not a controlled action' and will not require assessment and approval under the EPBC Act.

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Abbreviations and acronyms

Abbreviation/acronym	Definition
AHIMS	Aboriginal Heritage Information Management System
ALA	Atlas of Living Australia
ASS	Acid sulfate soils
AHD	Australian Height Datum
BC Act	(NSW) *Biodiversity Conservation Act 2016*
BCD	Biodiversity Conservation Division
BSC	Bellingen Shire Council
CEMP	Construction Environmental Management Plan
CLM Act	(NSW) *Crown Land Management Act 2016*
EP & A Act	(NSW) *Environmental Planning and Assessment Act 1979*
EPBC Act	(Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	(NSW) *Fisheries Management Act 1994*
DCCEEW	(Commonwealth) Department of Climate Change, Energy, the Environment and Water
DPE	(NSW) Department of Planning and Environment
LGA	Local government area
MNES	Matter/s of national environmental significance
NSW	New South Wales
PCT	Plant Community Type
PMST	Protected Matters Search Tool
SIA	Significant Impact Assessment
SPRAT	Species Profile and Threats Database
TEC	Threatened ecological community

1. Introduction

1.1 Proposed action

Bellingen Shire Council (BSC) is proposing to replace four existing bridges in the Mid North Coast region of New South Wales (NSW), namely Justins Bridge, Joyces Bridge, Hobarts Bridge and Duffys Bridge, with new bridge structures ('the Project'). Justins Bridge, Joyces Bridge and Hobarts Bridge are located on Darkwood Road, Darkwood and cross the Bellinger River, while Duffys Bridge is located on Kalang Road, Kalang and crosses the Kalang River (Figure 1.1).

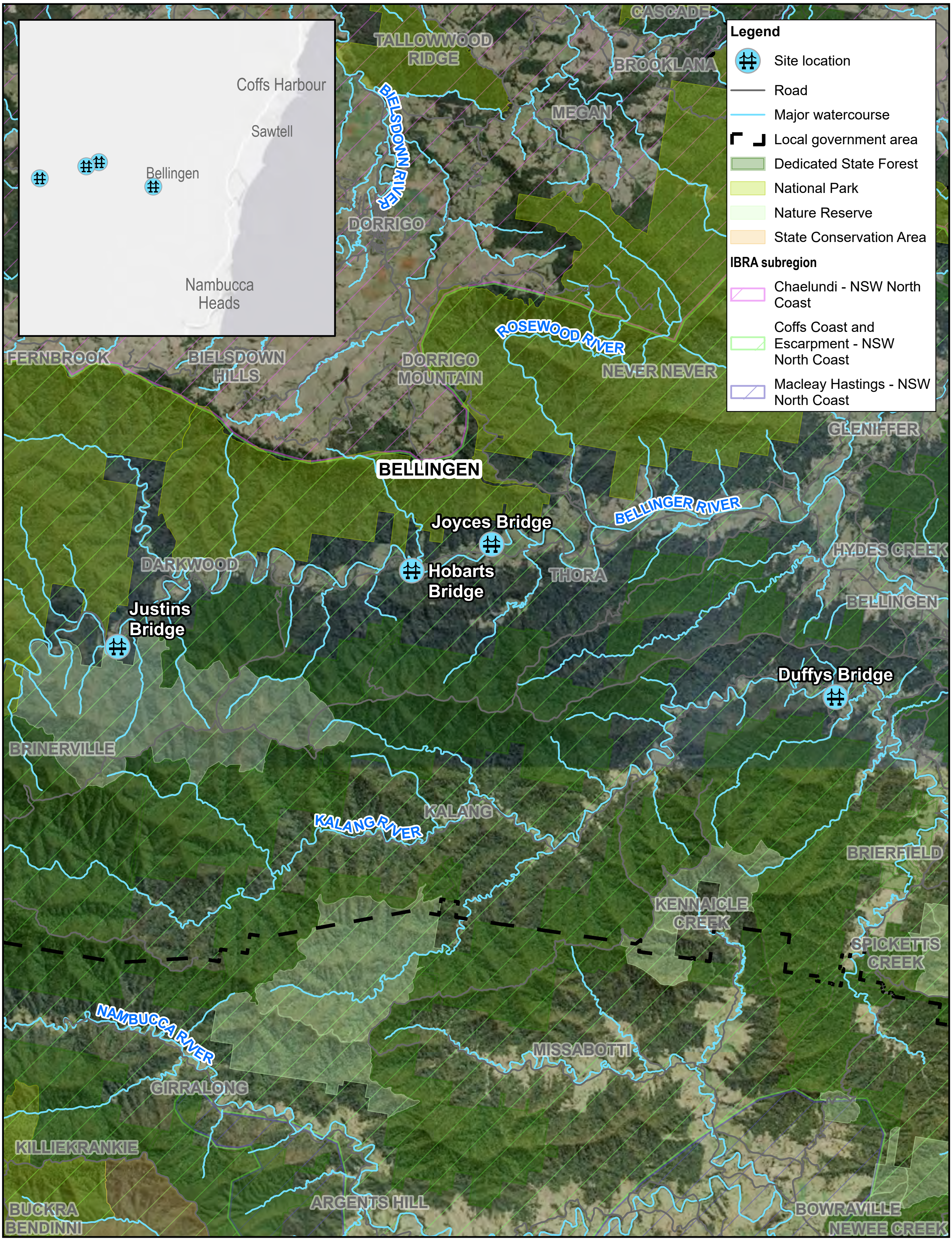
The four existing bridges are low-level crossings consisting of aging, timber structures that are nearing the end of their serviceable lives. BSC proposes to replace each bridge with a concrete structure that will provide increased flood immunity to residents and a safe and reliable crossing for road users.

The scope of the work for the Project includes:

- Construction of four new bridges, including bridge abutments and pilings:
  - Justins Bridge
  - Joyces Bridge
  - Hobarts Bridge
  - Duffys Bridge
- Removal of the current bridge structures at each site (note that the current bridges will be retained throughout the construction period to enable access across the rivers but will be removed following completion and commissioning of the new bridge structures)
- Installation of rock armour (scour protection)
- Realignment of the road approaches to each new bridge, including patching and resealing where required
- Rehabilitation and revegetation of the riverbank in the area of works

The development of concept designs for each of the bridges considered the following:

- Design life (durability)
- Road access
- Bridge load capacities
- Environmental constraints
- Safety in design and constructability



Paper Size ISO A4

0 1 2 3 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Project location

Project No. 12611463
Revision No. 0
Date 13/02/2024

FIGURE 1.1

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_001_ProjectLocation_0
Print date: 13 Feb 2024 - 15:01

Data source: public/NSW_Imagery: © Department of Customer Service 2020
World Light Gray Canvas Base: Esri, HERE, Garmin, USGS. GHD: site locations (2023); NSWSS: roads, watercourse, suburbs (2023); DCCEEW: IBRA (2023); DFSI: reserves (2024); SEED: state forest (2018).
Created by: bkaemmerling

1.2 Purpose of this report

This report has been prepared as supporting documentation for a referral made under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Referrals are made under the EPBC Act where there is potential that a proposed action will have a significant impact on a matter/s of national environmental significance (MNES). The purpose of a referral is to determine whether a proposed action will need formal assessment and approval under the EPBC Act.

Environmental assessments undertaken for the Project identified the potential for impacts to three threatened species and one migratory species, which are MNES under the EPBC Act. These species were assessed as known to occur or likely to occur in the project area and are:

- Bellinger River snapping turtle (*Myuchelys georgesi*) – listed as critically endangered under the EPBC Act
- Giant-barred frog (*Mixophyes iteratus*) – listed as endangered under the EPBC Act
- Grey-headed flying-fox (*Pteropus poliocephalus*) – listed as vulnerable under the EPBC Act
- Black-faced monarch (*Monarcha melanopsis*) – listed as migratory under the EPBC Act

The Bellinger River snapping turtle is only known from the Bellinger River catchment, on the north coast of New South Wales. The species range is small, within the catchment it is restricted to the Bellinger River, lower Rosewood and Never Never Rivers, and potentially Kalang River. The species was recently heavily impacted by a disease outbreak, resulting in an associated mortality event. Due to the impact of the disease, the Bellinger River snapping turtle is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals.

This MNES Assessment Report has been prepared to identify and assess any potential impacts to MNES from activities associated with construction and operation of the Project. The report includes the findings of desktop and field-based ecological assessments and a significant impact assessment (SIA) for the species above.

1.3 Key terms

Key terms used in this document are included in Table 1.1.

Table 1.1 Key Terms

Term	Meaning
Study area	Area or areas that were included in desktop searches and field ecology surveys. The study area surrounds each bridge structure, primarily comprising the bridge, roads and road verges, and cleared land.
Project area	The extended area within 10 km of each of the bridge sites.
Project footprint	The area impacted by the construction of each bridge, including temporary areas used for construction.
Project works	The activities required for construction of the bridges.
Threatened species	Native species listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent under the EPBC Act (as defined in section 178 of the EPBC Act).
Migratory species	Migratory species are those species listed on the EPBC Act migratory species list, established under section 209 of the EPBC Act.

1.4 Scope and limitations

This report has been prepared by GHD for Bellingen Shire Council and may only be used and relied on by Bellingen Shire Council for the purpose agreed between GHD and Bellingen Shire Council as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Bellingen Shire Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Description of the action

2.1 Project design and rationale

BSC is responsible for managing road-related transport infrastructure and providing safe and efficient access for the local government area (LGA) road network. The current Justins, Joyces, Hobarts and Duffys bridges are aging timber structures in poor condition that are nearing the end of their serviceable lives.

The key objectives of the Project are to improve user safety and improve network reliability into the future by replacing the existing bridge structures with new 100-year design life concrete structures.

Additional objectives of the Project include:

- Meeting customer network needs
- Minimising safety risks to the workforce carrying out the works
- Minimising impacts to road users
- Minimising environmental impacts from the Project

The existing bridges and proposed new works are described in Table 2.1.

Table 2.1 Existing bridge and proposed new bridge design

Existing bridge design	Proposed new works
Justins Bridge	
– Low-level, four span timber bridge with a length of 32 m – Deck level of approximately 89.7 m Australian Height Datum (AHD)	– Construction of a new single-lane bridge downstream of the existing bridge footprint – Approximate length of 42.5 m, including 30 m steel girder span over the main channel and additional 12 m concrete girder span to bridge a sediment area on the western side of the channel – Combination of bored concrete piles where weathered rock is found at the piers and western abutment and rock anchors at the eastern abutment due to shallow high strength rock – Increase deck level to approximately 91 m AHD to provide improved flood immunity
Joyces Bridge	
– Low-level, four-span timber bridge with a length of 48 m – Deck level of approximately 39.1 m AHD	– Construction of a new bridge downstream of the existing bridge footprint – Four span concrete structure approximately 49.5 m in length – Bridge spans of varying lengths including: • 7 m span on the western side to accommodate vehicle turning paths • 18 m span across the main channel to avoid environmental impact • 2 x 12 m spans on the eastern side – Increase deck level to approximately 41.1 m AHD to provide improved flood immunity

Existing bridge design	Proposed new works
Hobarts Bridge	
– Low-level, five-span timber bridge with a length of 48 m – Deck level of approximately 44.35 m AHD	– Construction of a new single-lane bridge downstream of the existing bridge footprint – Carriageway length of 54.5m width of 4.2 m widening to 5.78 m at the Darwood side to provide turning path access to the Chrysalis School – Various abutment and pier foundations including: • Reinforced concrete abutments and bored piles at Abutment A • Blade pier and bored piles at Pier 1 • Blade piers with rock anchors at Piers 2 and 3 • Reinforced concrete abutment with rock anchors at Abutment B – Increase deck level to approximately 46.5 m AHD to provide improved flood immunity
Duffys Bridge	
– Low-level, four-span timber bridge with a length of approximately 44 m and 4 m wide carriageway – Deck level of approximately 19.8 m AHD	– Construction of a new dual-lane bridge downstream of the existing bridge footprint – Approximate length of 51 m. Overall width of 7.2 m and a carriageway width of 7.1 m – Reinforced concrete abutment and driven piles – Increase deck level to approximately 21.5 m AHD to provide improved flood immunity

2.2 Assessment of alternatives

Alternative bridge designs (as shown in Table 2.1), construction methodologies and materials were considered during concept design development. Cost-benefit analyses have also been undertaken for the Project. The proposed bridge replacement works were considered the preferred options for each site, as they are considered to improve road safety whilst minimising environmental impacts.

The ‘do nothing’ option is not acceptable to BSC or the local community as the current bridge structures at each site pose a risk to road users, due to their age and structural design. The bridges are essential to maintaining safe access to remote communities within the BSC LGA. Existing bridges may incur further deterioration if no action is taken.

There are no feasible alternative locations for the new bridges as crossings over the Bellinger and Kalang rivers are required to provide access and connectivity through Darkwood Road and Kalang Road. The new bridges are proposed to be constructed immediately downstream of the existing bridges, to minimise the project footprint and so that the existing bridges can be used for access during the construction period.

2.3 Project location

2.3.1 Overview

The Project is located in the Mid North Coast area of NSW within the BSC LGA, approximately 420 km north-northeast of Sydney. The project footprints consists of four separate sites at the locations described in Table 2.2 and in is within a rural, forested area. The nearest town is Bellingen (Figure 1.1).

Table 2.2 Location of proposed activities

Project component	Location	Coordinates (GDA 2020)	Watercourse
Justins Bridge	Darkwood Road, Darkwood (approximately 35 km west of Bellingen)	-30.453727, 152.630649	Bellinger River
Joyces Bridge	Darkwood Road, Darkwood (approximately 18 km west of Bellingen)	-30.426143, 152.748049	Bellinger River
Hobarts Bridge	Darkwood Road, Darkwood (approximately 20 km west of Bellingen)	-30.433247, 152.722993	Bellinger River
Duffys Bridge	Kalang Road, Kalang (approximately 4 km south-west of Bellingen)	-30.467859, 152.855866	Kalang River

2.3.2 Land tenure, land use and zoning

The Justins, Joyces and Hobarts bridges provide access across the Bellinger River via Darkwood Road. Darkwood Road is a two-way road, which is unsealed at the Justins Bridge and Hobarts Bridge locations and sealed at the Joyces Bridge location. Duffys Bridge provides access across the Kalang River, via Kalang Road, which is a two-way, sealed road.

The bridges provide local access for remote, rural communities in the Thora and Kalang valleys. Land tenure, land use and zoning of each project site is described in Table 2.2.

Table 2.3 Land use and ownership

Project component	Tenure	Land use zone	Surrounding land uses	Other
Justins Bridge	Freehold, surrounded by nature conservation reserve (Baalijin Nature Reserve)	Environmental Management / Environmental Living	Agriculture and environmental land	Bellingen Shire Council owns the road. The waterway is under the jurisdiction of Crown Lands.
Joyces Bridge	Freehold	Environmental Living	Agriculture and environmental land	Bellingen Shire Council owns the road. The waterway is under the jurisdiction of Crown Lands.
Hobarts Bridge	Freehold	Environmental Living	– Agriculture and environmental land – Chrysalis School	Bellingen Shire Council owns the road. The waterway is under the jurisdiction of Crown Lands.

Project component	Tenure	Land use zone	Surrounding land uses	Other
Duffys Bridge	Freehold	Environmental Living	Agriculture and environmental land	Bellingen Shire Council owns the road. The waterway is under the jurisdiction of Crown Lands.

2.4 Construction and ancillary activities

2.4.1 Overview

The proposed Project works at each of the bridge sites will involve the following general construction activities:

– Vegetation clearing
– Installation of piers and rock anchors
– Construction of abutments and placement of decking units
– Installation of rock scour protection
– Realignment of approach roads
– Demolition of existing timber bridges
– Rehabilitation of site

Construction works are expected to be carried out over a 9-month period. The total instream and associated bank footprints are estimated to impact approximately 0.41 ha, across the four bridges. Further details on proposed site activities for each bridge are provided in the following sections.

2.4.2 Construction activities

The general activities required for the construction phase of each bridge will include the following:

– Set up site compound, laydown and stockpile areas outside of flood zones and roads.
– Clearing and grubbing surface vegetation and topsoil, stockpiling topsoil.
– Install erosion and sediment controls. For the Justins and Joyces bridges this will include sediment fencing and floating hydrocarbon booms with drop silt curtains around access pathways.
– Install access ramps to the waterways to exposed gravel/rock bars. These are mostly within the proposed bridge and scour rock footprints for each site. Access to the Justins Bridge site on the eastern side will be from the existing road shoulder.
– Repeated placement of two tonne rock bags to stabilise crane positions, controls and temporary access ways.
– Install low flow aquatic fauna passage pipes under the eastern access track at Joyces Bridge.
– Installation of piers:
  - Justins Bridge – install two rows of 3 x 600 mm bored piles into the bed of the Bellinger River with a concrete headstock cast in situ.
  - Joyces Bridge – install 9 x 600 mm piles (three per headstock) with three concrete headstocks into the bed of the Bellinger River.
  - Hobarts Bridge – install three concrete blade piers 1,300 mm wide x 4,655 – 6,240 mm long, each anchored into the bed of the Bellinger River by 3 x 600 mm bored piles or N28 anchors.
  - Duffys Bridge – Pier 1 and 2 – install two rows of five driven piles (10 per pile cap) into the bed of the Kalang River with two concrete headstocks cast in situ.
– Remove piling access works.

– Construction of new concrete abutments on the high banks:
  - Justins Bridge – using prefabricated wing walls and casting the 1,000 mm wide, 900 mm deep abutments in place, with 2 x 600 mm piles bored into bedrock or rock anchors.
  - Joyces Bridge – using prefabricated wing walls and casting the 950 mm wide abutments in place, each with 2 x 600 mm piles bored into bedrock.
  - Hobarts Bridge – using prefabricated wing walls and casting the 1,200 mm high abutment in place, with 3 x 600 mm embedded piles bored into bedrock.
  - Duffys Bridge – using prefabricated wing walls and casting the 1,200 mm wide, 1,600 – 2,000 mm deep abutments in place, with five driven piles per abutment. No anchors are to be used.

– Install scour rock around abutments to the toe of the bank keyed into high banks upstream and downstream.

– Construction of bridge deck structures – place beams and girders, place or pour concrete decks, backfill to abutments, stitch pour where applicable.

– Reshape road approaches to bridges.

– Demolish existing bridges:
  - Justins Bridge – remove all decking and girders, remove timber headstocks and steel components, cut off timber piles to bed level, leaving concrete piers and headstocks over the water and removing existing abutments.
  - Joyces Bridge – remove all decking and girders, partially remove abutments to improve tie-in, leaving existing piers, concrete headstocks and majority of abutments to minimise disturbance to bed and banks.
  - Hobarts Bridge – remove decking, girders and headstocks outside of the low flow area (of those constructed of timber), but leaving existing abutments and concrete piers to minimise disturbance to bed and banks.
  - Duffys – remove the deck, cutting the existing timber piers to bed level, but leaving the abutments to minimise disturbance to bed and banks.

– Finalise scour rock placement.

– Rehabilitate site, including plantings and temporary erosion and sediment controls to remain for three months or until stable.

2.4.3 Ancillary works

A temporary construction compound is anticipated to be established near each project footprint. Construction compounds will be mostly within the road corridors with some requirement to use adjacent private property, with access to be negotiated with the relevant landholders. The location of the compound would be determined by the construction contractor and would be dependent on the order in which works are undertaken.

The construction compound is likely to consist of the following:

– Small site shed

– Equipment laydown area

– Waste receptacles

– Construction materials

The construction compound would not be established under the dripline of any existing trees. Due to the rural nature of the project area, there is no high human activity expected within the area.

Where refuelling, fuel decanting and vehicle maintenance work is required this would take place in a designated sealed and bunded area within the construction compound area or offsite.

The following is an indicative list of construction plant and equipment that may be required for the project:

- Heavy vehicles associated with earthwork activities and construction including excavator, backhoe, skid steer, tipper, spreaders, roller and delivery trucks.
- Machinery including an excavator mounted drilling rig, small excavator, mobile shotcrete plant, small mobile crane, and various hand tools.

2.4.4 Construction timing and staging

Construction will occur concurrently between April 2024 and June 2025. All high-risk works will be completed within the dry season and/or a period of low rainfall and minimal flow. This period will minimise the risk of erosion, run-off and transport of sediment downstream during flooding events. High risk works include disturbance for piling access and approaches and works to construct the bridge substructure.

2.4.5 Operational phase

Upon completion of the Project, the operational phase activities will largely comprise maintenance works including:

- Vegetation control (e.g., mowing, herbicide treatments, weed removals and grass slashing)
- Line marking, pavement repairs and road resurfacing
- Maintenance of drainage structures and stormwater quality devices, including removal of sediment and debris
- Repair and replacement of road furniture including guardrails, signs, barriers, fencing and guide markers
- Structure maintenance including bridges

2.5 Decommissioning

The design life of each bridge structure is 100 years. Decommissioning will be in accordance with the relevant legislation at the time of decommissioning.

3. Legislative context

3.1 Commonwealth legislation

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's central piece of environmental legislation and is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The EPBC Act provides a legal framework to protect and manage MNES, which include:

- World Heritage properties
- National Heritage properties
- Wetlands of international importance (Ramsar wetlands)
- Listed threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- Water resources, in relation to coal seam gas development and large coal mining development

A person who proposes to take an action that is likely to have a significant impact on MNES must refer that action to the minister administering the EPBC Act. An action is defined broadly in the EPBC Act and includes any project, development ,undertaking, activity or series of activities, or any alteration of these actions.

The minister will make a decision based on information provided in the referral. Decisions made by the minister may include the following:

- Clearly unacceptable decision – meaning the proposed action has, or will have, a clearly unacceptable impact on protected matters.
- Controlled action decision – meaning the proposed action has, or will have, a significant impact on protected matters. A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the intensity, duration, magnitude and extent of the impact, and upon the sensitivity, value and quality of the environment that is impacted. SIAs are undertaken in accordance with the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DotE, 2013). A controlled action decision means further assessment of the proposed action is required for the minister to decide whether or not to approve the proposed action. The minister will advise the type of assessment required.
- Not a controlled action – particular manner decision – this decision means that the particular manner in which the action is proposed to be taken ensures that it won't have or is unlikely to have a significant impact on protected matters. Further assessment is not required for a not controlled action – particular manner decision; however, the action must be undertaken according to the particular manner in the decision notice.
- Not a controlled action decision – meaning the proposed action is unlikely to have a significant impact on protected matters, no matter how the action is proposed to be undertaken. No further assessment is required but the action must be undertaken as described in the referral.

Several MNES (three threatened species and one migratory species) have been identified as being potentially impacted by the Project; however, SIAs indicate the Project will not have any significant residual impacts on any MNES. It is anticipated that the Project will receive a decision of 'not a controlled action' from the minister. Relevant MNES are discussed further in Section 6.

3.2 New South Wales legislation

3.2.1 Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Conservation Act 2016* (BC Act) is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. Part 7 of the BC Act states the environmental assessment requirements for activities being assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP & A Act). If a significant impact is likely, a Species Impact Statement is required. Species Impact Statements have been undertaken for the Project and have been used to develop the SIAs for the relevant species assessed within this referral.

In 2023 a Species Impact Statement (SIS) was issued to the Biodiversity and Conservation Division of the Department of Planning and Environment (DP&E) as part of assessment of these proposed works. The focus of this SIS was an assessment of potential impacts to the Bellinger River Snapping Turtle (DPE 2023). Although the SIA indicated that it was unlikely the project would have a significant impact on the species, a conservative approach to the turtle was undertaken and a revised more detailed SIS was requested. An updated SIS is being submitted to the DP&E in conjunction with the EPBC referral.

3.2.2 Crown Land Management Act 2016

The *Crown Land Management Act 2016* (CLM Act) specifies how Crown lands are managed across NSW. Clause 31 of the CLM Act's subordinate legislation, the *Crown Land Management Regulation 2018,* provides 'prescribed purposes' for which a short-term licence may be granted. The Project will include dredging and reclamation works in a waterway. Under Section 200 of the *Fisheries Management Act 1994* (FM Act), a permit is required for dredging work carried out by a local government authority, unless the works are authorised by the CLM Act. The Project works are not authorised by the CLM Act, therefore a permit under the FM Act is required (see below).

3.2.3 Environmental Planning and Assessment Act 1979

The EP & A Act is the principal planning legislation used to plan and assess development proposals in NSW. Under Part 4 of the EP & A Act, certain development does not need consent, including developments where the proponent is a public authority. Such developments may still require assessment under Part 5 of the EP & A Act. The Project is not classified as state-significant infrastructure or state-significant development and can therefore be assessed under Division 5.1 of the EP & A Act.

BSC has an obligation under the EP & A Act to examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity. A Review of Environmental Factors has been undertaken for each of the proposed bridge upgrades in accordance with Part 5 of the EP & A Act which has been used to determine further requirements for assessments and/or approvals including the requirement for a referral under the EPBC Act.

3.2.4 Fisheries Management Act 1994

The FM Act regulates the protection, conservation, and recovery of threatened species (as defined under the FM Act), populations and ecological communities of fish and marine vegetation and fish habitats, as well as promoting the development and sharing of fisheries resources. Under Section 200 of the FM Act, a permit is required for dredging work carried out by a local government authority unless the works are authorised under the CLM Act.

As the Project is within Key Fish Habitat areas mapped under the FM Act, a Section 200 permit is required for dredging and reclamation works, unless the works are authorised under the CLM Act, in which case a Section 199 consultation with NSW Fisheries is required.

3.2.5 Roads Act 1993

The *Roads Act 1993* makes provisions with respect to the roads of NSW. Under Section 138 of the *Roads Act 1993*, consent is required for any works or activities in a public reserve, public road or footpath/nature strip. A Section 138 permit is required for the project.

4. Methodology

4.1 Approach

The ecological assessment for the Project included a desktop review of government records and environmental mapping layers, and a review of previous studies undertaken for the Project. Field assessments were also undertaken to investigate the ecological values within the study area. The desktop and field methodologies are detailed separately in Sections 4.2 and 4.4, respectively.

Assessments were conducted in accordance with the survey guidelines, referral guidelines, Recovery Plans, Commonwealth Conservative Advice, diagnostic criteria and conditions threshold matrix (as applicable to the MNES).

4.2 Desktop assessment

A desktop assessment was undertaken to identify and collate existing information on the ecological values within the study area and to determine the presence and relevance of threatened species and communities relevant to this assessment. The desktop assessment incorporated a review of the government records and mapping layers including the Threatened Biodiversity Data Collection and other relevant databases. Databases used in the Desktop search are outlined in Table 4.1.

Table 4.1 Desktop assessment information sources

Desktop search	Purpose
Atlas of Living Australia (ALA) Database	The ALA database was searched to retrieve historical records of threatened flora and fauna species assessed as likely to occur within 10 km of each Project footprint.
BioNet Atlas NSW	BioNet Atlas NSW was used to search threatened species sightings and their species biodiversity profiles within 10 km of each Project footprint.
DPI threatened species lists and distribution maps	DPI threatened species lists and distribution maps were used to identify threatened species (as defined under NSW legislation) sightings within the study area.
Protected Matters Search Tool (PMST)	The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) PMST search was conducted to identify MNES protected under the EPBC Act that have the potential to occur within 10 km of each Project footprint.
Species Profile and Threats Database (SPRAT)	The DCCEEW SPRAT profiles were assessed to determine habitat requirements and ecology of potentially occurring threatened species.

4.3 Previous studies

Baseline field surveys were conducted by Idyll Spaces Environmental Consultant to detect and/or quantify the presence of threatened fauna species and their required habitats (Idyll Spaces Environmental Consultants 2023). This involved a combination of fauna and flora habitat assessments and active searches. Where relevant, the results of this assessment were incorporated into this assessment.

Subsequent surveys involved more targeted approaches where specific methodologies were selected with respect to the species of interest. Methodologies for these additional surveys are provided in Section 4.4.

4.4 Field assessment

Field surveys of the project footprints were conducted in July and in November to December 2023 to identify and assess threatened species impact for flora and fauna from the proposed remediation works on Joyces, Hobarts, Justins and Duffys Bridges. The first field survey was undertaken by Idyll Spaces Environmental Consultants with one ecologist for a flora and fauna habitat survey on 12 July 2023. The second field survey was undertaken by two ecologists from GHD for a targeted fauna survey between 27 November to 1 December 2023. There were no access limitations during this field survey. A summary of the survey effort for both flora and fauna surveys within the four bridge sites are outlined in Table 4.2 and presented in Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4.

Table 4.2 Overview of survey effort within the project area

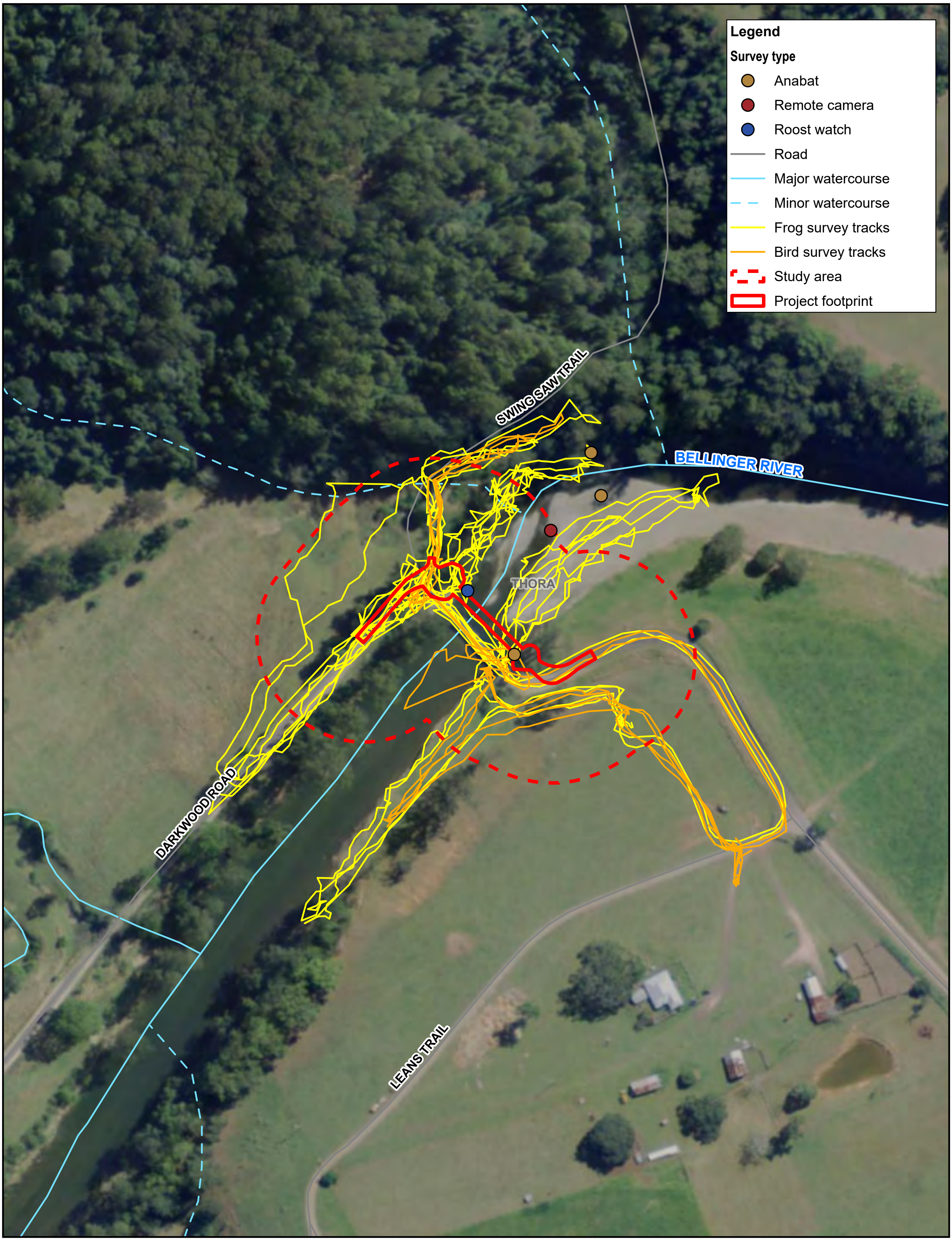
Field survey dates	Company	Team & scope	Flora survey effort	Fauna survey effort
12 July 2023	Idyll Spaces Environmental Consultants	1 ecologist Flora and fauna habitat survey	Plant Community Type (PCT) verification Identifying presence of threatened flora	– Opportunistic observations – Aural and visual surveys – Habitat assessments – Diurnal bird surveys
27 November – 1 December 2023	GHD	2 ecologists Targeted fauna survey	N/A	– Targeted fauna searches – Aural and visual surveys – Anabat detectors – Remote cameras – Diurnal bird surveys – Habitat assessments – Opportunistic observations – Spotlight area searches

Survey effort was undertaken using methods recommended by the Commonwealth (where provided). Survey effort per species are outlined in Table 4.3.

Table 4.3 Survey effort and species guidelines

MNES	Commonwealth guidelines	Survey effort
Bellinger River snapping turtle	No survey guideline.	– Opportunistic observations – Habitat assessments *Note: The species population size is extremely limited, the NSW Government regularly undertakes surveys as part of the NSW Government's Saving our Species program, and only a small number have been confirmed present in recent years (NSW DPE 2022). Targeted surveys were therefore not conducted and the species was assumed likely to occur at all sites*
Grey-headed flying-fox	Daytime field surveys for camps Survey of vegetation communities and food plants Night time surveys (100 m transects) (DEWHA 2010).	– Opportunistic observations – Aural and visual surveys – Targeted fauna searches – Anabat detectors – Habitat assessments – Spotlight area searches

MNES	Commonwealth guidelines	Survey effort
Giant barred frog	Visual encounter surveys Call surveys during the known calling period (September – May) Egg mass surveys Larval surveys (DCCEEW 2024).	– Opportunistic observations – Aural and visual surveys – Habitat assessments – Targeted fauna searches – Spotlight area searches
Black-faced monarch	2 ha survey over 20 min (spring or summer) Aural and visual surveys (DoE 2015).	– Targeted fauna searches – Aural and visual surveys – Diurnal bird surveys – Habitat assessments – Opportunistic observations



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GHD

Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Project No. 12611463
Revision No. 0
Date 13/02/2024

Survey effort - Joyces Bridge

FIGURE 4.1

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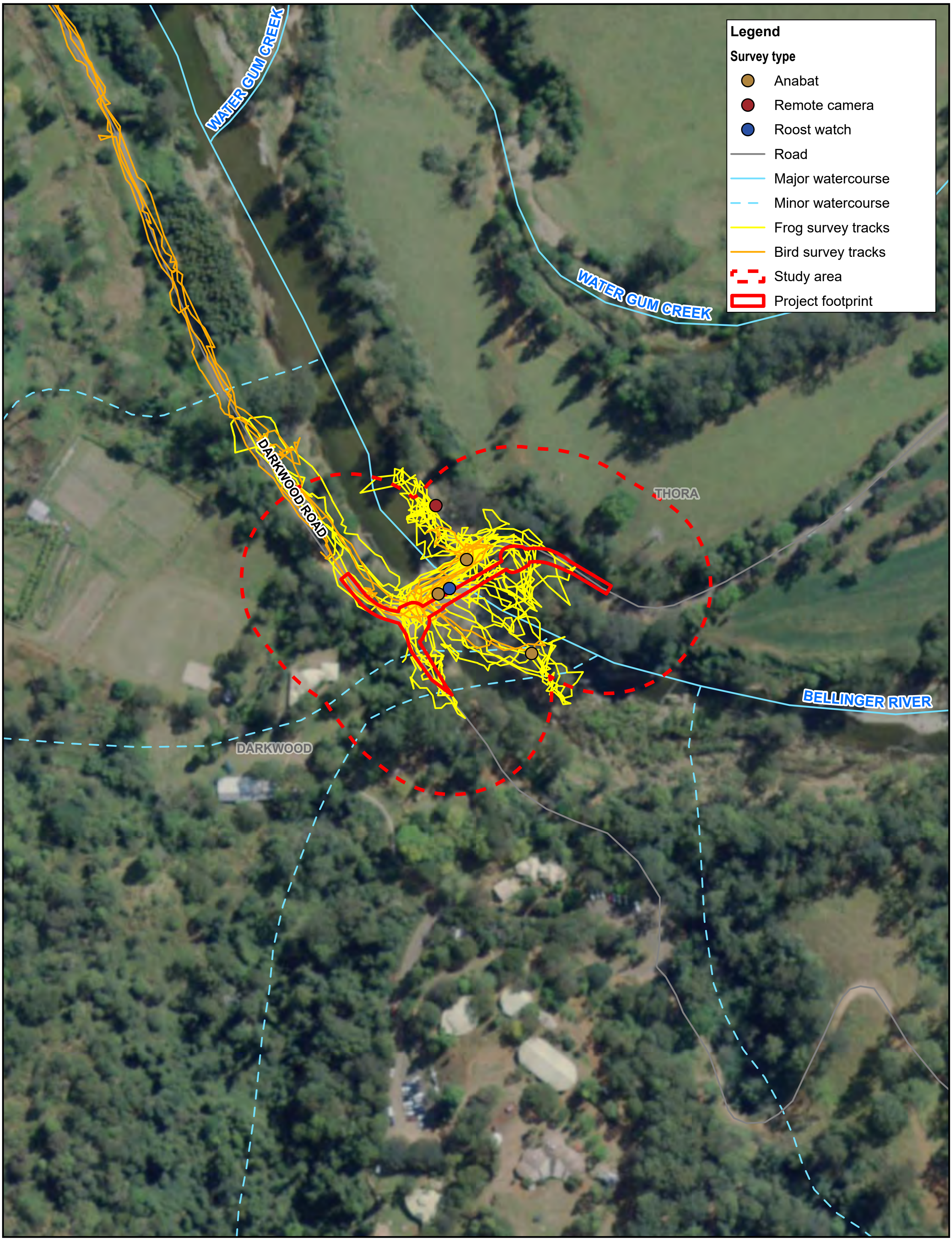
Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: project area, project footprint, survey data (2024); NSWSS: roads, watercourse, suburbs (2023).
Created by: bkaemmerling



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Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Project No. 12611463
Revision No. 0
Date 13/02/2024

Survey effort - Hobarts Bridge

FIGURE 4.2

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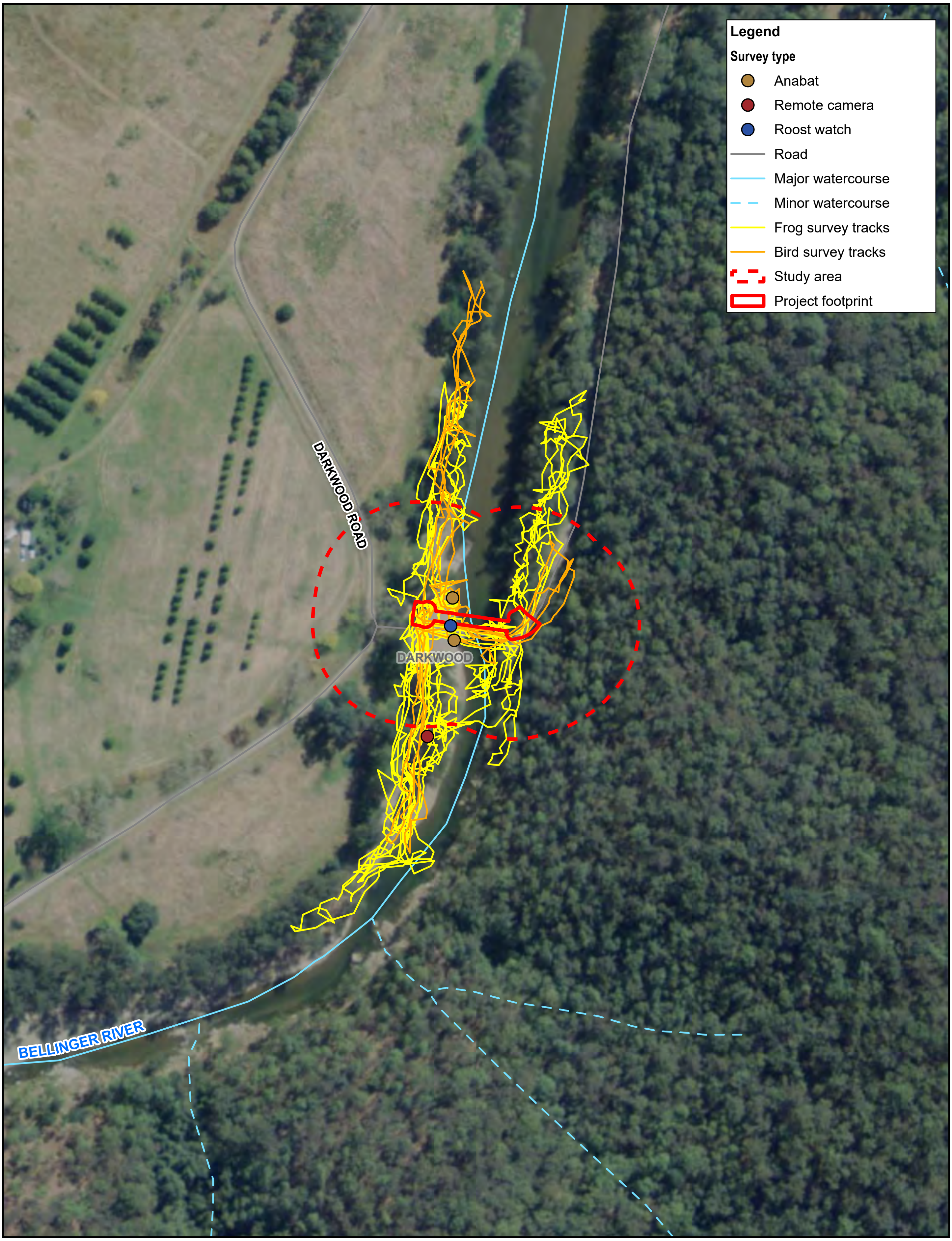

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Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Project No. 12611463
Revision No. 0
Date 13/02/2024

Survey effort - Justins Bridge

FIGURE 4.3

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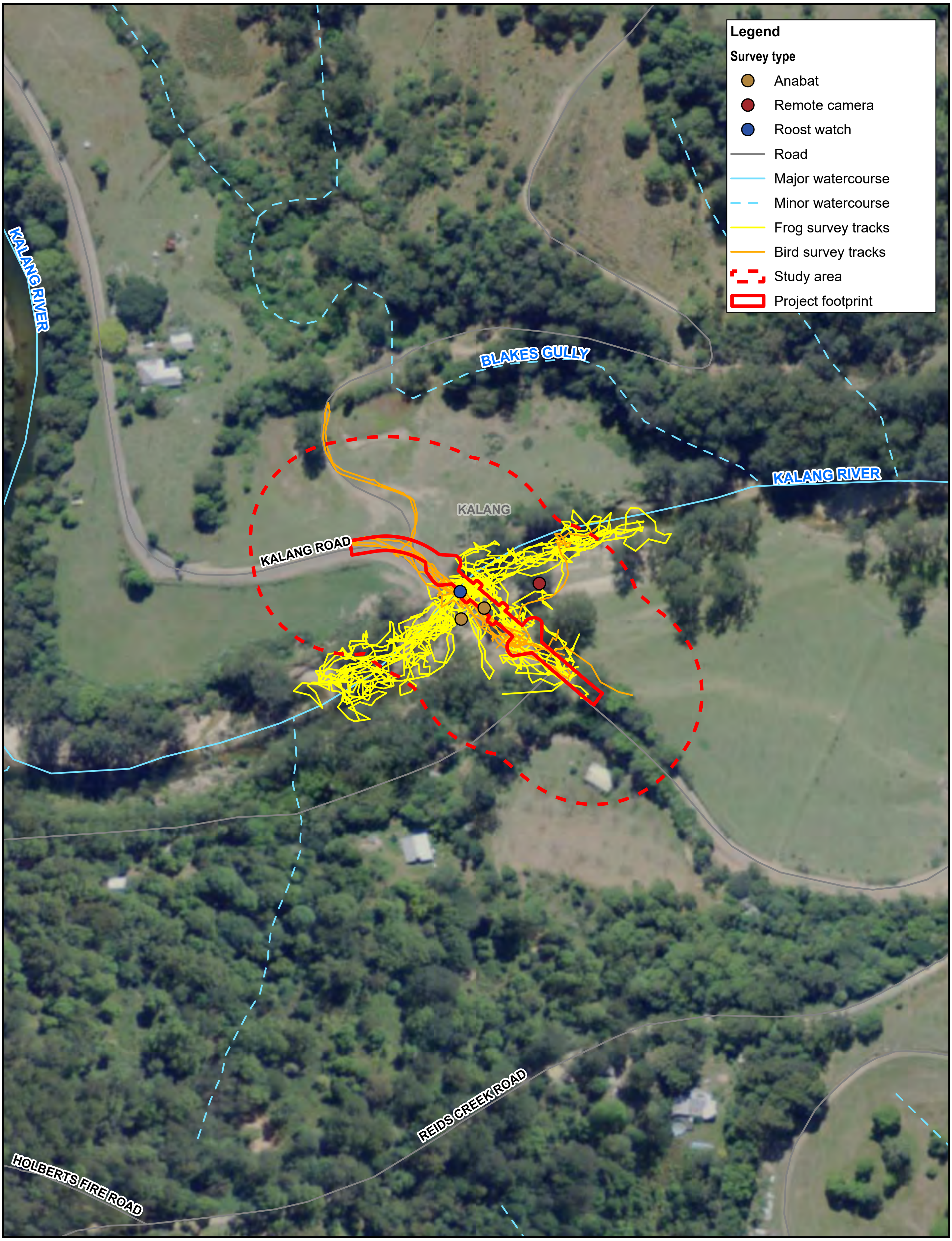

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Project No. 12611463
Revision No. 0
Date 13/02/2024

Survey effort - Duffys Bridge

FIGURE 4.4

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Created by: bkaemmerling

4.5 Likelihood of occurrence assessment

An assessment was conducted to attribute a 'likelihood of occurrence' to threatened species and migratory species that have been previously recorded or were predicted to occur within the project area. Identification of potential habitat for threatened species was based on information provided in the species profiles (DoEE 2020, OEH 2020), recovery plans, journal articles, and the field staffs' knowledge of species habitat requirements. The likelihood of occurrence assessment was further refined following field surveys. The likelihood of threatened biota occurring in the project area was assessed based on presence of records from the locality for the last 23 years (since 2000), species distribution and habitat preferences, and the suitability of potential habitat present in the construction footprint.

Table 4.4 provides a key to the likelihood of occurrence definitions. The likelihood of occurrence assessment is included in Appendix B. Species that were assessed as 'likely to occur' or 'confirmed present' as well as identified candidate species are the focus of this MNES assessment report.

Table 4.4 Key to likelihood of occurrence for threatened species

Likelihood	Definition
Confirmed present	The species or community was observed in the project area during field surveys.
Likely to occur	It is highly likely that a species inhabits the project footprint and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources) or has been recorded recently in the locality (10 km) and is known or likely to maintain resident populations in the construction footprint. Also includes species known or likely to visit the project footprint during regular seasonal movements or migration.
May occur	Potential habitat is present in the project footprint. Species unlikely to maintain sedentary populations, however, may seasonally use resources within the project footprint opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the construction footprint, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Unlikely to occur	It is unlikely that the species inhabits the project footprint and has not been recorded in the project area (10 km). It may be an occasional visitor, but habitat similar to the project footprint is widely distributed in the local area. Specific habitat is not present in the project footprint or the species is a non-cryptic perennial flora species that was specifically targeted by surveys and not recorded.

4.6 Significant impact assessment

A SIA was undertaken for MNES confirmed present or considered likely to occur within the project footprint. The assessment was made against the EPBC Act Significant Impact Guidelines 1.1 (DoE, 2013) for the following MNES:

– Bellinger River snapping turtle
– Grey-headed flying-fox
– Giant barred frog
– Black-faced monarch.

The SIAs are included in Section 5.1.

5. Existing environment

5.1 Physical environment

The Project is located within the New South Wales North Coast bioregion within the BSC LGA. The current dominant land use within the project area is road reserve for Darkwood Road (over Justins, Joyces and Hobarts bridges) and Kalang Road (over Duffys Bridge). The project area consists of land zoned under the *Bellingen Local Environment Plan 2010* as mostly C4 Environmental Living, with Justins Bridge also zoned as C3 Environmental Management. Land use surrounding the project area consists of agriculture and environmental land. A school (Chrysalis School) is located near Hobarts Bridge.

The project area consists of the four bridge locations, which are within the Bellinger River (Justins, Joyces and Hobarts bridges) and the Kalang River (Duffys Bridge). The Bellinger-Kalang River system is within the Bellinger River catchment and is one of the largest drainage systems of the NSW east coast and a major river system in the BSC LGA (discussed further in Section 5.2). The Bellinger River catchment is slightly disturbed, with around 85 percent of the catchment remaining forested (generally in the undulating areas of the upper catchment). Around 15 percent of the landscape has been changed, predominantly for cattle grazing (DPE, 2024). These areas are concentrated along the floodplains of the river and its tributaries and include the project area, where minor to moderate disturbance has occurred for construction of the existing road corridors and bridges.

There are large expanses of high value natural environments surrounding the project area, including the New England National Park, Bellinger River National Park, Diehappy State Forest, Scotchman State Forest, Gladstone State Forest and Baalijin Nature Reserve. The areas surrounding the bridge sites support a range of vegetation communities and habitats.

The dominant soil types at each of the bridge sites, as mapped on the Australian Soil Classification data layer (eSPADE, 2023) is Dermosols (within the watercourses) and Kurosols (outside the watercourses). Dermosol soils are non-cracking clay to clay loam soils that are widespread on mid to upper slope positions of low undulating hills and also located on alluvial flats (Ipswich City Council, 2014). Dermosols are usually non-dispersive but may be susceptible to rill and sheet erosion when left exposed to heavy rainfall and/or stream bank erosion when located adjacent to watercourses (Ipswich City Council, 2014). Kurosols are acidic texture contrast soils that generally have weak structures in the surface with a firm to hard-setting surface condition and poor initial infiltration resulting in increased run-off and subsequent erosion. Kurosols are sometimes dispersive in the subsoil; dispersive soils having a high erosion risk, particularly for tunnel and gully erosion (Ipswich City Council, 2014).

The Project is not within any areas mapped for potential acid sulfate soils (ASS) or listed as a Notified Site for contaminated land. The Project is not expected to uncover or interact with contaminated land or ASS.

The project area is within the Bellinger River catchment, within the Thora and Kalang Valleys where elevations range from around 10 m AHD at the Duffys Bridge site (closest to the coast) up to 92 m AHD near the Justins and Hobarts bridges, which are further inland. Much of the Bellinger catchment is mountainous, with limited areas of flat land associated with river and creek valleys. Steep areas of the catchment are under forest cover, while narrow floodplain and associated foothills have been cleared for grazing, cropping and other uses (NSW Government, 2024).

The physical environment of the project area relevant to each individual bridge site is summarised in Table 5.1.

Table 5.1 Summary of physical environment

Project component	Outstanding natural features in proximity to site	Elevation (m AHD)	Dominant soils	Other soil characteristics
Justins Bridge	– Bellinger River – New England National Park – Baalijin Nature Reserve – Diehappy State Forest	88 to 92	– Dermosols – Kurosols	– No ASS expected – No contaminated land expected
Joyces Bridge	– Bellinger River – Bellinger River National Park – Diehappy State Forest – Scotchman State Forest	30 to 35	– Dermosols – Kurosols	– No ASS expected – No contaminated land expected
Hobarts Bridge	– Bellinger River – Bellinger River National Park – Diehappy State Forest – Scotchman State Forest	40	– Dermosols – Kurosols	– No ASS expected – No contaminated land expected
Duffys Bridge	– Kalang River – Scotchman State Forest – Gladstone State Forst	10 to 15	– Dermosols – Kurosols	– No ASS expected – No contaminated land expected

5.2 Hydrology

The Project is within the Bellinger-Kalang River system, which is a major east coast drainage system with a catchment area of approximately 1,110 km^2. The Justins, Joyces, and Hobarts bridges are located within the Bellinger River, which has a total length of approximately 69 km, beginning in the Dorrigo Plateau in the Great Dividing Range and flowing south-east through an extensive coastal floodplain to Urunga, where it discharges to the Pacific Ocean. The Bellinger River estuary volume is approximately 14,441.6 ML (NSW DPE 2023). The lower estuary of the Bellinger River is formed where the Kalang River merges with the Bellinger River.

Duffys Bridge is located within the Kalang River, which is a major tributary of the Bellinger River with a length of approximately 77 km.

5.3 Flora and fauna

5.3.1 Threatened Ecological Communities

The PMST search identified the potential presence of the following threatened ecological communities (TECs) within the project area:

- Coastal swamp oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community
- Coastal swamp sclerophyll forest of New South Wales and South East Queensland
- Dunn’s white gum (*Eucalyptus dunnii*) moist forest in north-east New South Wales and south-east Queensland
- Lowland Rainforest of Subtropical Australia
- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions.

Vegetation communities identified at all bridges were remnants of the Plant Community Type (PCT) 3020 Northern Hinterland River Oak Sheltered Forest. PCTs are the master community-level typology used in NSW planning and assessment tools and vegetation mapping and management programs (DPE, 2023). PCT 3020 does not correspond with any of the TECs above. No TECs are considered likely to occur within the project area.

5.3.2 Flora

The PMST searches for the project identified a total of 25 flora species as potentially present within 10 km of each project footprint, based on bioclimatic modelling, knowledge of the species' distributions and habitat preferences (Appendix A). The likelihood of occurrence assessment (Appendix B) found that all flora species are unlikely to occur. No threatened flora species were identified within the project area during field surveys.

The project area is within a hinterland riparian zone where the surrounding vegetation is as follows:

– At Justins Bridge vegetation is dominated by *Casuarina cunninghamiana* (up to 15 m tall). Other terrestrial vegetation is limited to exotic species and isolated tufts of non-woody plants such as mat rush (*Lomandra hystrix*). The project footprint at Justins Bridge is mostly occupied by exotic grasses.
– At Joyces Bridge the surrounding vegetation is mostly comprised of exotic weeds and grasses, with isolated individuals of mat rush and occasional stands of *Casuarina cunninghamiana.*
– The vegetation surrounding Hobarts Bridge is dominated by flood-affected juvenile *Casuarina cunninghamiana* (approximately 3 m tall). Mat rush and exotic weeds are present along the banks.
– The vegetation around Duffys Bridge has a high density of exotic species, dominated by *Ligustrum sinense, Paspalum mandiocanum* and *Ageratum houstonianum.* The native vegetation present consists of occasional small plants of *Casuarina cunninghamiana.*, *Ficus coronata, Leptospermum brachyandrum*, and mat rush.

Terrestrial and aquatic flora features at each bridge site are summarised in Table 5.2.

Table 5.2 Summary of terrestrial and aquatic flora observed during field surveys

Project component	Terrestrial flora features observed during field surveys	Aquatic flora features observed during filed surveys
Justins Bridge	– One native tree on right bank and mixed native, and non-native shrubs on either side	– Floating clubrush (*Isolepis fluitans*) – Smartweed (Persicaria decipiens) – Spotted knotweed (*Persicaria strigose*) – Clasped pondweed (Potamogeton perfoliatus) – River sweetgrass (Potamophila parviflora) – Marsh clubrush (Schoenoplectus mucronatus) – River clubrush (Schoenpplectus Validus) – Ribbonweed (Valisneria nana)
Joyces Bridge	– Two mature Casuarina trees with fissures and/ or hollows are within two metres of the proposed works. – Area of 200 m^2 of native vegetation (and fauna habitat). Vegetation consists of exotic weeds and grasses, with isolated tuffs of Lomandra.	– Floating clubrush – Hydrilla (*Hydrilla verticilliata*) – Curled pondweed (*Potamogeton crispus*) – River sweetgrass – Marsh clubrush – Ribbonweed

Project component	Terrestrial flora features observed during field surveys	Aquatic flora features observed during filed surveys
Hobarts Bridge	– An area of 250 m^2 of small (<10 cm stem diameter) Casuarinas growing on shallow rocky soils. – Banks contain weeds and isolated tufts of non-woody plants e.g. Lomandra.	– Hydrilla – Smartweed – Spotted knotweed – Curled pondweed – Pondweed (*Potamogeton octandrus*) – River sweetgrass – Marsh clubrush – River clubrush – Cumbungi (*Typha sp.*) – Ribbonweed
Duffy's Bridge	– Area of 200 m^2 of native vegetation (and fauna habitat). Vegetation consists of small Casuarina, sandpaper fig tea tree and Lomandra. – Isolated specimens of exotic grasses and shrubs, in particular Small-leaved privet. – Some native trees, mixed native and non-native shrubs make up the riparian vegetation.	– Floating Clubrush – Millfoil (*Myriophbyllum sp.)* – Smartweed – Spotted Knotweed – Ribbonweed

5.3.3 Fauna

The PMST searches for the project identified a total of 35 threatened fauna species as potentially present within 10 km of each project footprint, based on bioclimatic modelling, knowledge of the species' distributions and habitat preferences. Thirteen migratory birds species were identified in the PMST search (Appendix A).

The likelihood of occurrence assessment (Appendix B) found several fauna species that were confirmed present or likely to occur as follows:

– Bellinger River snapping turtle (*Myuchelys georgesi*) – critically endangered under the EPBC Act – likely to occur at all project footprints

– Grey-headed flying-fox (*Pteropus poliocephalus*) – vulnerable under the EPBC Act – confirmed present at Hobarts Bridge

– Giant barred frog (*Mixophyes iteratus*) – vulnerable under the EPBC Act – confirmed present at all project footprints

– Black-faced monarch (*Monarcha melanopsis*) – migratory under the EPBC Act – confirmed present at Joyces Bridge

Terrestrial fauna habitat features identified within the project area are summarised in Table 5.3.

Table 5.3 Summary of existing terrestrial flora and fauna

Project component	Fauna
Justins Bridge	– Drinking sites for birds and mammals including the black-faced monarch – Refuges and breeding habitat for the giant barred frog and other amphibians – Foraging and roosting habitat and flyway for grey-headed flying-fox and microbat and bird species protected under the NSW BC Act – Foraging habitat for the Bellinger River snapping turtle and other aquatic fauna – Movement corridors for aquatic and terrestrial fauna – Roosting sites for arboreal mammals in fringing riparian vegetation
Joyces Bridge	– Riparian vegetation identified as breeding habitat for the giant barred frog – Hollows or crevice's in the bridge structure, may be used as roosting/ breeding habitat by Southern Myotis and (potentially) microbats – Foraging habitat for the Bellinger River snapping turtle and other aquatic fauna
Hobarts Bridge	– Roosting/breeding habitat for microbats – Foraging habitat for the Bellinger River snapping turtle and other aquatic fauna – Large hollow log near existing Casuarina on the eastern bank that may provide habitat for spotted-tail quoll, but it is outside of the study area – Open nature of vegetation and moist soil is potential habitat for the Bellinger River snapping turtle and the giant barred frog
Duffy's Bridge	– Potential habitat for breeding and foraging of the giant barred frog – Foraging habitat for the Bellinger River snapping turtle and other aquatic fauna – Hollows and crevices in the bridge structure that may be used for roosting/breeding by Southern Myotis and possibly other microbats

5.3.4 Biosecurity

The Project poses a minor chance of spreading pathogens. Vehicles, people and machinery have the potential to bring weed species and pathogens to the site or carry them from the site. To stop the spread of pathogens basic guidelines stated in hygiene guidelines – protocols to protect priority biodiversity areas in NSW from *Phytophthora cinnamomi*, myrtle rust, amphibian chytrid fungus and invasive plants (DPIE, 2020) will be implemented.

5.4 Cultural heritage

A search of the NSW Aboriginal Heritage Information Management System (AHIMS) indicated that the proposed works (including a 50 m buffer) do not contain any places or points of previously recorded Indigenous significance (Appendix C).

Vegetation clearing may be required, which has the potential to uncover items of Indigenous cultural heritage significance. All personnel working on site will receive training to limit the risk to Indigenous cultural heritage in the event of an unexpected find. If Indigenous cultural heritage items are found during project works, all works within the vicinity of the find must cease and management must be informed immediately. The steps outlined in unexpected heritage items procedure (Transport for NSW, 2022) will be followed.

6. Matters of national environmental significance

6.1 World heritage areas

The PMST search identified that Joyces and Justins bridges are within 10 km of the Gondwana Rainforests of Australia, which is a World Heritage Area. The Gondwana Rainforests are listed as world heritage for the following criteria:

– VII – Outstanding examples of earth's history
– IX - Outstanding examples of on-going evolution
– X – Important habitats for conservation of biological diversity

The project works will not impact the Gondwana Rainforests the size and scale of the proposed works is limited to the existing bridges and small adjacent areas. The project area is downstream of the Gondwana Rainforests of Australia World Heritage Area and is not hydrologically connected. There will be no indirect impacts through hydrological flows or water quality impacts as there are no downstream impacts to the World Heritage Area. As such, the Gondwana Rainforests have not been assessed as part of this referral.

6.2 National heritage places

The PMST search identified that Joyces and Justins bridges are within 10 km of the Gondwana Rainforests of Australia, which is a National Heritage place.

The project works will not impact the Gondwana Rainforests the size and scale of the proposed works is limited to the existing bridges and small adjacent areas. The project area is downstream of the Gondwana Rainforests of Australia National Heritage place and is not hydrologically connected. There will be no indirect impacts through hydrological flows or water quality impacts as there are no downstream impacts to the National Heritage place. As such, the Gondwana Rainforests have not been assessed as part of this referral.

6.3 Wetlands of international importance

There are no wetlands of international importance (Ramsar wetlands) within or in proximity to the project area.

6.4 Commonwealth marine areas

The Project is not within or in proximity to any Commonwealth Marine Areas.

6.5 Great Barrier Reef Marine Park

The Project is not within or in proximity to the Great Barrier Reef Marine Park.

6.6 Nuclear actions

The Project is not within or in proximity to any nuclear actions and does not involve any nuclear actions.

6.7 Water resources relating to coal seam gas development or coal mining development

The Project is not within or in proximity to any water resources relating to coal seam gas development or coal mining development and does not involve these actions.

6.8 Listed threatened ecological communities

No TECs were confirmed present or considered to have potential to occur within the Project area.

6.9 Listed threatened species

6.9.1 Bellinger River snapping turtle

6.9.1.1 Conservation status and species profile

The Bellinger River snapping turtle is listed as critically endangered under the EPBC Act.

The Bellinger River snapping turtle is only known from the Bellinger River catchment, on the north coast of New South Wales. The species range is small, within the catchment it is restricted to the Bellinger River, lower Rosewood and Never Never Rivers, and potentially Kalang River. The species was recently heavily impacted by a disease outbreak, resulting in an associated mortality event. Due to the impact of the disease, the Bellinger River snapping turtle is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals. Best practice techniques have been selected for avoidance, mitigation and management of potential impacts. The methods proposed are known to be effective at protecting aquatic environment and species. Monitoring will be conducted throughout the construction works to assess actual risks against those expected and allow for adaptive management if required. Given the susceptibility of the species to disease and the risk that any impact on the species can have on the viability of the population, measures will be implemented to support the active protection of the species throughout construction. Based on the avoidance and mitigation measures proposed, the project is not expected to exacerbate the effects of the Bellinger River virus on the Bellinger River snapping turtle.

The preferred habitat of the Bellinger River snapping turtle is deep waterholes (>2 m) with vegetation cover and rock substrates. Their habitat is patchily distributed; however, the species can travel between pools during standard river flow conditions (Cann et al. 2015; NSW Scientific Committee 2016; TSSC 2016). The Bellinger River snapping turtle rarely disperses overland as the species is primarily aquatic, however, the turtle has been observed to utilise fallen trees on the river and the bank to bask (Cann et al. 2015; NSW Scientific Committee 2016).

There is limited information available on the nesting and breeding patterns of the Bellinger River snapping turtle; however, it has been recognised that the nesting occurs between October to December, with females gravid from September to December (Cann et al. 2015; NSW Scientific Committee 2016; TSSC 2016). Eggs are laid in excavations on the riverbanks typically within 10 m of the water’s edge in heavily vegetated areas with sandy substrate. The species lays approximately 1-2 clutches per year with the eggs weight ranging between 4 to 6.1 grams (g) (Cann et al. 1997). The clutch size averages between 10 – 25 eggs, with hatchlings emerging after a 72-day period (Blamires et al. 2005; TSSC 2016; Coggers 2014).

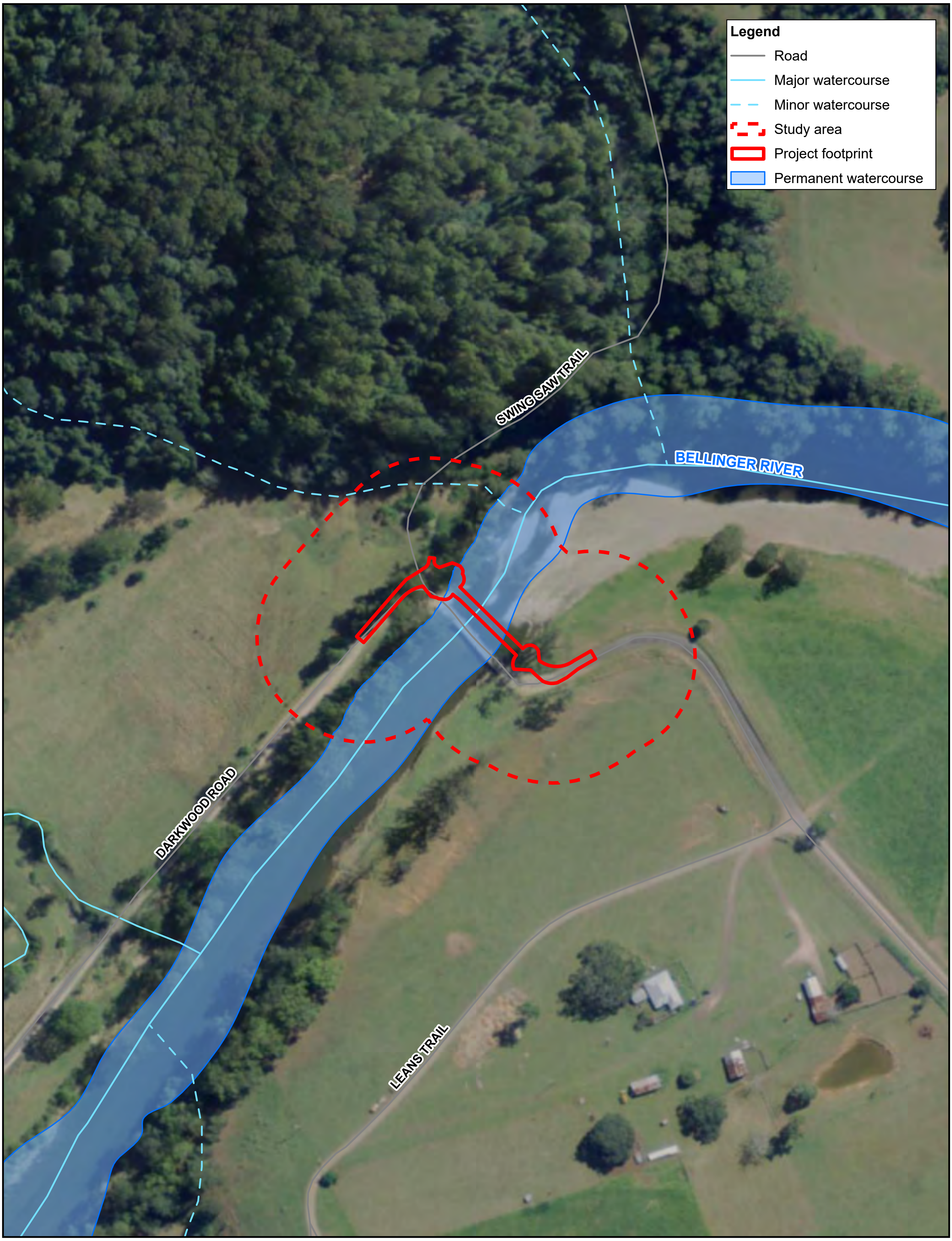
6.9.1.2 Desktop results

In the last five years between 2018 and 2022, the Bellinger River snapping turtle has been recorded during 48 different survey events within the catchment. Records were highest in 2018, with 23 sightings, while in 2019, turtle records significantly decreased to only three sightings (ALA 2023).

Since 2015, targeted surveys undertaken by the NSW Biodiversity Conservation Division (BCD) of the Biodiversity, Conservation and Science Directorate in the Environment and Heritage Group of the Department of Planning and Environment, have caught two wild Bellinger River snapping turtle in the waterhole directly upstream of Justins Bridge (BCD 2022). A radio-tracked captive-bred juvenile (released Spring 2019) was caught approximately 30 m downstream of the bridge in November 2019. Another captive-bred juvenile (released Spring 2018) has been tracked in the area around Justins Bridge since October 2020. This individual was last caught in the waterhole directly above the bridge in May 2022 (BCD 2022).

6.9.1.3 Survey results

Suitable habitat for the Bellinger River snapping turtle was confirmed present within the project footprint at Joyces Bridge, Hobarts Bridge, Justins Bridge and Duffys Bridge (Figure 6.1). Targeted surveys were not undertaken for the Bellinger River snapping turtle. The species population size is extremely limited, the NSW Government regularly undertakes surveys as part of the NSW Government's *Saving our Species* program, and only a small number have been confirmed present in recent years (NSW DPE 2022). Targeted surveys were therefore not conducted and the species was assumed likely to occur at all sites.



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Map Projection: Transverse Mercator
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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Joyces Bridge
Bellinger River snapping turtle
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 1 of 4

FIGURE 6.1

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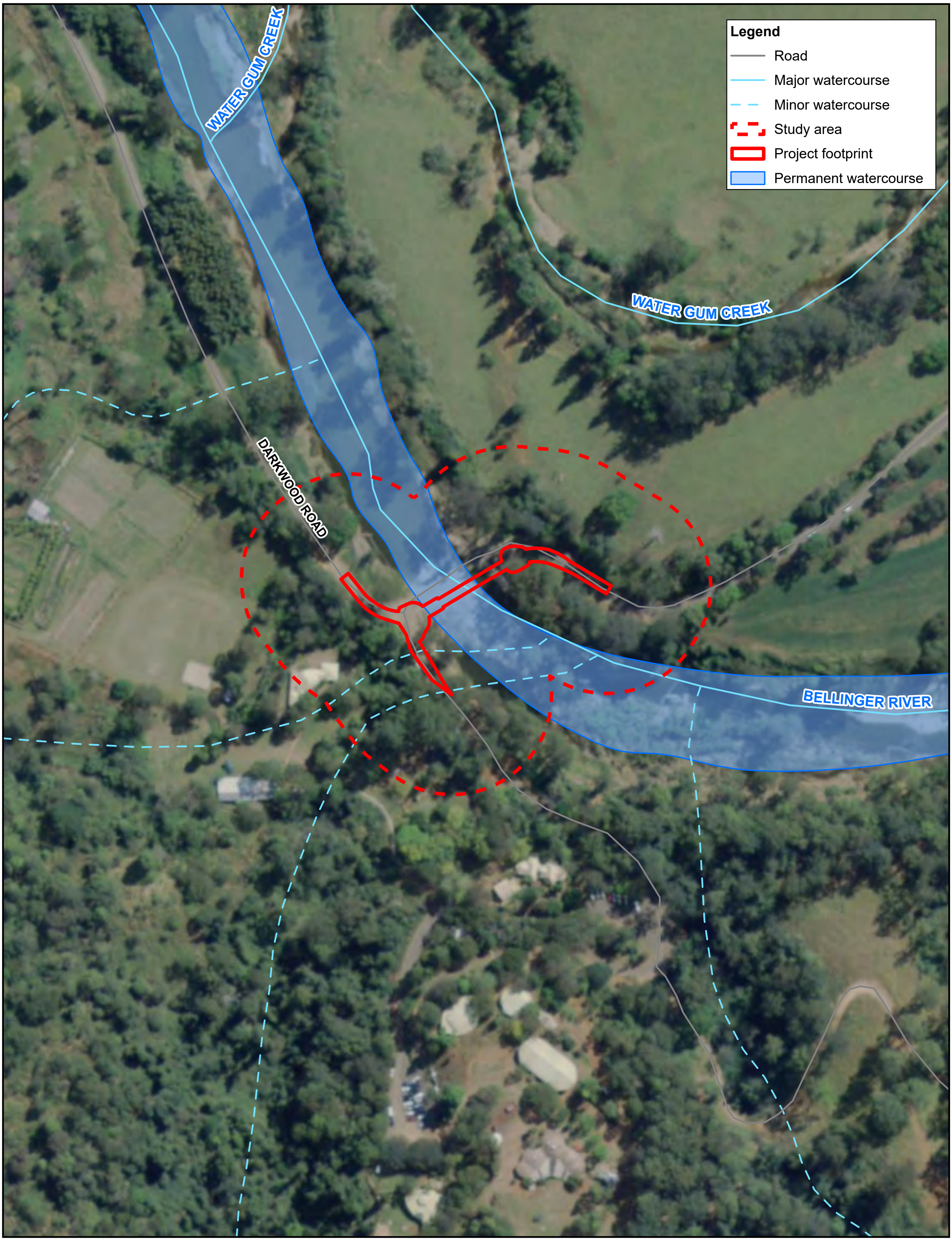
Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint (2024); NSWSS: roads, watercourse (2023), water feature (2024).
Created by: bkaemmerling



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Map Projection: Transverse Mercator
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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Hobarts Bridge
Bellinger River snapping turtle
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 2 of 4

FIGURE 6.1

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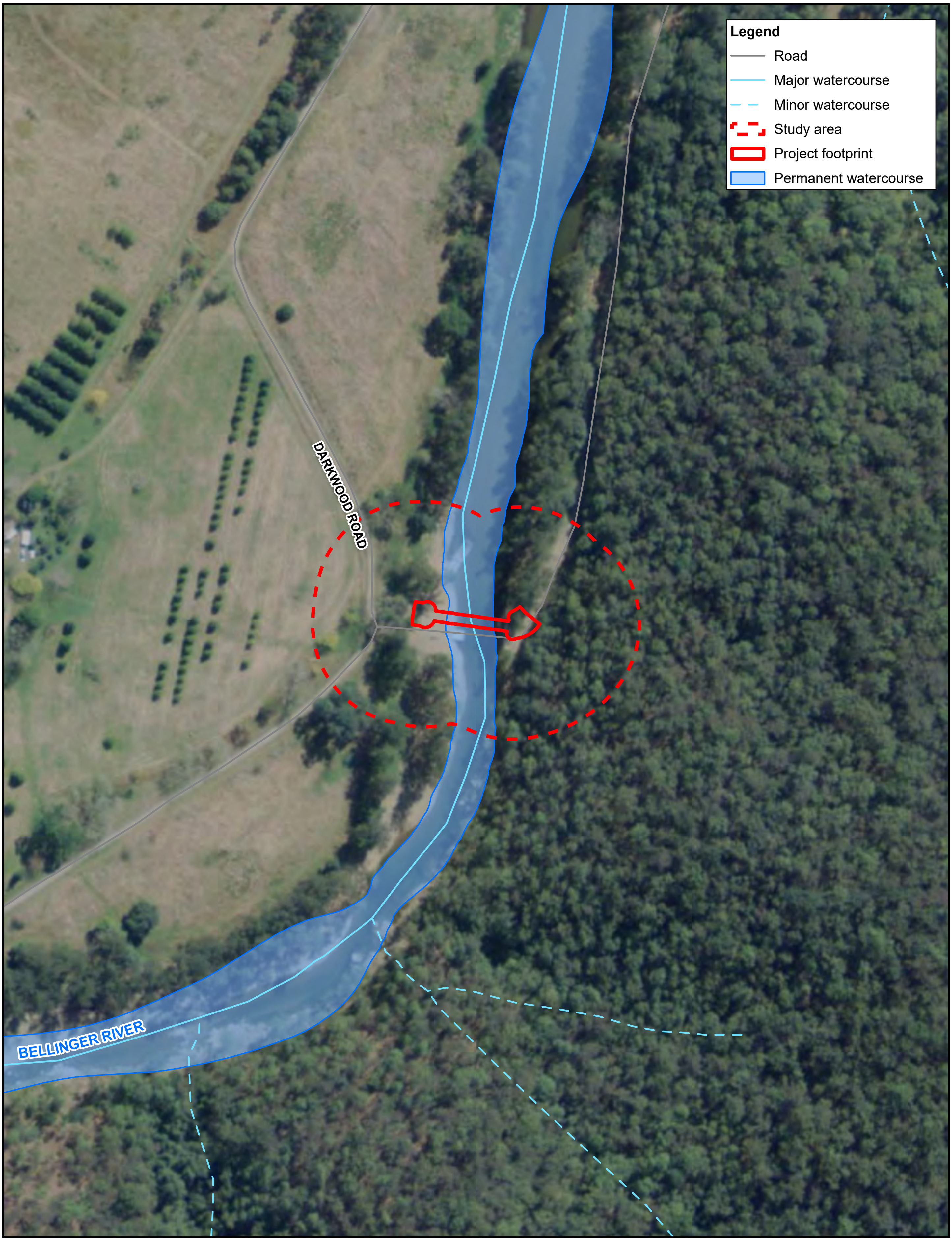

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Map Projection: Transverse Mercator
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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Justins Bridge
Bellinger River snapping turtle
Survey results and mapped habitat

Project No. **12611463**
Revision No. **0**
Date **13/02/2024**

Sheet 3 of 4

FIGURE 6.1

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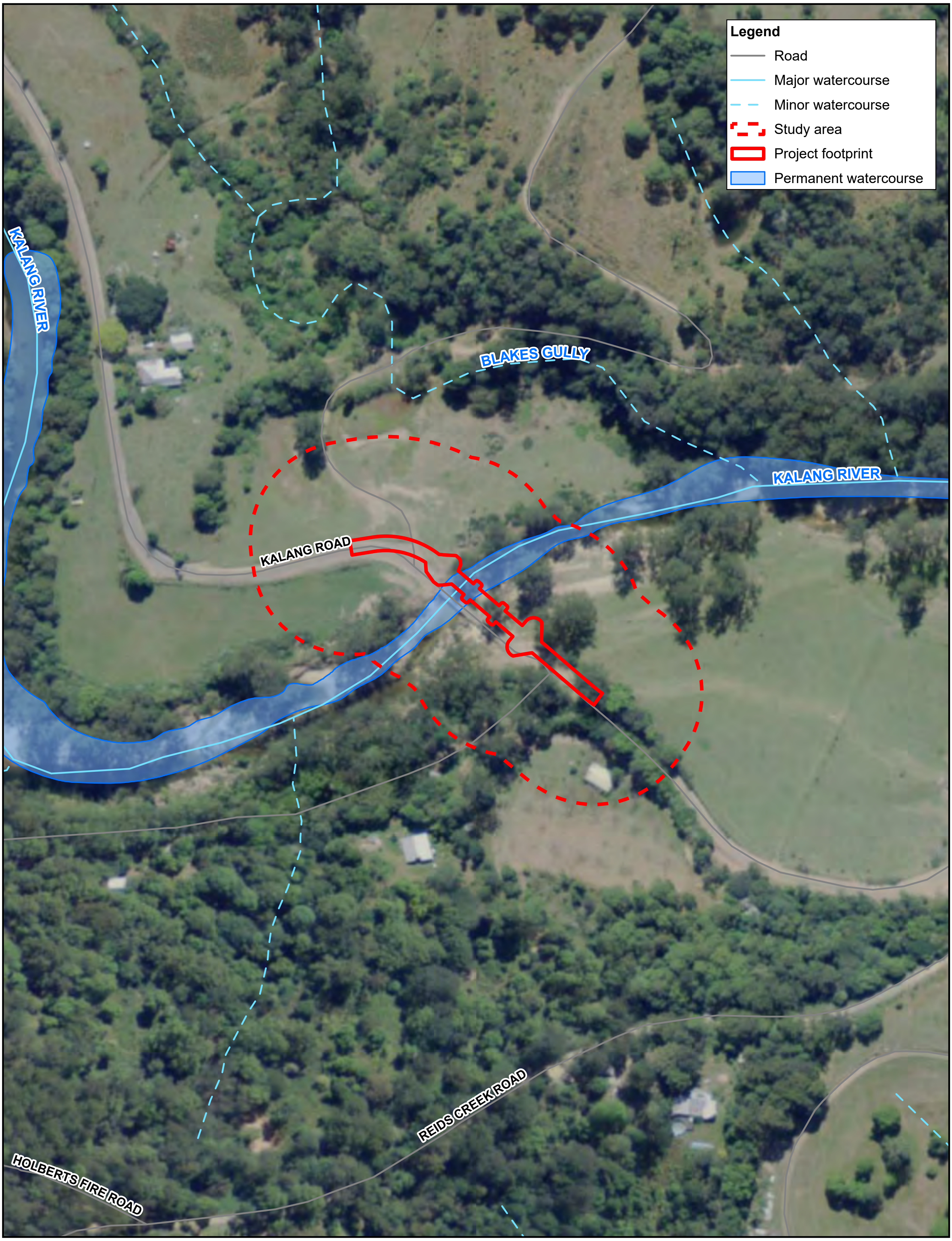

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Duffys Bridge
Bellinger River snapping turtle
Survey results and mapped habitat

Project No. 12611463
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Date 13/02/2024

Sheet 4 of 4

FIGURE 6.1

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Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint (2024); NSWSS: roads, watercourse (2023), water feature (2024).
Created by: bkaemmerling

6.9.1.4 Mapping Bellinger River snapping turtle habitat

The criteria used to map predicated Bellinger River snapping turtle habitat was based on the habitat description as per Commonwealth *Conservation Advice* Wollumbinia georgesi *Bellinger River snapping turtle* (TSSC 2016): *species has preference for moderate to deep pools with a rocky substrate*.

Conservatively, all permanent watercourse habitat within the project area was mapped as predicted habitat for the Bellinger River snapping turtle (Figure 6.1).

6.9.1.5 Key threats

The Bellinger River snapping turtle population have suffered declines due to the following threats, as detailed in the Commonwealth conservation advice for the species (TSSC 2016):

- Disease and the Bellinger River snapping turtle mortality event
- Limited distribution and specific habitat requirements
- Predation by goannas (*Varanus varius*) and foxes (*Vulpes vulpes*)
- Alteration to water quality
- Hybridisation with the Murray River turtle (*Emydura macquarii*)

The species' main threat has been a disease outbreak that caused mass mortality in 2015 and resulted in a substantial decline in the Bellinger River snapping turtle population and distribution (Zhang et al. 2018). Four hundred and thirty-three individuals are confirmed to have died following the outbreak (New South Wales Scientific Committee 2016), although the actual number is unknown and likely much higher as a majority of the infected individuals were found on shore close to the river. According to Chessman et al. (2020), an unknown virus now recognised as the 'Bellinger River virus', was responsible for the high mortality rate of the species and lead to their EPBC Act listing being changed to critically endangered (DCCEEW 2023).

Infected individuals display symptoms of blindness resulting from growths around the eye (septicaemic cutaneous ulcerative disease) with a 100% mortality rate. No other animals, including the Murray River Turtle (*Emydura macquarii*), appeared to be affected. Nucleic acid sequencing of the virus isolate has identified the entire genome and indicates that this is a novel nidovirus (Zhang et al. 2018). While sources of the outbreak are unknown and difficult to determine with certainty, river conditions in the lead up to the event were reported to be 'extremely low flow rates' with rainfall well below average. A severe heat episode also occurred in early December 2014 resulting in elevated water temperatures (Moloney et al. 2015).

Prior to the outbreak, the turtle was listed as vulnerable and considered 'locally abundant'. It is estimated that the population size was previously in the order of 2500 individuals. After the spread of the disease, it is now unclear how many turtles remain within the population. Targeted surveys of the species over five years has indicated a large decrease in recorded sightings. New estimates show the population size is likely to be less than 100 – 200 animals present in the wild (Zhang et al. 2018; ALA 2023). Approximately 60 km of the Bellinger River is known to be affected by the disease, representing 100 percent of the known range of the species in Bellinger River (TSSC 2016). Survival of the species may be dependent on captive breeding programs due to the very small number of mature adults that have survived in the wild (Chessman et al. 2020).

Although the disease itself has been a major threat, interspecific competition and hybridisation are known to occur with Murray River turtle particularly in the Kalang River. Alongside the continuation of the disease, these interactions with the Murray River turtle are identified as a significant threat that could lead to further declines in the species population (Chessman et al. 2020).

Additional threatening processes impacting the species including habitat modification from developments, pollution, other diseases, and predators (Cann et al. 2015; Chessman et al. 2020). Removal of ground cover is unlikely to impact turtle nesting since the disturbed project area doesn't align with the turtle's preference for heavily vegetated, sandy riverbanks.

After the mass mortality, it has been identified that the species is now significantly sensitive to changes within their habitat. Unlike other Australian aquatic freshwater turtles, the Bellinger River snapping turtle is more specific with their diet and do not adapt as well as other turtle species (Cann et al. 2015). Therefore, studies have indicated that slight disturbances pose the potential risk of affected individuals being unable to adapt to changes in habitat resulting in turtle death (Zhang et al. 2018; Cann et al. 2015). Habitat disturbances that have the potential to affect the species include riparian zone degradation resulting from the removal of riparian vegetation and colonisation by introduced weeds.

The introduced red fox (*Vulpes vulpes*) are a major contributor to the predation of nests and nesting females. Blamires et al. (2005) reported a turtle nest predation rate of 72% from foxes and goannas (*Varanus varius*) along the Bellinger River. As there are limited numbers of the species remaining, studies have projected the importance of conservation management plans that protect the species where risks of impact occur from habitat degradation, disturbances and increased threat of predators (Cann et al. 2015).

6.9.1.6 Potential impacts

Potential impacts from the project include degradation of habitat, injury/mortality to fauna, noise and vibration disturbance, water quality degradation, temporary restriction of instream connectivity and exacerbation of infectious disease.

6.9.1.6.1 Loss or degradation of habitat

The proposed works will involve vegetation clearing, approach road realignment, installation of piers and rock anchors, construction of abutments and placement of decking units over a seven-month period. Instream and associated bank footprints are estimated to impact a total of 0.064 ha habitat.

Justins Bridge

Approximately 8 m of riverbank to be disturbed on both sides of the river from high bank to toe. Direct impacts to aquatic vegetation are unlikely to occur. Removal of ground cover is unlikely to impact nesting turtles since the disturbed project area doesn't align with the turtle’s preference for heavily vegetated, sandy riverbanks. Riparian vegetation within the area was deemed to be poor along the left and right banks and therefore removal of a small number of native trees is unlikely to substantially impact foraging or sheltering resources for the Belling River snapping turtle. Duration of instream activities will be limited and will sit outside of the nesting season. No piers will be located within the low flow channel and therefore disturbance to the benthic substrate, consolidated and unconsolidated rock, gravel sediment, will be minimal. The timber components of the existing bridge will be removed but concrete piers will remain. Minor disturbance may occur during this process. It is proposed that one or two large snags may be removed to facilitate access and piling works. These snags will be relocated to adjacent habitat such that no loss of resources for the turtle occur.

Joyces Bridge

Approximately 16 m of riverbank is planned to be disturbed on the left side of the river from high bank to toe. Approximately 16 m of high bank on right side of the river will be disturbed in addition to the gravel bar that forms the low bank. Direct impacts to aquatic vegetation will be limited to disturbance of several small clumps of *Vallisneria nana* downstream of the existing bridge with a total area of approximately 1-2 m^2. The removal of ground cover is unlikely to have a direct impact on the Bellinger River snapping turtle due to their preference of deep waterholes (>2 m) with decent overhanging vegetation and rock substrates. Removal of ground cover is unlikely to impact nesting habitats since the disturbed project area doesn't align with the turtle’s preference for heavily vegetated, sandy riverbanks. Duration of instream activities will be limited and will sit outside of the nesting season. Disturbance to the benthic substrate will be limited to footprints of the bridge piers, which is comprised of consolidated and unconsolidated rock, gravel, and sediment expected to be affected. Piers one and two have been relocated from within the low flow channel to the outside margins, minimising instream activities and impact to aquatic habitat. Snag removal within the project footprint is unlikely to be required and therefore will not impact habitat resources for the species.

Hobarts Bridge

Approximately 12 m of riverbank to be disturbed on left side of the river from high bank to toe. Approximately 15 m of high bank on right side of the river will be disturbed in addition to the gravel bar that forms the low bank. Direct impacts to aquatic vegetation are unlikely to occur. Removal of ground cover is unlikely to impact turtle nesting since the disturbed project area does not align with the turtle's preference for heavily vegetated, sandy riverbanks. Riparian vegetation within the area was deemed to be poor along the left and right banks and therefore removal of some native trees is unlikely to substantially impact foraging or sheltering resources for the Bellinger River snapping turtle. Duration of instream activities will be limited and will sit outside of the nesting season. Disturbance to the benthic substrate will be limited to footprints of the bridge piers, which comprises consolidated and unconsolidated rock, gravel sediment. Piers two and three for Hobarts Bridge have been relocated from within the low flow channel to the outside margins minimising instream activities. Snag removal within the project footprint is unlikely to be required and therefore will not impact habitat resources for the species.

Duffys Bridge

Approximately 15 m of riverbank to be disturbed on left side of the river from high bank. 19 m of high bank of the right side will be disturbed. Direct impacts to aquatic vegetation will be limited (total area <1 m^2). All works nominated as being of a high environmental risk will be completed within the dry season and/or a period of low rainfall and minimal flow. This will be minimise the risk of erosion, run-off and transport of sediment downstream. High risk works include disturbance for piling access, bridge foundation and substructure works, and demolition and removal of foundation and substructure elements of the existing bridges.

A summary of the total impact to the Bellinger River snapping turtle is outlined in Table 6.1.

Table 6.1 Bellinger River snapping turtle habitat loss

Habitat type	Hobarts Bridge	Duffys Bridge	Joyces Bridge	Justins Bridge	Total
General Bellinger River snapping turtle habitat	0.015 ha	0.014 ha	0.024 ha	0.012 ha	**0.064 ha**

6.9.1.6.2 Injury/mortality to fauna

Aquatic habitats within the project footprints consists of pool-riffle and pool-run habitats. The Bellinger River snapping turtle may experience direct injury or mortality if individuals are present within the areas of disturbance at the time of works.

Key construction activities that have potential to cause turtle injury/mortality include clearing and earthworks within the riverbanks and the installation of rock bags within the low flow channel. The Bellinger River snapping turtle typically shows evasive movement when disturbed in the aquatic environment, and as such, individual turtles are expected to move away from the works to adjacent habitat wherever possible.

No direct injury or mortality of turtle eggs is expected to occur as the project footprints do not contain suitable turtle nesting habitat. Captive breeding program release sites are located upstream of Justins Bridge and therefore juvenile turtles have the potential to occur within the area. Consultation with BCD will be undertaken to ensure release of juvenile turtles does not overlap with construction activities.

6.9.1.6.3 Noise and vibration disturbance

Construction activities within the project footprints have the potential to result in the temporary disturbance of fauna as a result of noise and vibration disturbance. During the construction period, noise and vibration levels will increase due to the use of construction machinery for vegetation clearing, earthworks, installation of the bridge piles and rock anchors, and bridge/road assembly. Aquatic fauna such as turtles use sound to navigate, communicate and forage effectively and, as such, many species are sensitive to anthropogenic noise. Artificially generated noise may impact on fauna in the following ways (McCauley et al. 2003):

- Disturbance, leading to behavioural changes or displacement from biologically important habitat areas (such as breeding, feeding, nesting and nursery sites)
- Masking or interference with other biologically important sounds such as communication
- Physical injury to hearing or other organs
- Indirectly by inducing behavioural and physiological changes in predator or prey species

The majority of construction related noise and vibration associated with the bridge replacements is expected to cause minor disturbance only. Fauna behavioural changes that may occur include habitat avoidance and evasive movement. This could result in movement of individuals away from the area.

Installation of the bridge piers and rock anchoring will pose the greatest risk of noise and vibration disturbance to turtles, however these activities have been designed to utilise best practise construction methodology and occur over a minimal 1-2 week period. Specifically, an air rock anchor machine and excavator mounted bored piling machine have been selected as the preferred methodology. The use of an air rock anchor will funnel noise into the underground hole and minimise the sound immitted into the environment. In addition, the bored piling machine will produce sound pressure levels substantially lower than those emitted from pile driving.

6.9.1.6.4 Water quality degradation

Project construction works have the potential to mobilise sediments in association with vegetation clearing, earthworks and installation of bridge substructures. The banks within the project footprint have a high potential for erosion once ground cover is removed. Release of sediments into aquatic habitats can result in altered water chemistry (including increased turbidity, decreased oxygen levels, reduced light penetration), changes in channel morphology (including filling of pools), alteration of substrate composition and smothering of habitat resources (Wood and Armitage 1997). For the proposed activities, these impacts may have a temporary and localised effect on the turtle by reducing habitat value (e.g. amount of refuges, microhabitats and food availability) within the immediate and/or downstream area and influencing health and physiology. Degradation of potential nesting habitat downstream of the footprint from increased sediments and may reduce the suitability of the sites for turtle nesting.

Suspended sediments created during turbidity plumes may hinder the exchange of gases (such as oxygen and carbon dioxide) that occurs during cloacal respiration. This impact is considered to be temporary and is unlikely to interrupt overall respiratory processes significantly.

Bridge construction activities within and above Bellinger River also has the potential to result in the introduction of wastes and hazardous materials, such as fuels and lubricants. Key risk activities include construction of *in-situ* concrete elements (e.g. spillage of concrete and curing compounds). In severe cases, chemical pollution of the aquatic environment can result in long-term habitat degradation and widespread mortality of species.

6.9.1.6.5 Temporary restriction of instream connectivity

Construction works have been designed to avoid physical restriction of aquatic fauna movement. The low flow channel will remain open to flow and turtle movement throughout the duration of the works. A temporary non-physical barrier to turtle movement may occur during construction as a result of disturbance. Turtles may be reluctant to move through the footprints due to noise, vibration and/or people/machinery activity levels. Construction works will be restricted to daylight hours to allow periods of non-disturbance at night and works within the river channel will be prioritised and best practice construction methods selected to minimise the duration of disturbance. All instream works are scheduled to occur outside of turtle nesting season and therefore distribution to breeding migrations is expected to be minimal.

6.9.1.7 Measures to avoid, minimise or mitigate impacts

6.9.1.7.1 Avoidance

Throughout the design phase, consideration has been placed on reduction of impacts to surrounding environmental values through the selection of optimal bridge locations and improved bridge designs. The bridge designs for the four bridges were modified to extend the bridge spans to relocate the piling footprints outside of the low flow channels as much as possible. Designs for all four sites have been modified throughout the design process to reduce environmental impacts, described in Table 6.2.

Construction of the four bridges will avoid the nesting season of the species and therefore no direct impacts to breeding are expected to occur to any natural recruitment that continues to occur within the Bellinger River and Kalang River. Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance and to protect water quality/habitat conditions within and downstream of the footprints. Overall, given the avoidance of construction work within the nesting season and the measures proposed to protect the species and habitat, the project is not likely to result in any change to the abundance of the Bellinger River snapping turtle or result in any degradation of habitat.

Extensive consultation has been undertaken with the NSW BCD to develop avoidance and mitigation measures for the Project with regards to the Bellinger River snapping turtle.

Table 6.2 Avoidance measures

Impact	Avoidance
Justins Bridge	Piers for Justins Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin.
Joyces Bridge	Piers one and two for Joyces Bridge have been relocated from within the low flow channel to the outside margins.
Hobarts Bridge	Piers for Hobarts Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin. Piers two and three for Hobarts Bridge have been relocated from within the low flow channel to the outside margins.
Duffys Bridge	Piers for Duffy's Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin.

6.9.1.7.2 Degradation of habitat

Mitigation and management measures proposed to minimise the potential for habitat degradation include:

- Minimising the project footprint to the smallest area needed for construction work.
- Locating the bridges within previously disturbed areas immediately adjacent to the existing bridges.
- Minimising instream works through bridge design and construction methodology (i.e. rock bags).
- Minimising instream works and downstream impacts through the use of rock bags, liners and blinding construction to create safe and dry work areas that prevent any discharge of sediment, drilling fluid or concrete into the waterway. This approach avoids the need for earthfill and minimises the need for sediment and erosion controls in the immediate area.
- Scheduling the duration of construction works within the low flow channel to the minimum time necessary and outside the wet season (October to March).
- Retaining large woody debris, rocks, root balls from within the project footprint for reinstatement following the completion of construction.
- Keeping vehicle and machinery movements confined to designation access tracks and enforcing on-site speed limits.

- Providing environmental training to site personnel through a site induction and toolbox talks on local habitat, potential risks and avoidance, mitigation and management requirements.
- Rehabilitation and revegetating exposed surfaces and redundant road sections on completion of construction activities. Bank morphology will be restored to existing conditions.

Due to the very small area of habitat that will be directly impacted by the four bridge replacements, and the mitigation measures proposed to minimise habitat degradation, no significant impact to the Bellinger River snapping turtle or their associated habitat is expected to occur.

Water quality degradation mitigation measures are detailed below in Section 6.9.1.7.5.

6.9.1.7.3 Injury/mortality of fauna

Mitigation and management measures proposed to minimise the potential for turtle injury/mortality include:

- Conducting pre-clearance surveys by a suitably qualified ecologist experienced in undertaking surveys for the Bellinger River snapping turtle to inspect construction footprints for the presence of the Bellinger River snapping turtle. The pre-clearance surveys will include survey techniques suitable for the species and will target areas where individuals, including juveniles, may hide such as they hide under rocks, in banks, in water weed, in crevices, in leaf litter, buried under sand, under *Casuarina sp*. Root balls, in flood debris. All approvals and permits for turtle surveys would be obtained prior to the start of construction and a procedure developed in consultation with BCD for actions to be implemented in the event that a Bellinger River turtle/s is found located within or immediately adjacent (i.e. within 100 m) of the construction footprint.
- Construction of the four bridges will avoid the nesting season of the species and therefore no direct impacts to breeding are expected to occur to any natural recruitment that continues to occur within the Bellinger River.
- Requiring a suitably qualified and experienced Bellinger River snapping turtle ecologist to be present during any vegetation clearing, abutment excavation, and/or rock bag placement within the river channel.
- Minimising instream works through bridge design and construction methodology (i.e. rock bags).
- Scheduling the duration of construction works and works within the low flow channel to the minimum time.
- Enforcing stringent wash down procedures for all machinery and materials used for the project in accordance with the Department of Planning & Environment Bellinger River Snapping Turtle biosecurity protocol.
- Scheduling the duration of construction works and works within the low flow channel to the minimum time necessary and outside the Bellinger River snapping turtle nesting season (October to December).
- Providing environmental training to site personnel through a site induction and toolbox talks on the Bellinger River snapping turtle, its habitat, potential risks and avoidance, mitigation and management requirements.
- Keeping vehicle and machinery movements confined to designation access tracks and enforcing on-site speed limits.
- Informing BCD of any Bellinger River snapping turtles observed during the works and providing appropriately qualified veterinarian/wildlife carer assistant and/or rehabilitation to any turtles injured or suffering evidence of health concerns.

Due to the avoidance of the nesting season during the construction phase, and the mitigation measures proposed to minimise injury and mortality of the turtle, no significant impact to the Bellinger River snapping turtle is expected to occur.

6.9.1.7.4 Noise and vibration disturbance

Mitigation and management measures proposed to minimise the potential for noise and vibration disturbance include:

- Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance, including use of driven piles which reduces the piling duration compared to bored piles, and to protect water quality/habitat conditions within and downstream of the footprints.
- Noise blankest and soft starts will be used to manage noise impacts.

– Using an air rock anchor machine and excavator mounted bored piling machine to minimise the noise and vibration generated within the river channel.
– Minimising the duration of rock anchoring and piling to the shortest period possible.
– Using noise dampening devices on machinery wherever practical and requiring that all equipment is maintained and serviced in accordance with manufacturer's instructions to reduce noise levels.
– Requiring soft starts for a period of 5 minutes so that individuals have a chance to move away from the area before more intense noise and vibrations start.
– Restricting construction activities to daylight hours to avoid excessive light levels at night.

Due the machinery selected for the rock anchoring and bored piling, combined with the short duration of these works and the requirement for pre-clearance surveys within 100 m upstream and downstream of the bridge locations, the construction works are not expected to cause noise and vibration disturbance at levels that significant impact the Bellinger River snapping turtle.

6.9.1.7.5 Water quality degradation

Mitigation and management measures proposed to minimise the potential for water quality degradation include:

– Stringent wash down procedures for all machinery and materials used for the project in accordance with the Department of Planning & Environment Bellinger River Snapping Turtle biosecurity protocol.
– Monitoring of water quality conditions (visual and *in situ* recordings) to identify the potential for water quality degradation within Bellinger River and allow for adaptive management. Water quality monitoring will be conducted weekly during works within the low flow channel.
– Scheduling the duration of construction works during the dry season when rainfall and river flow volumes are low.
– Preparing and implementing a project specific Erosion and Sediment Control Plan (ESCP) in accordance with International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control Guidelines. The ESCP will be prepared by a highly experienced Certified Professional in Erosion and Sediment Control (CPESC). Key measures will include:
  - Installing erosion protection measures in the form of sediment fences or similar where required to minimise the transport of sediment into the river.
  - Minimising erosion potential through scour protection treatments at abutments.
  - Minimising vegetation clearing and the area of bare ground required for construction to only that which is necessary.
  - Appropriately managing and protecting stockpiles. Stockpiles will be a maximum of 1.5 m high and will be set back at least 100 m from the Bellinger River.
– A site-specific EMP. Management measures will include:
  - Site management will in accordance with the waste management practices detailed in *Managing Urban Stormwater: Soils and Construction* (4th edition) (Landcom 2004), particularly Section 6: Sediment and Waste Control.
  - Section 8.2(a): Empty bins for concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter at least weekly and otherwise as necessary. Dispose of any waste in an approved manner.
  - Waste material, other than vegetation and tree mulch, will not to be left on site once the works have been completed.
  - Working areas will be maintained, kept free of rubbish and cleaned up at the end of each working day.
  - A closed system reverse cycle circulation system with sediment trap will be used to collect all water and sediment released during drilling for rock anchors.
  - Drilling support fluid will be biodegradable and a vacuum truck used to dispose of material at the completion of drilling.

- Installing rock bags, liners and blinding construction to create bunded work platforms to prevent spills.
- Requiring all auxiliary works activities, including chemical and waste storage, will be located at least 100 m from Bellinger River.

Due to the scheduling of construction during the dry season, monitoring of water quality and implementation of best practice controls, among other mitigation measures proposed to minimise water quality degradation, no significant impact to the Bellinger River snapping turtle is expected to occur.

6.9.1.7.6 Temporary restriction of connectivity

Construction works have been designed to avoid physical restriction of turtle movement. The low flow channel will remain open to flow and turtle movement throughout the duration of the works. A temporary non-physical barrier to turtle movement may occur during construction as a result of disturbance. Turtles may be reluctant to move through the footprints due to noise, vibration and/or people/machinery activity levels. Construction works will be restricted to daylight hours to allow periods of non-disturbance at night and works within the river channel will be prioritised and best practice construction methods selected to minimise the duration of disturbance. All instream works are scheduled to occur outside of turtle nesting season and therefore distribution to breeding migrations is expected to be minimal.

Due to the Project's avoidance of the use of physical barriers during construction, and the scheduling of construction during daylight hours and outside of the nesting season, among other mitigation measures proposed to minimise restriction of connectivity for the turtle, no significant impact to the Bellinger River snapping turtle is expected to occur.

6.9.1.8 Habitat critical to the survival of the species

There is no formal definition of habitat critical to the survival of the species for the Bellinger River snapping turtle. The Commonwealth Significant impact guidelines 1.1. (DoE 2013) definition applies.

The Bellinger River snapping turtle is endemic to the Bellinger River catchment. Within the catchment, the species is restricted to Bellinger River, Kalang River, and the lower parts of Rosewood and Never Never Rivers (Blamires et al. 2005; NSW Scientific Committee 2016).

Based on the species restricted distribution, habitat across the Study area is considered habitat critical to the survival of the species on the basis that the habitat is necessary for:

– Foraging, breeding and dispersal
– Long-term maintenance of the species
– Maintaining genetic diversity
– The recovery of the species

6.9.1.9 Status as an important population

The concept of 'important populations' is generally not applicable to critically endangered listed species, the Commonwealth significant impact assessment considers the impacts of the Project on the whole of the 'population'. There is no formal definition of important populations for the Bellinger River snapping turtle. The Commonwealth Significant impact guidelines 1.1 (DoE 2013) definition applies.

The Bellinger River snapping turtle follows the type III survivorship with fatalities reducing with age resulting in populations with a higher number of large adults (Blamires et al. 2005). Consequently, the turtle population is sensitive to changes in adult survivorship.

It is evident that since 2015, a major decline of population has occurred due to an unknown disease that impacted the Bellinger River snapping turtle by causing a mass mortality of individuals in the autumn and summer months of 2015 (Chessman et al. 2020). These fatalities resulted in a significant reduction in the abundance and distribution of the species throughout the catchment.

With the species constrained distribution, the population within the Study area is considered important on the basis that they are key source population for breeding or dispersal and are necessary for maintaining genetic diversity.

6.9.1.10 Significant impact assessment

The SIA found the Project is unlikely to result in a significant residual impact to the Bellinger River snapping turtle. On the basis that suitable avoidance and mitigation measures will be implemented to minimise the residual impacts to the Bellinger River snapping turtle.

The SIA for the Bellinger River snapping turtle was undertaken in accordance with the Significant Impact Guidelines 1.1 and is included in Table 6.3.

Table 6.3 Significant impact assessment – Bellinger River snapping turtle

Significant impacts criteria	Assessment	
Lead to a long-term decrease in the size of a population	**Unlikely**	The Bellinger River snapping turtle population within the project area is considered an important population for source and genetic purposes. The Project will impact 0.064 ha of suitable habitat for the species. While the species has a small distribution, the design and alignment of the bridges have been selected to avoid and minimise direct and indirect impacts to the habitat of the Bellinger River snapping turtle. Design of the new bridges will span the river and piers will be located outside, or on the margins, of the low flow channel to avoid permanent direct impact to the aquatic habitat and minimise temporary habitat disturbance during construction. Aquatic habitat loss will be restricted to the immediate footprint of the bridge piers. Two piers will be located on the margins of the low flow channel at Joyces and Hobarts Bridges, while the low flow channel will be completely avoided at Justins Bridge and Hobarts Bridge. Temporary impacts to Bellinger River snapping turtle habitat during construction have been minimised through the use of rock bags, liners and blinding construction to create safe and dry work areas that prevent any discharge of sediment, drilling fluid or concrete into the waterway. This approach avoids the need for earthfill and minimises the need for sediment and erosion controls in the immediate area. Reducing the impact of adverse effects on the Bellinger River snapping turtle habitat within and downstream of each of the project footprints. In addition, the alignment of the new bridges utilises existing disturbed areas such that vegetation clearing, and disturbance of riverbanks will be minimal. No substantial changes to the composition or quality of the riparian zone or riverbanks are expected and, as such, changes to foraging and sheltering resources for the Bellinger River snapping turtles are unlikely to occur. Temporary disturbance as a result of noise and vibration from traffic, pier boring, rock anchoring and general construction machinery has been minimised through the selection of an excavator mounted boring machine and air rock anchoring machine. A project specific EMP and erosion and sediment control plan will be developed to outline management requirements during construction. Monitoring against the EMP will occur throughout construction to allow for adaptive management if required. Overall, based on the avoidance, mitigation and management measures proposed for the protection of Bellinger River snapping turtle habitat, the extent of habitat that will be impacted by the project is not expected to lead to a long-term decrease in the size of a population.
Reduce the area of occupancy of the species	**Unlikely**	The Bellinger River snapping turtle occurs only in the Bellinger River catchment, where it is restricted to the Bellinger River, lower parts of the Rosewood and Never Never Rivers and possibly Kalang River. While the restricted occupancy of the species renders it more susceptible to impacts affecting the species occupancy, the Project will address these potential impacts through the implementation of mitigation measures to avoid and minimise the direct and indirect impacts to the species and its habitat (detailed above). The design of the bridges has considered the movement requirements of the species and will not result in a barrier to turtle passage. Once operational, the Project will have negligible impact on the species, forming no barrier to movement. The Bellinger River snapping turtle is expected to persist locally through the operation phase of the Project. The impact to suitable habitat will not cause the species to disappear from any 2 km x 2 km area, (i.e. the scale at which area of occupancy is assessed under the EPBC Act (TSSC 2016) and the IUCN Standards and Petitions Committee 2022). Accordingly, the Project is not anticipated to reduce the area of occupancy of the species.

Significant impacts criteria	Assessment	
Fragment an existing population into two or more populations	**Unlikely**	The proposed works will not result in the fragmentation or isolation of habitat for the Bellinger River snapping turtle. The proposed works will not result in permanent change to turtle movement between areas of potential habitat for the Bellinger River snapping turtle. Turtle may be reluctant to move through the footprint due to noise, vibration and/or people/machinery activity levels. Construction works within the river channel will be prioritised and best practice construction methods selected to minimise the duration of disturbance. A total of 0.064 ha of suitable habitat will be impacted by the construction phase of the Project. No substantial changes to the composition or quality of the riparian zone or riverbanks are expected and, as such, changes to foraging and sheltering resources for the Bellinger River snapping turtles are unlikely to occur. Impacts to habitat is at a local scale and unlikely to impact habitat or movement to the extent that parts of the population become genetically isolated from one another.
Adversely affects habitat critical to the survival of a species	**Unlikely**	All habitat within the Study area is considered habitat critical to the survival of the species. The Project will impact 0.064 ha of suitable habitat. Design of the new bridges will span the river and piers will be located outside, or on the margins, of the low flow channel to avoid permanent direct impact to the aquatic habitat and minimise temporary habitat disturbance during construction. Aquatic habitat loss will be restricted to the immediate footprint of the bridge piers. The design of the project footprints are minimal and temporary in nature, the Project is considered unlikely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	**Unlikely**	No gravid females have been caught since targeted surveys started in 2015 and there has been no evidence of any natural recruitment occurring within the population (BCD 2022). Low levels of recruitment may be occurring, however, currently the viability of the population is dependent on captive breeding. Potential nesting of the Bellinger River snapping turtle has been previously recorded downstream of Justins Bridge and the captive breeding program has a release site for hatchlings upstream of this bridge project footprint. Construction of the four bridges will avoid the nesting season of the species and therefore no direct impacts to breeding are expected to occur to any natural recruitment that continues to occur within the Bellinger River. Given the extremely small population size of the Bellinger River snapping turtle, any reduction in turtle abundance could have the potential to impact the viability of the local population. Risks of the project include direct injury/morality of individuals from works within the river channel, habitat degradation, and disturbance. Strict avoidance and mitigation/management controls will be implemented to protect the species and its habitat. Key actions will include pre-clearance surveys by experienced Bellinger River turtle ecologists to confirm no turtles are present within the footprint of the works. Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance and to protect water quality/habitat conditions within and downstream of the footprints. Overall, given the avoidance of construction work within the nesting season and the measures proposed to protect the species and habitat, the project is not likely to result in any change to the abundance of the Bellinger River snapping turtle or result in any degradation of habitat. As such the project is not likely to disrupt the breeding cycle of a population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**	The Bellinger River snapping turtle occurs within a restricted distribution, within the Bellinger River catchment. The Project will impact 0.064 ha of suitable habitat. Due to the impact of the disease, the species is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals. As such, a precautionary approach has been taken for the project with regard to the design of the bridge structures and the proposed construction methodology, equipment and program. Best practice techniques have been selected for avoidance, mitigation and management of potential impacts. The methods proposed are known to be effective at protecting aquatic environment and species. Monitoring will be conducted throughout the construction works to assess actual risks against those expected and allow for adaptive management if required. Given the susceptibility of the species to disease and the risk that any impact on the species can have on the viability of the population. A project specific EMP and erosion and sediment control plan will be developed to outline management requirements during construction. The operation of the Project is not expected to impact the species habitat. Overall, based on the avoidance, mitigation and management measures proposed for the protection of Bellinger River snapping turtle habitat, the Project is not expected to modify, destroy, remove, isolate

Significant impacts criteria	Assessment	
		or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat	**Unlikely**	The Commonwealth conservation advice for the Bellinger River snapping turtle lists threats from invasive species. The predation of turtle nests by European foxes is a threat to the species. Turtle nest predation is reported at a rate of 72 percent in the Bellinger River ((TSSC 2016). The recent introduction of the Murray River turtle to the Bellinger River catchment is also a threat to the species through competition and risk of species hybridisation. The Project will implement a site-specific EMP which will include proper disposal of site waste to avoid attracting invasive species. The Project is considered unlikely to result in further establishment of European foxes, Murray River turtle, or other invasive species.
Introduce disease that may cause the species to decline	**Unlikely**	Disease is a major threat to the population of Bellinger River snapping turtle. Over an approximate two-month period over 400 individuals were confirmed to have died from the disease outbreak which affected 100 percent of the species distribution, and resulted in the reduction of 14 to 27 percent of the species population (TSSC 2016). The Bellinger River turtle is the only know species to be affected by the multi-factorial syndrome. The susceptibility of the species to the disease was suggested to be as a result of poor river conditions resulting in immunocompromised individuals. The Project has potential to impact water quality, mitigation measures will be implemented to minimise the potential for water quality degradation. These include erosion and sediment control, scheduling construction work during dry season, stringent washdown procedures, site-specific EMP and weekly monitoring of water quality conditions. Based on the avoidance and mitigation measures proposed for the protection of water quality within the Bellinger and Kalang Rivers, construction works are not expected to result in the degradation of habitat the further spread/introduction of disease that may cause the species to decline.
Interfere with the recovery of the species	**Unlikely**	There is no recovery plan for the Bellinger River snapping turtle. The Commonwealth conservation advice lists conservation actions for the species. These include the following in-field actions: measures to reduce run-off degrading habitat quality; protection of nests by European foxes; removing Murray River turtles from the Bellinger River; and implementing hygiene protocols for equipment. The Project will implement mitigation measures to manage erosion and sedimentation and the EMP details strict hygiene measures including washdown of machinery during the construction phase. The Project will not result in the further establishment and spread of the European fox or the Murray River turtle. The Project is considered unlikely to interfere with the recovery of the Bellinger River snapping turtle.

6.9.2 Grey-headed flying-fox

6.9.2.1 Conservation status and species profile

The grey-headed flying-fox is listed as vulnerable under the EPBC Act.

The species is endemic to Australia and occurs from Ingham Queensland, through to Adelaide in South Australia (DAWE 2021), with temporal and seasonal variation occurring in response to the availability of foraging resources. The species inhabits the coastal lowlands, slopes and tablelands of eastern Australia (DAWE 2021). The species feeds in a variety of habitats ranging from rainforests, open forest, open and closed woodlands and vegetation dominated by *Melaleuca* and *Banksia* species (DAWE 2021). The primary food source are blossoms from *Eucalyptus* and related genera (Eby 1998). The species' food sources are not continuously available throughout the year. Important winter and spring foraging habitat includes woodlands with *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora, C. eximia, C. maculata* (south from Nowra), *Grevillea robusta* and *Melaleuca quinquenervia* (DAWE 2021).

This species roosts in camps typically associated with water sources, in vegetation communities including rainforest, *Melaleuca*, mangroves and riparian vegetation (Nelson 1965; Van der Ree et al. 2006). Grey-headed flying-foxes roost in groups of various sizes on exposed limbs of large trees, with a preference for roosting sites near water such as lakes, rivers or the coast (Van der Ree et al. 2005). Grey-headed flying-fox are seasonal breeders, with a single breeding event occurring each year and births ensue from October to December. This species is prone to aborting foetuses, mass abortion events and premature births in response to environmental stress, particularly anthropogenic stress such as disturbance to camps and habitat clearing (DAWE 2021). Roosting sites typically comprise of rainforest patches, *Melaleuca* stands, mangroves and riparian habitats (Nelson 1965). The species typically utilise the same roosting site for longs periods of time (Lunney and Moon 1997). The species commutes daily to foraging sites, which are usually within 15 km of the roosting site (Tidemann 1998), however can travel up to 50 km at night-time to different feeding areas as food resources change (DAWE 2021).

6.9.2.2 Desktop results

Historical records occur throughout the Bellingen region and Project area. Per the DCCEEW National Flying-fox monitoring viewer (DCCEEW 2024) there are three grey-headed flying-fox camps located within the Bellingen region. One camp (ID 629) is located adjacent to the existing Hobarts Bridge which has recorded up to 9,999 grey-headed flying fox individuals over repeated years.

Two other grey-headed flying-fox camps are located in the Bellingen township. One camp (ID 10) has historically recorded up to 50,000 individuals over repeated years, and is recognised as nationally important camps as it has recorded >10,000 grey-headed flying-fox individuals in more than one year in the last 10 years (DAWE 2021). A second camp (ID 783) also located in the Bellingen township has recorded <50,000 individuals over one year, and between 16,000 – 49,000 individuals over two seasons, however this camp is not recognised as nationally important camp.

6.9.2.3 Survey results

A grey-headed flying-fox camp was confirmed present approximately 120 m adjacent to the existing Hobarts Bridge. The camp is known to be used as a maternity camp for the species. During the field survey at least 1000 individuals were observed with dependent young. The camp was restricted to a bamboo plantation. The species is known to forage up to 15 km from roosts. Accordingly, foraging habitat within the Project area and wider Bellingen region is likely to be important foraging habitat for the species.

6.9.2.4 Mapping grey-headed flying-fox habitat

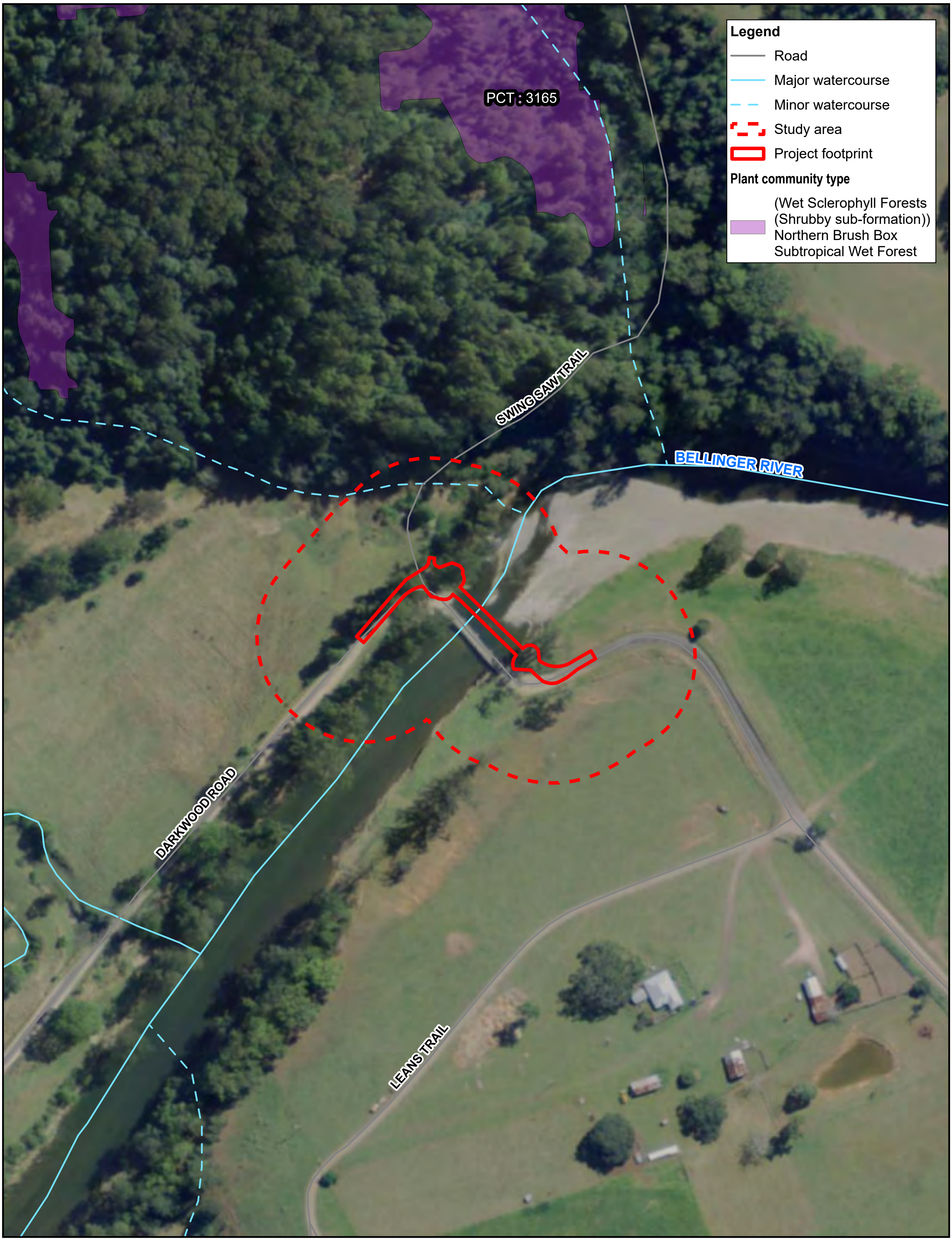
The criteria used to map predicated grey-headed flying-fox habitat was based on the habitat description as per Commonwealth National recovery plan for the species: *Important winter and spring vegetation communities are those that contain Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora citriodora, C. eximia, C. maculata, Grevillea robusta, Melaleuca quinquenervia or Syncarpia glomulifera (*DAWE 2021*)*.

Foraging habitat was mapped as PCTs with key foraging species that occur within the Study area:

– PCT 3165 – Northern Brush Box Subtropical Wet Forest
– PCT 3252 – Northern Hinterland Grey Gum-Mahogany Grassy Forest
– PCT 3253 – Northern Hinterland Grey Gum-Turpentine Mesic Forest

Key foraging species present within these PCTs include *Syncarpia glomulifera, Corymbia maculata* and *Eucalyptus siderophloia.*

Figure 6.2 illustrates the mapped habitat of the grey-headed flying fox.



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Grey-headed flying-fox - Joyces Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 1 of 4

FIGURE 6.2

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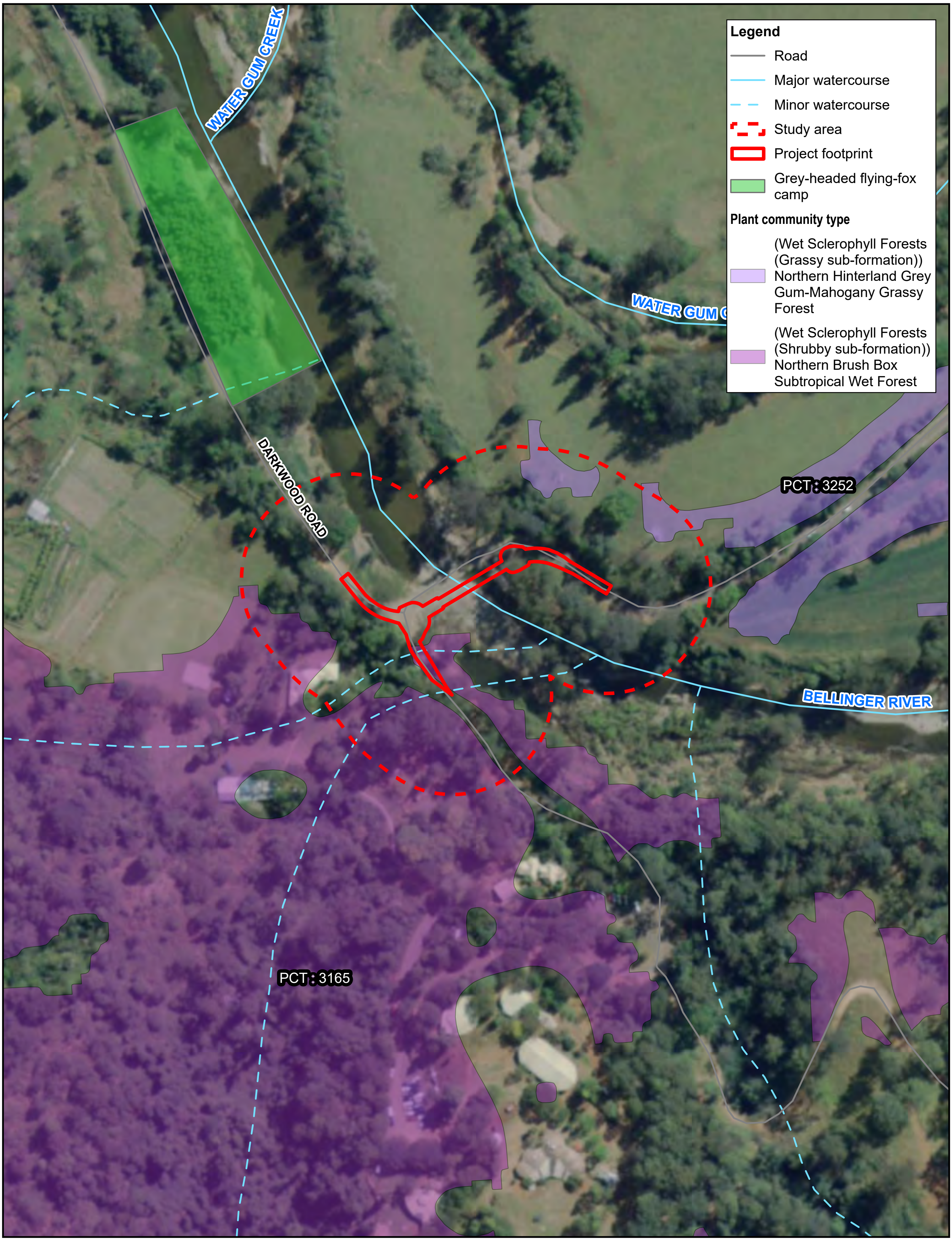
Print date: 13 Feb 2024 - 15:06

Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: bkaemmerling



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Grey-headed flying-fox - Hobarts Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 2 of 4

FIGURE 6.2

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Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
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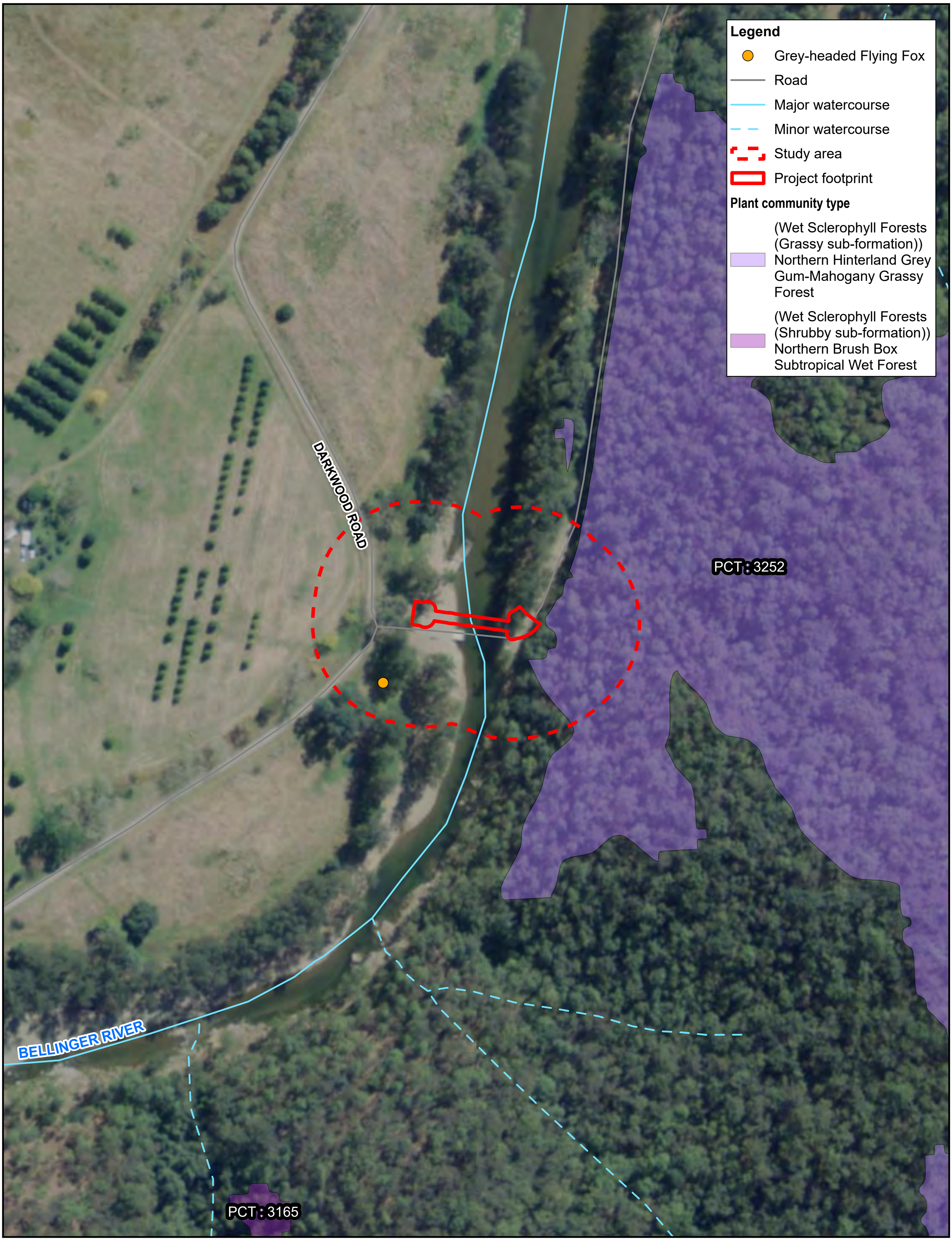

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Grey-headed flying-fox - Justins Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 3 of 4

FIGURE 6.2

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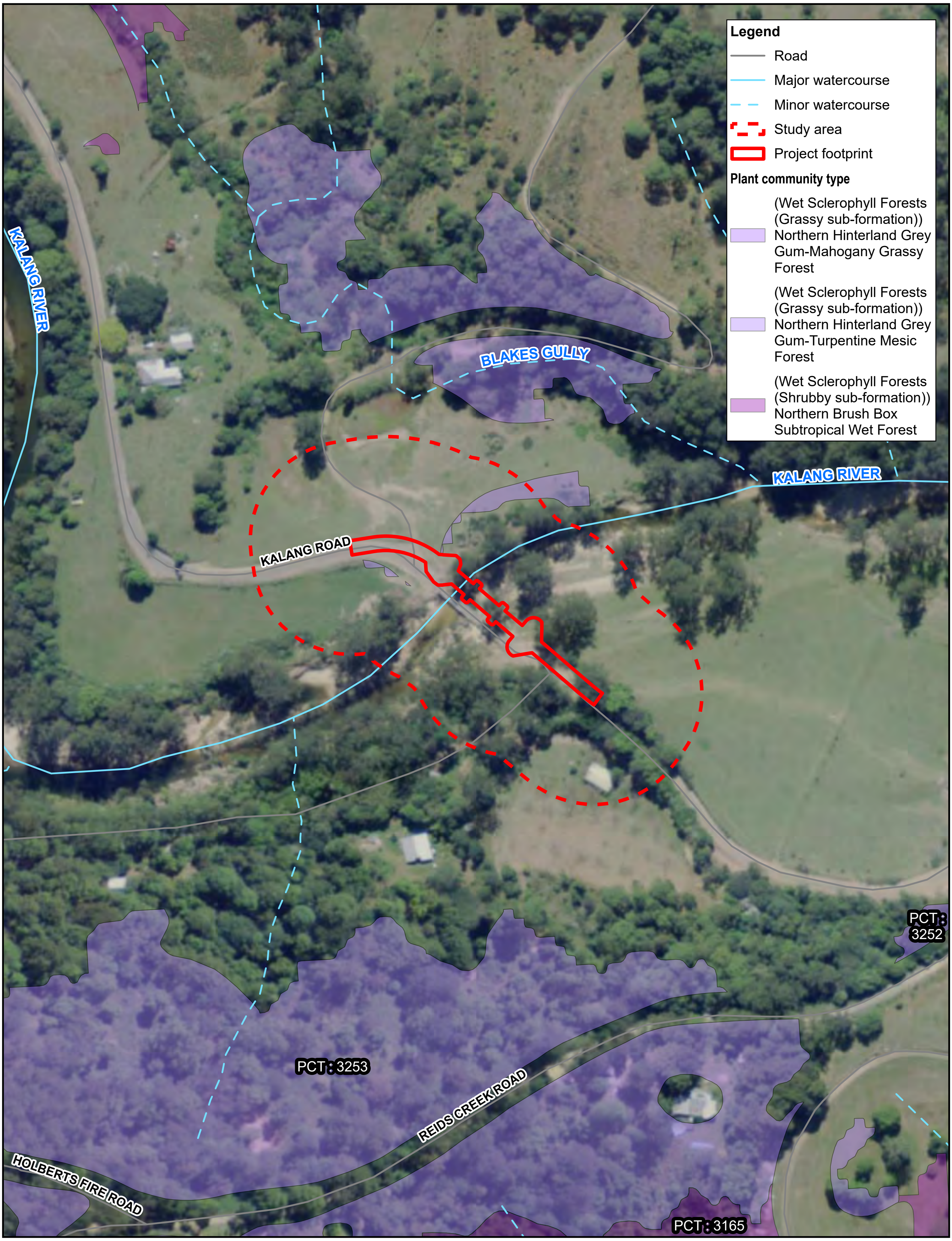
Print date: 13 Feb 2024 - 15:06

Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: bkaemmerling



Paper Size ISO A4

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Grey-headed flying-fox - Duffys Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 4 of 4

FIGURE 6.2

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Print date: 13 Feb 2024 - 15:06

Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: bkaemmerling

6.9.2.5 Key threats

The grey-headed flying-fox population have suffered declines due to the following threats, as detailed in the Commonwealth *National Recovery Plan for the grey-headed flying-fox Pteropus poliocephalus* including (DAWE 2021):

– Loss and degradation of foraging and roosting habitat
– Conflict with people resulting in disturbance and mortality
– Electrocution and entanglement
– Climate change

6.9.2.6 Potential impacts

Potential impacts from the project include loss of habitat, degradation of habitat by increased dust, run-off and sedimentation, injury/mortality to fauna and disturbance to wildlife due to noise and vibration. The potential impacts from the proposed bridge projects are discussed in the following sections.

6.9.2.6.1 Loss of habitat

The Project is anticipated to result in the loss of 0.01 ha of potential foraging habitat for the species. This foraging habitat is located adjacent to a grey-headed flying-fox camp, and therefore within the known foraging distance of the grey-headed flying-fox (i.e. within 20 km). However, limited native flowering tree species will be impacted by the Project (i.e. *Casuarina cunninghamiana*), and no important foraging tree species will be cleared for the Project. Potential foraging habitat is widely available in the local and regional landscape, including in protected areas (i.e. within Dorrigo National Park, Bellinger River National Park, New England National Park and numerous reserves). Accordingly, the loss of 0.01 ha of suitable foraging habitat constitutes the loss of low quality foraging tree. Therefore, foraging habitat would not constitute habitat critical to the survival of the species on the basis that important winter and spring flowering species were not recorded within the Project footprint. The loss of foraging habitat is unlikely to adversely impact the viability of the nearest camps.

A summary of the total impact to the grey-headed flying-fox is outlined in Table 6.4.

Table 6.4 Grey-headed flying-fox habitat loss

Habitat type	Hobarts bridge	Duffys bridge	Joyces bridge	Justins bridge	Total
General flying-fox habitat	0.010 ha	0 ha	0 ha	0 ha	**0.010 ha**

6.9.2.6.2 Degradation of habitat by increased dust, run-off and sedimentation

Construction activities have the potential to generate localised dust, erosion, run-off and sedimentation through increased vehicle movements, clearance of vegetation and earthworks. This can reduce the abundance and diversity of adjacent terrestrial and aquatic habitats by physically smothering vegetation, changing nutrient levels, impeding the growth and germination of plant species, encouraging weed incursions and altering the movement and behaviour of fauna species. Foraging habitat within the Project area for the grey-headed flying-fox are not considered habitat critical to the survival of the species. A grey-headed flying-fox camp is known approximately 120 m adjacent to Hobarts Bridge and localised degradation of that habitat would have the potential to reduce the quality and availability of local roosting habitats during the construction period in the event where mitigation measures are not implemented.

6.9.2.6.3 Injury and mortality of fauna

Vegetation clearance during construction of the Project has the potential to cause injury and mortality to local fauna sheltering in trees. Increased traffic during the construction phase may also increase local incidence of fauna injury and mortality. These issues are unlikely to represent a major risk for the grey-headed flying-fox, given the species does not roost within the immediate Project footprint and construction clearing of vegetation will be restricted to daylight hours. Injury and mortality risks to the species during construction are more likely to be due to the potential for entanglement in construction fencing. Albeit fencing will not contain barbed-wire or netting, both known to result in grey-headed flying-fox entanglement.

6.9.2.6.4 Disturbance to wildlife due to light, noise and vibration

Clearance of vegetation has the capacity to cause indirect disturbance to wildlife due to an increase in the exposure to noise and vibration. Increased light, noise and vibration can alter the behaviour of individual animals and disrupt the balance of intra- and interspecies interactions. Such disruptions typically favour feral predators and generalist species that owe their success to broad ecological tolerances and have the ability to actively exploit disturbed environments.

Installation of the bridge piers and rock anchoring will pose the greatest risk of noise and vibration disturbance, however these activities have been designed to occur over a 1-2 week period. This will increase noise levels within the Project areas and can adversely impact grey-headed flying-fox through the disruption of roosting behaviours. Construction will result in short-term, localised increase in vehicle movements.

The construction will be limited to daylight hours, no nighttime works will be undertaken, removing the requirement for lighting and the potential to disturb the grey-headed flying-fox roost.

Construction of the Hobarts Bridge remediation work include the disturbance of the maternity roost camp during diurnal construction activities. This has the potential to cause individual grey-headed flying-fox to leave camp during the day. The laydown area for the construction is within 120 m of the roosting camp and the increased heavy vehicle traffic associated with construction has the potential to result in temporary disturbances to the camp during construction, which persists approximately 3-5 m from the edge of Darkwood Road.

6.9.2.7 Measures to avoid minimise or mitigate impacts

6.9.2.7.1 Avoidance

Throughout the design phase, consideration has been placed on reduction of impacts to surrounding environmental values through the selection of optimal bridge locations and improved bridge designs. The project footprint for the bridges will be generally restricted to include the existing cleared road easement, reducing the area of impact to habitat and minimising degradation of habitat and associated runoff. The alignments chosen for the new bridges are immediately adjacent the existing bridges to minimise disturbance and clearing of native vegetation. Impacts to grey-headed flying-fox habitats are minimised to the removal of several low-quality foraging trees, none of which are known to be important spring or winter flowering tree species.

6.9.2.7.2 Loss of habitat

Notwithstanding the avoidance measures, loss of vegetation (and the habitat it provides) associated with the Project is an unavoidable impact. The following measures will be undertaken to minimise and mitigate the impacts of unavoidable vegetation and habitat loss:

– Restrict clearing to the smallest area needed for construction of roads, services and access.
– Locate laydown areas and other temporary works areas in areas already subject to existing disturbance wherever possible.
– Schedule construction to minimise the active works area needed at any time.
– Demarcate no-go areas of ecological sensitivity both on site and in construction plans, including all vegetation not to be cleared. All vegetation to be retained should be surveyed and clearly demarcated.

- Felled vegetation will be mulched and reused on site. Hollow logs and large debris will be salvaged for the use of habitat creation/enhancement during site rehabilitation.
- Rehabilitate and revegetate temporary construction areas as soon as possible after the completion of local construction works.
- Implement an EMP inclusive of pre-clearance survey prior to construction. Implement agreed management measures which may include capture and relocation of threatened fauna species if entrapped within the construction footprint.

6.9.2.7.3 Degradation of habitat by increased dust, run-off and sedimentation

The following mitigation measures will be instigated to minimise the impacts of dust, run off and sedimentation during construction:

- Erosion and sediment control measures employed during construction will be consistent with the practices described in the International Erosion Control Association, Best Practice Erosion and Sediment Control Guideline.
- The EMP will include dust management measures.
- Restrict speed limits and other traffic control mechanisms to minimise dust generation.
- Undertake routine dust suppression and monitoring during dry conditions to minimise dust dispersal during construction.
- Rehabilitate disturbed areas as soon as is practicable to minimise exposed surface periods.
- Designate appropriate locations for soil stockpiles, rubbish and waste materials on site and safely secure until disposed material.
- Monitor weather conditions during construction and establish extreme weather stand-down and temporary control protocols to minimise adverse outcomes resulting from extreme weather events.
- Follow best practice procedures for fuel and chemical storage protocols and spill responses.

6.9.2.7.4 Injury and mortality of fauna

The following measures will be instigated to minimise wildlife injury and mortality during construction:

- Construction of Hobarts Bridge will be undertaken outside of the breeding season for the grey-headed flying-fox (October to December).
- Enforce on-site speed limits to 40 km/hr in the vicinity of the works zone to restrict the incidence of vehicle strike.
- Clearly demarcate no-go areas of sensitive vegetation and habitat, including all vegetation and habitat not to be cleared.
- Fencing will be erected for the construction of the bridges, fencing will be barbed-wire free and netting-free to avoid grey-headed flying-fox entanglements.
- Undertake pre-clearance surveys of construction (clearing) areas to identify and demarcate potential breeding sites for threatened fauna species prior to vegetation removal.
- Engage suitably qualified and experienced fauna spotter-catchers to supervise all clearing activities within areas of high ecological value (i.e. areas of predicted habitat for threatened fauna species, areas with high densities of hollow-bearing trees, rocky outcrops, riparian vegetation associated with waterways).
- Employ of sequential clearing practices and use of suitably qualified fauna spotter catcher.
- Educate employees regarding the presence of EPBC Act listed species, including grey-headed flying-fox camp.
- Erect warning signage near high-risk areas such as areas of roosting habitat for the grey-headed flying-fox. Grey-headed flying-fox awareness will be included in all worker inductions.
- Inspect trenches, excavations and machinery daily for the presence of trapped fauna.

– Identify the closest vet or wildlife carer prior to construction commencing. Relevant contact details to be included EMP and circulated during pre-start material to all relevant staff. Develop adverse incident response procedures to detail actions to be taken in the event of wildlife injury or mortality during clearing. This will include procedures for capture and transport of injured wildlife to qualified veterinarian or humane on-site euthanasia and formalisation of arrangements with a local veterinarian to treat and care for wildlife injured during for the construction period.

6.9.2.7.5 Disturbance to wildlife due to light, noise and vibration

A range of mitigation measures will be undertaken to minimise the impact that noise, vibration and disturbance have on local wildlife populations. The following measures will be instigated to minimise the impacts of light, noise and vibration during construction:

– Timing construction of the Hobart bridge outside of the species breeding season (October to December).
– The construction of Hobarts bridge will cease if the nearby camp contains females that are in the late stages of pregnancy or have dependant young that cannot fly on their own; and will cease during or immediately after climatic extremes (heat stress event, cyclone event) or during a period of significant food stress in the regional landscape.
– The construction should be supervised by a person with knowledge and experience relevant to the management of flying-foxes and their habitat to make an assessment on whether the activity can go ahead consistent with these mitigation measures and as detailed further in the Commonwealth *Referral guideline for management actions in Grey-headed and Spectacled flying-fox camps* (DoE 2015a).
– Construction to be restricted to daylight hours only to reduce the need for lighting and resultant light spill into adjacent habitat and to reduce noise and vibration impacts on the grey-headed flying-fox.
– Service and maintain all plant and equipment to minimise machinery noise as much as possible.
– Develop and implement measures for the construction site to control vehicle movements and speeds and reduce the unnecessary generation of vehicular noise.
– Restrict large scale operations such as vegetation clearing, installation of the bridge piers and rock anchoring to daylight hours to reduce the need for lighting and resultant light spill into adjacent habitat and to reduce noise and vibration impacts on nocturnal fauna species.
– Comply with construction vehicle maintenance schedules and operational restrictions designed to limit noise impacts during construction.

6.9.2.8 Habitat critical to the survival of the species

Habitat critical to survival is defined in the National Recovery Plan for the species (DAWE 2021) as habitats that are associated with important winter and spring flowering food tree species that are in limited supply across the species' range, due to historical land clearing, predominantly in coastal areas. This includes vegetation communities that have been field-verified to contain the following winter and spring forage species: *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora citriodora, C. eximia, C. maculata, Grevillea robusta, Melaleuca quinquenervia* or *Syncarpia glomulifera* (DAWE 2021). Habitat critical to the survival may also include vegetation communities not containing the above tree species but which (DAWE 2021):

– Contain native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May)
– Contain native species used for foraging and occur within 20 km of nationally important camp as identified on the Department's interactive flying-fox web viewer, or
– Contain native and or exotic species used for roosting at the site of a nationally important grey-headed flying-fox camp as identified on the Department's interactive flying-fox web viewer

Field surveys within the Project footprints have not verified the presence of tree species that contain critical winter and spring food trees, native species used for foraging within 20 km of a nationally important camp or contain native or exotic species used for roosting at the site of a nationally important camp. Accordingly, the Project area is not considered to be habitat critical to the survival of the species.

6.9.2.9 Nationally important camps

Nationally important camps are defined in National Recovery Plan for the species (DAWE 2021) as those that have contained ≥ 10,000 Grey-headed Flying-foxes in more than one year in the last 10 years or have been occupied by more than 2,500 Grey-headed Flying-foxes permanently or seasonally every year for the last 10 years (DoE 2015).

Per the DCCEEW National Flying-fox monitoring viewer (DCCEEW 2024) there are three grey-headed flying-fox camps located within the Bellingen region. One camp (ID 629) is located adjacent to the existing Hobarts Bridge which has recorded between 2,500 – 9,999 grey-headed flying fox individuals over repeated years and recorded between 500 – 2,499 individuals every year since 2013. However, this camp does not constitute a nationally important camp, as it is does not meet the criteria detailed in DAWE (2021).

Two other grey-headed flying-fox camps are located in the Bellingen township. One camp (ID 10) has historically recorded up to 50,000 individuals over repeated years and is recognised as nationally important camps as it has recorded >10,000 grey-headed flying-fox individuals in more than one year in the last 10 years (DAWE 2021). A second camp (ID 783) also located in the Bellingen township has recorded <50,000 individuals over one year, and between 16,000 – 49,000 individuals over two seasons, however this camp is not recognised as nationally important camp.

6.9.2.10 Status as an important population

There is no formal definition of important populations for the grey-headed flying-fox, the definition within the Commonwealth significant impact guidelines 1.1 (DoE 2014) were used.

Due to the species' extensive range and movement between camps, the national population is considered a single, interbreeding population (Webb and Tidemann 1995). The Project area is not near the limit of the species range and is not considered a key source population necessary for maintaining genetic diversity. However, given the grey-headed flying-fox camp adjacent to Hobarts bridge has recorded up to between 2,500 – 9,999 individuals, the local population may be considered a key source population for breeding or dispersal. Therefore, the population within the vicinity of the Project area is considered an important population.

6.9.2.11 Significant impact assessment

The Project is unlikely to result in a significant residual impact on the grey-headed flying-fox (vulnerable under the EPBC Act) (Table 6.5). A significance of impact assessment has been undertaken against the Commonwealth Significant impact guidelines 1.1. (DoE 2013).

Table 6.5 Significant impact assessment – grey-headed flying-fox

Significant impacts criteria	Assessment	
Lead to a long-term decrease in the size of an important population of the species	**Unlikely**	The grey-headed flying-fox population is considered an important population under the definition outlined in the Significant impact guidelines 1.1 (DoE 2013). The Project will result in the direct loss of 0.01 ha of potential foraging habitat for the species, which does not constitute habitat critical to the survival of the species due to the absence of key winter and spring flowering tree species within the Project footprint. Three camps are located within the Bellingen region. One of which is located 120 m adjacent to Hobarts Bridge, and two camps located within the Bellingen township (one recognised as nationally important camp). Given the Project area is within the foraging distance of three grey-headed flying-fox camps, foraging habitat within the Project area has potential to receive high levels of foraging activity. However, the potential for the loss of 0.01 ha to lead to a long-term population decrease is considered low, on the basis that habitat impacted is not habitat critical and that large tracts of protected habitat is available within foraging distance located within Dorrigo National Park, Bellinger River National Park, New England National Park and numerous reserves within 20 km of the three camps.
Reduce the area of occupancy of an important population	**Unlikely**	The grey-headed flying-fox population is considered an important population under the definition outlined in the Significant impact guidelines 1.1 (DoE 2013). While the nearest camp, adjacent to Hobarts Bridge is not a nationally important camp, one camp located in Bellingen township is a nationally important camp. While all three camps are outside of the Project footprint, the Project will result in the loss of 0.01 ha of suitable foraging habitat. However, this does not constitute habitat critical to the survival of the species, and loss of this habitat is not considered likely to reduce the area of occupancy of the species, given the species' capacity to mobilise in response to the availability of flowering vegetation. The grey-headed flying-fox is likely to use the camp adjacent to Hobarts bridge during significant lifecycle phases including birth, lactation, conception and as a maternity camp. While construction of Hobarts bridge has the potential to disturb the colony particularly as a result of construction, resulting in roost abandonment, particularly during the breeding season. However the construction will be timed to avoid the breeding season of the species (October to December). The construction of Hobarts bridge is unlikely to reduce the occupancy of the species, given the construction will avoid significant lifecycle timing and the nationally important camp known within the nearby Bellingen township will remain unaffected by the Project.
Fragment an existing important population into two or more populations	**Unlikely**	The grey-headed flying-fox is considered a single, mobile population (DAWE 2021). The species has an extensive range with the capacity to move large distance between camps at a national level, in response to the availability of foraging resources. The loss of 0.01 ha potential foraging habitat attributed to the Project will have localised impact that will not pose any barrier to movement. As such, impacts attributed to the Project will not fragment the population into two or more populations.
Adversely affect habitat critical to the survival of a species	**Unlikely**	The Project will cause the loss of 0.01 ha of suitable foraging habitat for the species. This habitat does not constitute habitat critical to the survival of the species based on the absence of critical winter and spring flower tree species. A grey-headed flying-fox camp is located 120 m from Hobarts bridge, while this camp is not recognised as a 'Nationally important camp', it is important for significant lifecycle stages of the species (i.e. maternity camp). One nationally important camp is known within the nearby Bellingen township, recording 16,000 – >50,000 grey-headed flying-fox individuals annually. This nationally important camp is likely to constitute habitat critical to the survival of the species and will remain unaffected by the Project. On this basis, the Project is unlikely to adversely affect habitat critical to the survival of a species.

Significant impacts criteria	Assessment	
Disrupt the breeding cycle of an important population	**Unlikely**	The grey-headed flying-fox population is considered an important population under the definition outlined in the Significant impact guidelines 1.1 (DoE 2013). The Hobarts Bridge Project footprint is located 120 m adjacent to a known grey-headed flying-fox camp. This camp has been utilised by the species almost seasonally since 2013. While it is not recognised as a nationally important grey-headed flying-fox camp, the species is likely to utilise it as a maternity camp. While noise, dust and vibration disturbances have potential to disrupt the breeding cycle of the species, the Project will minimise disruption to the grey-headed flying-fox through mitigation measures. These include timing construction of the Hobart bridge outside of the species breeding season (October to December). Additionally, the construction of Hobarts bridge will cease if the camp contains females that are in the late stages of pregnancy or have dependant young that cannot fly on their own; and will cease during or immediately after climatic extremes (heat stress event, cyclone event) or during a period of significant food stress in the regional landscape. The construction should be supervised by a person with knowledge and experience relevant to the management of flying-foxes and their habitat to make an assessment on whether the activity can go ahead consistent with the mitigation measures and as detailed further in the Commonwealth *Referral guideline for management actions in Grey-headed and Spectacled flying-fox camps* (DoE 2015a). A known nationally important camp is located 16.5 km east of the construction area, which will remain unaffected and likely provides important breeding habitat for the species in the local region. On the basis that the mitigation measures are implemented, the project is considered unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**	The design and alignment of the bridges have been implemented in such a way to minimise impacts to the grey-headed flying fox, as the project is utilising already cleared areas for works. The Project will result in the loss of 0.01 ha of potential foraging habitat. The Hobarts Bridge Project footprint is located 210 m adjacent to a known camp, and two nationally important camps are located within Bellingen township, foraging habitat within the region is likely to represent habitat utilised by the camp on a regular basis, particularly during the winter and spring resource bottleneck, or after perturbations like large-scale fires. However, the foraging habitat impacted by the Project is not considered habitat critical to the survival of the species based on the absence of critical winter and spring foraging resources. Protected foraging habitat is available in the Bellingen region in conservation areas. On that basis, the Project has a low likelihood of causing the species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely**	No invasive species are listed among the key threats to the grey-headed flying-fox in the Commonwealth National Recovery Plan (DAWE 2021) for the species. The Project is unlikely to introduce or encourage the spread of any invasive species that could adversely affect the species.
Introduce disease that may cause the species to decline	**Unlikely**	The grey-headed flying-fox is susceptible to Lyssavirus. While this is generally stable in the population, exposure to significant ecological stress can cause an increase in the incidence of Lyssavirus that can cause local declines in the species (DAWE 2021). Given Hobarts Bridge construction has potential to disturb the nearby camp, mitigation measures will be implemented to reduce the potential for construction-based impacted to cause adverse stress to an extent required to induce an increase in Lyssavirus. Additionally, the species is susceptible to *Phytophthora cinnamomi* due the soil fungus's ability to infect eucalypt species and cause dieback and habitat degradation. Biosecurity requirements (e.g. weed and seed declarations) will be implemented for the Project, and thus, this risk has been assessed as low. As such, the Project is unlikely to modify, destroy, remove or isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Significant impacts criteria	Assessment	
Interfere substantially with the recovery of the species	**Unlikely**	The Commonwealth National Recovery Plan for the species details recovery objectives, these focus on habitat identification, protection, restoration and monitoring, and community understanding and education. Recovery objectives 1 and 2 are field-based objectives, focusing on identifying, protecting and increase foraging and roosting habitat for the species. The Project will not directly impact on any known roosting habitat, Hobarts bridge has the potential to indirectly impact the known camp 120 m adjacent to the project footprint. On the basis that construction timing avoids the breeding season of the species (October to December); a person experienced in flying-fox management is present at the construction of Hobarts bridge to supervise the species behaviour as a result of the construction, and that the construction is to cease dependent on the following (DoE 2015): – If the camp contains females that are in the late stages of pregnancy or have dependant young that cannot fly on their own – During or immediately after climatic extremes (heat stress event, cyclone event) or during a period of significant food stress in the regional landscape Upon the implementation of these mitigation measures, the indirect impact to roosting habitat is considered unlikely to interfere substantially with the recovery of the species. The loss of potential foraging habitat has the potential to contribute to the adverse impacts on the camp adjacent to Hobarts Bridge. The Project will impact 0.01 ha of predicted foraging habitat which does not constitute habitat critical to the survival of the species, on the basis that no important winter or spring flowering trees were observed in the project footprints. While a low risk given the extent of habitat removal in the context of landscape-level habitat availability, if the loss jeopardised the viability of the camp, it would have the potential to interfere with the recovery of the species. Recovery objectives 9 is development-based and aims to reduce the impact of electrocution and entanglement. Relevant to the Project, fencing will be erected during construction. Barbed-wire and netting are known as major hazards for flying-fox entanglement, resulting in injury or mortality. The Project's fencing will be barbed-wire and netting free to avoid entanglement of the grey-headed flying-fox. The Project will not result in a greater potential for the species to become electrocuted. Accordingly, the Project is considered unlikely to interfere substantially with the recovery of the species.

6.9.3 Giant barred frog

6.9.3.1 Conservation status and species profile

The giant barred frog is listed as vulnerable under the EPBC Act.

The giant barred frog is sparsely distributed from near Hervey Bay in Queensland, south to the Blue Mountains in NSW. The species occurs from elevations between 100-1000 m asl. The Coffs Harbour-Dorrigo catchment is considered a stronghold for the species in NSW. The species inhabits lowland open wet forests (i.e. rainforest and wet sclerophyll forest) near permanent flowing drainages (TSSC 2021). The species occurs within the narrow strip of vegetation either side of a stream or river where there is deep, damp, leaf litter for sheltering and foraging. Occasionally the species occurs within riparian habitats of drier forest or degraded riparian remnants surrounding dams. The giant barred frog breeds in spring to autumn (TSSC 2021).

6.9.3.2 Desktop results

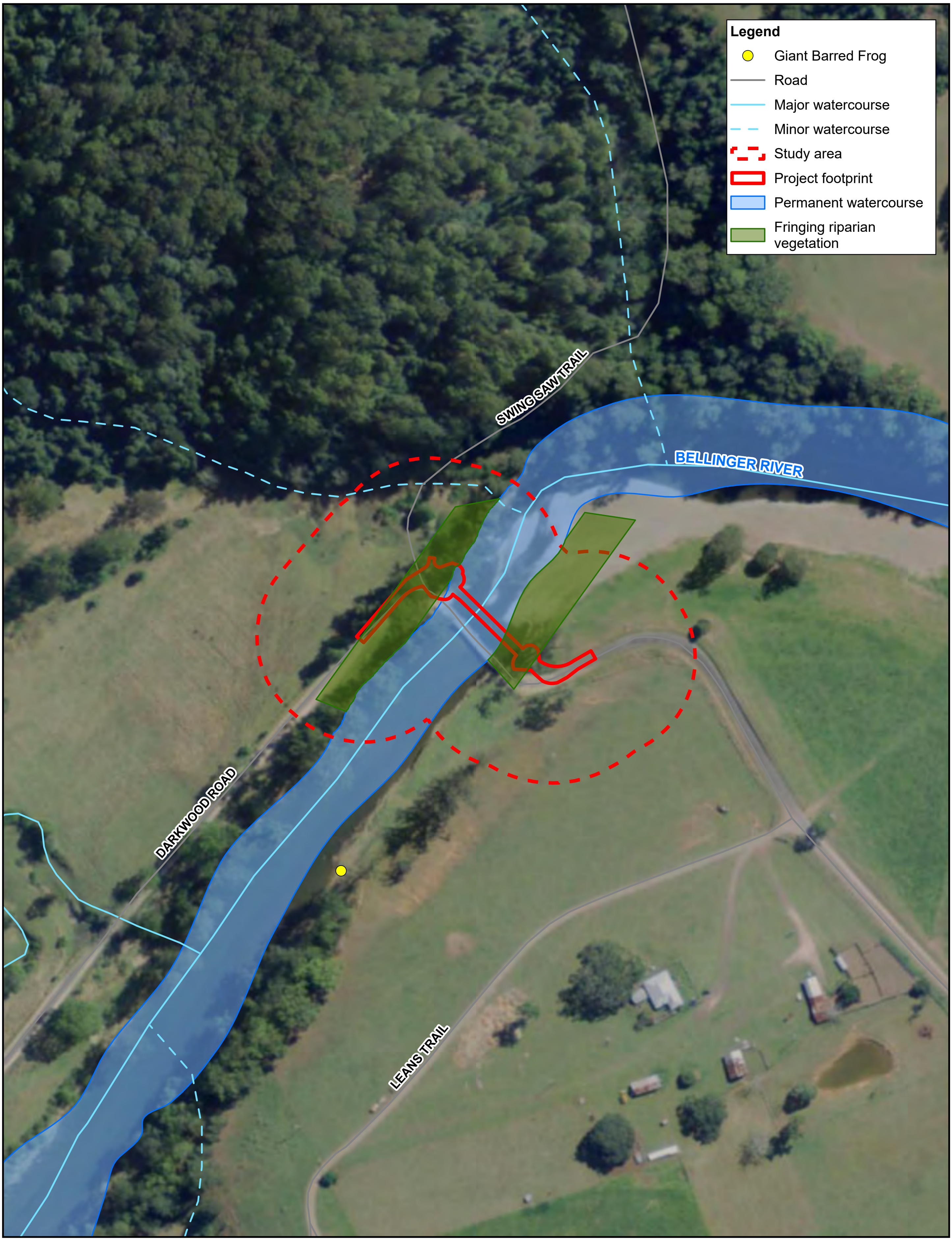
The species is a NSW Category 2 Conservation Protected in New South Wales. Accordingly, records of the giant barred frog are generalised to 10 km by NSW OEH and are presented in a repeated grid pattern in ALA (2024). Accordingly, while the specific locations of the historical records are not provided, it can be determined that the species occurs within the Bellingen region, and potentially within the Project area.

6.9.3.3 Survey results

Habitat for the Giant Barred Frog was found to occur at each of the four project footprints in the form of abundant leaf litter, considered suitable for both sheltering and foraging and suitable breeding habitat (pools in larger streams) (TSSC 2021). Relatively low levels of disturbance were observed at each watercourse (excluding Joyce's Bridge which support cattle grazing on the south-eastern bank), despite evidence of infestation of weeds.

A total of 19 giant barred frogs were observed across the four sites. The species was recorded in a variety of habitats along the Bellinger River and Kalang River, with the consistent habitat niche across each bridge site being heavy leaf litter. The field survey results are summarised below:

– **Joyces Bridge:** one adult was confirmed present on one night of surveys. This individual was recorded atop of *Lantana camara* and broad-leaved privet leaf litter. This site is likely to also provide breeding habitat for the species. Refer to Figure 6.3.
– **Hobarts Bridge:** a metamorph was recorded on one night of the survey, on the edge of the water. This site provides breeding habitat for the species. While no adults were detected (likely due high noise levels from rapids and inaccessibility issues to areas around the existing bridge) the location is also likely to provide foraging and refuge habitat for the species. Refer to Figure 6.4.
– **Justins Bridge:** adults were recorded on all four nights of surveys on both banks of the river. Each individual was recorded atop leaf litter of *Casuarina cunninghamiana* needles. This site is likely to provide breeding habitat for the species. Refer to Figure 6.5.
– **Duffys Bridge:** adults were recorded on all four nights of surveys on both banks of the river. The individuals were recorded atop leaf litter of *Casuarina cunninghamiana* needles and in a paddock on the edge of the bridge. This site is likely to provide breeding habitat for the species. Refer to Figure 6.6.



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Giant barred frog - Joyces Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 1 of 4

FIGURE 6.3

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Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data, habitat type (2024); NSWSS: roads, watercourse (2023).
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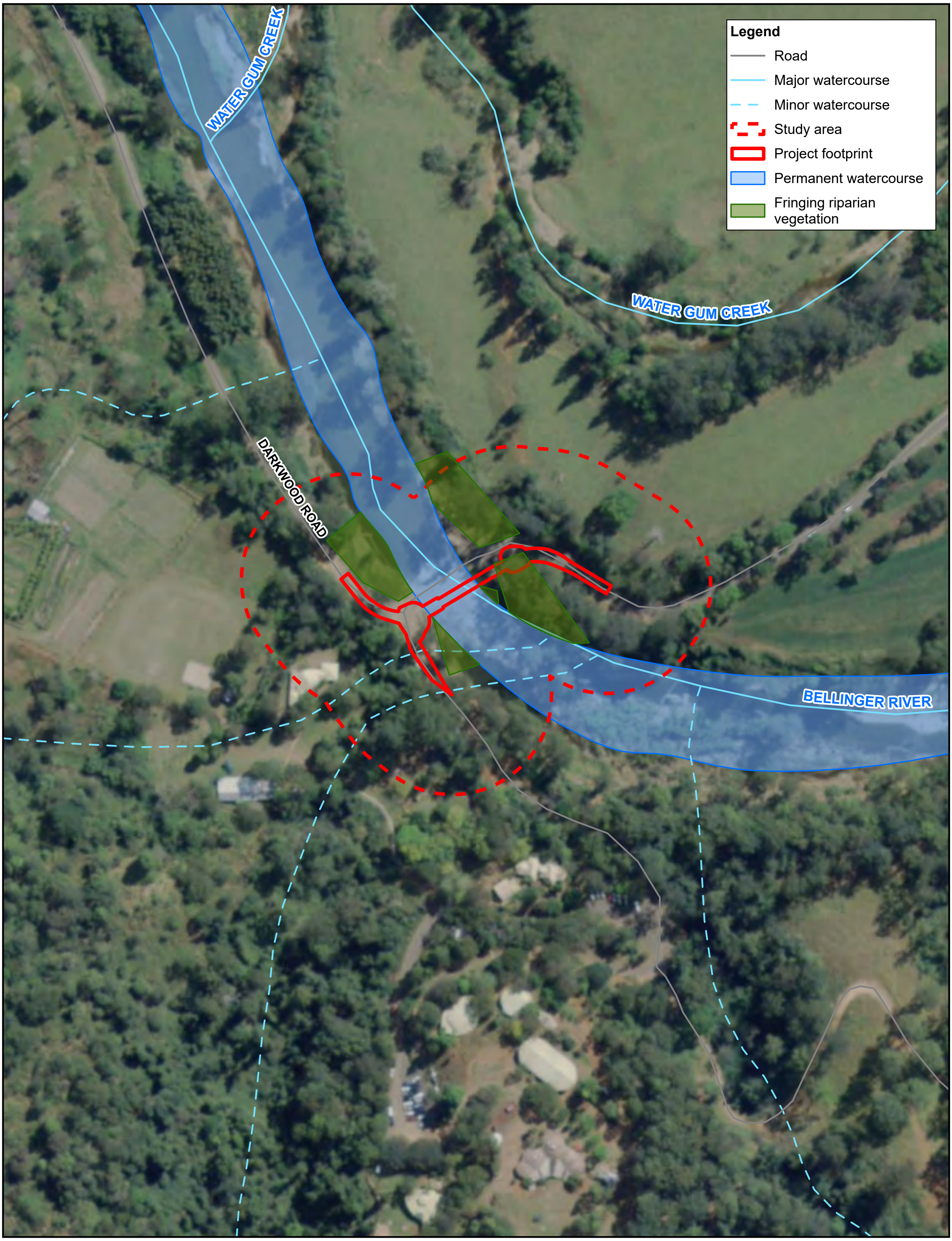

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Map Projection: Transverse Mercator
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Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Giant barred frog - Hobarts Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 2 of 4

FIGURE 6.3

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Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data, habitat type (2024); NSWSS: roads, watercourse (2023).
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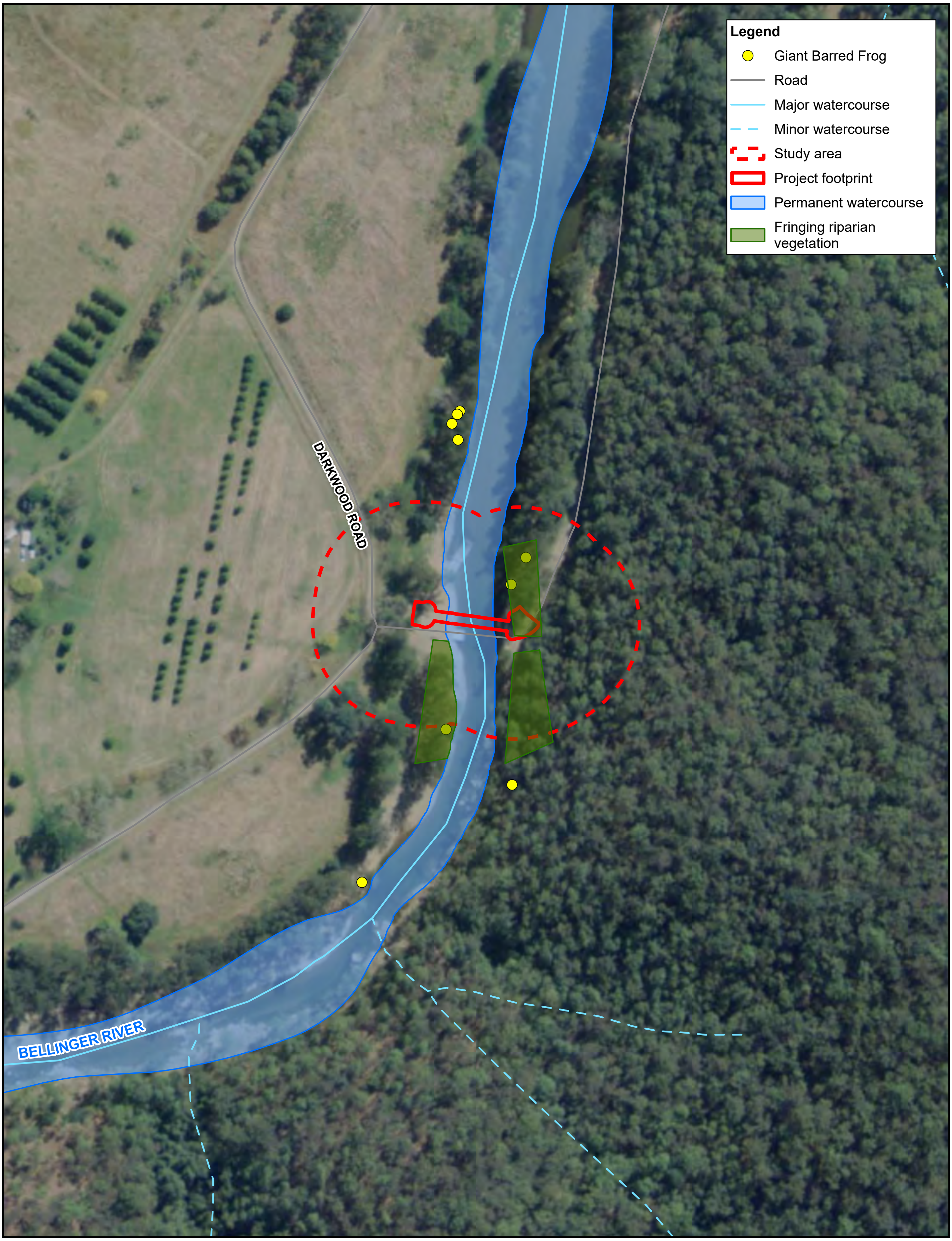

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Giant barred frog - Justins Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 3 of 4

FIGURE 6.3

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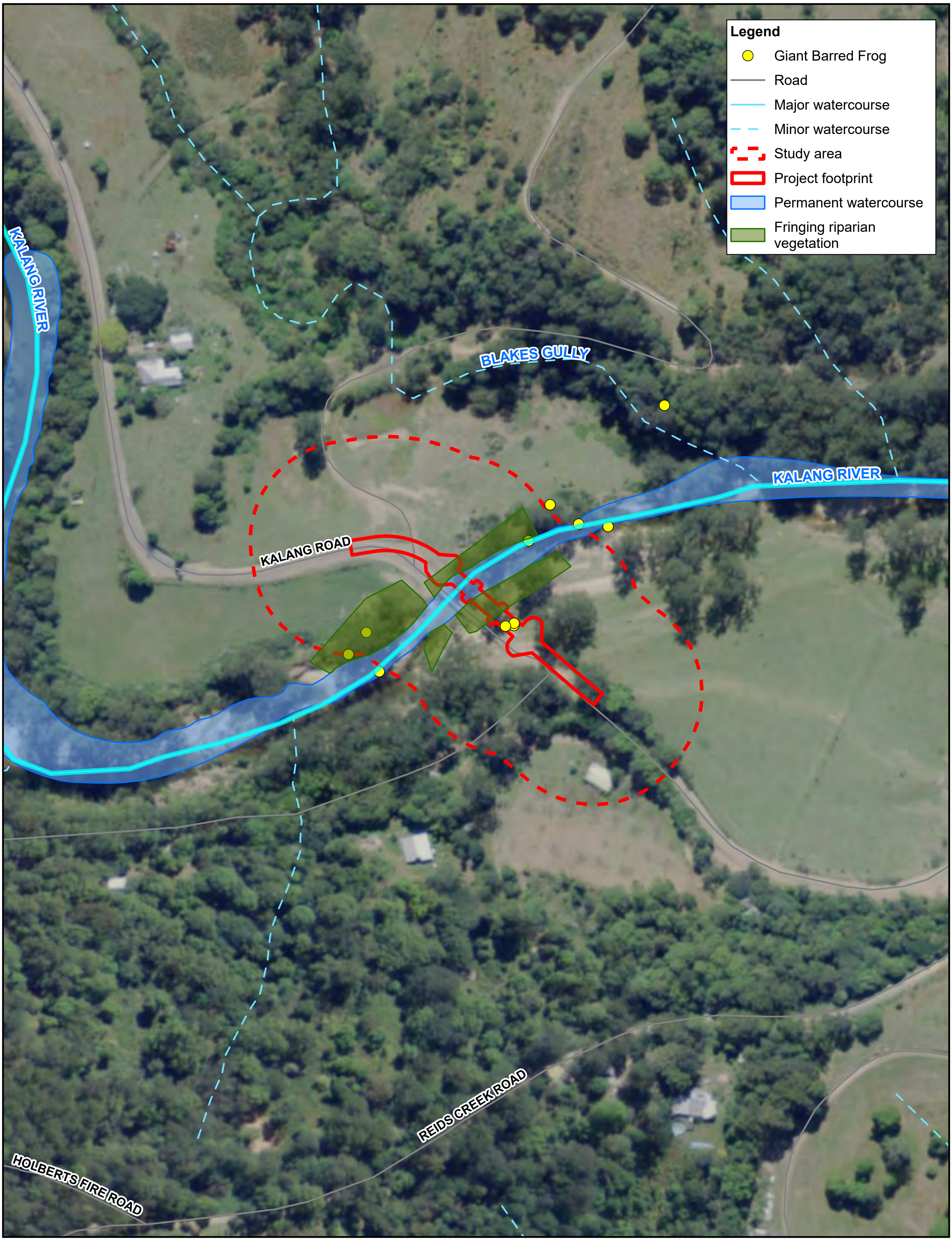
Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data, habitat type (2024); NSWSS: roads, watercourse (2023).
Created by: bkaemmerling



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Giant barred frog - Duffys Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 4 of 4

FIGURE 6.3

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Print date: 13 Feb 2024 - 15:07

Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data, habitat type (2024); NSWSS: roads, watercourse (2023).
Created by: bkaemmerling

6.9.3.4 Mapping giant barred frog habitat

The criteria used to map predicated giant barred frog habitat was based on the habitat description as per Commonwealth conservation advice for the species (TSSC 2021):

Foraging habitat – near permanent flowing drainages (from shallow, rocky rainforest streams to slow-moving rivers) in lowland open wet-forests (rainforest and wet sclerophyll forest) and on cleared land. The species stays in the riparian zone all year round, generally confined to a narrow strip of vegetation either side of a stream or river. This habitat provides deep, damp, leaf litter that is utilised for both shelter and foraging. Occasionally, the Giant Barred Frog has been found in other riparian habitats, such as those in drier forest or degraded riparian remnants and even around dams.

The criteria for foraging and sheltering habitat was mapped as the fringing riparian habitat adjacent to Bellinger River and Kalang River.

Breeding habitat – eggs are flicked onto overhanging or steeply sloped banks or rocks, when hatched drop into still or slowly flowing pools or at the sides of streams.

The criteria for breeding habitat was mapped as the permanent watercourse (including immediate banks) of Bellinger River and Kalang River.

Mapped foraging and breeding habitat is illustrated through Figure 6.3, Figure 6.4, Figure 6.5 and Figure 6.6.

6.9.3.5 Key threats

The giant barred frog population have suffered declines due to the following threats, as detailed in the Commonwealth conservation advice (TSSC 2021) for the species:

- Vegetation clearance and habitat fragmentation
- Climate change including increased temperature and change to precipitation patterns; and increased intensity and frequency of bushfire
- Chytrid fungus resulting in mortality
- Habitat degradation by feral pigs, domestic stock, invasive weeds (including mistflower, lantana and exotic grasses)
- Predation by feral cats, freshwater yabby and predatory fish species

6.9.3.6 Potential impacts

Potential impacts from the project include loss and degradation of habitat, injury/mortality to fauna, introduction and spread of invasive weeds and pests and exacerbation of infectious disease. The potential impacts from the proposed bridge projects are discussed in the following sections.

6.9.3.6.1 Loss and degradation of habitat

Vegetation clearing, substrate disturbance and movement of equipment within the Project footprint of the bridges have the potential to result in habitat loss and degradation. The Project will impact 0.166 ha of suitable habitat for the giant barred frog. The Project footprints will include the existing road easement, reducing impact to vegetation and habitat. Some riparian vegetation will be impacted on both left and right banks at all four bridges. Approximately 8-16 m of riverbank will be disturbed on either side of the banks for each bridge footprint. Removal of vegetation will likely impact on giant barred frog foraging and sheltering habitat, however impacts will be localized within the Project footprint and will not impact foraging and sheltering habitat in areas adjacent to the Project area. The Project design has micro sited bridge piers to reduce the impact to aquatic habitat.

A summary of the total impact is outlined in Table 6.6.

Table 6.6 Giant barred frog habitat loss

Habitat type	Hobarts bridge	Duffys bridge	Joyces bridge	Justins bridge	Total
General barred frog habitat	0.025 ha	0.035 ha	0.081 ha	0.025 ha	**0.166 ha**

A change in habitat conditions through the alteration of riverbank and riverbank profiles, substrate composition and loss of riparian vegetation can degrade foraging and habitat resources in the immediate area of the bridge construction sites. Vegetation clearing can create favourable conditions for weed growth and has the potential for introduction and spread weeds during construction. This increased risk of weeds has the potential to reduce the abundance of foraging and sheltering habitat available for the giant barred frog. The giant barred frog eggs are stuck to overhanging or steeply sloped banks or rocks where the tadpoles drop into the stream upon hatching. Direct works within the Bellinger and Kalang Rivers will be restricted to two piles located on the outside margins of the low flow channel at Joyces and Hobarts bridges respectively. Piers are located completely outside the low flow channel at Justins and Duffy's Bridges. Accordingly, impact to potential instream breeding habitat for the giant barred frog is unlikely to be significant. Riverbank habitat will be impacted during the construction phase, however this will be remediated with bank morphology to be restored to existing conditions.

6.9.3.6.2 Injury/mortality to fauna

The intensive nature of vegetation clearing has an elevated potential to adversely impact local fauna that shelter in ground habitat (logs, soil, leaf litter and beneath rocks). Fauna species most at risk include nocturnal species that are likely to be sheltering during the day when clearing activities are underway, and slow-moving species or sedentary species that are less able to flee the clearing zone (e.g. frogs). Increased vehicle movements during the construction phase may also increase the local incidence of fauna injury and mortality through vehicle strike and collision. Additional threats include the entrapment within open excavation areas. Threatened fauna species with heightened risk of injury or mortality during construction include the giant barred frog, due to localised occurrence, nocturnal behaviour and relatively slow dispersal ability.

Aquatic habitats within the project footprints consists of pool- riffle and pool-run habitats. Metamorph giant barred frogs may experience direct injury or mortality if individuals are present within the areas of disturbance at the time of works. Key construction activities that have potential to cause injury/mortality include clearing and earthworks within the riverbanks and the installation of rock bags within the low flow channel. Given the adult giant barred frogs have low dispersal ability (potential to move 100 m per night), the species is susceptible to construction phase impacts.

6.9.3.6.3 Introduction and spread of invasive weeds and pests

Construction activities have the potential to introduce and/or spread invasive weeds and pests throughout the construction area. This can result in disruptions to natural ecosystem functioning by altering the balance of inter-species competition and predation.

Inappropriate waste disposal and provision of water has the capacity to attract higher local concentrations of feral predators, increasing the predation pressures on local wildlife.

An increase in bare ground and open areas, associated with land clearance required for the Project footprint, will favour weedy species, particularly lantana and mistflower, which can suppress the regeneration of native species and reduce the available habitat for native species. This can cause significant damage to New South Wales primary industries and undermine the ecological integrity of bushland remnants by competitively excluding native plant species that provide food, shelter and nesting resources for native wildlife. Additionally, surface water flow has the potential to distribute weed species from construction areas to nearby watercourses, resulting in weeds being distributed further downstream during the wet season.

6.9.3.6.4 Exacerbation of infectious disease

Chytridiomycosis is stream-borne virus caused by the amphibian chytrid fungal pathogen. Infected frog populations exhibit diverse susceptibility to chytrid, with some species being extremely vulnerable, resulting in mass die-off and extinction (TSSC 2021). The giant barred frog is known to carry chronic infection of chytrid, it has been suggested that the species abundance has dropped largely as a result of the disease. It is uncertain whether the species is continuing to decline from chytrid. Transmission of chytridiomycosis can be exacerbated by the handling of multiple frogs by researchers. Any action that results in the capture and handling of multiple frogs has the potential to spread the disease within the local frog population. Given the Project is likely to directly impact on habitat for the giant barred frog, there is potential for active management or translocation of frogs that would facilitate disease transmission.

6.9.3.7 Measures to avoid, minimise or mitigate impacts

6.9.3.7.1 Avoidance

Throughout the design phase, consideration has been placed on reduction of impacts to surrounding environmental values through the selection of optimal bridge locations and improved bridge designs. The project footprint for the bridges will be generally restricted to include the existing cleared road easement, reducing the area of impact to habitat and minimising degradation of habitat and associated runoff. The bridge designs for the four bridges were modified to extend the bridge spans to relocate the piling footprints outside of the low flow channels as much as possible. Designs for all four sites have been modified throughout the design process to reduce environmental impacts, described in Table 6.7.

Construction of the four bridges will avoid the peak breeding season of the species (November to February) therefore minimised direct impacts to breeding are expected to occur. Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance and to protect water quality/habitat conditions within and downstream of the footprints. Overall, given the avoidance of construction work within the breeding season and the measures proposed to protect the species and habitat, the project is not likely to result in any change to the abundance of the giant barred frog or result in any degradation of habitat.

Table 6.7 Avoidance measures

Impact	Avoidance
Justins bridge	Piers for Justins Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin.
Joyces bridge	Piers one and two for Joyces Bridge have been relocated from within the low flow channel to the outside margins.
Hobarts bridge	Piers for Hobarts Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin. Piers two and three for Hobarts Bridge have been relocated from within the low flow channel to the outside margins.
Duffy’s bridge	Piers for Duffy’s Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin.

6.9.3.7.2 Loss and degradation of habitat

Mitigation and management measures proposed to minimise the potential for habitat loss and degradation include:

- Minimising the project footprint to the smallest area needed for construction work.
- Locating the bridges within previously disturbed areas immediately adjacent to the existing bridges.
- Demarcate no-go areas of ecological sensitivity both on site and in construction plans, including all vegetation not to be cleared. All vegetation to be retained should be surveyed and clearly demarcated.
- Minimising instream works through bridge design and construction methodology (i.e. rock bags).

- Minimising instream works and downstream impacts through the use of rock bags, liners and blinding construction to create safe and dry work areas that prevent any discharge of sediment, drilling fluid or concrete into the waterway. This approach avoids the need for earthfill and minimises the need for sediment and erosion controls in the immediate area.
- Monitoring of water quality conditions (visual and *in-situ* recordings) to identify the potential for water quality degradation within Bellinger River and allow for adaptive management. Water quality monitoring will be conducted weekly during works within the low flow channel.
- Scheduling the duration of construction works within the low flow channel to the minimum time necessary and outside the wet season (October to March) and the giant barred frog peak breeding season (November to February).
- Retaining large woody debris, rocks, root balls from within the project footprint for reinstatement following the completion of construction.
- Keeping vehicle and machinery movements confined to designation access tracks and enforcing on-site speed limits.
- Providing environmental training to site personnel through a site induction and toolbox talks on local habitat, potential risks and avoidance, mitigation and management requirements.
- Rehabilitation and revegetating exposed surfaces and redundant road sections on completion of construction activities. Bank morphology will be restored to existing conditions.

Due to the very small area of habitat that will be directly impacted by the four bridge replacements, and the mitigation measures proposed to minimise habitat loss and degradation, no significant impact to the giant barred frog or their associated habitat is expected to occur.

6.9.3.7.3 Injury/mortality to fauna

The following measures will be instigated to minimise wildlife injury and mortality during construction:

- Construction of the four bridges will avoid the peak breeding season (November to February) of the species and therefore reduce direct impacts to breeding.
- Enforce on-site speed limits to 40 km/hr to restrict the incidence of vehicle strike.
- Clearly demarcate no-go areas of sensitive vegetation and habitat, including all vegetation and habitat not to be cleared.
- Undertake pre-clearance surveys of construction (clearing) areas to identify and demarcate potential breeding sites for threatened fauna species prior to vegetation removal.
- Undertake nocturnal surveys on suitable nights prior to construction to capture and relocate giant barred frogs prior to construction commencement.
- Engage suitably qualified and experienced fauna spotter-catchers to supervise all clearing activities within areas of high ecological value (i.e. areas of predicted habitat for threatened fauna species, areas with rocky outcrops, riparian vegetation associated with waterways). To be available to capture and relocate giant barred frogs during construction.
- Educate employees regarding the presence of EPBC Act and BC Act listed species, particularly species with increased risk of injury and mortality such as the giant barred frog due to their slow moving and sedentary nature.
- Inspect trenches, excavations and machinery daily for the presence of trapped fauna.
- Minimise the time that excavations are open and place escape poles or structures within excavations to allow fauna to escape. Cover excavations and holes if possible. Place damp hessian sacks in excavations and holes where they cannot be covered to allow trapped fauna to hide under until collected and relocated.
- Minimising instream works through bridge design and construction methodology (i.e. rock bags).

- Identify the closest vet or wildlife carer prior to construction commencing. Relevant contact details to be included in a Construction Environmental Management Plan (CEMP) and circulated during pre-start material to all relevant staff. Develop adverse incident response procedures to detail actions to be taken in the event of wildlife injury or mortality during clearing. This will include procedures for capture and transport of injured wildlife to qualified veterinarian or humane on-site euthanasia and formalisation of arrangements with a local veterinarian to treat and care for wildlife injured during for the construction period.

6.9.3.7.4 Introduction and spread of invasive weeds and pests

The following measures will be instigated to minimise the introduction and spread of introduced species throughout the Project:

- Develop and implement an EMP to inform all construction activities that outlines protocols to prevent the introduction of weed and pest species into the area and minimise the spread of declared weeds and pests within the site.
- Undertake prevention and management of pest animal and invasive species in accordance with the *Biosecurity Act 2015*. Likewise, management of declared local pests and invasive species will be undertaken in accordance with North Coast Regional Strategic Weed Management Plan 2023-2027.
- Establish appropriate on-site waste-storage and disposal protocols, with designated waste-storage areas and appropriate (i.e. closed) waste receptacles and frequent waste disposal schedules to minimise attracting feral animals (e.g. foxes, dogs and pigs).
- Include weed and pest management protocols in all site inductions.
- Prohibit employees from bringing domestic animals onto the construction site.
- Enforce strict weed hygiene protocols including weed-washdowns, inspections and weed and seed certifications of all vehicles, machinery and plant prior to entering the construction site. Wash-downs and inspections should also be undertaken regularly for vehicles travelling to different parts of the site to minimise internal spread of weeds within the works area as well as to mitigate the spread of chytrid fungus.
- Establish a designated access track network and restrict all vehicle movements to designated access tracks. Enforce no off-road driving.
- Undertake pre-construction inventory and mapping of all weed-affected areas and identify areas of high risk that should be designated as no-go areas or areas requiring active weed management during and after construction.
- Undertake periodic inspections of weed-affected areas throughout the construction period and implement weed control to weeds of management concern, including declared and environmental weeds.
- Identify and control all declared weed infestations on the construction site throughout construction.
- Monitor treated areas to assess the success of declared pest/weed eradication.
- Rehabilitate and revegetate temporary works areas as soon as possible to minimise the potential for weed establishment.
- Utilise stockpiled topsoil and mulched vegetation during landscaping and revegetation.
- Utilise native species endemic to the region in revegetation to minimise importation of plants.
- Undertake regular post-construction monitoring of rehabilitation areas and high-risk weed areas.

Mitigation measures relevant to disease amongst frogs is detailed below.

6.9.3.7.5 Exacerbation of infectious disease

The following measures will be instigated to minimise the exacerbation of infectious disease throughout the Project:

- Extra vigilance for vehicles and machinery that have operated within the distribution of common eastern froglet (*Crinia signifera*), a known vector of chytrid fungus.
- Implementing safe hygiene protocols when handling frogs. Frog salvage personnel will wear gloves and one bag-one frog policy for relocating frogs (i.e. disposable gloves, disposable sample bags, sterile equipment).

- Clean and dry all equipment and wet or muddy footwear before and between visiting frog sites. This may include cleaning the tyres of your vehicle before visiting known high-risk sites where threatened frog species may live.
- Avoid translocating giant barred frog individuals further than necessary if individuals are located within the construction Project footprint to minimise the potential spread of chytrid.
- Carry cleaning utensils and a disinfectant for use between sites.
- Record any chytrid-infected frogs and contact Frogwatch Helpline on 0419 249 728.

6.9.3.8 Habitat critical to the survival of the species

There is no formal definition of habitat critical for survival for the giant barred frog. The Commonwealth Significant impact guidelines 1.1. (DoE 2013) definition applies:

- For activities such as foraging, breeding, roosting, or dispersal
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- To maintain genetic diversity and long-term evolutionary development, or
- For the reintroduction of populations or recovery of the species or ecological community

The species inhabits lowland open wet forests (i.e. rainforest and wet sclerophyll forest) near permanent flowing drainages (TSSC 2021). The species occurs within the narrow strip of vegetation either side of a stream or river where there is deep, damp, leaf litter for sheltering and foraging. Occasionally the species occurs within riparian habitats of drier forest or degraded riparian remnants surrounding dams. The giant barred frog breeds in spring to autumn (TSSC 2021).

The Project footprint is located adjacent to the Bellinger River and Kalang River, suitable foraging, sheltering and breeding habitat is present within the Project area, and 19 giant barred frog individuals were recorded during the field survey. On this basis, the habitat within the Project area is likely to constitute habitat critical to the survival of the species.

6.9.3.9 Status as an important population

There is no formal definition of important populations for the giant barred frog. The Commonwealth Significant impact guidelines 1.1. (DoE 2013) definition applies:

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range

The Coffs Harbour-Dorrigo catchment is considered a stronghold for the species in NSW. This area encompasses the Project area. Accordingly, the giant barred frog population within the Project area is considered an important population on the basis that the is likely a key source population either for breeding or dispersal.

6.9.3.10 Significant impact assessment

The Project is **unlikely to result in a significant impact** on the giant barred frog (vulnerable under the EPBC Act and endangered under the BC Act) due to impacts to habitat critical to the survival of the species (Table 6.8). A significance of impact assessment has been undertaken against the Commonwealth Significant impact guidelines 1.1. (DoE 2013).

Table 6.8 Significant impact assessment - giant barred frog

Significant impacts criteria	Assessment	
Lead to a long-term decrease in the size of an important population of the species	**Unlikely**	The population within the Project area is considered an important population. The Coffs Harbour-Dorrigo catchment is considered a stronghold for the species in NSW. The Project footprint has been predominantly located in areas of existing disturbance and road easements. However, the Project will impact a total of 0.17 ha of suitable habitat for the giant barred frog. A change in habitat through the alteration of riverbank and riverbank profiles, substrate composition and loss of riparian vegetation can degrade foraging and habitat resources in the immediate area of the bridge construction sites. Adult giant barred frogs are reliant on riparian vegetation and dense leaf litter for foraging and sheltering habitat, the species requires permanently flowing drainages and overhanging or steeply sloped banks for breeding habitat. The Project will impact foraging, sheltering and breeding habitat. However, tracts of habitat for the species occurs adjacent to the Project footprints along the Bellinger River and Kalang River and provides habitat for the species within the local area. Post-construction rehabilitation and revegetating exposed surfaces and redundant road sections will be undertaken including restoring the bank morphology to existing conditions. Based on the extent of suitable habitat within the local and regional landscape, and that the region is a stronghold for the species, the Project is unlikely to lead to a long-term decrease in the size of an important population.
Reduce the area of occupancy of an important population	**Unlikely**	The population within the Project area is considered an important population. The Project will result in a minor direct loss of habitat. While the species uses permanent flowing drainages for breeding habitat, the giant barred frog has potential to use the Bellinger River and Kalang River for breeding. Indirect impacts to areas downstream imposed by sedimentation, erosion has the potential to result in water quality degradation. The Project will result in the clearance of riparian vegetation which provides sheltering and foraging habitat for the species, particularly in areas of deep, damp leaf litter adjacent to streams or rivers. While the Project will result in the loss of habitat, the impact is minor in context with the habitat available in the local and regional landscape. The loss of habitat is unlikely to cause a permanent disappearance of the species from a 2 km x 2 km (the scale at which area of occupancy is measured under the EPBC Act (TSSC 2021) and IUCN (2022)) area such that there would be a decrease in the area of occupancy of the species.
Fragment an existing important population into two or more populations	**Unlikely**	The Project is located within the central region of the species distribution and is located the catchment of a known stronghold of giant barred frogs (Bellingen River-Coffs Harbour catchment). The Project will result in the loss of a minimal 0.17 ha of suitable habitat. Potential habitat is widely available in the local and regional landscape, including in protected areas (i.e. within Dorrigo National Park, Bellinger River National Park, New England National Park and numerous reserves. Within that context, the loss of habitat is unlikely to result in the fragmentation of the species at a local or regional level.
Adversely affect habitat critical to the survival of a species	**Unlikely**	The Project footprint is located adjacent to the Bellinger River and Kalang River, 0.17 ha of suitable foraging, sheltering and breeding habitat is present within the Project area. However, further potential habitat occurs adjacent to the Project footprints, along the riparian strip adjacent to the Bellinger and Kalang Rivers and in conservation areas in the regional landscape (i.e. New England National Park, Bellinger River National Park etc). The Project is considered unlikely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	**Unlikely**	The population within the Project area is considered an important population. The species uses permanently flowing drainages for breeding habitat. While the instream construction works has the potential to disrupt the breeding cycle of the species, this can be avoided through construction timing outside of peak breeding season between November to February, and avoiding in-stream construction during the wet season (October to March). Additionally, the potential for the construction of the bridges to impact breeding habitat quality will be managed through stringent vehicle and machinery washdowns, monitoring of water quality conditions, and construction timing. The implementation of mitigation measures will be enacted to ensure the project does not affect individuals or breeding habitat quality. These measures are expected to prevent an adverse impact to the breeding of the species to the degree that it would disrupt the breeding cycle of a population.

Significant impacts criteria	Assessment	
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**	The Project will result in a total loss of 0.17 ha of suitable habitat for the giant barred frog. Potential habitat is widely available in the local and regional landscape, including in protected areas. Within this context, habitat loss resulting from the project is unlikely to have a local or regional impact on giant barred frog habitat. The design of the new bridges will span the river and piers will be located outside or on the margins of the low flow channels. The construction of the bridges has potential to disrupt the banks of the river which provide habitat for the species. However, the alignment of the new bridges will utilise existing disturbed areas such that vegetation and disturbances of the riverbanks will be minimised. Accordingly, no major changes are expected to the riparian zones, riverbanks or river channel which allows for foraging, sheltering and breeding habitat of the frog to be maintained. Following this, to minimise impacts to the riverbank, a sediment and erosion control plan will be developed to outline management required during the construction phase. Based on these avoidance and mitigation measures, the context of habitat loss and disturbance are expected to be minimal and will not result in an impact to the species habitat such that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely**	The Commonwealth conservation advice for the giant barred frog list predation by feral cats and habitat degradation by feral pigs and invasive weeds (including mistflower, lantana and exotic grasses) as key threats to the species. The Project will implement a project EMP which will include mitigation measures to prevent the introduction of weed and pest species into the area and minimise the spread of declared weeds and pests within the site. Likewise, management of declared local pests and invasive species will be undertaken in accordance with North Coast Regional Strategic Weed Management Plan 2023-2027. The Project is considered unlikely to result in an invasive species becoming established in the giant barred frogs habitat.
Introduce disease that may cause the species to decline	**Unlikely**	A key threat to the species is mortality due to chytrid fungus. The giant barred frog is known to carry chronic infection of chytrid. Transmission of chytridiomycosis can be exacerbated by the handling of multiple frogs. Any action that results in the capture and handling of multiple frogs has the potential to spread the disease within the local frog population. Given the Project is likely to directly impact on habitat for the giant barred frog, there is potential for active management or translocation of frogs that would facilitate disease transmission. Mitigation measures to minimise the exacerbation of infectious disease throughout the Project will be implemented including: – Extra vigilance for vehicles and machinery that have operated within the distribution of common eastern froglet (*Crinia signifera*), a known vector of chytrid fungus – One bag-one frog policy using disposable gloves and bags – Strict vehicle hygiene protocols – Avoiding translocating giant barred frog individuals further than necessary if individuals are located within the construction Project footprint to minimise the potential spread of chytrid. Mitigation measures are outlined in Section 6.9.3.7.5. The project is expected to manage the potential for the introduction and spread of chytrid, it is unlikely that the species would decline as a result of the Project.

Significant impacts criteria	Assessment	
Interfere substantially with the recovery of the species	**Unlikely**	The Commonwealth conservation advice for the species lists conservation actions for the giant barred frog. Field-based actions include: – Control introduced species – Control weeds and conduct habitat restoration of forest and streambank habitat – Designate protection zones around known site locations to ensure habitat is not fragmented – Manage flow regimes to enhance breeding opportunities to ensure that stream works do not impinge on the species habitat, degrade water quality or substantially affect current flow regimes – Monitor and control damage to riparian areas by feral pigs – Implement suitable hygiene protocols to protect priority populations from infection of chytrid The Project will implement a number of mitigation measures to minimise impacts to habitat loss, habitat degradation, injury and mortality and exacerbation of disease to the giant barred frog. These include: construction CEMP weed and pest measures, vehicle hygiene measures, vegetation restoration post-construction, bridge design sited outside of the low-flow channel as much as possible, demarcating areas of vegetation outside the clearing zone, minimising instream works, implementation of hygiene measures to protect the giant barred frog from chytrid and the spread of chytrid as a result of the project. Further avoidance and mitigation measures are detailed in Section 6.9.3.7. Mitigation measures enacted align with the conservation actions listed for the giant barred frog. The Project is considered unlikely to substantially interfere with the recovery of the species.

6.10 Listed migratory species

6.10.1 Black-faced monarch

6.10.1.1 Conservation status and species profile

The black-faced monarch is listed as migratory under the EPBC Act.

The black-faced monarch is widespread in eastern Australia. In NSW, the species is widespread in the east where it occurs along the coast and the eastern slopes and tablelands of the Great Dividing Range. The species breeds in eastern Australia between October to February, before migrating north during winter (DCCEEW 2023a; DoE 2015). The species primarily inhabits wet rainforest ecosystems including vine-thicket and vine-forest and has been recorded in gullies of dry/wet sclerophyll/woodlands/forests and open eucalypt forests where there is a shrubby understorey. During migration the species is known to utilise marginal habitats such as coastal foothills, Brigalow scrub, coastal scrub, mangroves etc (DCCEEW 2023a).

6.10.1.2 Desktop results

The black-faced monarch has been historically recorded within the Bellingen region. The species has been recorded within 1 km of each of the four bridge footprints, below details the nearest records (ALA 2024a):

– Duffy Bridge – one individual 0.3 km west in 2021
– Joyce Bridge – one individual 0.7 km northeast in 2021
– Hobarts Bridge – one individual 0.6 km northeast in 2019
– Justins Bridge – one individual 0.3 km northeast in 2009

Historical records of the species are abundant in the region, with records typically located near dense vegetation.

6.10.1.3 Survey results

This species was heard calling in the vicinity of Joyces Bridge. Suitable habitat occurs within the broader locality of the Project footprint.

6.10.1.4 Mapping black-faced monarch habitat

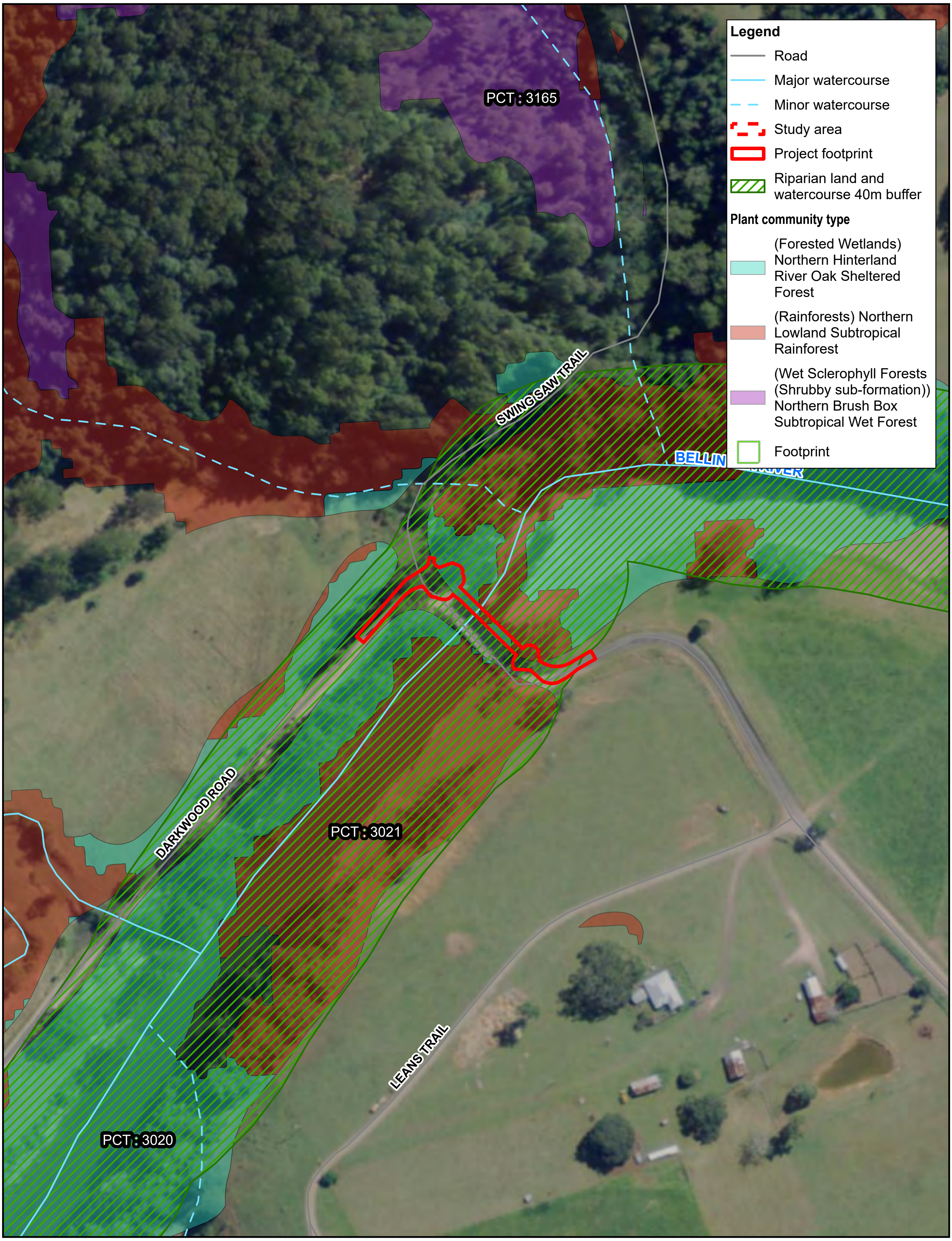
The criteria used to map predicted black-faced monarch habitat was based on the habitat description as per Commonwealth draft referral guidelines for 14 migratory birds (DoE 2015): *wet forest specialist, occurring mainly in rainforests and riparian vegetation. In wet sclerophyll forest, the species mostly frequents sheltered gullies and slopes with a dense understorey of ferns and/or shrubs.*

All riparian vegetation within the Study area were considered habitat.

The following PCTs were also considered habitat for the black-faced monarch:

– PCT 3020 – Northern Hinterland River Oak Sheltered Forest
– PCT 3021 – Northern Lowland Subtropical Rainforest
– PCT 3165 – Northern Brush Box Subtropical Wet Forest
– PCT 3252 – Northern Hinterland Grey Gum-Mahogany Grassy Forest
– PCT 3253 – Northern Hinterland Grey Gum-Turpentine Mesic Forest

Figure 6.7 outlines the mapped habitat of the black-faced monarch.



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Black-faced Monarch - Joyces Bridge
Survey results and mapped habitat

Project No. **12611463**
Revision No. **0**
Date **13/02/2024**

Sheet 1 of 4
FIGURE 6.4

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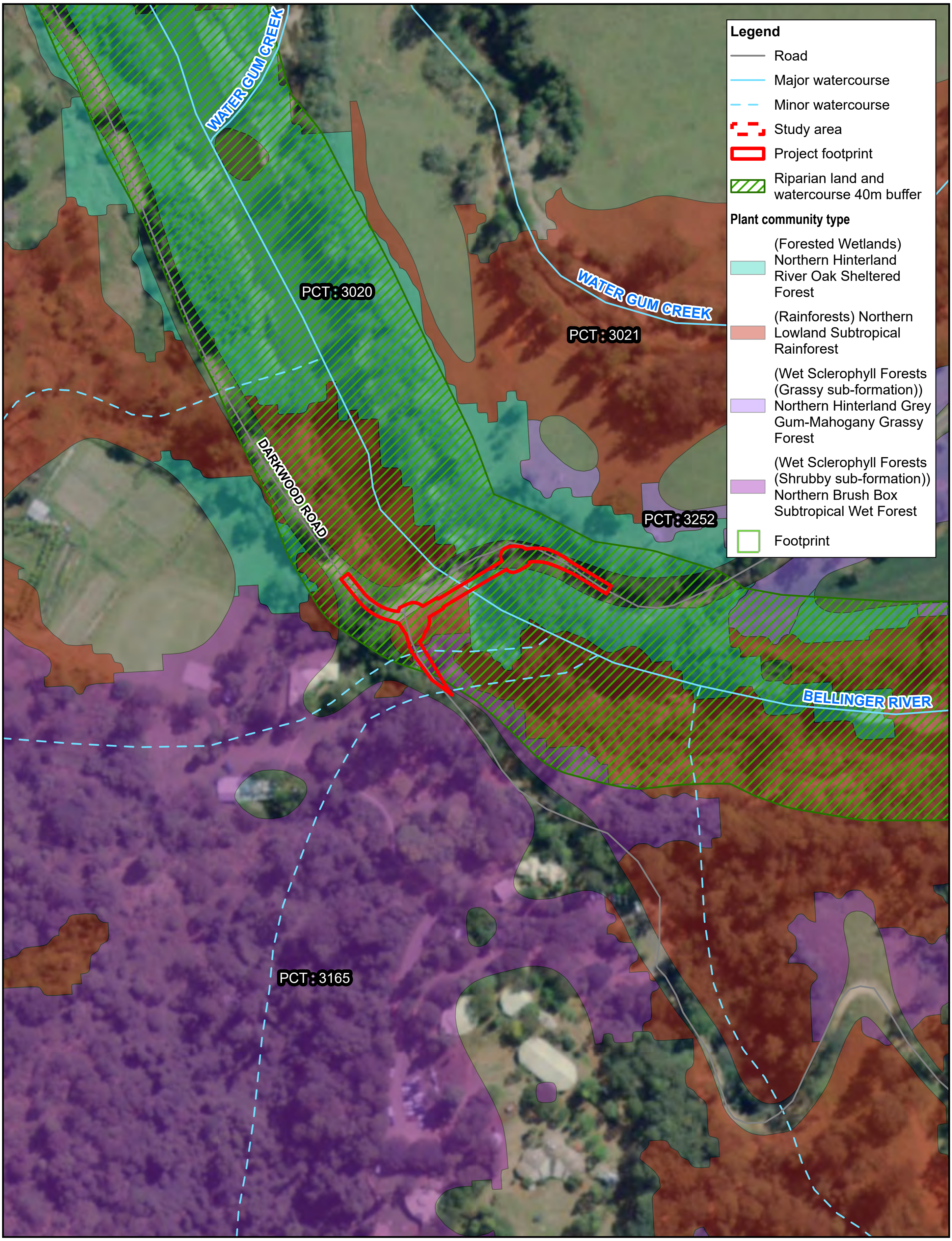
Print date: 13 Feb 2024 - 15:08

Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data, riparian buffer (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: bkaemmerling



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Black-faced Monarch - Hobarts Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 2 of 4

FIGURE 6.4

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Print date: 13 Feb 2024 - 15:08

Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data, riparian buffer (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
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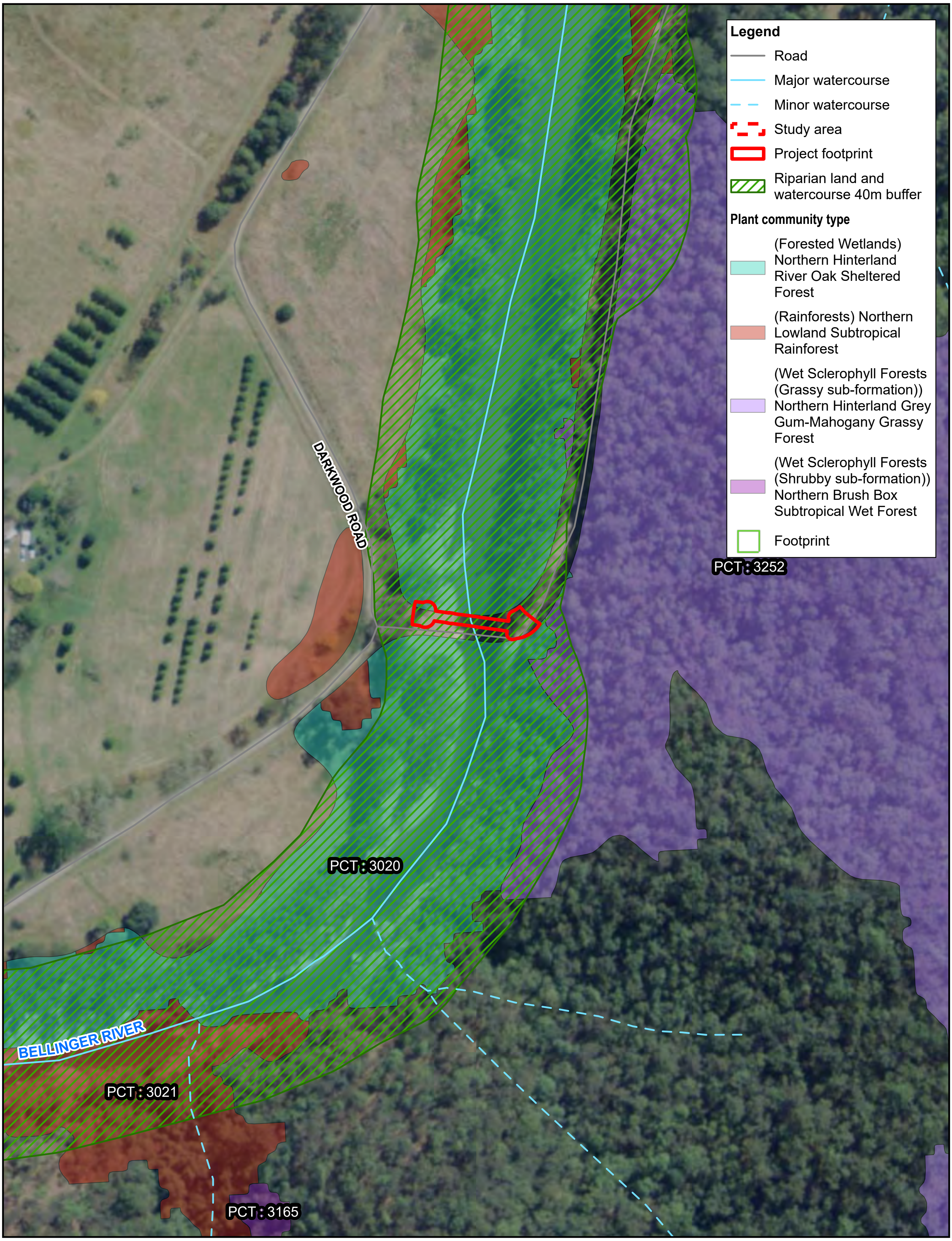

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River
Matters of National Environmental Significance

Black-faced Monarch - Justins Bridge
Survey results and mapped habitat

Project No. 12611463
Revision No. 0
Date 13/02/2024

Sheet 3 of 4

FIGURE 6.4

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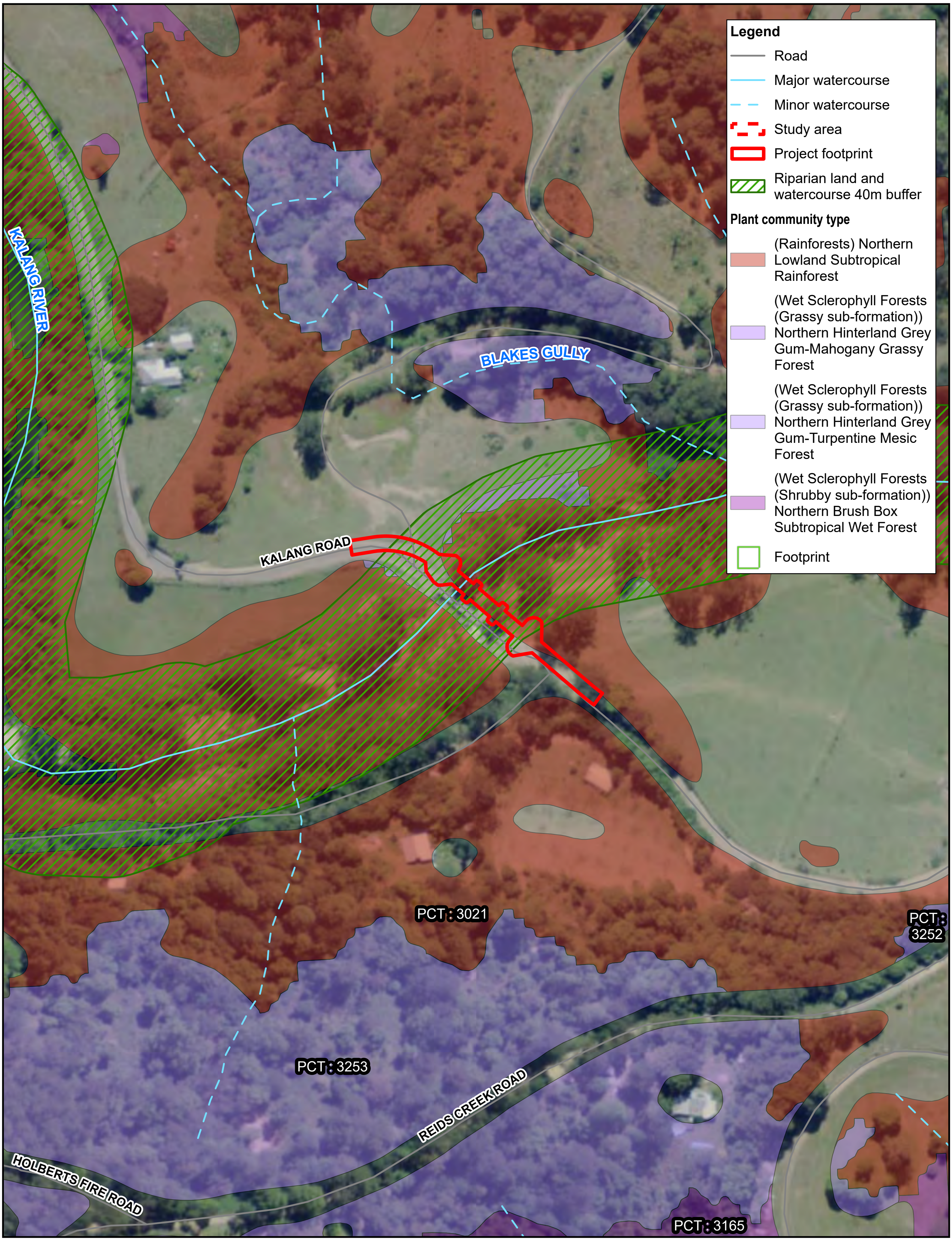
Print date: 13 Feb 2024 - 15:08

Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data, riparian buffer (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: bkaemmerling



Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

Bellingen Shire Council
Bellingen River
Matters of National Environmental Significance

Project No. 12611463
Revision No. 0
Date 13/02/2024

Black-faced Monarch - Duffys Bridge
Survey results and mapped habitat

Sheet 4 of 4

FIGURE 6.4

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Print date: 13 Feb 2024 - 15:08

Data source: public/NSW_Imagery: © Department of Customer Service 2020. GHD: study area, project footprint, survey data, riparian buffer (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: bkaemmerling

6.10.1.5 Key threats

The Commonwealth draft referral guideline (DoE 2015) lists invasive species threats to the black-faced monarch. These include the black rat (*Rattus rattus*) and invasive vines of riparian habitat. There are records of the black rat within 3 - 6 km of Justin Bridge, Joyces Bridge, Hobarts Bridge and Duffys Bridge (ALA 2024a). No invasive vine species were confirmed present across the Project footprints. No further key threats to the species are outlined in the Commonwealth documentation.

6.10.1.6 Potential impacts

Potential impacts from the project include loss of habitat, degradation of habitat, injury/mortality to fauna, disturbance to wildlife due to noise and vibration, introduction and spread of invasive weeds and pests. The potential impacts from the proposed bridge projects are discussed in the following sections.

6.10.1.6.1 Loss of habitat

The proposed works will involve vegetation clearing of approximately 0.36 ha of habitat for the black-faced monarch. This will result in direct loss of vegetation and associated habitat.

Vegetation clearing and inundation will result in the direct loss of fauna habitat through the removal of structural features that provide microhabitats and resources for perching, foraging and nesting. The removal of these features will likely decrease the number of individual animals that can be accommodated in a given area and will may increase competition for resources, such as food and shelter, in immediately surrounding habitats.

A summary of the total impact is outlined in Table 6.9.

Table 6.9 Black-faced monarch habitat loss

Habitat type	Hobarts bridge	Duffys bridge	Joyces bridge	Justins bridge	Total
General Black-faced monarch habitat	0.114 ha	0.092 ha	0.103 ha	0.048 ha	**0.358 ha**

6.10.1.6.2 Degradation of habitat

Vegetation clearing, substrate disturbance and movement of equipment within the Project footprint of the bridges have the potential to result in habitat loss, degradation and disturbance. A change in habitat conditions through the alteration of riverbank and riverbank profiles, substrate composition and loss of riparian vegetation can degrade foraging and habitat resources in the immediate area of the bridge construction sites. Vegetation clearing can create favourable conditions for weed growth and has the potential for introduction of weeds to site from construction machinery (harbouring seeds from previous projects). This increased risk of weeds has the potential to reduce the abundance of foraging and nesting habitat available for the black-faced monarch.

6.10.1.6.3 Injury and mortality of fauna

The Project has the potential to cause direct injury and mortality of wildlife due to vegetation clearing, construction and earthworks. Indirect injury and mortality may also occur due to collision with construction vehicles and entanglement in site fencing. Vegetation clearing activities during the construction phase is likely to have the highest risk of injury and mortality to local fauna. Increased vehicle movements during the construction phase may also increase the local incidence of fauna injury and mortality through vehicle strike and collision.

6.10.1.6.4 Disturbance to wildlife due to noise and vibration

Construction activities within the project footprints have the potential to result in the temporary disturbance of fauna as a result of noise and vibration disturbance. During the construction period, noise and vibration levels will increase due to the use of construction machinery for vegetation clearing, earthworks, installation of the bridge piles and rock anchors, and bridge/road assembly. Artificially generated noise may impact on fauna in the following ways (McCauley et al. 2003): disturbance, leading to behavioural changes or displacement from biologically important habitat areas (such as breeding, feeding, nesting and nursery sites); masking or interference with other biologically important sounds such as communication; physical injury to hearing or other organs; and indirectly by inducing behavioural and physiological changes in species.

The majority of construction related noise and vibration associated with the bridge replacements is expected to cause minor disturbance only. Fauna behavioural changes that may occur include habitat avoidance and evasive movement. This could result in movement of individuals away from the area.

6.10.1.6.5 Introduction and spread of invasive weeds and pests

Construction activities have the potential to introduce and/or spread invasive weeds and pests throughout the construction area. This can result in disruptions to natural ecosystem functioning by altering the balance of inter-species competition and predation.

Inappropriate waste disposal and provision of water has the capacity to attract higher local concentrations of feral predators, increasing the predation pressures on local wildlife.

An increase in bare ground and open areas, associated with land clearance required for the Project footprint, will favour weedy species, particularly *Lantana camara*, which can suppress the regeneration of native species and reduce the available habitat for native species. This can cause significant damage to Queensland’s primary industries and undermine the ecological integrity of bushland remnants by competitively excluding native plant species that provide food, shelter and nesting resources for native wildlife. Additionally, surface water flow has the potential to distribute weed species from construction areas to nearby watercourses, resulting in weeds being distributed further downstream during the wet season.

6.10.1.7 Measures to avoid, minimise or mitigate impacts

6.10.1.7.1 Avoidance

Throughout the design phase, consideration has been placed on reduction of impacts to surrounding environmental values through the selection of optimal bridge locations and improved bridge designs. The project footprint for the bridges will be generally restricted to include the existing cleared road easement, reducing the area of impact to habitat and minimising degradation of habitat and associated runoff. The alignments chosen for the new bridges are immediately adjacent the existing bridges to minimise disturbance and clearing of native vegetation.

6.10.1.7.2 Loss of habitat

The following measures will be undertaken to minimise and mitigate the impacts of unavoidable vegetation and habitat loss:

– Restrict clearing to the smallest area needed for construction of roads, services, access and cut and fill.
– Locate laydown areas, site offices and other temporary works areas in areas already subject to existing disturbance wherever possible.
– Schedule construction to minimise the active works area needed at any time.
– Demarcate no-go areas of ecological sensitivity both on site and in construction plans, including all vegetation not to be cleared. All vegetation to be retained should be surveyed and clearly demarcated.
– Felled vegetation will be mulched and reused on site. Hollow logs and large debris will be salvaged for the use of habitat creation/enhancement outside the extent of works.

- Rehabilitate and revegetate temporary construction areas within the extent of works as soon as possible after the completion of local construction works.
- Implement a CEMP inclusive of pre-clearance survey prior to construction. Implement agreed management measures which may include seed collection and propagation of native flora species, and capture and relocation of threatened fauna species if entrapped within the construction footprint.

6.10.1.7.3 Degradation of habitat

Mitigation and management measures proposed to minimise the potential for habitat degradation include:

- Minimising the project footprint to the smallest area needed for construction work.
- Locating the bridges within previously disturbed areas immediately adjacent to the existing bridges.
- Keeping vehicle and machinery movements confined to designation access tracks and enforcing on-site speed limits.
- Providing environmental training to site personnel through a site induction and toolbox talks on local habitat, potential risks and avoidance, mitigation and management requirements.
- Rehabilitation and revegetating exposed surfaces and redundant road sections on completion of construction activities. Bank morphology will be restored to existing conditions.

6.10.1.7.4 Injury and mortality of fauna

Mitigation and management measures proposed to minimise the potential for injury/mortality include:

- Enforce on-site speed limits to 40 km/hr to restrict the incidence of vehicle strike.
- Clearly demarcate no-go areas of sensitive vegetation and habitat, including all vegetation and habitat not to be cleared.
- Undertake pre-clearance surveys of construction (clearing) areas to identify and demarcate nests and other potential breeding sites prior to vegetation removal.
- Engage suitably qualified and experienced fauna spotter-catchers to supervise all clearing activities within areas of high ecological value (i.e. areas of predicted habitat).
- Scheduling construction works that will impact black-faced monarch habitat to be undertaken outside the black-faced monarch breeding season (October to March).
- Inspect trenches, excavations and machinery daily for the presence of trapped fauna.
- Minimise the time that excavations are open and place escape poles or structures within excavations to allow fauna to escape.
- Fencing will be erected for the construction of the bridges, fencing will be barbed-wire free and netting-free to avoid entanglements.
- Identify the closest vet or wildlife carer prior to construction commencing. Relevant contact details to be included in EMP and circulated during pre-start material to all relevant staff. Develop adverse incident response procedures to detail actions to be taken in the event of wildlife injury or mortality during clearing. This will include procedures for capture and transport of injured wildlife to qualified veterinarian or humane on-site euthanasia and formalisation of arrangements with a local veterinarian to treat and care for wildlife injured during for the construction period.

6.10.1.7.5 Disturbance to wildlife due to noise and vibration

Mitigation and management measures proposed to minimise the potential for noise and vibration disturbance include:

- Minimising the duration of rock anchoring and piling to the shortest period possible
- Using noise dampening devices on machinery wherever practical and requiring that all equipment is maintained and serviced in accordance with manufacturer’s instructions to reduce noise levels

- Requiring soft starts for a period of five minutes so that individuals have a chance to move away from the area before more intense noise and vibrations start
- Restricting construction activities to daylight hours to avoid excessive light levels at night

6.10.1.7.6 Introduction and spread of invasive weeds and pests

The following measures will be instigated to minimise the introduction and spread of introduced species throughout the Project:

- Develop and implement a CEMP to inform all construction activities that outlines protocols to prevent the introduction of weed and pest species into the area and minimise the spread of declared weeds and pests within the site.
- Undertake prevention and management of pest animal and invasive species in accordance with the *Biosecurity Act 2015*. Likewise, management of declared local pests and invasive species will be undertaken in accordance with North Coast Regional Strategic Weed Management Plan 2023-2027.
- Establish appropriate on-site waste-storage and disposal protocols, with designated waste-storage areas and appropriate (i.e. closed) waste receptacles and frequent waste disposal schedules to minimise attracting feral animals (e.g. foxes, dogs and pigs).
- Include weed and pest management protocols in all site inductions.
- Prohibit employees from bringing domestic animals onto the construction site.
- Enforce strict weed hygiene protocols including weed-washdowns, inspections and weed and seed certifications of all vehicles, machinery and plant prior to entering the construction site. Wash-downs and inspections should also be undertaken regularly for vehicles travelling to different parts of the site to minimise internal spread of weeds within the works area.
- Establish a designated access track network and restrict all vehicle movements to designated access tracks. Enforce no off-road driving.
- Undertake pre-construction inventory and mapping of all weed-affected areas and identify areas of high risk that should be designated as no-go areas or areas requiring active weed management during and after construction.
- Undertake periodic inspections of weed-affected areas throughout the construction period and implement weed control to weeds of management concern, including declared and environmental weeds.
- Identify and control all declared weed infestations on the construction site throughout construction.
- Monitor treated areas to assess the success of declared pest/weed eradication.
- Rehabilitate and revegetate temporary works areas as soon as possible to minimise the potential for weed establishment.
- Utilise stockpiled topsoil and mulched vegetation during landscaping and revegetation.
- Utilise native species endemic to the region in revegetation to minimise importation of plants.
- Undertake regular post-construction monitoring of rehabilitation areas and high-risk weed areas.

6.10.1.8 Habitat critical to the survival of the species

The concept of 'important habitat' is relevant to migratory listed species under the EPBC Act. Important habitat for the black-faced monarch is defined as: '*Wet forest specialist, found mainly in rainforest and wet sclerophyll forest, especially in sheltered gullies and slopes with a dense understorey of ferns and/or shrubs.'* (DoE 2015a)

Habitats within the Project footprint **does not meet the definition of important habitat**. While hinterland riparian vegetation occurs within parts of the Project footprint, the Project footprint has also been altered by historical clearing, grazing land and bamboo plantation.

6.10.1.9 Status as an important population

The concept of 'ecologically significant proportion of a population' is used in the Draft referral guideline for 14 birds listed as migratory (DoE 2015a), defined as 4,600 individuals (1%) and 460 individuals (0.1%) of the black-faced monarch.

It is **unlikely that the Project will impact an ecologically significant proportion of a population** of the species (i.e. 0.1% or 1%).

6.10.1.10 A Significant impact assessment

The Project is **unlikely to result in a significant impact** on the black-faced monarch (migratory under the EPBC Act) (Table 6.10). A significance of impact assessment has been undertaken against the Commonwealth Significant impact guidelines 1.1. (DoE 2013).

Table 6.10 Significant impact assessment – black-faced monarch

Significant impact criteria	Assessment	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	**Unlikely**	The Project area is not located within 'important habitat' as defined by the Commonwealth draft referral guidelines (DoE 2015). Accordingly, the Project has avoided any impact on important habitat for the species. The Project footprints have been designed to reduce impacts to surrounding habitat values through the selection of optimal bridge locations and improved bridge designs. The Project will result in the loss of 0.38 ha of suitable habitat for the black-faced monarch. Large tracts of potential habitat is available within the local and regional landscape in protected areas (i.e. Dorrigo National Park, Bellinger River National Park, New England National Park). Within this context, the loss of 0.38 ha of habitat is unlikely to substantially modify, destroy or isolate the species. The project footprint for the bridges will be generally restricted to include the existing cleared road easement, reducing the area of impact to habitat and minimising degradation of habitat and associated runoff. Strict environmental controls and management actions will be implemented, including an EMP to avoid and minimise the potential for proposed construction works to degrade the surrounding environment. The Project is considered unlikely to substantially modify, destroy, or isolate an area of habitat.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	**Unlikely**	Feral cats and European foxes are known occur in the area. Both species represent invasive species that are harmful to migratory species and increase predation pressure of species resting within the study area. Considering the species are already locally established, the Project is unlikely to introduce additional invasive fauna to the investigation areas. In addition, the Project will implement a Weed and Pest Management Plan in order to reduce the occurrence of pest species within the local region. Invasive flora species poses a threat to migratory species through the degradation of habitat and potential impacts to foraging resources. The risk of invasive flora species has been addressed by the requirement of weed and seed declaration for all vehicles on site. Additionally, weed management practiced implemented, targeted towards reducing weed abundance and encroachment into the area.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	**Unlikely**	The local population is not likely to meet the definition for an 'ecologically significant proportion of the population'. The Project will impact on low value areas of habitat in areas of predominantly non-remnant habitat that have been subject to historical clearing and would not represent important habitat. Given the abundance of important habitat persisting in areas adjacent to the study area, the Project would not disrupt the life cycle of an ecologically significant proportion of the black-faced monarch.

7. Conclusion

This report has been prepared to identify and assess any potential impacts to MNES from the activities associated with the construction and operation of the Project, which involves the replacement of four existing timber bridges with new concrete structures within the Bellinger and Kalang rivers in the Bellingen LGA.

Ecological assessments undertaken for the project area identified the following MNES that were assessed as confirmed present or likely to occur within the project area:

- Bellinger River snapping turtle
- Grey-headed flying-fox
- Giant barred frog
- Black-faced monarch

The construction of the Project will result in temporary disturbance to the bed and banks of the waterways and minor permanent disturbance including removal of vegetation to construct the bridge abutments and upgrade the road approaches to each bridge. Additional project works that may impact MNES include earthworks, topsoil handling and stockpiling, use and storage of hazardous materials and general construction activities causing increased dust, light, noise and vibration. The impacts to MNES may include:

- Loss or degradation of habitat
- Injury or mortality to fauna
- Noise and vibration disturbance
- Water quality degradation
- Temporary restriction of instream connectivity
- Introduction and spread of invasive weeds and pests
- Exacerbation of infectious disease

The project design has minimised the amount of vegetation clearing to the extent required for the proposed new bridges and realignment of road approaches. The primary avoidance measure used is increasing the bridge spans to avoid bridge piers and construction works in the low flow channel. The outcome of this is to reduce vegetation clearing and the impact to species (Bellinger River snapping turtle) habitat. The Project will result in potential impacts to the areas of habitat shown in Table 7.1.

Table 7.1 Summary of habitat impacted by the Project

Species	Habitat impacted (ha)				
	Justins Bridge	Joyces Bridge	Hobarts Bridge	Duffys Bridge	Total
Bellinger River snapping turtle	0.012	0.024	0.015	0.014	**0.064**
Grey-headed flying-fox	0.000	0.000	0.010	0.000	**0.010**
Giant barred frog	0.025	0.081	0.025	0.035	**0.166**
Black-faced monarch	0.048	0.103	0.114	0.092	**0.358**

A SIA was undertaken for each MNES assessed as confirmed present or likely to occur in the project area. The Bellinger River snapping turtle is considered highly susceptible due to the impact of the ‘Bellinger River virus’, any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals. As such, a precautionary approach has been taken for the project with regard to the design of the bridge structures and the proposed construction methodology, equipment and program. The SIAs found that all species are unlikely to have a significant residual impact as a result of the Project.

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Appendix A

Protected Matters Search Tool results

Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 19-Dec-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	54
Listed Migratory Species:	15

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	22
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	2
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area	In feature area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area	In feature area
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia			
Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Atrichornis rufescens			
Rufous Scrub-bird [655]	Endangered	Species or species habitat may occur within area	In buffer area only
Botaurus poiciloptilus			
Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In feature area
FROG			
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat known to occur within area	In feature area
Philoria sphagnicola Sphagnum Frog [59709]	Vulnerable	Species or species habitat likely to occur within area	In feature area
INSECT			
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In feature area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat likely to occur within area	In feature area
MAMMAL			
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat likely to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Notamacropus parma Parma Wallaby [89289]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
PLANT			
Acronychia littoralis			
Scented Acronychia [8582]	Endangered	Species or species habitat may occur within area	In feature area
Arthraxon hispidus			
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Bertya sp. Clouds Creek (M.Fatemi 4)			
[84675]	Endangered	Species or species habitat may occur within area	In buffer area only
Coleus nitidus listed as Plectranthus nitidus			
Nightcap Plectranthus, Silver Plectranthus [91380]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Cryptostylis hunteriana			
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area	In feature area
Cynanchum elegans			
White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In feature area
Haloragis exalata subsp. velutina			
Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hicksbeachia pinnatifolia			
Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat known to occur within area	In feature area
Leichhardtia longiloba listed as Marsdenia longiloba			
Clear Milkvine [91911]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macadamia integrifolia			
Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area	In feature area
Parsonsia dorrigoensis			
Milky Silkpod [64684]	Endangered	Species or species habitat known to occur within area	In feature area
Persicaria elatior			
Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In feature area
Phaius australis			
Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area	In feature area
Rhodamnia rubescens			
Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Rhodomyrtus psidioides			
Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Sarcochilus fitzgeraldii			
Ravine Orchid [19131]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Syzygium hodgkinsoniae			
Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat may occur within area	In feature area
Thesium australe			
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii			
[40080]	Endangered	Species or species habitat likely to occur within area	In feature area
REPTILE			
Coeranoscincus reticulatus			
Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Myuchelys georgesi listed as Wollumbinia georgesi			
Bellinger River Snapping Turtle, Georges' Snapping Turtle, Georges Helmeted Turtle, [88103]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus			
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus			
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis			
Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca			
Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster			
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Sterna striata			
White-fronted Tern [799]		Migration route may occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

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Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
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Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
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Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

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This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

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4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 19-Dec-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	58
Listed Migratory Species:	15

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	21
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	2
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	2
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties

[Resource Information]

Name	State	Legal Status	Buffer Status
Gondwana Rainforests of Australia	QLD	Declared property	In buffer area only

National Heritage Places

[Resource Information]

Name	State	Legal Status	Buffer Status
Natural			
Gondwana Rainforests of Australia	NSW	Listed place	In buffer area only

Listed Threatened Ecological Communities

[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area	In feature area
Dunn's white gum (Eucalyptus dunnii) moist forest in north-east New South Wales and south-east Queensland	Endangered	Community may occur within area	In buffer area only
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area	In feature area
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	Community may occur within area	In feature area

Listed Threatened Species

[Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia			
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Atrichornis rufescens Rufous Scrub-bird [655]	Endangered	Species or species habitat known to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In feature area
FROG			
Litoria subglandulosa Glandular Frog [1807]	Vulnerable	Species or species habitat may occur within area	In feature area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat known to occur within area	In feature area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Philoria sphagnicola Sphagnum Frog [59709]	Vulnerable	Species or species habitat likely to occur within area	In feature area
INSECT			
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In feature area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Notamacropus parma			
Parma Wallaby [89289]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area	In feature area
Pseudomys oralis			
Hastings River Mouse, Koontoo [98]	Endangered	Species or species habitat may occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
PLANT			
Arthraxon hispidus			
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Bertya sp. Clouds Creek (M.Fatemi 4) [84675]	Endangered	Species or species habitat may occur within area	In buffer area only
Callistemon pungens [55581]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Coleus nitidus listed as Plectranthus nitidus Nightcap Plectranthus, Silver Plectranthus [91380]	Endangered	Species or species habitat may occur within area	In feature area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area	In feature area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In feature area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
Gingidia rupicola Mountain Angelica, Broad-leafed Carrot [86880]	Endangered	Species or species habitat may occur within area	In feature area
Haloragis exalata subsp. velutina Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat may occur within area	In feature area
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat known to occur within area	In feature area
Leichhardtia longiloba listed as Marsdenia longiloba Clear Milkvine [91911]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area	In feature area
Neoastelia spectabilis [6404]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat known to occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In feature area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Sarcochilus fitzgeraldii Ravine Orchid [19131]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii [40080]	Endangered	Species or species habitat likely to occur within area	In feature area
REPTILE			
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Harrisoniascincus zia			
Rainforest Cool-skink [84785]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Myuchelys georgesi listed as Wollumbinia georgesi			
Bellinger River Snapping Turtle, Georges' Snapping Turtle, Georges Helmeted Turtle, [88103]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus			
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus			
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis			
Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca			
Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area

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Motacilla flava			
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Pterodroma cervicalis			
White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons			
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Rostratula australis as Rostratula benghalensis (sensu lato)			
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Sterna striata			
White-fronted Tern [799]		Migration route may occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Bellinger River	National Park	NSW	In feature area
Dorrigo	National Park	NSW	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
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- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 19-Dec-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	58
Listed Migratory Species:	15

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	21
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	2
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	2
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Legal Status	Buffer Status
Gondwana Rainforests of Australia	QLD	Declared property	In buffer area only

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Natural			
Gondwana Rainforests of Australia	NSW	Listed place	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area	In feature area
Dunn's white gum (Eucalyptus dunnii) moist forest in north-east New South Wales and south-east Queensland	Endangered	Community may occur within area	In buffer area only
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area	In feature area
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	Community may occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia			
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Atrichornis rufescens Rufous Scrub-bird [655]	Endangered	Species or species habitat known to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In feature area
FROG			
Litoria subglandulosa Glandular Frog [1807]	Vulnerable	Species or species habitat may occur within area	In feature area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat known to occur within area	In feature area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Philoria sphagnicola Sphagnum Frog [59709]	Vulnerable	Species or species habitat likely to occur within area	In feature area
INSECT			
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In feature area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Notamacropus parma			
Parma Wallaby [89289]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area	In feature area
Pseudomys oralis			
Hastings River Mouse, Koontoo [98]	Endangered	Species or species habitat may occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
PLANT			
Arthraxon hispidus			
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Bertya sp. Clouds Creek (M.Fatemi 4) [84675]	Endangered	Species or species habitat may occur within area	In buffer area only
Callistemon pungens [55581]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Coleus nitidus listed as Plectranthus nitidus Nightcap Plectranthus, Silver Plectranthus [91380]	Endangered	Species or species habitat may occur within area	In feature area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area	In feature area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In feature area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
Gingidia rupicola Mountain Angelica, Broad-leafed Carrot [86880]	Endangered	Species or species habitat may occur within area	In feature area
Haloragis exalata subsp. velutina Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat may occur within area	In feature area
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat known to occur within area	In feature area
Leichhardtia longiloba listed as Marsdenia longiloba Clear Milkvine [91911]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area	In feature area
Neoastelia spectabilis [6404]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat known to occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In feature area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Sarcochilus fitzgeraldii Ravine Orchid [19131]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii [40080]	Endangered	Species or species habitat likely to occur within area	In feature area
REPTILE			
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Harrisoniascincus zia			
Rainforest Cool-skink [84785]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Myuchelys georgesi listed as Wollumbinia georgesi			
Bellinger River Snapping Turtle, Georges' Snapping Turtle, Georges Helmeted Turtle, [88103]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus			
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus			
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis			
Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca			
Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca			
Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pandion haliaetus			
Osprey [952]		Species or species habitat known to occur within area	In feature area
Pterodroma cervicalis			
White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Sterna striata			
White-fronted Tern [799]		Migration route may occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Bellinger River	National Park	NSW	In feature area
Dorrigo	National Park	NSW	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Telecommunications Cable Installation	2001/223	Not Controlled Action	Completed	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
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-Ocean Biogeographic Information System
-Australian Government, Department of Defence
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-Australian Tropical Herbarium, Cairns
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-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

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Please feel free to provide feedback via the Contact us page.

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 19-Dec-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	52
Listed Migratory Species:	14

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	3
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	2
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Legal Status	Buffer Status
Gondwana Rainforests of Australia	QLD	Declared property	In buffer area only

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Natural			
Gondwana Rainforests of Australia	NSW	Listed place	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within area	In buffer area only
Dunn's white gum (Eucalyptus dunnii) moist forest in north-east New South Wales and south-east Queensland	Endangered	Community may occur within area	In buffer area only
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area	In feature area
New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands	Critically Endangered	Community may occur within area	In buffer area only
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	Endangered	Community may occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
Atrichornis rufescens Rufous Scrub-bird [655]	Endangered	Species or species habitat likely to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Melanodryas cucullata cucullata			
South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Rostratula australis			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata			
Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
Turnix melanogaster			
Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In feature area
FROG			
Mixophyes balbus			
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Mixophyes iteratus			
Giant Barred Frog, Southern Barred Frog [1944]	Vulnerable	Species or species habitat known to occur within area	In feature area
Philoria sphagnicola			
Sphagnum Frog [59709]	Vulnerable	Species or species habitat likely to occur within area	In feature area
INSECT			
Argynnis hyperbius inconstans			
Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
Chalinolobus dwyeri			
Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat likely to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Notamacropus parma			
Parma Wallaby [89289]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area	In feature area
Pseudomys oralis			
Hastings River Mouse, Koontoo [98]	Endangered	Species or species habitat may occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
PLANT			
Arthraxon hispidus			
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area	In feature area
Bertya sp. Clouds Creek (M.Fatemi 4)			
[84675]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Callistemon pungens [55581]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Chiloglottis anaticeps Duck's-head Wasp-orchid [55027]	Endangered	Species or species habitat may occur within area	In buffer area only
Coleus nitidus listed as Plectranthus nitidus Nightcap Plectranthus, Silver Plectranthus [91380]	Endangered	Species or species habitat known to occur within area	In feature area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In feature area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
Haloragis exalata subsp. velutina Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Leichhardtia longiloba listed as Marsdenia longiloba Clear Milkvine [91911]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area	In feature area
Neoastelia spectabilis [6404]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat likely to occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhodamnia rubescens			
Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Rhodomyrtus psidioides			
Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Sarcochilus fitzgeraldii			
Ravine Orchid [19131]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thesium australe			
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area
Vincetoxicum woollsii listed as Tylophora woollsii			
[40080]	Endangered	Species or species habitat likely to occur within area	In feature area
REPTILE			
Coeranoscincus reticulatus			
Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area	In feature area
Harrisoniascincus zia			
Rainforest Cool-skink [84785]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Myuchelys georgesi listed as Wollumbinia georgesi			
Bellinger River Snapping Turtle, Georges' Snapping Turtle, Georges Helmeted Turtle, [88103]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus			
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Sterna striata			
White-fronted Tern [799]		Migration route may occur within area	In buffer area only
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Baalijin	Nature Reserve	NSW	In feature area
Bellinger River	National Park	NSW	In buffer area only
New England	National Park	NSW	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Telecommunications Cable Installation	2001/223	Not Controlled Action	Completed	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix B

Likelihood of occurrence assessment

Scientific name	Common name	EPBC Act status	Distribution and habitat requirements	Likelihood of occurrence			
				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Flora							
Acronychia littoralis	Scented acronychia	E	Scented Acronychia is found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW, within 2 km of the coast on sandy soil. Scented Acronychia occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.
Arthraxon hispidus	Hairy-joint grass	V	Scattered locations through SE QLD and northern coast and tablelands of NSW to Kempsey and inland to Glen Innes. Found in or on the edges of rainforest and wet eucalypt forest, often near creeks or swamps. Also recorded in woodland, or around freshwater springs on coastal foreshore dunes, gullies, and creek banks and on creek beds in open forests.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.
Asperula asthenes	Trailing woodruff	V	Occurs in scattered locations from Bulahdelah to Kempsey. Some records from Port Stephens/Wallis Lakes area. Occurs in damp sites, often along riverbanks.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Bertya sp. Clouds Creek (M. Fatemi 4)	-	E	A 3 m tall hairy stemmed shrub that only occurs in NSW west of the Great Dividing Range. The species occurs in low shrubland or heath, surrounded by eucalypts. It mainly grows on rocky, steep slopes within shallow soil. Flowers after August and are still in seed-set between January to February.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Callistemon pungens	-	E	In NSW, occurs on the northern tablelands from Inverell to the eastern escarpment in New England NP. Habitats range from riparian areas dominated by Casuarina cunninghamiana subsp. cunninghamiana to woodland and rocky shrubland and if often observed growing along rocky watercourses with sandy granite or basalt creek beds. Flowers over spring and summer.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Chiloglottis anaticeps	Duck's-head wasp-orchid	E	Known from three subpopulations at Barokee (Cathedral Rock National Park), Mooraback (Werrikimbe National Park) and Hastings Forest Way (Werrikimbe National Park) in NSW. All subpopulations occur at high elevation (800 to 1,400 m above sea level).	**Unlikely to occur** The project area is not within a known area containing the species. The project area is below 100 m above sea level. The species has not been historically recorded within 5 km and suitable habitat is absent from the project footprint. As such the species is unlikely to occur.	**Unlikely to occur** The project area is not within a known area containing the species. The project area is below 100 m above sea level. The species has not been historically recorded within 5 km and suitable habitat is absent from the project footprint. As such the species is unlikely to occur.	**Unlikely to occur** The project area is not within a known area containing the species. The project area is below 100 m above sea level. The species has not been historically recorded within 5 km and suitable habitat is absent from the project footprint. As such the species is unlikely to occur.	**Unlikely to occur** The project area is not within a known area containing the species. The project area is below 100 m above sea level. The species has not been historically recorded within 5 km and suitable habitat is absent from the project footprint. As such the species is unlikely to occur.
Coleus nitidus listed as *plectranthus nitidus*	Nightcap plectranthus	E	This species is a multi-stemmed herb forming small clumps 30 – 0150 cm tall. It forms small clumps in gullies and on boulders in rainforest or open forest on the margins of rainforest (DEWHA, 2008). Its distribution is restricted to southeast Queensland northeast New South Wales, occurring from Nightcap Range north to the McPherson Range.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.

Scientific name	Common name	EPBC Act status	Distribution and habitat requirements	Likelihood of occurrence			
				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Cryptostylis hunteriana	Leafless tongue-orchid	V	Occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences not well defined. Grows mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with Large Tongue Orchid and the Bonnet Orchid. Soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. Flowers November-February.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Cynanchum elegans	White-flowered wax plant	E	This species is a climbing plant with a variable form. This species is found from Gloucester district to the Wollongong area and inland to Mt Dangar. It is often found in ecotones between dry subtropical rainforest and sclerophyll forest/woodland communities from Brunswick Heads to the Illawarra region (DEWHA, 2008).	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.
Euphrasia arguta	-	CE	Recently rediscovered near Nundle on the north-western slopes and tablelands, once known from scattered locations between Sydney, Bathurst and Walcha. Known populations occur in eucalypt forest with a mixed grass/shrub understorey, while previous records are described as occurring in open forest, grassy country and river meadows. Dense stands observed in cleared firebreak areas, suggesting it may respond well to disturbance.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Gingidia rupicola	Mountain Angelica	E	Endemic to NSW and known from only two locations within New England National Park. Occurs in Snow Gum (Eucalyptus pauciflora) Woodland and at the edge of Antarctic Beech (Nothofagus moorei) forest. Grows in humic soil in pockets in ledges or cracks in basalt or trachyte rocks, mostly on cliff faces at altitudes of 1400–1750 m above sea level.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Haloragis exalata subsp. velutina	Tall velvet sea-berry	V	Occurs on the north coast of NSW, and is abundant in inaccessible areas of the Macleay River. Grows in damp places near watercourses, in woodland on steep rocky slopes of gorges.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Hicksbeachia pinnatifolia	Red boppel nut	V	Occurs in the coastal areas of north-east NSW from the Nambucca Valley north to south-east Queensland. Occurs in subtropical rainforest, moist eucalypt forest and Brush Box forest. The species usually habitats flat to gently inclined valley flats to steeply inclined slopes and hillcrests. Soils are generally slightly acidic loams derived from basalt (Weston, 1995).	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.
Leichhardtia longiloba listed as Marsdenia longiloba	Clear milkvine	V	Scattered sites on the north coast of NSW north from Barrington Tops to QLD. Grows in subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and in areas with rocky outcrops. Associated species include *Eucalyptus crebra, E. microcorys, E. acmenoides, E. saligna, E. propinqua, Corymbia intermedia and Lophostemon confertus.*	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.

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				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Macadamia integrifolia	Macadamia nut	V	Found in remnant rainforest in northern NSW and south-east Queensland, preferring partially open areas such as rainforest edges. While specimens have been collected from the North Coast of NSW, this species is not known to occur naturally in NSW.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Neoastelia spectabilis	Silver sword lily	V	This soft-stemmed lily-like plant is only found in New South Wales, specifically in the New England National Park which occurs on the eastern edge of the New England Tablelands. It is associated in Antarctic Beech rainforest, often growing in rocky crevices near waterfalls and seepage lines on rocky slopes. It occurs in altitudes between 900 - 1150 m.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Parsonsia dorrigoensis	Milky silkpod	E	Scattered populations on the north coast between Kendall and Woolgoolga. Grows on brown clay soils in subtropical and warm temperate rainforest, on rainforest margins and in moist eucalypt forest up to 800 m asl. Has a preference for more open areas and forest edges.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.
Phaius australis	Lesser swamp-orchid	E	Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Grows in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Persicaria elatior	Knotweed	V	Recorded in south-eastern NSW from Ulladulla to the Victorian border. Known from Raymond Terrace and the Grafton area in northern NSW. Normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Rhodamnia rubescens	Scrub turpentine	CE	Occurs in coastal districts north from Batemans Bay in New South Wales to areas inland of Bundaberg in Queensland. Populations typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000 -1,600 mm. Found in littoral, warm temperate and subtropical rainforest, and wet sclerophyll forest usually on volcanic and sedimentary soils. Highly to extremely susceptible to infection by Myrtle Rust.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.
Rhodomyrtus psidioides	Native guava	CE	Occurs from Broken Bay, approximately 90 km north of Sydney, to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation and also occur up to approximately 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Pioneer species found in littoral, warm temperate and subtropical rainforest, and wet sclerophyll forest often near creeks and drainage lines. Extremely susceptible to infection by Myrtle Rust.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.

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Sarcochilus fitzgeraldii	Ravine orchid	V	Occurs north-east NSW, north of the Macleay River, to Maleny in south-east Queensland. Grows mainly on rocks, amongst organic matter, in cool, moist, shady ravines, gorges and on cliff faces in dense subtropical rainforest at altitudes between 500 and 700 m. Occasional clumps are found on the bases of fibrous-barked trees.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** Suitable habitat for the species occurs within the Project footprint, however there are historical records within 5 km of the Project and the species may occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Syzygium hodgkinsoniae	Smooth-bark rose apple, red lilly pillly	V	Syzygium hodgkinsoniae has a distribution from Richmon River (NSW) to Maleny and Kin Kin (QLD), with disjunct populations in Kuranda and Gordonvale (QLD). S. hodgkinsoniae occurs in riverine subtropical or gallery rainforests on deep rich alluvial and basalt soils at altitudes up to 300 m (Barry & Thomas, 1994; Floyd, 1989; Hyland, 1983; NSW DECCW, 2005; Sheringham & Westaway, 1995; Stanley & Ross, 1986).	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Thesium austral	Austral toadflax	V	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Occurs in grassland or grassy woodland, and is often found in association with Kangaroo Grass.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Vincetoxicum woollsii listed as *Tylophora woollsii*	-	E	This species is a slender, woody climber growing up to 3 m long. It is found in the New South Wales north coast and New England Tablelands, north to southern Queensland. It grows in moist eucalypt forest, moist sites in dry eucalypt forests and rainforest margins (OEH, 2020).	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.
Fauna							
Amphibians							
Litoria subglandulosa	Glandular frog	V	Known only from stream habitats on the eastern escarpment of the Great Dividing Range from the “The Flags” near Walcha in the south to Girraween National Park in the north, a distance of about 250 km. Glandular Frogs may be found along streams in rainforest, moist and dry eucalypt forest or in subalpine swamps.	**May occur** The broader Project Area may support suitable breeding habitat. The species has been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area may support suitable breeding habitat. The species has been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.
Mixophyes balbus	Stuttering frog	V	This large frog is found along the east coast of Australia from Southern Queensland to north-east Victoria. Their preferred habitat is rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has not been recorded within 5 km of the Project footprint however has the potential to occur.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has been recorded within 5 km of the Project footprint and has the potential to occur.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has not been recorded within 5 km of the Project footprint however has the potential to occur.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has been recorded within 5 km of the Project footprint and has the potential to occur.

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				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Mixophyes iteratus	Giant barred frog	V	Distributed along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains. Stronghold in northern NSW, particularly the Coffs Harbour-Dorrigo area. Typically found along freshwater streams with permanent or semi-permanent water, generally at lower elevation. Favours moist riparian habitats such as rainforest or wet sclerophyll forest for the deep leaf litter which provides shelter and foraging. Sometimes occur in other riparian habitats with drier forest or degraded riparian remnants, and occasionally around dams.	**Confirmed present** One adult was confirmed present on one night of surveys. This individual was recorded atop of *Lantana camera* and broad-leaved privet leaf litter. This site is likely to also provide breeding habitat for the species.	**Confirmed present** A metamorph was recorded on one night of the survey, on the edge of the water. This site provides occupied breeding habitat for the species. While no adults were detected (likely due high noise levels from rapids and inaccessibility issues to areas around the existing bridge) the location is also likely to provide foraging and refuge habitat for the species.	**Confirmed present** Adults were recorded on all four nights of surveys on both banks of the river. Each individual was recorded atop leaf litter of *Casuarina cunninghamiana* needles. This site is likely to provide breeding habitat for the species.	**Confirmed present** Adults were recorded on all four nights of surveys on both banks of the river. The individuals were recorded atop leaf litter of *Casuarina cunninghamiana* needles or in a paddock on the edge of the bridge. This site is likely to provide breeding habitat for the species.
Philoria sphagnicola	Sphagnum frog	V	Occurs as a series of fragmented populations along the eastern escarpment of the Great Dividing Range in north-east NSW from Chaelundi State Forest south to Killabakh Nature Reserve near Comboyne. Habitat characterised by high moisture levels. Typically found in high rainfall areas at high elevation in Sphagnum Moss beds or seepages on steep slopes. Habitat often occurs in rainforest (including Antarctic Beech forest) and wet sclerophyll forest. Also occur at lower elevation (to about 250 m) in wet coastal foothills.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat was absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat was absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat was absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat was absent from the Project footprint. As such, the species is unlikely to occur.
Birds							
Anthochaera phrygia	Regent honeyeaster	CE	Mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. Very patchy distribution in NSW, mainly confined to the two main breeding areas and surrounding fragmented woodlands. Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests.	**Unlikely to occur** No suitable habitat for the species occurs within the Project footprint, and the species was not identified during the field survey. No historical records occur within 5 km.	**Unlikely to occur** No suitable habitat for the species occurs within the Project footprint, and the species was not identified during the field survey. No historical records occur within 5 km.	**Unlikely to occur** No suitable habitat for the species occurs within the Project footprint, and the species was not identified during the field survey. No historical records occur within 5 km.	**Unlikely to occur** No suitable habitat for the species occurs within the Project footprint, and the species was not identified during the field survey. No historical records occur within 5 km.
Atrichornis rufescens	Rufous Scrub-bird	E	Found above 600 m sea level in north-eastern NSW, including subtropical, warm temperate and cool temperate rainforests, and nearby moist and wet eucalypt forests. Requires dense ground cover, a moist microclimate at ground level and abundant leaf litter, which is usually restricted to ecotones, forested watercourses and wetlands, and areas regenerating from fires, storms or along roadsides.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Botaurus poiciloptilus	Australasian bittern	E	Occurs within eastern and south-eastern Australia. Considered uncommon throughout much of its range (Pizzey and Knight, 1999). Occurs in and about water in reedbeds, sedges and rushes (Menkhorst et al., 2019). Occasionally seen in tussock paddocks, saltmarshes, and brackish wetlands.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Calidris ferruginea	Curlew sandpiper	CE	Distributed around most of the Australian coastline. Occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. Migrates to Australia for the non-breeding period, arriving between August and November, and departing between March and mid-April. Generally occupies littoral and estuarine habitats, and is mainly found in intertidal mudflats of sheltered coasts in NSW. Also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. Forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Calyptorhynchus lathami lathami	South-eastern glossy black-cockatoo	V	Uncommon although widespread throughout suitable forest and woodland habitats. Occurs from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species).	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.
Charadrius leschenaultia	Greater sand plover	V	Breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. The species is almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Climacteris picumnus victoriae	Brown treecreeper (south-eastern subspecies)	V	Brown treecreepers (south-eastern) are endemic to south-eastern Australia from the Grampians in western Victoria, through central New South Wales to the Bunya Mountains in Queensland (DCCEEW, 2023). The subspecies mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. They also occur in mallee, forests, and woodlands subject to periodic inundation (DCCEEW, 2023).	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Erythrotriorchis radiatus	Red goshawk	V	The red goshawk is widely distributed throughout northern and eastern Australia, particularly in a wide coastal strip along eastern Queensland, through to Cape York and the Northern Territory / Kimberly. The species occurs in a range of habitats, often at ecotones, including coastal and sub-coastal tall open forests, tropical savannahs crossed by wooded or forested watercourses, woodlands, edges of rainforests and gallery forests along watercourses, and wetlands that include Melaleuca and Casuarina species (Menkhorst et al., 2019). The species typically nests in tall trees within 1 km of permanent water and favours habitats that support a high abundance of bird species (Pizzey and Knight, 1999).	**May occur** Suitable habitat for the species occurs within the broader Project Area of the Project footprint, however there are no historical records within 5 km of the Project. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within the broader Project Area of the Project footprint, however there are no historical records within 5 km of the Project. The species is highly mobile and may occur temporarily.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

Scientific name	Common name	EPBC Act status	Distribution and habitat requirements	Likelihood of occurrence			
				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Falco hypoleucos	Grey falcon	V	The grey flacon is an elusive species that occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia. The species is mainly found where annual rainfall is less than 500 mm, except when wet years are followed by drought, when the species may become marginally more widespread, although it is essentially confined to the arid and semi-arid zones at all times. The species appears to be absent from Cape York Peninsula, areas east of the Great Dividing Range in Queensland and NSW, south of the Great Dividing Range in Victoria, and south of latitude 26°S in Western Australia.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Grantiella picta	Painted honeyeater	V	Nomadic species occurring at low densities throughout its range. Most commonly found on the inland slopes of the Great Dividing Range in NSW, where almost all breeding occurs. More likely to be found in the north of its distribution in winter. Inhabits Boree/Weeping Myall (Acacia pendula), Brigalow (A. harpophylla) and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Hirundapus caudacutus	White-throated needletail	V, Mi	Almost exclusively aerial, it does prefer wooded, inland areas and heathland. In coastal areas they have been seen flying over mudflats and beaches. Widespread throughout eastern and south-eastern Australia. It has been recorded long all coastal regions of QLD and NSW (Menkhorst et al., 2019). Breeds in eastern Siberia, north-eastern China and Japan between August to October and arrives in Australia during September and October. Upon arrival they move south along both sides of the Great Dividing Range in QLD and NSW. They head north again, passing through QLD in February and March (DCCEEW, 2023).	**May occur** The species has been historically recorded within 5 km of the Project. The species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions. Unlikely to be a permanent occupant.	**May occur** The species has been historically recorded within 5 km of the Project. The species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions. Unlikely to be a permanent occupant.	**May occur** The species has been historically recorded within 5 km of the Project. The species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions. Unlikely to be a permanent occupant.	**May occur** The species has been historically recorded within 5 km of the Project. The species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions. Unlikely to be a permanent occupant.
Lathamus discolor	Swift parrot	CE	The swift parrot breeds in Tasmania during the summer, before migrating north to mainland Australia for the winter (DCCEEW, 2023). The species inhabits dry sclerophyll forests and woodlands, particularly areas supporting winter-flowering species (DCCEEW, 2023). Mostly recorded in box-ironbark woodlands (Menkhorst et al., 2019). Routinely returns to winter foraging habitat.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** Suitable habitat for the species occurs within broader locality of the Project footprint. The species was not identified during the field survey. Historical records occur within 5 km of the Project and the species may occur.
Melanodryas cucullate cucullate	South-eastern hooded robin	E	Found throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies picata. Prefers lightly wooded country, usually open eucalypt woodland, Acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Neophema chrysostoma	Blue-winged parrot	V	During the non-breeding period, from autumn to early spring, birds are recorded in western NSW, with some reaching south-eastern NSW, particularly on the southern migration. Inhabits a range of habitats from coastal, sub-coastal and inland areas, through to semi-arid zones. Tends to favour grasslands and grassy woodlands, often found near wetlands both near the coast and in semi-arid zones. Sometimes seen in altered environments such as airfields, golf-courses and paddocks. Pairs or small parties forage mainly near or on the ground for seeds of a wide range of native and introduced grasses, herbs and shrubs.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.
Numenius madagascariensis	Eastern curlew	CE	Occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. Generally occupies coastal lakes, inlets, bays and estuarine habitats, and is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts in NSW. Rarely seen inland.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.
Rostratula australis	Australian painted snipe	E	The Australian painted snipe has a broad distribution across, though is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland, NSW, and Victoria (DCCEEW, 2023). The species generally inhabits shallow, terrestrial freshwater wetlands, including temporary and permanent lakes, swamps, claypans and waterlogged grasslands (DCCEEW, 2023, Menkhorst et al., 2019). Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum (DCCEEW, 2023) A rare species seldom seen.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Stagonopleura guttata	Diamond firetail	V	Widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. Scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities, and often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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Turnix melanogaster	Black-breasted button-quail	V	Endemic to south-eastern Queensland and far north-eastern NSW, at scattered sites from the Byfield region south to the Border Ranges and mainly on and east of the Great Divide but extending inland to the inner western slopes, up to 300 km from the coast. The species is rare in NSW, it hasn't been detected in NSW since 2000 and ecological requirements are largely unknown. Preferred habitat includes drier low closed forests, including dry rainforests, vine forest and vine thickets, often in association with Hoop Pine, and Bottletree scrubs. The understorey may be dense or sparse, but a deep, moist leaf-litter layer, in which the birds forage, is an important component of habitat. Birds have been recorded using Lantana thickets at edges of rainforest or Lantana understorey of forest or rainforest, but it is not known if Lantana associations are suitable for sustaining breeding.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.
Insects							
Argynnis hyperbius inconstans	Australian fritillary	CE	Open, swampy, coastal areas where the larval food plant, *Viola betonicifolia*, occurs; usually in association with *Lomandra longifolia* and grasses, especially Bladey Grass.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Phyllodes imperialis smithersi	Pink underwing moth	E	This moth is typically found below 600 m altitude in subtropical rainforest on fertile alluvium and rich volcanic soils. It occurs in association with the vine *Carronia multisepalea*, a vine which is needed for this species to breed.	**May occur** The broader Project Area of the Project footprint may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area of the Project footprint may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area of the Project footprint may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area of the Project footprint may support suitable breeding habitat. The species has been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.
Mammals							
Chalinolobus dwyeri	Large-eared pied bat	E	The large-eared pied bat occurs in eastern Australia, from Rockhampton to Canberra (DCCEEW, 2023). The species roosts in sandstone cliffs, rock outcrops and woodland valleys and requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging. In south-east Queensland, the species is known from rainforest and moist eucalypt forest habitats at high elevation (DCCEEW, 2023).	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km. The species may occur temporarily.	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km. The species may occur temporarily.	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km. The species may occur temporarily.	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km. The species may occur temporarily.
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tail quoll	E	The spotted-tailed quoll is found along both sides of the Great Dividing Range from the Victorian to the Queensland borders (DCCEEW, 2023). Prefers mature wet forest habitat, though known to inhabit a range of forest environments, from rainforest to open woodland (EOH, 2023). They require forests with suitable den sites such as rock crevices, caves, hollow logs, burrows, and tree hollows.	**May occur** This species was not observed during field surveys or remote camera survey efforts. There are no historical records within 5 km of the Project footprint however there is suitable denning habitat within the broader Project Area. The species has a large home range and may occur temporarily.	**May occur** This species was not observed during field surveys or remote camera survey efforts. There are no historical records within 5 km of the Project footprint however there is suitable denning habitat within the broader Project Area. The species has a large home range and may occur temporarily.	**May occur** This species was not observed during field surveys or remote camera survey efforts. There are no historical records within 5 km of the Project footprint however there is suitable denning habitat within the broader Project Area. The species has a large home range and may occur temporarily.	**May occur** This species was not observed during field surveys or remote camera survey efforts. There are no historical records within 5 km of the Project footprint however there is suitable denning habitat within the broader Project Area. The species has a large home range and may occur temporarily.

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Notamacropus parma	Parma wallaby	V	Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.
Petauroides Volans	Greater glider (southern and central)	V	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria. This species is largely restricted to tall, mature, eucalypt forests and woodlands (DCCEEW, 2023; Eyre et al., 2022). Species requires abundance of hollow- bearing trees which provide den sites and is generally restricted to extensive forest networks larger than 160 km2 (DCCEEW, 2023).	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Petaurus australis australis	Yellow-bellied glider (southern-eastern)	V	The yellow-bellied glider has a widespread but patchy distribution from south-eastern Queensland to the SA-Victoria border (DCCEEW, 2023). The species occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests (Rees et al. 2007). Yellow-bellied gliders favour large patches of mature old growth forest that provide suitable trees for foraging and shelter, with a preference for forests with a high proportion of winter-flowering and smooth-barked eucalypt. Hollow-bearing trees are a critical habitat feature for the yellow-bellied glider due to their usage as dens.	**May occur** Suitable habitat for the species occurs within the broader locality of the Project footprint, however the species was not identified during the field survey. There are no historical records occur within 5 km of the Project.	**May occur** Suitable habitat for the species occurs within the broader locality of the Project footprint, however the species was not identified during the field survey. There are no historical records occur within 5 km of the Project.	**May occur** Suitable habitat for the species occurs within the broader locality of the Project footprint, however the species was not identified during the field survey. There are no historical records occur within 5 km of the Project.	**May occur** Suitable habitat for the species occurs within the broader locality of the Project footprint, however the species was not identified during the field survey. There are no historical records occur within 5 km of the Project.
Petrogale penicillate	Brush-tailed rock-wallaby	V	Occurs from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. It typically shelters or basks during the day in rock crevices, caves and overhangs and are most active at night when foraging. Browse on vegetation in and adjacent to rocky areas.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**Unlikely to occur** The species has not been historically recorded within 5 km of the Project footprint and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Phascolarctos cinereus	Koala	E	Found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests of NSW, with some smaller populations on the plains west of the Great Dividing Range. Inhabits eucalypt woodlands and forests, and feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but will select preferred browse species in any one area.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur while moving to areas of suitable habitat.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur while moving to areas of suitable habitat.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur while moving to areas of suitable habitat.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur while moving to areas of suitable habitat.

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				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Potorous tridactylus tridactylus	Long-nosed potoroo (northern)	V	Generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns, or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.
Pseudomys novaehollandiae	New Holland mouse	V	Largely restricted to the coast of central and northern NSW, with one inland occurrence near Parkes. Known from Royal National Park (NP), the Kangaroo Valley, Kuringai Chase NP, and Port Stephens's to Evans Head near the Queensland border. Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. Soil type may be an important indicator of suitability of habitat, with deeper top soils and softer substrates being preferred for digging burrows.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**Unlikely to occur** The species has not been historically recorded within 5 km of the Project footprint and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Pseudomys oralis	Hastings River mouse	E	Occurs from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. It typically shelters or basks during the day in rock crevices, caves and overhangs and are most active at night when foraging. Browse on vegetation in and adjacent to rocky areas.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**Unlikely to occur** The species has not been historically recorded within 5 km of the Project footprint and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Pteropus poliocephalus	Grey-headed flying-fox	V	Generally found within 200 km of the eastern coast of Australia, from Rockhampton to Adelaide. May be found in unusual locations in times of natural resource shortage. Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	**May occur** Suitable foraging habitat occurs within broader Project Area. The species has been historically recorded within 5 km. Known to travel large distances to forage and may occur temporarily.	**Confirmed present** Grey-headed flying-fox camp was recorded within 120m of Project footprint. Black Flying-foxes also occur in this camp. This is a maternity camp for both species; dependant young observed, comprising at least 1000 individuals and restricted to a bamboo plantation.	**May occur** Suitable foraging habitat occurs within broader Project Area The species has been historically recorded within 5 km. Known to travel large distances to forage and may occur temporarily.	**May occur** Suitable foraging habitat occurs within broader Project Area. The species has been historically recorded within 5 km. Known to travel large distances to forage and may occur temporarily.
Reptiles							
Coeranoscincus reticulatus	Three-toed snake-tooth skink	V	Occurs on the coast and ranges from the Macleay valley in NSW to south-eastern Queensland. Very uncommon south of Grafton. Inhabits rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. Lives in loose soil, leaf litter and rotting logs, and feeds on earthworms and beetle grubs. Recorded in garden beds and urban yards under leaf litter on alluvial soils.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.

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				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Harrisoniascincus zia	Rainforest cool-skink	V	Recorded from high elevation areas of the Great Dividing Range in two disjunct regions of Queensland and NSW: – Northern region: Southeast Queensland and northeast NSW from Main Range and Yabbra National Parks in the west to Springbrook and Nightcap National Parks in the east – Southern region: Northeast NSW from Guy Fawkes River and Cunnawarra National Parks in the west to Dorrigo National Park in the east All records of the species are from > 500 m elevation, with most occurrences from > 700 m elevation.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Myuchelys georgesi listed as *Wollumbinia georgesi*	Bellinger River snapping turtle	CE	This freshwater turtle is endemic to the Bellinger Catchment on the north coast of New South Wales. It is typically prefers moderate to deep pools with a rocky substrate.	**Likely to occur** Suitable habitat is present within the Project footprint. The species is likely to occur.	**Likely to occur** Suitable habitat is present within the Project footprint. The species is likely to occur.	**Likely to occur** Suitable habitat is present within the Project footprint. The species is likely to occur.	**Likely to occur** Suitable habitat is present within the Project footprint. The species is likely to occur.
Migratory species							
Actitis hypoleucos	Common sandpiper	Mi	Found along all coastlines of Australia and in many areas inland, the species is widespread in small numbers. Uses a wide range of coastal wetlands and some inland wetlands. Mostly found around muddy margins or rocky shores and rarely on mudflats. Often associated with mangroves and sometimes found in areas of mud littered with rocks and snags. Generally foraging in shallow water and on bare soft mud at the edge of wetlands. The species does not breed in Australia.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Apus pacificus	Fork-tailed swift	Mi	Aerial feeder, foraging on insects between 1 m and 300 m above the ground. Widespread and highly mobile during non-breeding season.				
Calidris acuminata	Sharp-tailed sandpiper	Mi	The sharp-tailed sandpiper is a non-breeding visitor to much of Australia, particularly Queensland, New South Wales and central Northern Territory. The species is often encountered in inland freshwater wetlands, but also favours damp grasslands, tidal flats, mangroves and swamp margins.				
Calidris melanotos	Pectoral sandpiper	Mi					
Cuculus optatus	Oriental cuckoo	Mi					
Gallinago hardwickii	Latham's snipe	Mi	Latham's Snipe is a non-breeding visitor to Australia, arriving in south-eastern Australia between August and January. During its migration, the species is encountered along much of eastern Australia. The species often occurs in groups or individually in freshwater wetlands near the coast, preferring dense vegetation cover such as sedges, grasses, lignum, reeds and rushes.				
Monarcha melanopsis	Black-faced monarch	Mi	The black-faced monarch is a wet forest specialist, occurring mainly in rainforest and riparian vegetation. In wet sclerophyll forest the species mostly frequents sheltered gullies and slopes with a dense understorey of ferns and/or shrubs. This habitat description is based on the Commonwealth draft referral guidelines for 14 migratory birds (DoE, 2015).	**Confirmed present** The species was heard calling in the vicinity of Joyces Bridge during surveys for the project. All riparian vegetation with in the study area was considered predicted habitat for the species.	**May to occur** All riparian vegetation with in the study area was considered predicted habitat for the species.	**May to occur** All riparian vegetation with in the study area was considered predicted habitat for the species.	**May to occur** All riparian vegetation with in the study area was considered predicted habitat for the species.
Motacilla flava	Yellow wagtail	Mi					
Myiagra cyanoleuca	Satin flycatcher	Mi					

Scientific name	Common name	EPBC Act status	Distribution and habitat requirements	Likelihood of occurrence			
				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Pandion haliaetus	Osprey	Mi					
Rhipidura rufifrons	Rufous fantail	Mi	The rufous fantail is distributed throughout northern and eastern coastal Australia, though is considered more common in the north. The species inhabits sclerophyll forests, often in gullies dominated by eucalypts and usually within a dense shrubby understory that often includes ferns. Movement patterns for the rufous fantail are not well-known, and eastern populations are believed to migrate to northern Australian during the winter.				
Symposiachrus trivirgatus ad Monarcha trivirgatus	Spectacled monarch	Mi					
Threatened ecological communities							
Coastal swamp oak (*Casuarina glauca*) forest of New South Wales and South East Queensland ecological community		E					
Coastal swamp sclerophyll forest of New South Wales and South East Queensland		E					
Dunn's white gum (*Eucalyptus dunnii*) moist forest in north-east New South Wales and south-east Queensland		E					
Lowland rainforest of sub-tropical Australia		CE					
New England peppermint (*Eucalyptus nova-anglica*) grassy woodlands		CE					
Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and Soth East Queensland bioregions		E					

Appendix C

AHIMS searches

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : 12611463

Client Service ID : 801448

Rochelle Barclay

230 Harbour Drive
Coffs Harbour New South Wales 2450

Attention: Rochelle Barclay

Email: rochelle.barclay@ghd.com

Date: 18 July 2023

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -30.4684, 152.8544 - Lat, Long To : -30.4673, 152.8564, conducted by Rochelle Barclay on 18 July 2023.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : BSC Bridges

Client Service ID : 817390

Rochelle Barclay

230 Harbour Drive
Coffs Harbour New South Wales 2450

Attention: Rochelle Barclay

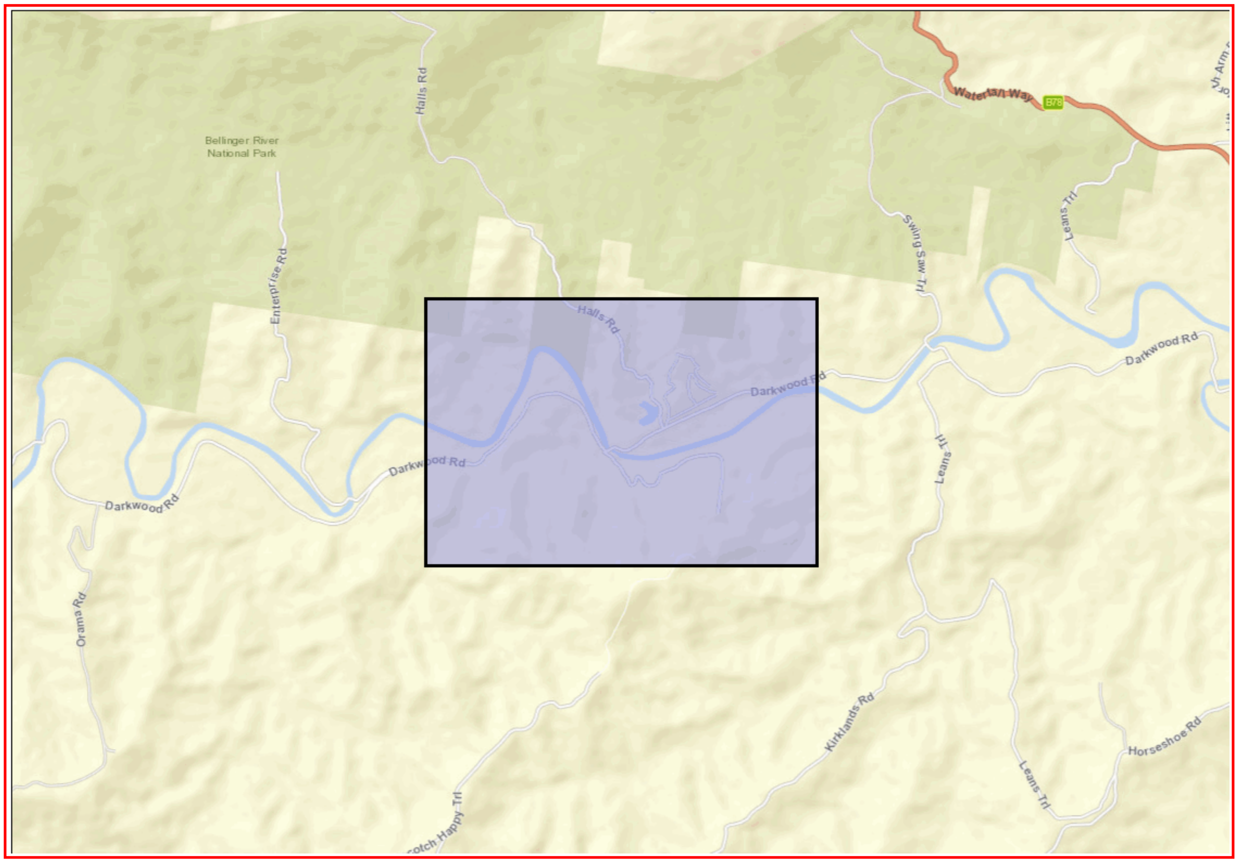
Email: rochelle.barclay@ghd.com

Date: 07 September 2023

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -30.4413, 152.7083 - Lat, Long To : -30.4228, 152.7392, conducted by Rochelle Barclay on 07 September 2023.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



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- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

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- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : 12611463

Client Service ID : 801923

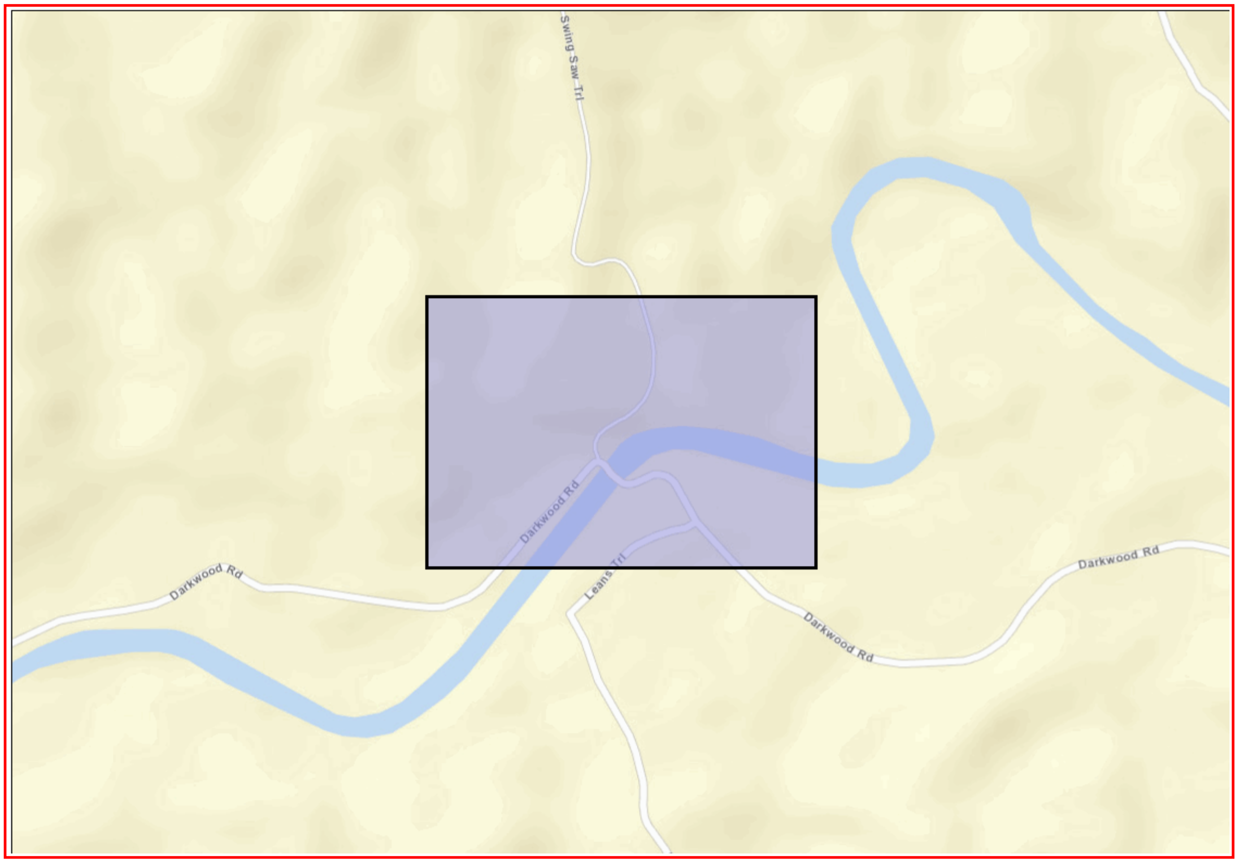
Rochelle Barclay
230 Harbour Drive
Coffs Harbour New South Wales 2450
Attention: Rochelle Barclay
Email: rochelle.barclay@ghd.com

Date: 19 July 2023

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -30.4278, 152.7444 - Lat, Long To : -30.4231, 152.7521, conducted by Rochelle Barclay on 19 July 2023.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

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- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

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- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : BSC Bridges

Client Service ID : 817264

Date: 06 September 2023

Rochelle Barclay

230 Harbour Drive
Coffs Harbour New South Wales 2450

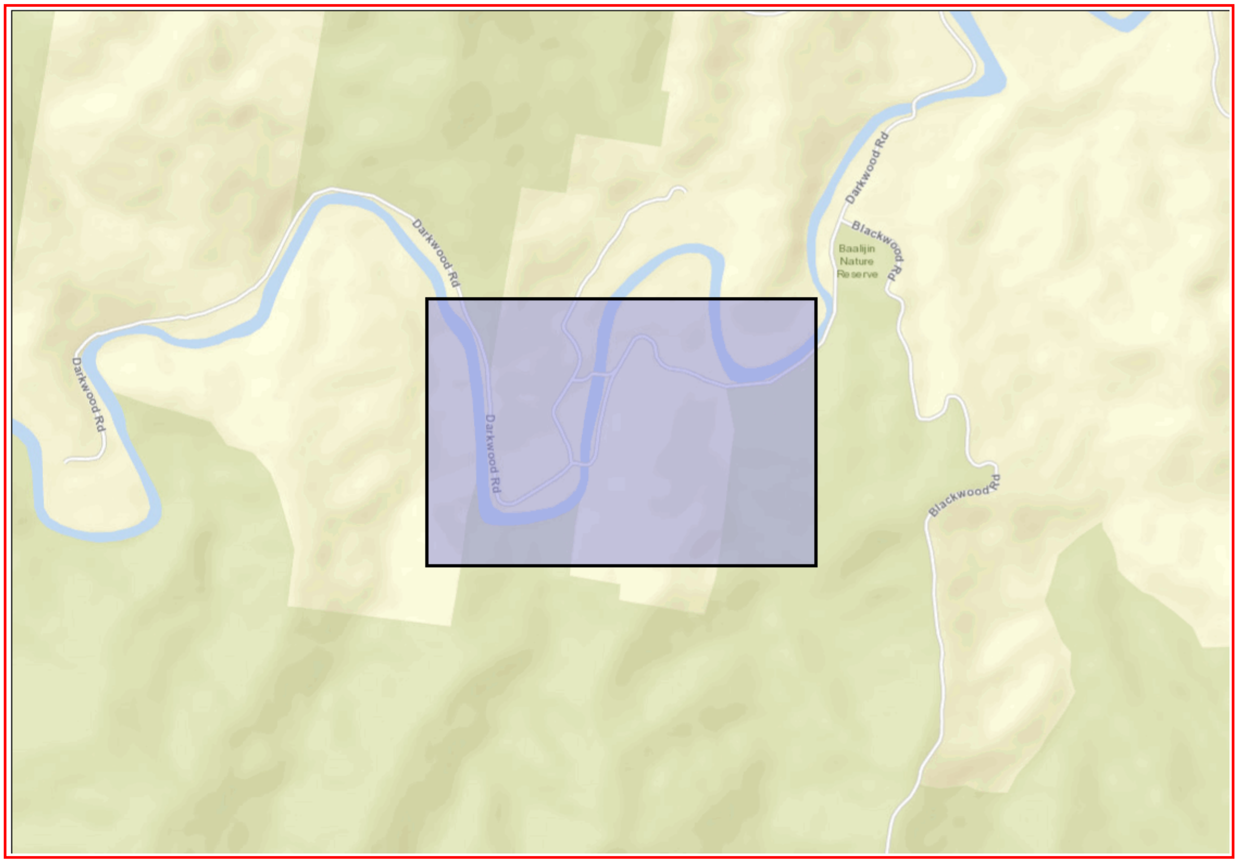
Attention: Rochelle Barclay

Email: rochelle.barclay@ghd.com

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -30.4572, 152.6245 - Lat, Long To : -30.4479, 152.6399, conducted by Rochelle Barclay on 06 September 2023.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



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Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
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- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

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The Power of Commitment

Appendix C

Species Impact Statement

Your ref: Project number 12611463
Our ref: DOC24/783638-7

General Manager
Bellingen Shire Council
PO Box 117
BELLINGEN NSW 2454

Attention: Mr Marc Rouqueirol

Dear Mr Griffioen

RE: Request for concurrence, Bellingen Shire Bridge Replacements, Darkwood Road and Kalang Road, Bellingen Shire

Thank you for your letter dated 24 September 2024 seeking concurrence from the Environment Agency Head for the proposed replacement of four bridges crossing the Bellinger and Kalang Rivers at Darkwood Road and Kalang Road in the Bellingen Shire local government area.

The proposal is being assessed as an activity under Part 5 of the *Environmental Planning and Assessment Act 1979* and the Bellingen Shire Council is the determining authority. The power to grant concurrence has been delegated to me.

The Biodiversity, Conservation and Science Group of the NSW Department of Climate Change, Energy, the Environment and Water has reviewed the Species Impact Statement (SIS) for the proposed activity dated 9 August 2024 and supporting documentation and I am satisfied the Environment Agency Head's requirements and the requirements of the *Biodiversity Conservation Act 2016* (BC Act) and the *Biodiversity Conservation Regulation 2017* have been met to a sufficient standard.

I have decided to grant concurrence under section 7.12 of the BC Act for the proposed activity subject to the conditions at Attachment A.

If you have any questions about this matter, please do not hesitate to contact Mr Dimitri Young, Senior Team Leader Planning North East at dimitri.young@environment.nsw.gov.au or 6659 8272.

Yours sincerely

GABRIELLE PIETRINI
Director, North East
<u>Biodiversity, Conservation and Science</u>

As delegate for the Secretary administering the *Biodiversity Conservation Act 2016*

4 November 2024

Enclosure: Attachment A - Conditions of concurrence – Bellingen Shire Bridge Replacement – Darkwood Road and Kalang Road, Bellingen Shire LGA

Attachment A – Conditions of concurrence – Bellingen Shire Bridge Replacement – Darkwood Road and Kalang Road, Bellingen Shire LGA

1. Conditions of concurrence 2 – 13 below must be complied with for the activity at each of the four bridges, Hobarts Bridge, Joyces Bridge, Justins Bridge and Duffys Bridge.

2. The activity must be undertaken in accordance with these conditions of concurrence and:
    a. The Species Impact Statement (SIS) for the *Bellingen Shire Bridge Replacement* prepared by GHD dated 9 August 2024.
    b. Review of Environmental Factors – Replacement of Hobarts Bridge prepared by GHD Pty Ltd and dated 13 September 2023
    c. Review of Environmental Factors – Replacement of Joyces Bridge prepared by GHD Pty Ltd and dated 13 September 2023
    d. Review of Environmental Factors – Replacement of Justins Bridge prepared by GHD Pty Ltd and dated 13 September 2023
    e. Review of Environmental Factors – Replacement of Duffys Bridge prepared by GHD Pty Ltd and dated 23 July 2024

3. All results from each of the two pre-clearance Bellinger River snapping turtle surveys, to be undertaken by a suitably qualified ecologist experienced in surveying for freshwater turtles three weeks prior and one week prior to instream construction works, must be submitted within one week after the completion of surveys to the Senior Team Leader Planning North East of the Biodiversity, Conservation and Science Group of the NSW Department of Climate Change, Energy, the Environment and Water via email to planning.northeast@environment.nsw.gov.au.

4. Fauna surveys within the direct disturbance areas are to be undertaken by a suitably qualified and experienced ecologist prior to, and on the same day as:
    a. any of the initial earthworks that would disturb the riverbank.
    b. any vegetation clearing.

5. Once a suitably qualified and experienced ecologist has determined that potential microbat habitat may be present underneath the new bridges:
    a. daily inspections for microbats must be completed prior to any works being undertaken on the bridge structure, and
    b. no works are to occur if microbats are found there until a microbat management plan has been prepared and implemented, noting the plan must be prepared to the satisfaction of the Senior Team Leader Planning North East of the Biodiversity, Conservation and Science Group of the NSW Department of Climate Change, Energy, the Environment and Water and submitted via email to planning.northeast@environment.nsw.gov.au.

6. Prior to the activity being undertaken, a procedure to avoid direct impacts to the giant barred frog must be prepared to the satisfaction of the Senior Team Leader Planning North East of the Biodiversity, Conservation and Science Group of the NSW Department of Climate Change, Energy, the Environment and Water and submitted via email to planning.northeast@environment.nsw.gov.au. The procedure must include, but may not be limited to:
    a. Methods and procedures for excluding giant barred frogs from streambank habitat proposed to be directly impacted.
    b. Pre-clearing and pre-works survey and capture protocols for giant barred frogs and tadpoles.
    c. Protocols for the release of captured frogs and tadpoles.

7. The Bellingen Shire Council is to contact the Senior Team Leader Planning North East of the Biodiversity, Conservation and Science Group of the NSW Department of Climate Change, Energy, the Environment and Water via email to planning.northeast@environment.nsw.gov.au no later than one week before commencing any works at any location to request the current status of any known Bellinger River snapping turtles in proximity to the works areas.

8. The activity is to be undertaken in accordance with the construction schedule in Table 6.1 of the SIS.

9. The activity is to be undertaken in accordance with the Integrated Management System Project Hygiene Plan prepared by Bellingen Shire Council provided to BCS on 13 September 2024.

10. No Bellinger River snapping turtles are to be directly impacted, handled, or relocated at any time.

11. If Bellinger River snapping turtles are detected within the direct area of impact during pre-clearance surveys or during construction, they are to be left in situ and monitored by observation. No works are to be undertaken until the turtles have been confirmed to have left the direct area of impact.

12. Targeted survey for roosting threatened microbats within the existing bridges is to be undertaken no more than one week prior to the planned demolition of the existing bridges, and demolition is not to commence:
    a. until such surveys confirm no threatened microbats are roosting in the existing bridge to be demolished, or
    b. if threatened microbats are found to be roosting in any of the existing bridges, until a microbat management plan is prepared to the satisfaction of the Senior Team Leader Planning North East of the Biodiversity, Conservation and Science Group of the NSW Department of Climate Change, Energy, the Environment and Water and submitted via email to planning.northeast@environment.nsw.gov.au. The microbat management plan must be implemented before demolition works commence and must include, but may not be limited to, the following measures:
        i. a strategy for excluding threatened microbats from the relevant bridge(s) to be undertaken outside of the breeding season of the relevant species in preparation for demolition.
        ii. continued monitoring of the existing bridge(s) during the exclusion phase and immediately prior to demolition.
        iii. Post-demolition, seasonal monitoring of the new bridge(s) and surrounding areas for one year.

13. Prior to the activity being undertaken, the proposed design of the replacement microbat roosting features to be incorporated into the new bridges is to be prepared to the satisfaction of the Senior Team Leader Planning North East of the Biodiversity, Conservation and Science Group of the NSW Department of Climate Change, Energy, the Environment and Water and submitted via email to planning.northeast@environment.nsw.gov.au.

14. Works are not to occur at Hobarts Bridge when temperatures exceed 40°C to avoid adverse impacts on heat-stressed grey-headed flying-foxes.

Department of Climate Change, Energy, the Environment and Water

NSW GOVERNMENT

Your ref: email dated 18 September 2023
Our ref: DOC23/829361-41

General Manager
Bellingen Shire Council
PO Box 117
BELLINGEN NSW 2454

Attention: Mr Marc Rouqueirol

Dear Mr Griffioen

RE: Environment Agency Head's Requirements for a Species Impact Statement – Bellingen Shire Bridge Replacements

On 16 October 2023, the Biodiversity, Conservation and Science Group (BCS) of the NSW Department of Climate Change, Energy, the Environment and Water provided the Environment Agency Head's (EAH's) Requirements for a Species Impact Statement (SIS) for the project to replace Hobarts Bridge, Joyces Bridge and Justins Bridge in accordance with Section 7.21 of the *Biodiversity Conservation Act 2016* (BC Act).

The Bellingen Shire Council provided a draft SIS to BCS in response to these requirements on 13 February 2024. The draft SIS indicated the proposed activity had been expanded to include the replacement of a fourth bridge, Duffys Bridge, which is located on Kalang Road and crosses the Kalang River.

BCS considers the Duffys Bridge study area is biogeographically similar to the Hobarts Bridge, Joyces Bridge and Justins Bridge study areas, and the four bridges are likely to have comparable lists of candidate threatened entities. Therefore, BCS considers the existing EAH requirements can be applied to the expanded proposed activity.

The requirements in Attachment A of our letter dated 16 October 2023 titled "*Environment Agency Head's Requirements – Species Impact Statement – Bridge Replacement Projects – Hobarts Bridge, Joyces Bridge and Justins Bridge – Darkwood*" are to be taken to apply to the expanded proposed activity, which is to replace Joyces Bridge, Hobarts Bridge, Justins Bridge, and Duffys Bridge.

If you have any further questions about this issue, please contact Mr Gene Mason, Senior Conservation Planning Officer North East, BCS, on 8289 6315 or at gene.mason@environment.nsw.gov.au.

Yours sincerely

GABRIELLE PIETRINI
Director North East
<u>Biodiversity, Conservation and Science</u>

31 October 2024

Species Impact Statement

Bellingen Shire Bridge Replacement

Bellingen Shire Council

23 July 2024

→ **The Power of Commitment**

Project name	Hobarts, Justins and Joyces Bridges Environmental Assessment
Document title	Species Impact Statement | Bellingen Shire Bridge Replacement
Project number	12611463
File name	12611463-REP_Bellinger River Snapping Turtle Species Impact Statement.docx

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	T. Moeser A Weatherall	N Clark S Lawer		A Oliver		29/08/23
S4	1	E. Odner T. Moeser N. Fokes	K Dalton		A Oliver		22/01/24
S4	2	N. Fokes	S Lawer		A Oliver		09/02/24
S4	3	N. Clark	S Lawer		A Oliver		31/05/24
S4	4	N. Clark	S Lawer		A Oliver		23/07/24

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230 Harbour Drive,
Coffs Harbour, New South Wales 2450, Australia
T +61 2 6650 5600 | **F** +61 2 9475 0725 | **E** cfsmail@ghd.com | **ghd.com**

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Appendices

Declaration

This Species Impact Statement (SIS) has been prepared by GHD Pty Ltd in accordance with the requirements of Sections 7.20 and 7.21 of the *Biodiversity Conservation Act 2016* (BC Act), Section 7.6 of the *Biodiversity Conservation Regulation 2017*, and the requirements issued on behalf of the Chief Executive (CE) of the then Office of Environment and Heritage (OEH) dated 29 March 2019 (Appendix A).

The SIS was prepared principally by Shawn Lawer of GHD, on behalf of the applicant, Bellingen Shire Council. The applicant has read and understands the implications of the recommendations made in the statement and accepts that the recommendations may be placed as conditions of consent or concurrence for the proposal.

Signature

Shaun Lawer,

B. Urban and Regional Planning, MBA, MPIA

Technical Director, Planning and Environment

GHD Pty Ltd

I, Marc Rouqueirol, from Bellingen Shire Council, being the applicant for the replacement of Hobarts Bridge, Duffys Bridge, Justins Bridge, and Joyces Bridge in the Bellinger River have read and understood this Species Impact Statement. I understand the recommendations made in the statement and accept that they may be imposed as conditions of consent or concurrence for the action proposed.

Signature

Marc Rouqueirol

Project Manager

Bellingen Shire Council

Qualifications and Experience of Author

Team Member	Qualifications	Relevant Experience
Dr Natalie Clark 	Doctor of Philosophy, University of Queensland, 2008 Honours, University of Queensland, 2004 Bachelor of Science majoring in Zoology and Marine Biology, University of Queensland, 2002	Natalie is the Business Group Leader of the South Queensland Natural Resource Management Group with over 15 years' experience in ecosystem monitoring, impact assessment and environmental management. She has a strong understanding of Commonwealth and State legislative requirements applicable to natural environments and projects. Natalie has recently delivered draft technical reports and EIS chapters for two PHES projects and has a detailed understanding of the design and operational aspects of PHES and major water infrastructure projects. Natalie was the technical lead for the flora, fauna and fish passage components of Urannah Water Scheme Project EIS, which included two PHES and a major water storage dam within Eungella. Technical reports and EIS chapters were produced for each component of the Project and include description of impacts, proposed avoidance and mitigation measures, assessment of significance and calculation of biodiversity offsets. Natalie engaged extensively with Commonwealth and State regulators during this project. Natalie was also the Project Manager for ecology surveys and early approvals support for the Capricornia Energy Hub PHES within Eungella. Natalie was the fishway scientist and environmental approvals lead for the Rookwood Weir Project over the 12-year period of the Project design and construction. In addition to leading the delivery of the ecology EIS chapters and technical reports, Natalie supported Sunwater with obtaining secondary approvals, and biodiversity offsets. Natalie led the design process for the development of an innovative fishway as well as the first specifically designed turtle ramp in Australia. Other major water infrastructure projects that Natalie has led within the local region include Big Rocks Weir EIS and Burdekin Fall Dam ecology surveys, Fitzroy Barrage and Tartus Weir environmental assessments.
Tim Moeser 	Central Queensland University BSc Aquatic Resource Management 2007	Tim is an Aquatic Ecologist with GHD based in Southeast Queensland. His background includes targeted surveys for threatened aquatic species, water quality monitoring, sediment and benthic sampling, habitat assessments and river restoration projects. Tim has worked in several regions in the field including North Queensland, Central Queensland, and Western Australia.

Team Member	Qualifications	Relevant Experience
Nicole Fokes 	Bachelor of Environmental Science (Ecological Conservation) Charles Sturt University 2021 Diploma Conservation and Land Management – NSW TAFE 2016	Nicole is a northern New South Wales ecologist with four years of experience within the environmental sector, with a particular focus on flora and fauna surveys, vegetation and habitat mapping, and environmental approvals, and ecological impact assessments. Nicole has developed strong field identification skills and is experienced in undertaking targeted flora and fauna surveys across a range of Queensland and New South Wales ecosystems. Nicole is skilled in surveys of birds, reptiles, mammals, frogs, and vegetation.
Elise Odner 	Bachelor of Science – Biology & Environmental Science, USQ 2022 Bachelor of Business, QUT 2019 Bachelor of Creative Industries, QUT 2019	Elise is a graduate ecologist with one year experience. She has been gaining experience in both terrestrial and aquatic projects and field work. The field opportunities that Elise has been involved in include water monitoring, protected plant survey, fauna trapping and translocation, pre-clearing fauna surveys, fauna spotting, habitat assessments, and environmental audits. Elise has undertaken fieldwork in several regions including, Queensland, New South Wales, and Western Australia.

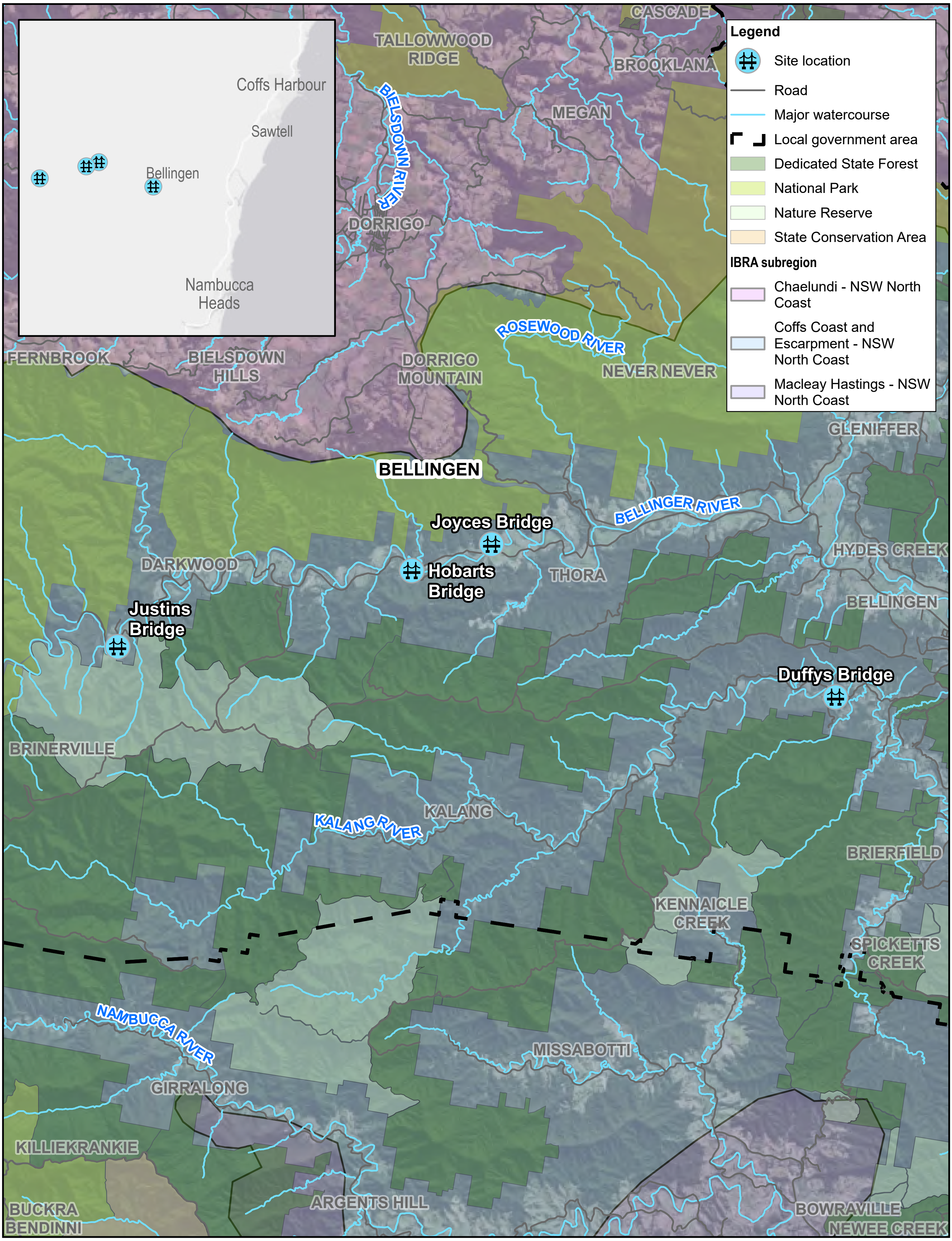
Abbreviations and definitions

Abbreviation	Definition
AHD	Australian Height Datum
ALA	Atlas of Living Australia
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BSC	Bellingen Shire Council
Environment Agency Head (EAH)	Secretary of the NSW Department of Planning and Environment (or delegate)
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Conservation status	Is regarded as the degree of representation of a species or community in formal conservation reserves
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DP	Deposited Plan, the plan number given to a subdivision that is registered by the Land Property Information.
DP&E	Department of Planning and Environment
DPI	Department of Primary Industries
LGA	Local Government Area
NSW	New South Wales
PCT	Plant community type - derived using the NSW PCT classification system
PMST	Protected Matters Search Tool
SIS	Species Impact Statement
SPRAT	Species Profile and Threats Database
TEC	Threatened Ecological Community
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

1. Contextual information

1.1 Project overview

Bellingen Shire Council (BSC) is responsible for managing road related transport infrastructure and providing safe and efficient access for the Local Government Area's (LGA's) road network. BSC has identified the existing structures at Hobarts, Justins, Joyces and Duffys Bridges within the Bellinger catchment are nearing the end of their useful life and require replacement to provide a safe and reliable crossing point for local traffic and emergency vehicles. Project overview is presented in Figure 1.1. BSC has since received government funding to replace these four bridges.



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellinger River Species Impact Statement

Project No.	**12611463**
Revision No.	**0**
Date	**24/01/2024**

Project overview

FIGURE 1.1

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_SpeciesImpactStatement.aprx - 12611463_001_ProjectOverview
Print date: 24 Jan 2024 - 14:48

Data source: World Imagery: Earthstar Geographics
World Light Gray Canvas Base: Esri, HERE, Garmin, USGS. GHD: site locations (2023); NSWSS: roads, watercourse, suburbs (2023); DCCEEW: IBRA (2023); DFSI: reserves (2024); SEED: state forest (2018).
Created by: thunt2

1.2 Species Impact Statement Requirements

BSC is assessing the Project under Part 5 Division 5.1 of the *Environment Planning and Assessment Act 1979* (EP&A Act) and Part 7 of the *Biodiversity Conservation Act 2016* (BC Act). Through this process the potential for significant impacts to the Bellinger River Snapping Turtle (*Myuchelys georgesi*) were identified.

In 2023 a Species Impact Statement (SIS) was issued to the Biodiversity and Conservation Division of the Department of Planning and Environment (DP&E) as part of assessment of these proposed works. The focus of this SIS was an assessment of potential impacts to the Bellinger River Snapping Turtle (DPE 2023). Subsequently, BCD advised that a revised SIS was required that addressed potential impacts to known or potentially present threatened species or communities listed under the NSW BC Act or their habitat.

The purpose of a Species Impact Statement (SIS) is to:

– Allow the proponent to identify threatened species, ecological communities, or their habitats, assess the likely effect of impact from the activity on threatened species, ecological communities, or their habitats, and provide appropriate amelioration for adverse impacts resulting from the activity.
– Assist the Environment Agency Head (EAH) in assessing the activity in accordance with Part 7 of the Biodiversity Conservation Act 2016 (BC Act).

The EAH requirements for this SIS are attached at Appendix A.

Ecological values that are protected under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and which are not also protected under the NSW BC Act have not been included within this SIS and are expected to be addressed in a separate report detailing the potential impacts to Matters of National Environmental Significance.

The EAH requirements for this SIS identify the following species must be considered as candidate threatened species as they have either been recorded in the general area, are within the species' known geographic limits or their broad habitat preferences may be present in the study area (Table 1.1). Additional threatened species and communities are addressed throughout the report as relevant.

Table 1.1 Subject threatened species identified in the EAH requirements

Scientific Name	Common name	BC Act status
Birds		
Pandion cristatus	Eastern Osprey	Vulnerable
Ptilinopus magnificus	Wompoo Fruit-dove	Vulnerable
Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable
Mammals		
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable
Myotis macropus	Southern Myotis	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Reptiles		
Myuchelys georgesi	Bellinger River Snapping Turtle	Critically endangered

Scientific Name	Common name	BC Act status
Amphibians		
Mixophyes iteratus	Giant Barred Frog	Vulnerable

The EAH requirements for this SIS and the section within which they are addressed in this SIS are outlined in Table 1.2.

Table 1.2 EAH requirements for this SIS

EAH Requirements Section	EAH Requirement	SIS Section	SIS Heading
1	Form of the Species Impact Statement		Declaration
2. Contextual Information			
2.1	Description of the activity and study area	Section 1.1	Project overview
2.1.1	Describe the activity	Section 1.6	Proposed site activities
2.1.2	Define the study area	Section 1.5	Study site
2.2	Relevant maps and figures	Throughout report	
2.3	Vegetation	Section 2.3.3	Vegetation and flora
3. Initial assessment			
3.1	Identifying candidate threatened species	Section 2.2	Likelihood of occurrence
3.2	Identify subject threatened species	Section 2.2	Likelihood of occurrence
3.2.1	Habitat assessment to confirm suitable habitat	Section 4.2	Habitat assessment
3.2.2	Targeted survey	Section 4.3	Targeted threatened fauna surveys
3.2.3	Final review of the list of subject threatened species	Section 4.1	Fauna species
4. Assessment of likely impacts on threatened species			
4.1	Assessment of species likely to be affected	Section 5	Assessment of likely impacts on threatened species
4.2	Discussion of conservation status	Section 5	Assessment of likely impacts on threatened species
4.3	Discussion of local and regional abundance and distribution	Section 5	Assessment of likely impacts on threatened species
4.3.1	Discussion of other known local populations	Section 5	Assessment of likely impacts on threatened species
4.3.2	Discussion of habitat utilisation	Section 5	Assessment of likely impacts on threatened species
4.4	Assessment of habitat	Section 5	Assessment of likely impacts on threatened species
4.4.1	Description of habitat values	Section 5	Assessment of likely impacts on threatened species
4.4.2	Impacts on threatened species and/or population in the national park estate	Section 5	Assessment of likely impacts on threatened species
4.5	Discussion of the likely effect of the activity at local and regional scales	Section 5	Assessment of likely impacts on threatened species
4.5.1	Significance within a local context	Section 5	Assessment of likely impacts on threatened species

EAH Requirements Section	EAH Requirement	SIS Section	SIS Heading
4.5.2	Discussion of connectivity	Section 5	Assessment of likely impacts on threatened species
4.5.3	Consideration of threatening processes	Section 5	Assessment of likely impacts on threatened species
4.6	Description of feasible alternatives	Section 6.1	Feasible alternatives
5. Assessment of likely impacts on threatened ecological communities			
5.1	Assessment of ecological communities (both endangered and critically endangered) likely to be affected	N/A	
5.2	Discussion of conservation status	N/A	
5.2.1	Significance within a local context	N/A	
5.2.2	Discussion of corridor values	N/A	
5.2.3	Discussion of regional significance	N/A	
5.2.4	Impacts on Ecological Communities in the national park estate	N/A	
5.3	Assessment of habitat	N/A	
5.3.1	Description of disturbance history	N/A	
5.3.2	Extent of habitat removal	N/A	
5.4	Description of feasible alternatives	N/A	
6. Ameliorative measures			
6.1	Description of ameliorative	Section 6	Avoidance measures
6.1.1	Biodiversity impact amelioration strategy	Section 7	Impact assessment, mitigation and management measures
6.1.2	Long-term management strategies	Section 7	Impact assessment, mitigation and management measures
7	Statement of long-term viability	Section 5	Assessment of likely impacts on threatened species
8. Additional information			
8.1	Qualifications and experience		Qualifications and experience of author
8.2	Other approvals required for the development or activity	Section 8	Other approvals required for the Project
8.3	Licensing matters relating to the survey		

1.3 Terminology

Table 1.3 outlines the Terminology used throughout the SIS.

Table 1.3 Terminology used in the SIS

Term	Definition
Study area	Area or areas that were included in desktop searches and field ecology surveys. The Study area surround each bridge structure, primarily comprising the bridge, roads and road verges and the cleared land.
Project area	The extended area within 10 km of each of the bridge sites.
Project footprint	The exact area impacted by the construction of each bridge.
Project works	The construction of the bridges.

Term	Definition
Conservation significant species	Species listed as Extinct, Extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent under the EPBC act.
Threatened species	Species defined as critically endangered, endangered, vulnerable under the *Biodiversity Conservation 2017* (BC Act).

1.4 Purpose and scope of this report

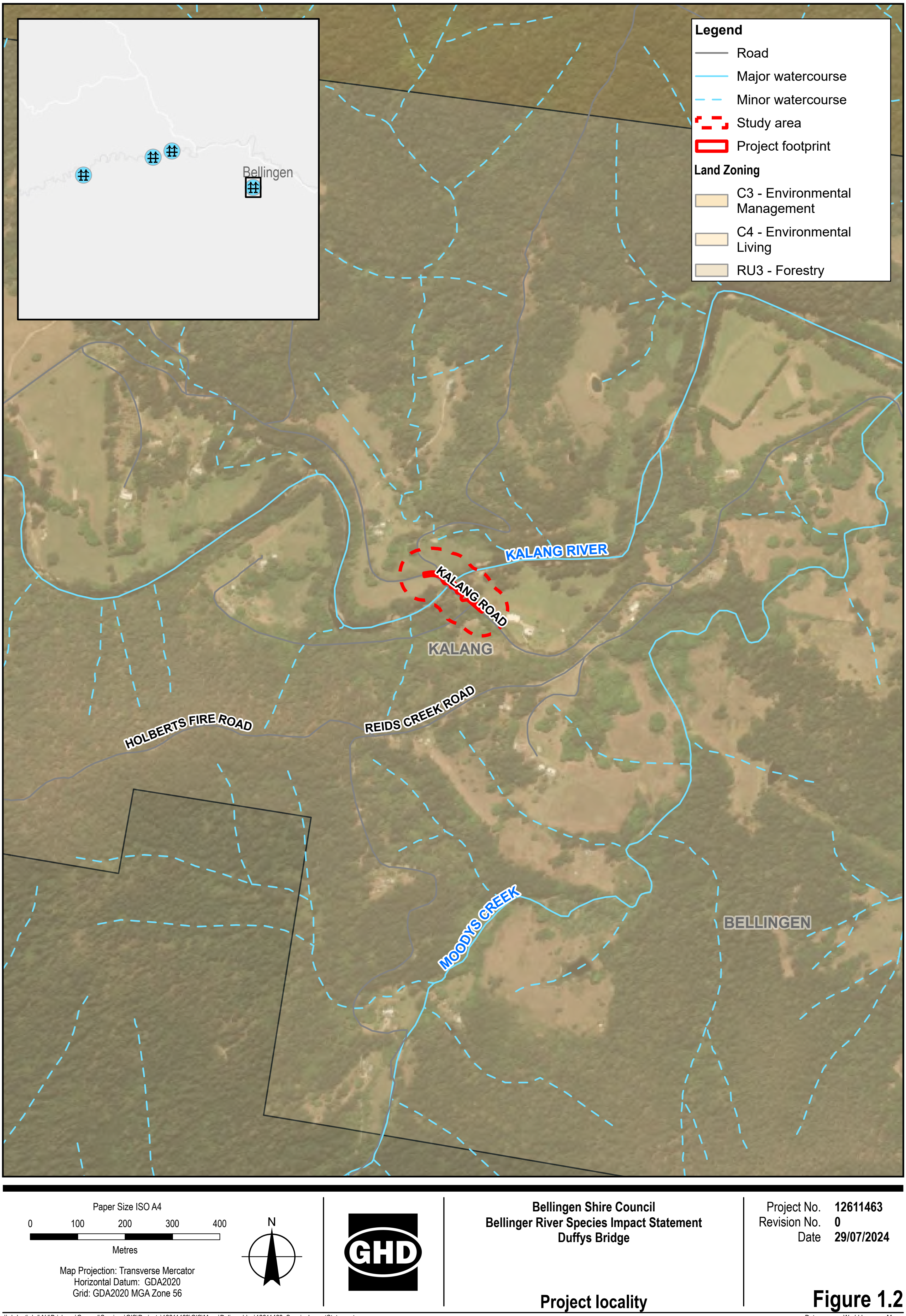
This SIS has been prepared by GHD Pty Ltd (GHD) on behalf of BSC to assess the potential impacts to conservation significant, and threatened, species and communities, from the proposed bridge replacements and identify management actions to be implemented during construction and operation. The report should be read in conjunction with assumptions and limitations outlined within Appendix B. The assessment has been undertaken in accordance with Section 7 of the *Biodiversity Conservation Regulation 2017* and includes:

- Description of the proposed development for Hobarts, Justins, Joyces and Duffys Bridge replacements.
- Description of the potential conservation significant species impacted by development works including:
  - A general description of the species and study area that is likely to be affected by the action.
  - An assessment of the species presence within the study area likely to be affected by the action.
  - Details of the species local, regional and State-wide conservation status, the key threatening processes and habitat requirements.
  - An estimate of the local and regional abundance of the threatened biota.
  - An assessment of whether the threatened biota is adequately represented in conservation reserves (or other similar protected areas) in the region.
  - An assessment of whether any of the threatened biota is at the limit of its known distribution.
  - A full description of the type, location, size and condition of the habitat of the threatened biota and details of the distribution and condition of similar habitats in the region.
- Assessment of potential impacts to the threatened biota as a result of Project construction and operation.
- Description of avoidance, mitigation and management measures to be adopted during construction and operation.

1.5 Project Area

The Project occurs generally within the New South Wales North Coast Bioregion, Northern Rivers Catchment Management Authority and the BSC LGA. The Project overview is shown in Figure 1.1 and each bridges locality is show in Figure 1.2, Figure 1.3, Figure 1.4 and Figure 1.5.

The Project Area referred to in this assessment is a larger area within 10 km of each of the bridge sites (i.e. includes areas that are outside the proposed impact areas). The additional information captured for the Project Area has been used to provide context to determine the significance of ecological features identified within the Study Area. For example, whether the ecological features are part of a larger area, or whether there are potential impacts on other ecological features outside the Study Area. The Project Area was only assessed at a desktop level.



Bellingen Shire Council
Bellinger River Species Impact Statement
Duffys Bridge

Project No. 12611463
Revision No. 0
Date 29/07/2024

Project locality

Figure 1.2

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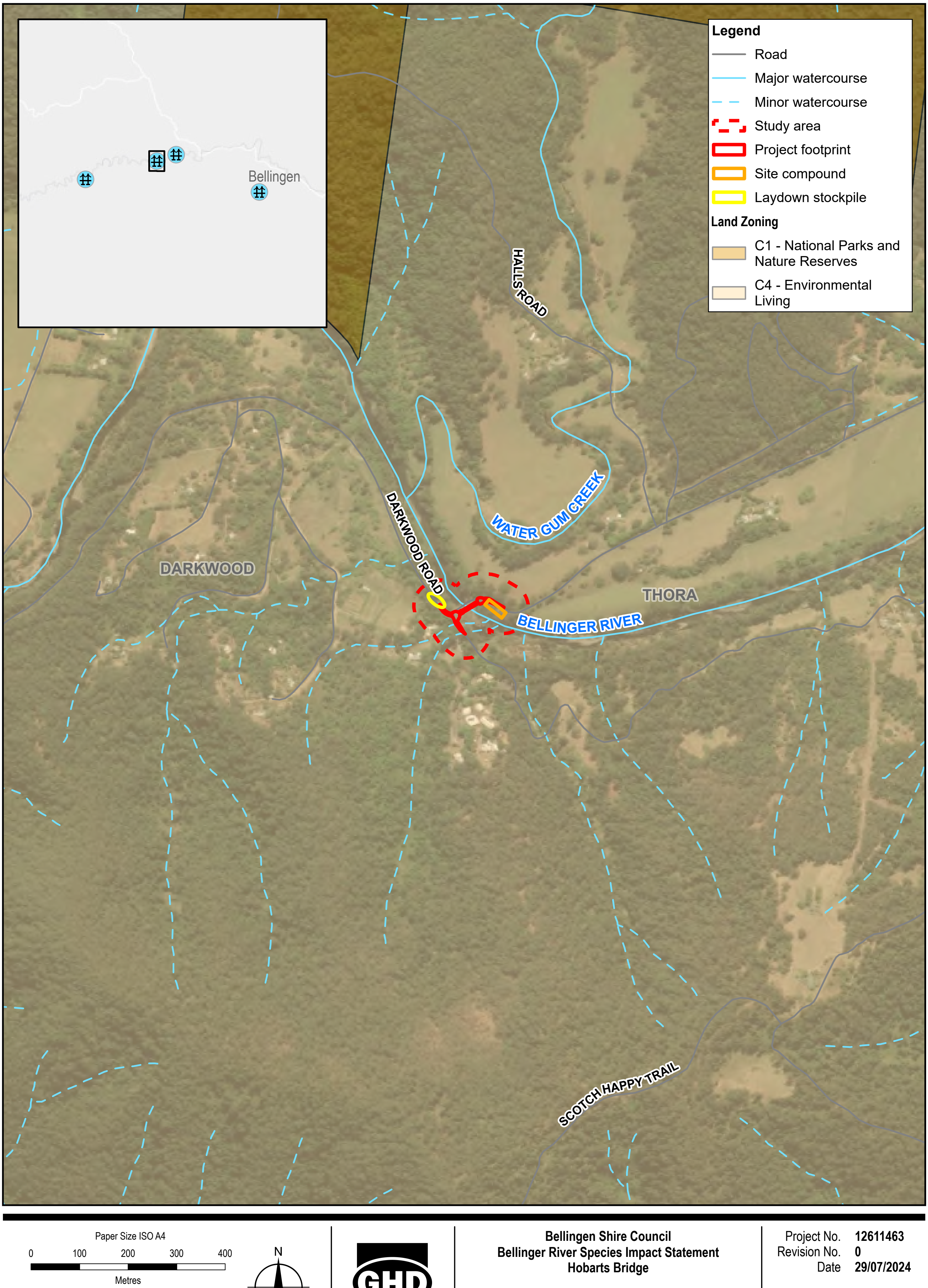
Data source: World Imagery: Maxar
World Light Gray Canvas Base: Esri, HERE, Garmin, USGS. GHD: study area, project footprint (2024); NSWSS: roads, watercourse, suburbs (2023); DPHI: zoning (2024).
Created by: mvandermerwe



Bellingen Shire Council
Bellinger River Species Impact Statement
Hobarts Bridge

Project No. 12611463
Revision No. 0
Date 29/07/2024

Project locality

Figure 1.3

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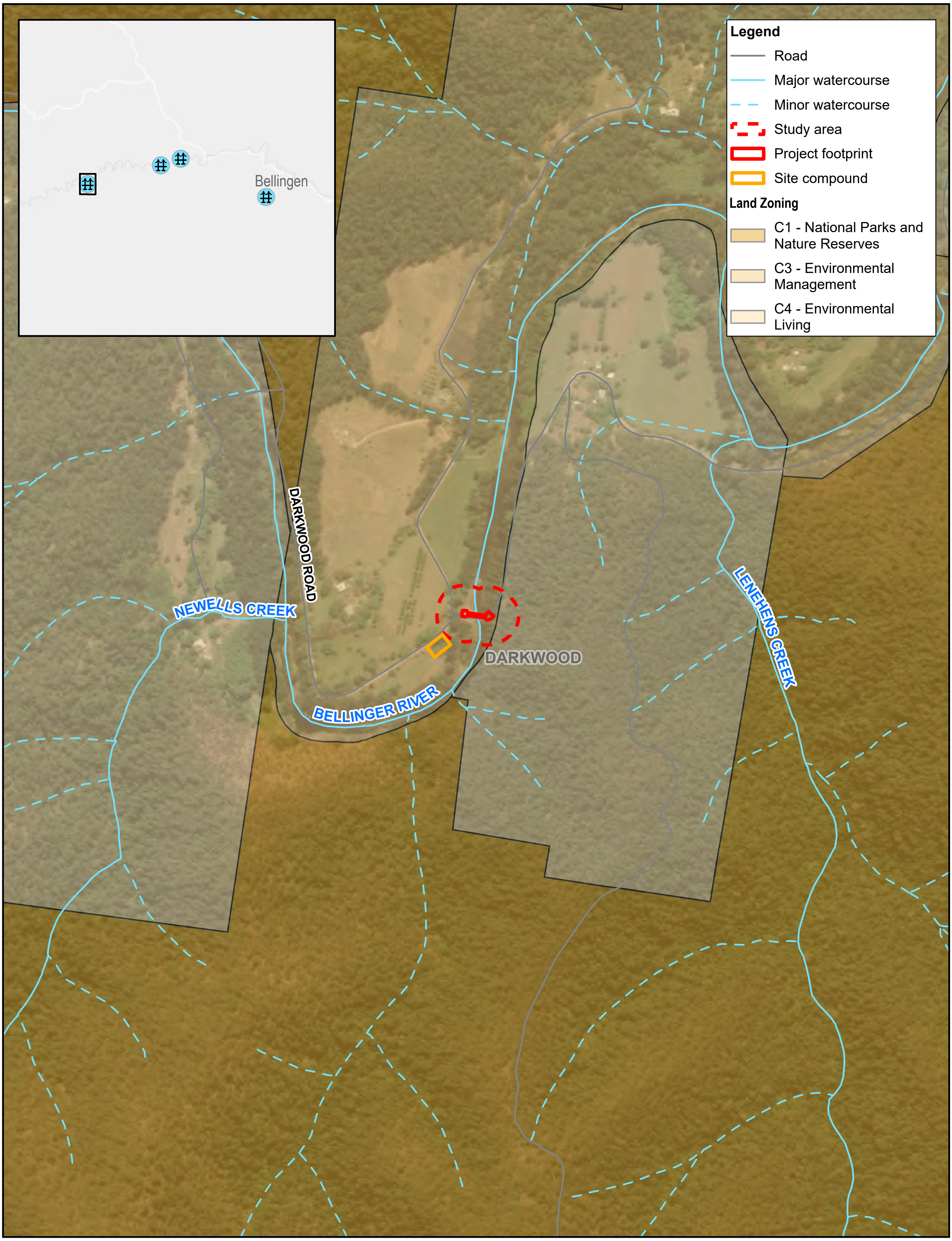

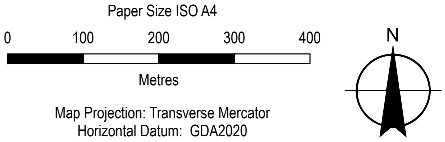

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

Bellingen Shire Council
Bellinger River Species Impact Statement
Justins Bridge

Project No.	**12611463**
Revision No.	**0**
Date	**29/07/2024**

Project locality

Figure 1.4

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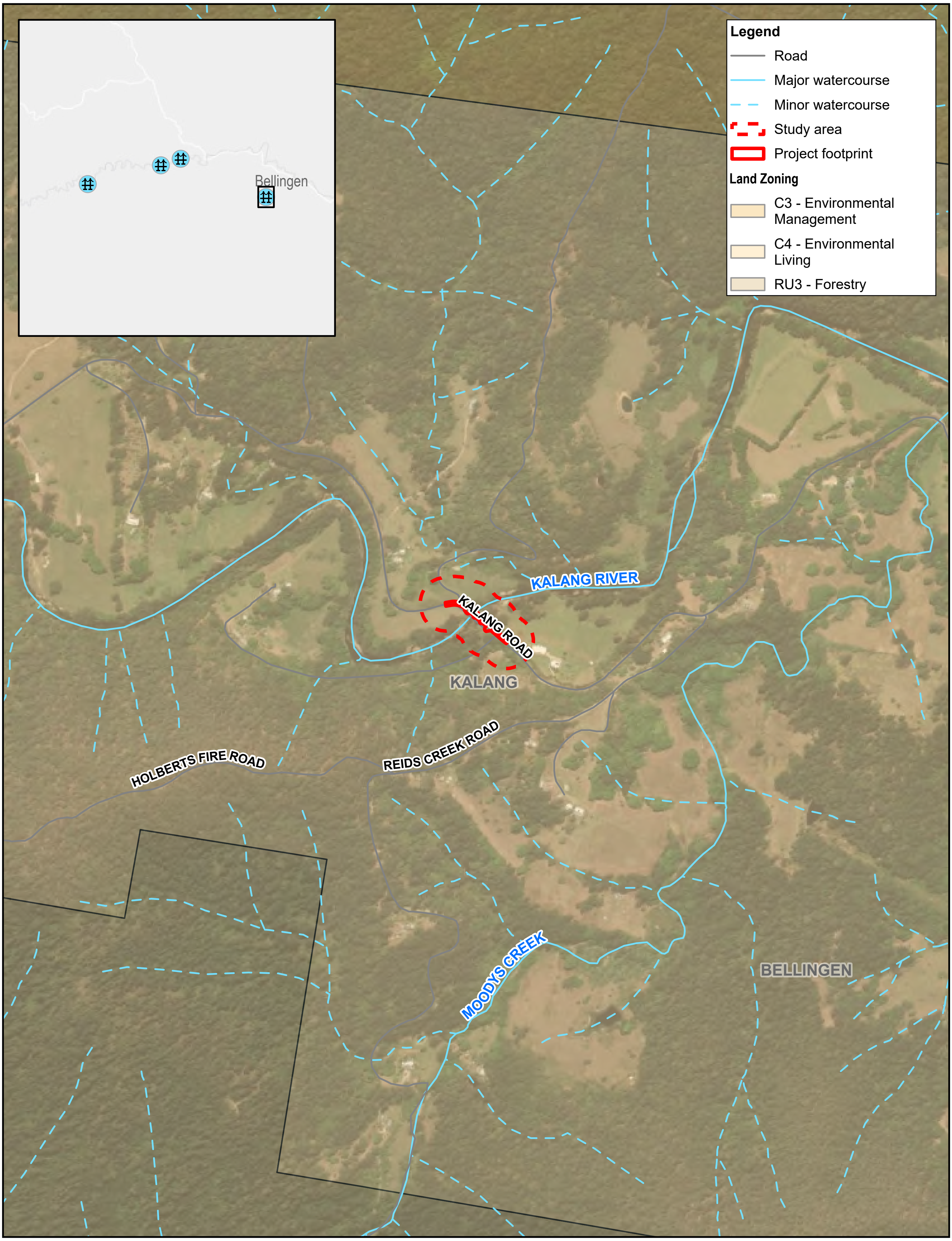

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Bellinger River Species Impact Statement
Duffys Bridge

Project No. **12611463**
Revision No. **0**
Date **29/07/2024**

Project locality

Figure 1.5

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Created by: mvandermerwe

1.6 Proposed site activities

1.6.1 Overview

The proposed Project works at each of the bridge sites will involve the following general construction activities:

- Vegetation clearing
- Installation of piers and rock anchors
- Construction of bridge substructure
- Construction of abutments and placement of decking units (superstructure)
- Installation of rock scour protection
- Realignment of approach roads
- Finishing of ancillary bridge components at road level (i.e. signages, road sealing, concreting in controlled areas)
- Demolition of existing timber bridges
- Rehabilitation of site

Construction works are expected to be carried out over a 7-month period. Instream and associated bank footprints are estimated to impact approximately 0.41 ha. Further details on proposed site activities for each bridge are provided in the following sections.

	In-stream works Vegetation clearing / earthworks on river bank, installation of piers and rock anchors, instream substructure works	Embankment works Construction of abutments outside of waterway low flow channel, construction of superstructure and road approaches	Fishing works – roads and ancillary bridge components Construction at road level only including barriers signage, road sealing, concreting.	Demolition of existing timber bridges and rehabilitation
Joyces Bridge	Works to occur outside of breeding season of Bellinger River Snapping Turtle and peak breeding season of Giant Barred Frog. No works to occur July to February Works permissible March – June	Works to occur outside nesting season for Bellinger River turtle and peak breeding season of Giant Barred Frog. No works to occur October to January Works permissible March to September	Works permissible any time	No bridge removal during southern myotis breeding period. No works
Hobarts Bridge	Works to occur outside of peak breeding season of Bellinger River Snapping Turtle and Giant Barred Frog. No works to occur July to February Works permissible March – June	Works to occur outside nesting season for Bellinger River turtle and peak breeding season of Giant Barred Frog. No works to occur October to January Works permissible March to September	Works permissible any time	
Justins Bridge	Works to occur outside of peak breeding season of Bellinger	Works to occur outside nesting season for Bellinger River turtle	Works permissible any time	

	River Snapping Turtle and Giant Barred Frog. No works to occur July to February Works permissible March – June	and peak breeding season of Giant Barred Frog. No works to occur October to January Works permissible March to September		
Duffys Bridge	Works to occur outside of peak breeding season of Bellinger River Snapping Turtle and Giant Barred Frog. No works to occur July to February Works permissible March – June	Works permissible any time		Works permissible any time

1.6.2 Joyces Bridge

Joyces Bridge (Plate 1.1) is located on Darkwood Road, crossing the Bellinger River approximately 18 kilometres (km) west of Bellingen. The proposed Project works involve upgrading the road realignment and removing the existing 48 metre (m) four span, timber bridge and installing a new 49.5 m four span, concrete bridge structure on an improved alignment immediately downstream and adjacent to the current footprint. The form of construction will include:

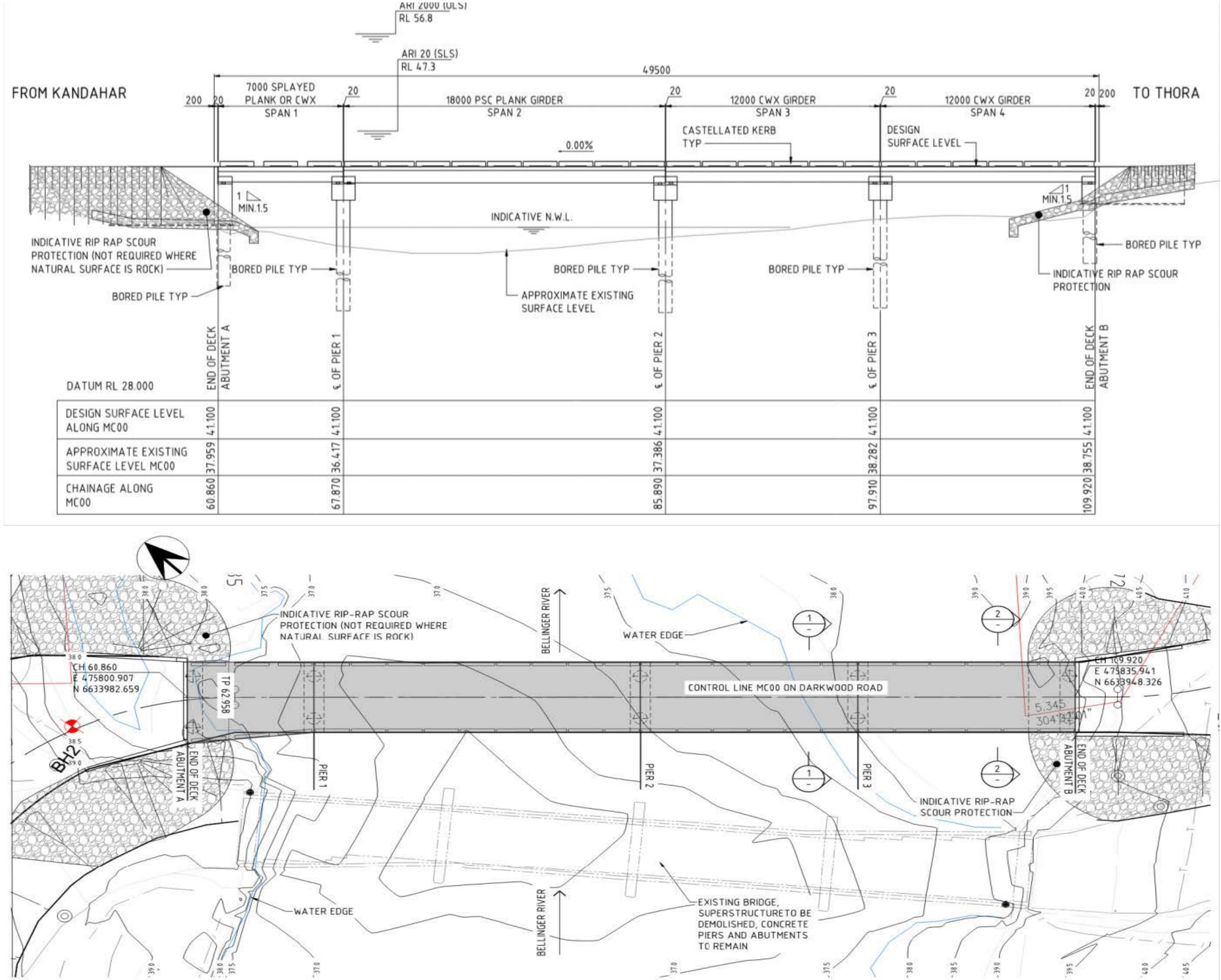
– Foundations will be bored, cast in-situ 600 millimetre (mm) diameter concrete piles.
– Piers one and two will be located in the low-flow section of Bellinger River. Pier three is located on the existing gravel bank outside of the flow channel.
– The substructure will consist of cast in-situ concrete abutments and precast concrete headstocks. Rock scour protection will be placed on the banks surrounding the abutments.
– The super structure is made up of two spans of 12 m precast bridge beams, one longer span of 18 m pre-stressed bridge planks and one shorter 7 m plank span at the western end. The two plank spans will require cast in-situ deck pours. Trafficable bridge width of 4.2 m.
– All spans will use bolt on concrete kerbs. The two plank spans will be cast in-situ deck pours.
– Road approaches will be rebuilt, include 35 m of road works on the eastern side and 60 m on the western side to tie into the existing Darkwood Road.
– The bridge will be raised approximately 1.7-2.0 m in height to increase flood immunity.

The Project footprint for the proposed activities at this location are approximately 0.11 ha.

The concept design for Joyces Bridge is shown in Figure 1.6.

A full design and construction methodology report is provided in Appendix C.

Plate 1.1 Joyces Bridge – existing timber structure



	END OF DECK ABUTMENT A	℄ OF PIER 1	℄ OF PIER 2	℄ OF PIER 3	END OF DECK ABUTMENT B
DESIGN SURFACE LEVEL ALONG MC00	41.100	41.100	41.100	41.100	41.100
APPROXIMATE EXISTING SURFACE LEVEL MC00	37.959	36.417	37.386	38.282	38.755
CHAINAGE ALONG MC00	60.860	67.870	85.890	97.910	109.920

Figure 1.6 Joyces Bridge concept design

1.6.3 Hobarts Bridge

Hobarts Bridge (Plate 1.2) is located on Darkwood Road, crossing the Bellinger River at Darkwood, approximately 17 km west of Bellingen.

Plate 1.2 Hobarts bridge – existing timber structure

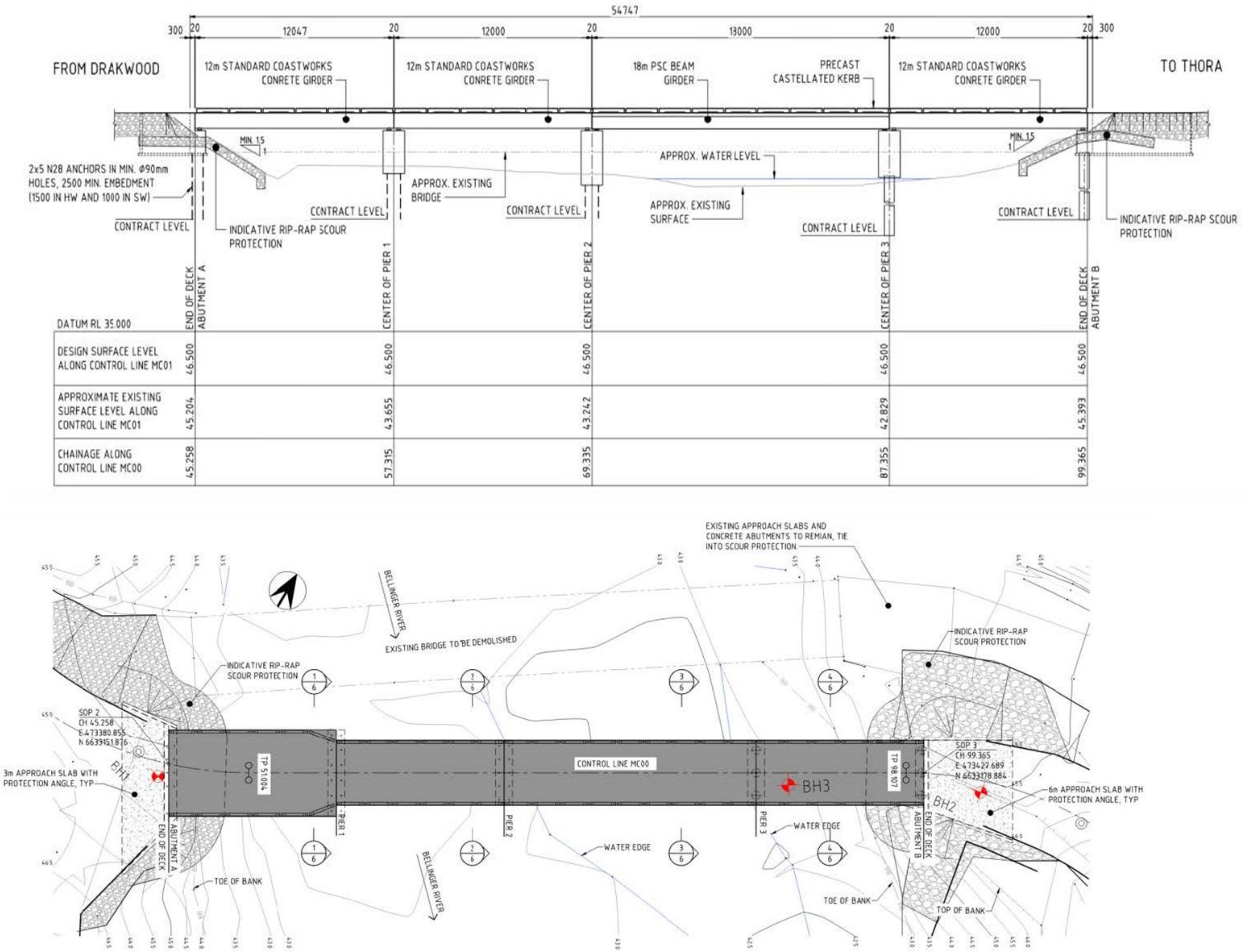
The proposed Project works involve upgrading the road realignment, removing the existing 48 m five span timber bridge and installing a new 54.5 m four span, concrete bridge structure of increased height on an improved alignment immediately upstream and adjacent to the current footprint.

The form of construction will include:

- Foundations will be bored, cast in-situ 600 mm diameter concrete piles at Abutment B and Pier 3, and rock anchors for the remainder of the bridge.
- Piers two and three will be located on the edge of the low-flow section of Bellinger River. Pier one is located on the banks outside of the flow channel.
- The substructure will consist of cast in-situ concrete abutments and precast concrete headstocks. Rock scour protection will be placed on the banks surrounding the abutments.
- The super structure is made up of three spans of 12 m precast bridge beams and one longer span of 18 m pre-stressed bridge planks. The plank span will require a cast in-situ deck pour. Trafficable bridge width of 4.2 m.
- All spans will use bolt on concrete kerbs.
- Road approaches will be rebuilt, include 40 m of road works on the eastern side and 50 m on the western side to tie into the existing Darkwood Road.
- The bridge will be raised approximately 2.0 m in height to increase flood immunity.

The Project footprint for the proposed activities at this location are approximately 0.12 ha. The concept design for Hobarts Bridge is shown in Figure 1.7.

A full design and construction methodology report is provided in Appendix D.



	Abutment A	Pier 1	Pier 2	Pier 3	Abutment B
DESIGN SURFACE LEVEL ALONG CONTROL LINE MC01	46.500	46.500	46.500	46.500	46.500
APPROXIMATE EXISTING SURFACE LEVEL ALONG CONTROL LINE MC01	45.204	43.655	43.242	42.829	45.393
CHAINAGE ALONG CONTROL LINE MC00	45.258	57.315	69.335	87.355	99.365

Figure 1.7 Hobarts Bridge concept design

1.6.4 Justins Bridge

Justins Bridge (Plate 1.3) is located on Darkwood Road, crossing the Bellinger River approximately 26 km west of Bellingen.

Plate 1.3 Justins Bridge – existing timber structure

The proposed Project works involve removing the existing 42.5 m four span timber bridge and installing a new 42 m two span, steel/concrete composite bridge structure of increased height on an improved alignment immediately downstream and adjacent to the current footprint.

The form of construction will include:

– Foundations will be bored, cast in-situ 600 mm diameter concrete piles for Abutment A and Pier 1, and rock anchors for Abutment B.
– The pier and western abutment (Abutment A) are located on the outer edge of the flow channel. The eastern abutment is located on the bank outside of the flow channel (Abutment B).
– The substructure will consist of cast in-situ concrete abutments and precast concrete in-situ headstocks. Rock scour protection will be placed on the banks surrounding the abutments.
– The super structure is made up of one 12 m bridge beam span and one 30 m spliced steel girder span.
– Trafficable bridge width of 4.5 m.
– All spans will use bolt on concrete kerbs.
– Road approaches will be rebuilt, include 35 m of road works on the eastern side and 60 m on the western side to tie into the existing Darkwood Road.
– The bridge will be raised approximately 1.5 m in height to increase flood immunity.

The Project footprint for the proposed activities at this location are approximately 0.05 ha. The concept design for Justins Bridge is shown in Figure 1.8.

A full construction design and methodology report is provided in Appendix E.

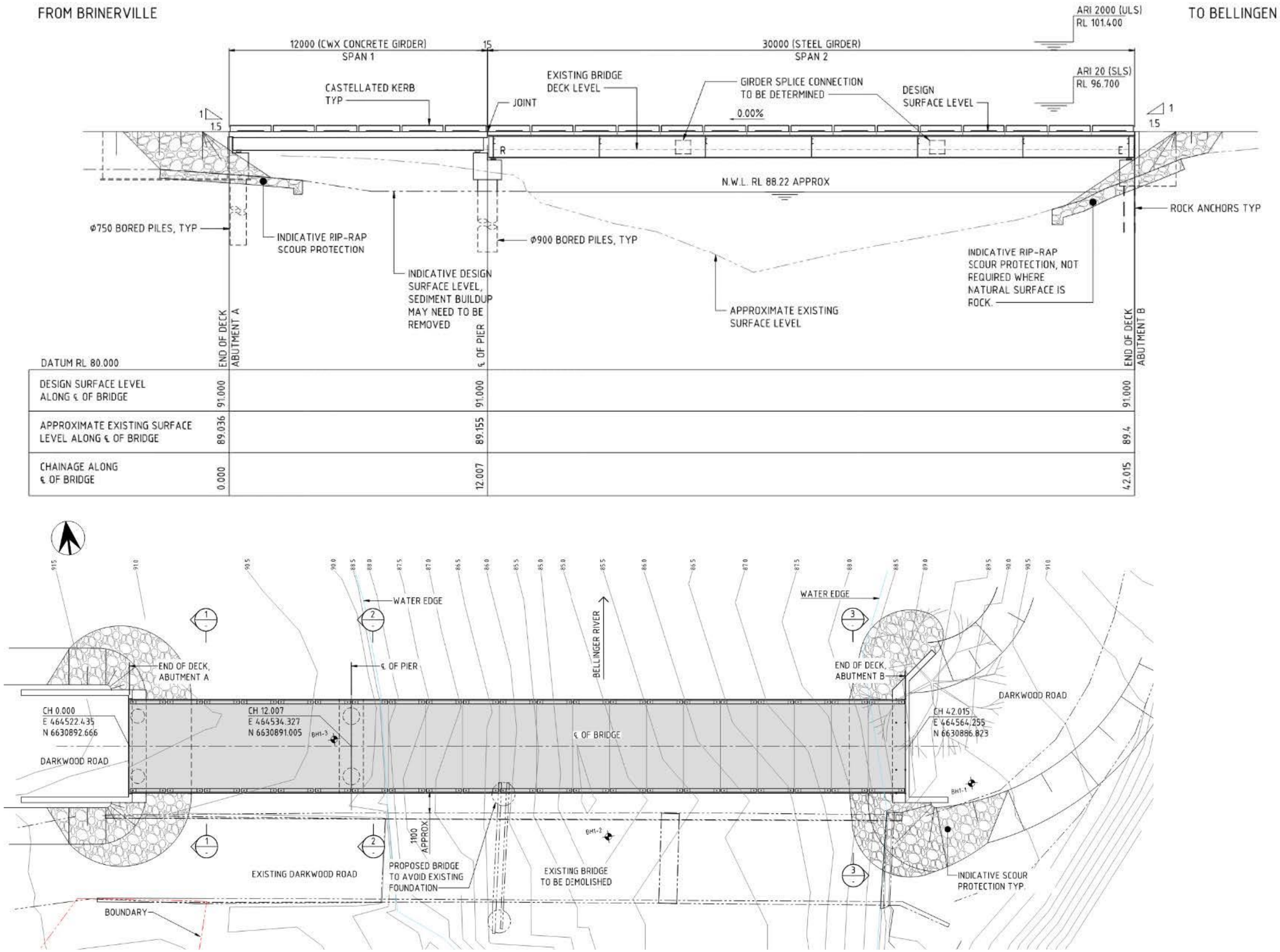


Figure 1.8 Justins Bridge concept design

1.6.5 Duffys Bridge

Duffys Bridge (Plate 1.4) is located on Kalang Road, Kalang NSW, crossing the Kalang River, and provides local access for the community. Council intends to replace the existing timber structure due to its current condition. The existing Duffys Bridge is a four-span timber bridge approximately 44 m long with a 4 m wide carriageway. The bridge is a low-level crossing with a deck height at approximately 19.8 m AHD (Australian Height Datum) based on previous survey.

The proposed concept bridge design is a 44 m concrete dual lane bridge with an overall bridge width of 7.2 m, providing an approximately 7.1 m carriageway. The bridge deck will have a level of 21.5 m (AHD datum) which is approximately 1.7 m higher than the existing bridge level to provide increased flood immunity to residents. The new bridge is to be constructed to the downstream of the existing so that access along Kalang Road can be maintained during construction. Typical reinforced concrete abutment and driven piles would be utilised as abutments and piers due to the dense alluvial gravel deposits potentially creating early refusal for driven piles.

The proposed Project works involve removing the existing 44 m four span timber bridge and installing a new dual lane 51 m (3x17m) three span, concrete bridge structure of increased height on an improved alignment immediately downstream and adjacent to the current footprint. The form of construction will include:

– Foundations driven steel piles, for Abutments and Piers.
– The abutments are located on the bank outside of the flow channel.
– Pier 2 is located outside of the low flow channel.
– Pier 1 is located on the edge of the low flow channel and bank toe.
– The substructure will consist of cast in-situ concrete abutments, in-situ pile caps, in-situ pier columns and in-situ pier headstocks.
– Rock scour protection will be placed on the banks surrounding the abutments.
– The super structure is made up of three spans of 17 m Pre-Stressed Concrete planks.
– Trafficable bridge width of 7.2 m.
– All spans will use traffic barriers.
– Road approaches will be rebuilt, include approximately 50 m of road works on the to tie into the existing Kalang Road on both sides of the bridge.
– The bridge will be raised approximately 1.5 m in height to increase flood immunity.

Plate 1.4 Duffys Bridge – existing timber structure

The Project footprint for the proposed activities at this location are approximately 0.14 ha. The concept design for Duffys Bridge is shown in Figure 1.9.

The construction methodology and mitigation measures will be consistent with best practice similar to that detailed within the attached construction methodology reports.

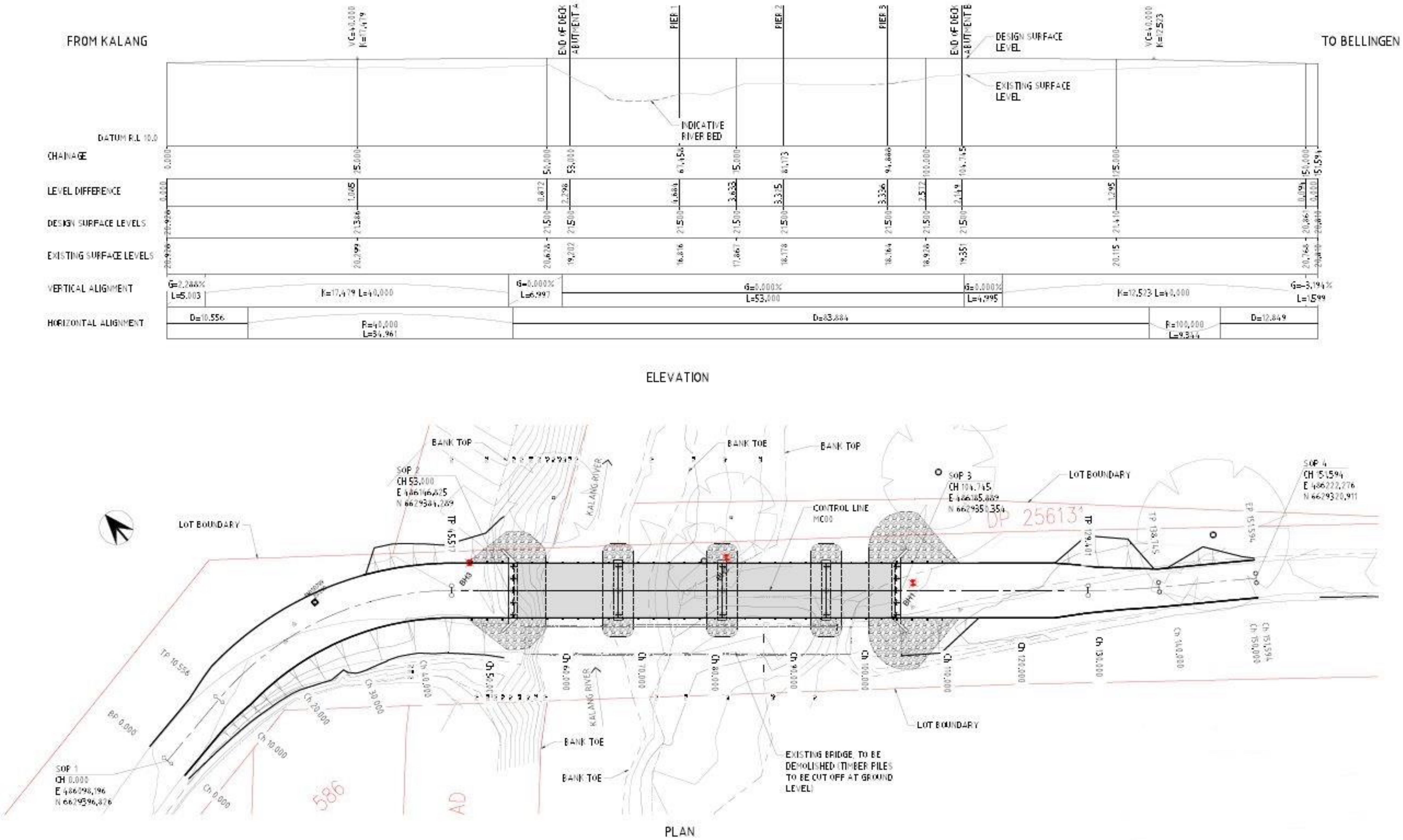


Figure 1.9 Duffys Bridge Concept Design

1.6.6 Road and other ancillary works

As part of each bridge upgrade, a new road alignment will be required. This road alignment has been included in each of the Project Footprints, presented in Figure 2.1, Figure 2.2, Figure 2.3 and Figure 2.4.

A temporary construction compound is anticipated to be established nearby to the Project Footprints within the road corridor as well as partially on private property, with access to be negotiated with private residents. The location of the compound would be determined by the contractor and would be dependent on the order in which works are undertaken.

The compound area is likely to consist of the following:

– Small site shed.
– Equipment laydown area.
– Waste receptacles.
– Construct material.
– The compound area would not be established under the dripline of any existing trees. Due to the rural nature of the Projects, there is no high human activity expected within the area.

Refuelling, fuel decanting and vehicle maintenance work, if required, would take place in a designated sealed and bunded area within the construction compound area or offsite.

The Project would require a range of construction plant and equipment. The following is an indicative list of equipment that would be required for the project:

– Heavy vehicles associated with earthwork activities and construction including excavator, backhoe, skid steer, tipper, spreaders, roller and delivery trucks, etc.
– Machinery required for the works would include an excavator mounted drilling rig, small excavator, mobile shotcrete plant, small mobile crane, various hand tools.

2. Methods

2.1 Desktop assessment

Prior to the field survey, a desktop assessment was undertaken to identify relevant ecological values and facilitate an informed approach to the field survey. The following subsections describe the information that was reviewed to provide an understanding of the ecological values that should be considered as part of this assessment.

2.1.1 Database searches

The desktop assessment incorporated a review of the government records and mapping layers including the *Threatened Biodiversity Data Collection* and other relevant databases. Databases and desktop mapping utilised during the desktop assessments are summarised in Table 2.1. These resources were used to determine the presence of threatened species and communities relevant to this assessment.

Table 2.1 Desktop assessment information sources

Desktop search	Purpose
Atlas of Living Australia (ALA) Database	The ALA database was searched to retrieve historical records of conservation significant flora and fauna species assessed as likely to occur within 10 km of each Project footprint.
BioNet Atlas NSW	BioNet Atlas NSW was used to search threatened species sightings and their species biodiversity profiles within 10 km of each Project footprint.
DPI threatened species lists and distribution maps	DPI threatened species lists and distribution maps were used to identify threatened species sightings within the study area.
Protected Matters Search Tool (PMST)	The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) PMST search was conducted to identify MNES protected under the EPBC Act that have the potential to occur within 10 km of each Project footprint.
Species Profile and Threats Database (SPRAT)	The DCCEEW SPRAT profiles were assessed to determine habitat requirements and ecology of potentially occurring conservation significant species.

2.1.2 Previous studies

Idyll Spaces Environmental Consultants conducted a baseline survey to detect and / or quantify the presence of conservation significant fauna and their required habitats (Idyll Spaces Environmental Consultants 2023). This involved a combination of fauna and flora habitat assessments and active searches. Where relevant the results of this assessment have been incorporated into this SIS.

Subsequent surveys involved more targeted approaches where specific methodologies were selected with respect to the species of interest. Methodologies for these additional surveys are provided in Section 2.3.

2.2 Likelihood of occurrence

Following collation of database records and review of species and community profiles, a ‘likelihood of occurrence’ assessment was prepared with reference to the habitats contained within the Project footprint at each bridge. Identification of potential habitat for threatened, and conservation significant species was based on information provided in the species profiles (DoEE 2020, OEH 2020), recovery plans, journal articles, and the field staffs’ knowledge of species habitat requirements. The likelihood of occurrence assessment was further refined following field surveys. The likelihood of threatened biota occurring in the Project footprint was assessed based on presence of records from the Project Area for the last 20 years (since 2000), species distribution and habitat preferences, and the suitability of potential habitat present in the Project footprint.

Species were classified as ‘may occur’, if the suitable habitat was present within the Project footprint however due to their highly mobile behaviours or large home ranges, any impact is likely to be negligible due to more suitable habitat available surrounding the Project footprint.

Table 2.2 provides a key to the likelihood of occurrence in the Project footprints of threatened biota. Following completion of a likelihood of occurrence assessment, species that were 'likely to occur' or 'confirmed present' as well as candidate species identified during field surveys were the focus of assessments of significance, as outlined in **Declaration** and Section 4.

Table 2.2 Key to likelihood of occurrence for threatened species

Likelihood	Definition
Confirmed present	The species or community was observed in the study area during field surveys.
Likely to occur	It is highly likely that a species inhabits the Project footprint and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources) or has been recorded recently in the Project Area (10 km) and is known or likely to maintain resident populations in the Project footprint. Also includes species known or likely to visit the Project footprint during regular seasonal movements or migration.
May occur	Potential habitat is present in the Project footprint. Species unlikely to maintain sedentary populations, however, may seasonally use resources within the Project footprint opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the Project footprint, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Unlikely to occur	It is unlikely that the species inhabits the Project footprint and has not been recorded in the Project Area (10 km). It may be an occasional visitor, but habitat similar to the Project footprint is widely distributed in the local area. Specific habitat is not present in the Project footprint or the species is a non-cryptic perennial flora species that was specifically targeted by surveys and not recorded.

2.3 Field assessment

2.3.1 Survey effort summary

Field surveys of the Project footprints were conducted in July and in November to December 2023 to identify and assess threatened species impact for flora and fauna from the proposed remediation works on Joyces, Hobarts, Justins and Duffys Bridges. The first field survey was undertaken by Idyll Spaces Environmental Consultants with 1 ecologist for a flora and fauna habitat survey on 12 July 2023. The second field survey was undertaken by 2 ecologists from GHD for a targeted fauna survey between 27 November to 1 December 2023. There were no access limitations during this field survey. A summary of the survey effort for both flora and fauna surveys within the four bridge sites are outlined in Table 2.3 and presented in Figure 2.1, Figure 2.2, Figure 2.3 and Figure 2.4.

Table 2.3 Overview of survey effort within the Project area

Field survey dates	Company	Team & scope	Flora survey effort	Fauna survey effort
12 July 2023	Idyll Spaces Environmental Consultants	1 ecologist Flora and fauna habitat survey	PCT verification Identifying presence of threatened flora	– Opportunistic observations – Aural (visual) and audial surveys – Habitat assessments – Diurnal bird surveys
27 November – 1 December 2023	GHD	2 ecologists Targeted fauna survey		– Targeted fauna searches – Aural (visual) and audial surveys – Anabat detectors – Remote cameras – Diurnal bird surveys – Habitat assessments – Opportunistic observations – Spotlight area searches

2.3.2 Fauna field survey methods

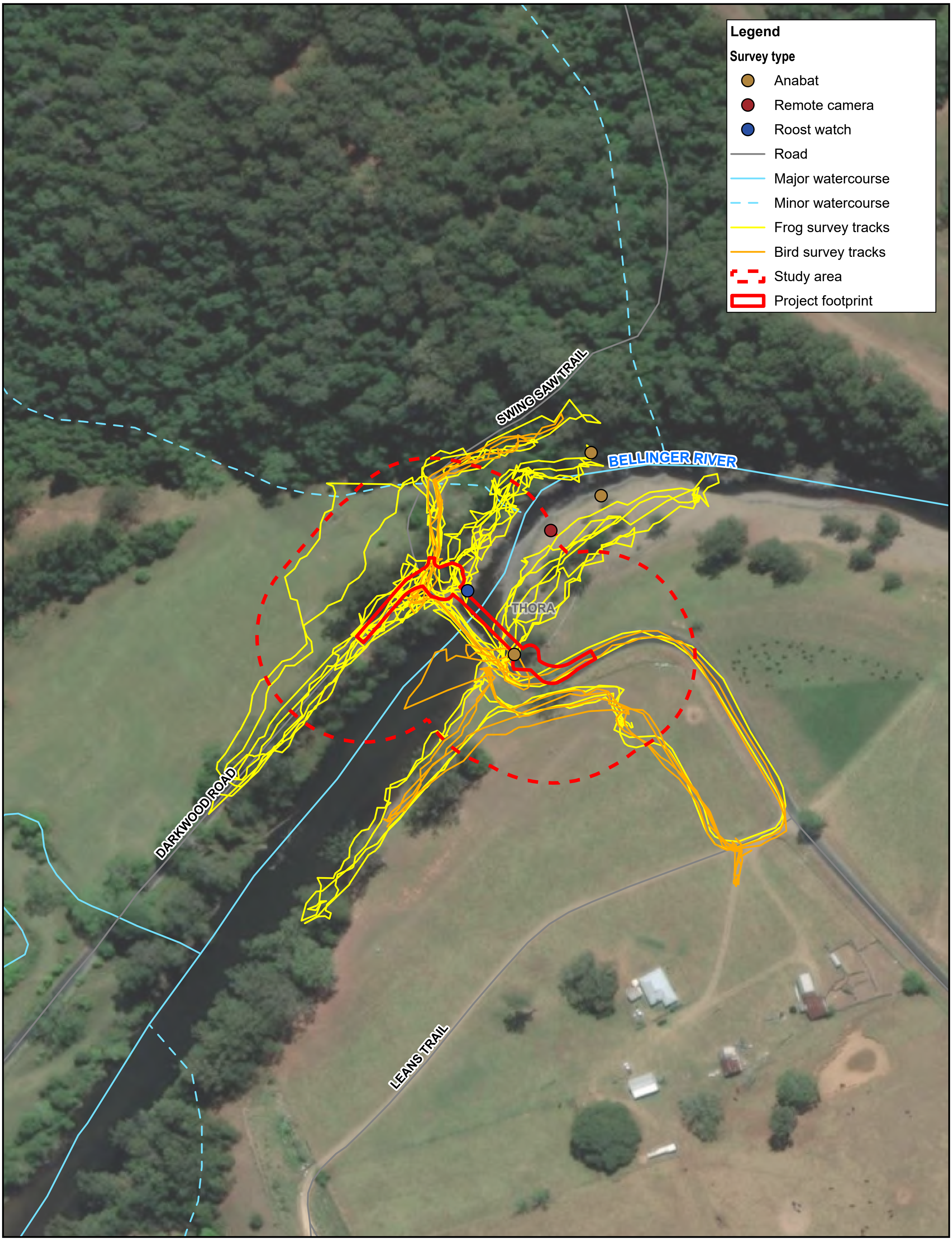
Techniques use for fauna surveys within the study area aimed to assess habitat values present for potentially occurring threatened species. The field surveys included a variety of methods at each bridge site including diurnal bird surveys, diurnal roost checks, dusk roost watches and targeted Giant Barred Frog call play back. Detailed descriptions of survey techniques are included in Table 2.4. Detailed targeted fauna methodology is provided in Section 2.3.2. All observations were recorded on proforma field datasheets.

Table 2.4 Fauna field survey methodology

Assessment type	Survey dates	Detailed survey methodology	NSW guidelines
General field assessment			
Habitat assessment	**Field survey 1:** 12 July 2023 **Field survey 2:** Rotation of all bridges: 27 November – 1 December 2023	Habitat assessments were undertaken at the four bridges along Bellinger River as shown in Figure 4.5, Figure 4.6, Figure 4.7and Figure 4.8. and discussed in Section 4.2. At each of the survey sites, the value of habitats for terrestrial fauna was assessed based on the presence of key resources and microhabitats. This was determined by the structural complexity of vegetation and the presence of features such as hollow-bearing trees, nests and roosts, rocky outcrops, dens, caves, leaf litter and woody debris. Key habitat features important for all threated species were recorded.	Conduct a comprehensive habitat assessment across the whole site, identifying key habitat features which include, location, size, landscape features, biometric vegetation, and condition of habitat (including critical habitat) for all threated species and populations that are assumed present. All native and introduced vegetation to be recorded.
Opportunist searches for wildlife and traces	**Field survey 1:** All bridges - 12 July 2023 **Field survey 2:** Rotation of all bridges: 27 November – 1 December 2023	All incidental observations of fauna during surveys were recorded. All secondary fauna traces were recorded including bones, feathers, skulls, sloughed skins, faecal pellets, tracks, burrows and scratches.	No NSW species-specific guideline, however, it is advised that thorough searches at each site to justify the level of effort and include information on the size of the site and the duration.
Spotlighting area searches	**Field survey 2:** Rotation of all bridges: 27 November – 1 December 2023	Spotlight area searches were conducted at the four bridges. Spotlighting area searches were conducted by two ecologists with flashlights surveying one bridge per night. Spotlighting surveys were conducted to target nocturnal and arboreal mammals.	Spotlighting activities are completed with a minimum of 200 lumens light, and the surveyor(s) are to move slowly and quietly through the habitat to observe active and non-active individuals.
Remote cameras	**Field survey 2:** Rotation of all bridges: 27 November – 1 December 2023	Remote surveillance cameras (Reconyx Hyperfire 2.0) were deployed at each bridge (Figure 2.1, Figure 2.2, Figure 2.3 and Figure 2.4.) Remote cameras were deployed in representative habitat types to target conservation significant species. Each camera was left in situ and baited with chicken wings to target the Spotted-tailed Quoll.	No NSW species-specific guidelines.

Assessment type	Survey dates	Detailed survey methodology	NSW guidelines
Anabat detectors	**Field survey 2:** Rotation of all bridges: 27 November – 1 December 2023	Full-spectrum acoustic monitoring devices (Anabat Swift – Titley's Scientific) were utilised to detect the echolocation calls of microchiropteran species within the Project area. Anabat detectors were deployed at two locations in mature Eucalypt vegetation that provided suitable roosting structures for microbats (e.g. tree hollows, stumps and old stags). Anabats were deployed at least 1 m off the ground and situated along potential flyways like tracks, watercourses or cleared easements. Recordings were analysed by specialist sub-consultant Greg Ford from Balance Environmental. The Anabats were deployed at each bridge (Figure 2.1, Figure 2.2, Figure 2.3 and Figure 2.4.)	No NSW species-specific guidelines.
Targeted fauna surveys – Refer to sections 2.3.2.1 to 2.3.2.4 for detailed survey methodology			
Mixophyes iteratus (Giant Barred Frog)	**Field survey 2** Rotation of all bridges: 27 November – 1 December 2023	Visual surveys in 500m transects at each site over four nights to achieve at least 480 survey minutes. Initial survey conducted by Idyll Spaces Environmental Consultants to be proposed as the initial survey to meet the requirement for the first and last surveys to be at least 14 days apart. Refer to Section 2.3.2.3. Refer to Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4.	Aural – visual surveys in 500 m transect undertaken for a total of 480 min in four repeat surveys (where individual nights count as repeats provided first and last survey are at least 14 days apart). Survey months: October – March.
Myotis macropus (Southern Myotis)	**Field survey 2** Joyces Bridge – 30/11/2023 Hobarts Bridge – 29/11/2023 Duffys Bridge – 27/11/2023 Justins Bridge – 28/11/2023	One Anabat set over four nights at each bridge site (16 detector nights in total). 30-minute roost search per structure (bridge or building) 20-minute survey at dusk per bridge for exiting bats. Refer to Section 2.3.2.1.	30-minute roost search per structure (bridge or building) Four Anabats set over four nights (total of 16 detector nights) (OEH 2018). Survey months: October – March.
Dasyurus maculatus maculatus (Spotted-tailed Quoll)	**Field survey 2** 27 November – 1 December 2023	One baited remote camera set at each site for four nights. Searches for signs (latrines etc). Refer to Section 2.3.2.3.	No NSW species-specific guideline.
Ptilinopus *Magnificus* (Wompoo Fruit-dove) and *Ptilinopus superbus* (Suburb Fruit-dove)	**Field survey 2** Joyces Bridge – 28/11/2023 Hobarts Bridge – 29/11/2023 Duffys Bridge – 30/11/2023 Justins Bridge – 28/11/2023	One 20-minute census prior to dusk at each bridge site. Incidental surveys during diurnal habitat assessments. Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4 Refer to Section 2.3.2.4.	No NSW species-specific guideline. One 20-minute census at dawn or dusk for water sources.

Assessment type	Survey dates	Detailed survey methodology	NSW guidelines
White-bellied Sea-eagle (*Haliaeetus leucogaster*) and Eastern Osprey (*Pandion cristatus*)	**Field survey 2** Joyces Bridge – 28/11/2023 Hobarts Bridge – 29/11/2023 Duffys Bridge – 30/11/2023 Justins Bridge – 28/11/2023	Searches for stick nests or other evidence of breeding. Refer to Section 2.3.2.4.	Searches for large stick nests within tree canopy; or presence of an adult with nest material; or adults observed duetting within breeding period. Survey months: July – December (sea-eagle), April – November (osprey).
Grey-headed Flying-fox (*Pteropus poliocephalus*)	**Field survey 2** Joyces Bridge – 30/11/2023 Hobarts Bridge – 29/11/2023 Duffys Bridge – 27/11/2023 Justins Bridge – 28/11/2023	Searches for evidence of roost camps. Refer to Figure 4.2. Opportunistic observations and targeted 20-minus census at dusk at each bridge site. Refer to Section 2.3.2.1.	Search for camps and roosting habitat. If a camp is located survey for breeding females. Camps used for breeding must be mapped. Use GPS to map outer perimeter of the camp. Survey months: October – December.
Stephens's Banded Snake (*Hoplocephalus stephensii*)	**Field survey 2** Rotation of all bridges: 27 November – 1 December 2023	Spotlighting searches for evidence of breeding in tree-hollows, under woody debris or loose bark, and on ground cover. Refer to Section 2.3.2.3.	Search for suitable habitat, active individuals, non-active individuals (searching under suitable shelter habitats). Walking through suitable habitat should be slow (2 km/h), stopping every 10 m to observe active individuals.
Bellinger River Snapping Turtle (*Myuchelys georgesi*)	**No targeted survey required – see Section 4.3.11.4**	N/A	N/A



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Bellingen Shire Council
Bellinger River Species Impact Statement
Joyces Bridge

Survey effort

Project No. 12611463
Revision No. 0
Date 29/07/2024

FIGURE 2.1

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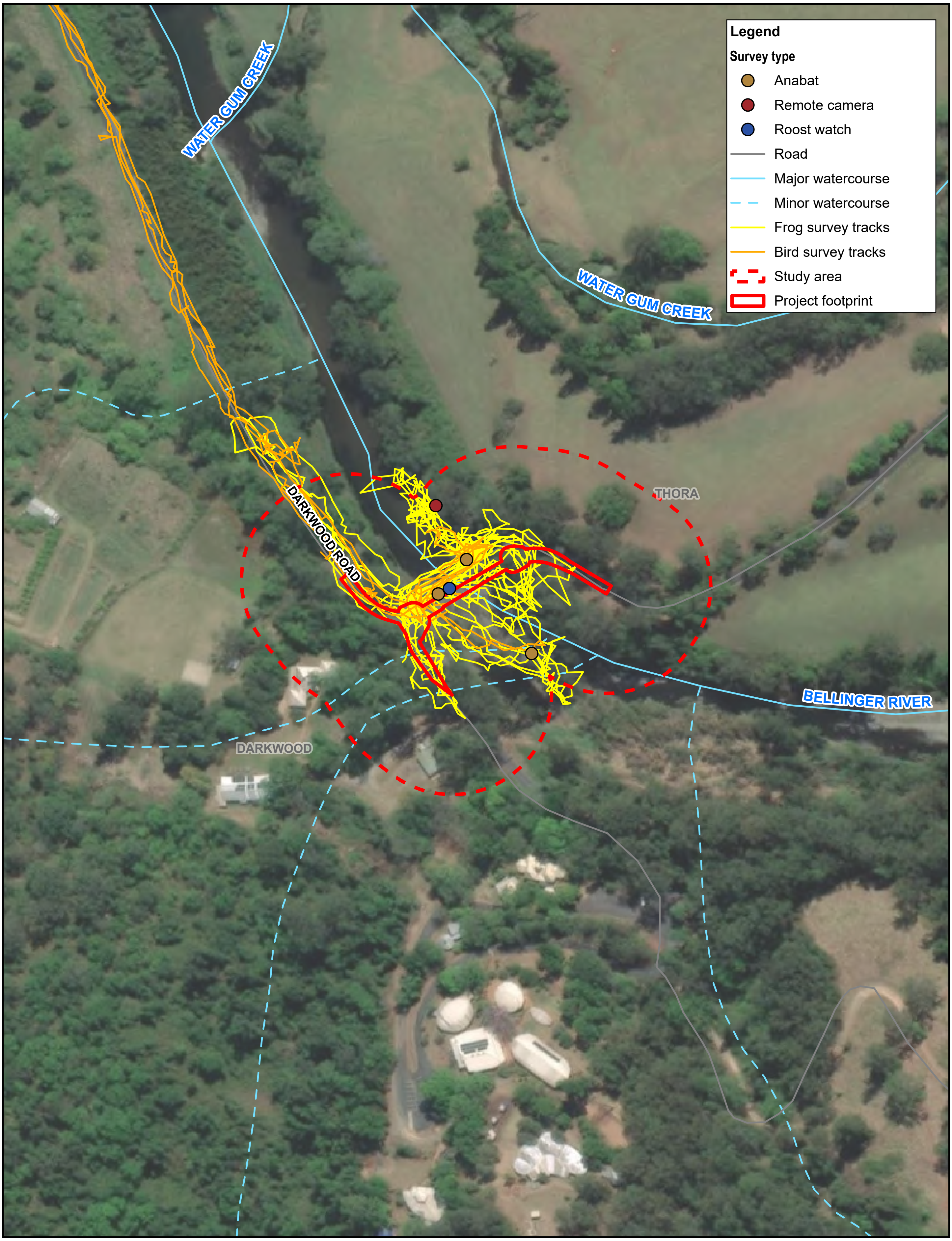
Created by: mvandermerwe



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Bellingen Shire Council
Bellinger River Species Impact Statement
Hobarts Bridge

Project No. **12611463**
Revision No. **0**
Date **29/07/2024**

Survey effort

FIGURE 2.2

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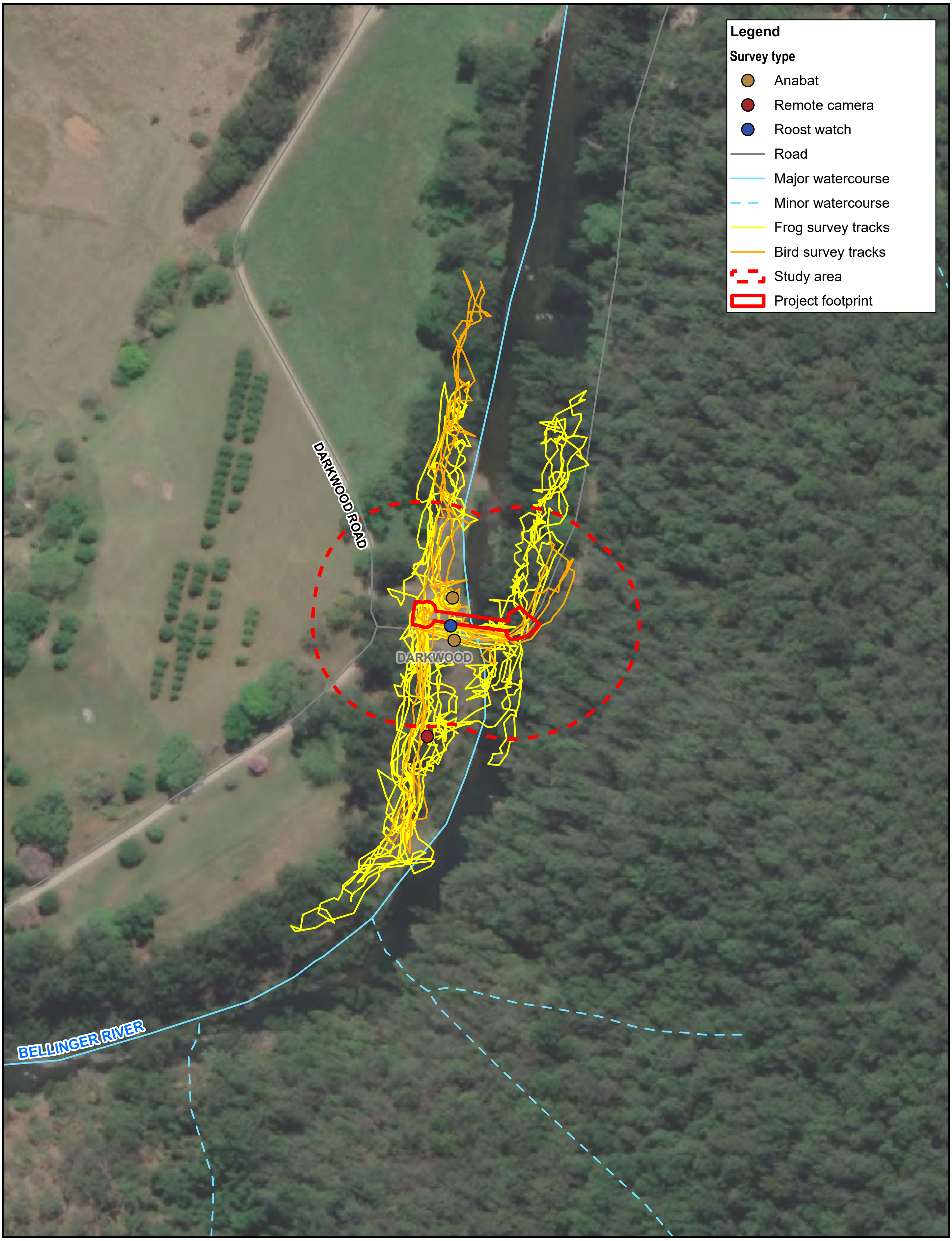

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Bellingen Shire Council
Bellinger River Species Impact Statement
Justins Bridge

Project No. **12611463**
Revision No. **0**
Date **29/07/2024**

Survey effort

FIGURE 2.3

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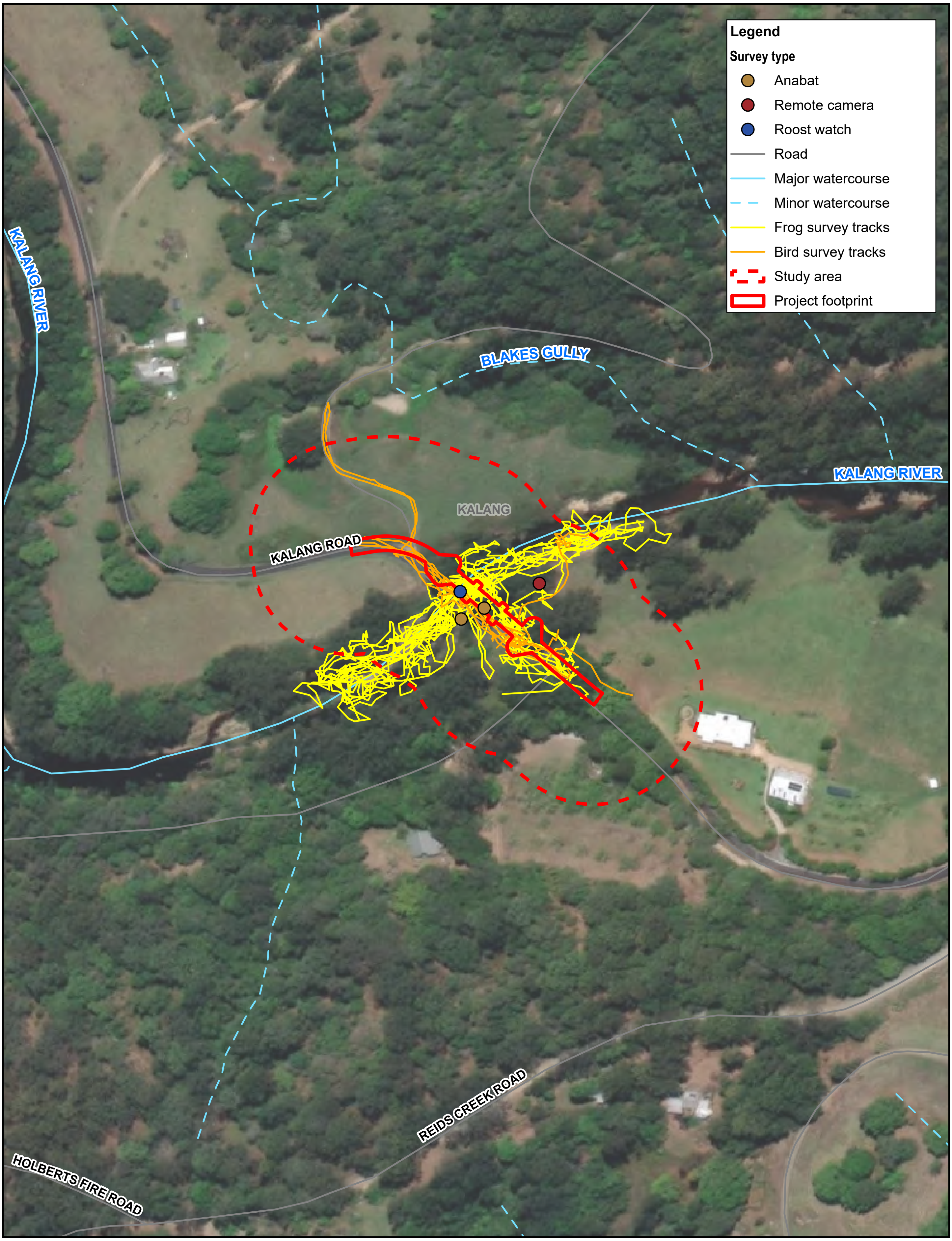
Print date: 29 Jul 2024 - 11:46

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: project area, project footprint, survey data (2024); NSWSS: roads, watercourse, suburbs (2023).
Created by: mvandermerwe



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River Species Impact Statement
Duffys Bridge

Survey effort

Project No. 12611463
Revision No. 0
Date 29/07/2024

FIGURE 2.4

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Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: project area, project footprint, survey data (2024); NSWSS: roads, watercourse, suburbs (2023).
Created by: mvandermerwe

2.3.2.1 Microbat surveys

Targeted Southern Myotis (*Myotis macropus*) field survey methodology

The underside of each bridge was scanned for roosting microbats during the day, where possible, to identify suitable roosting habitat underneath each wooden structure in line with the 'New South Wales Species credit threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method' (OEH 2018). Each bridge has old timber materials associated with the structural integrity and original engineering, which often provides small suitable roosting habitat for microbats in the cracks and crevices. Given the high water levels at some of the sites, some areas of the bridge were inaccessible. Two ecologists conducted a dusk roost watch for 30-40 minutes at each bridge site to observe if any microbats were emerging from roost sites in the bridge.

Microbat ultrasonic echolocation call recordings (Anabat surveys) were undertaken using four Anabat units over four nights. Anabats were deployed adjacent to the waterway and in potential flyways (Plate 2.1). Recorded calls were analysed by a Senior Scientist Craig Grabham. Calls were identified using zero-crossing analysis and AnalookW software (version 4.1t, Chris Corben 2015). *The Bat calls of NSW: Region based guide to the echolocation calls of microchiropteran bats* (Pennay *et al*. 2004) was used to assist call analysis. Call identification was assisted by consulting records from the Atlas of NSW Wildlife (OEH 2020a).

Plate 2.1 Anabat detector positioning (L: Joyces Bridge. R: Justins Bridge)

2.3.2.2 Terrestrial fauna surveys

Targeted Spotted-tail Quoll (*Dasyurus maculatus*) field survey methodology

Targeted surveys for the Spotted-tail Quoll (*Dasyurus maculatus*) were conducted from 27 November – 1 December 2023. Field survey utilised a combination of baited cameras and active searches for latrine sites and refuge habitat. In total, four baited remote cameras were deployed for the species, one at each bridge site.

Spotted-tail quoll study sites were selected in accessible locations within close proximity to the bridge sites. Due to the small scale of the project, baited cameras and spotlighting were the two survey methods used in targeted spotted-tail quoll surveys. There is no NSW species-specific guideline so field survey methodologies were conducted in accordance with the Survey Guidelines for Australia's Threatened Mammals (DSEWPC, 2011).

Grey-headed Flying-fox (*Pteropus poliocephalus*) field survey methodology

Targeted surveys for the Grey-headed Flying-fox (*Pteropus poliocephalus*) were conducted from 27 November – 1 December 2023. Field surveys utilised a combination of active searches for camps and roosting habitat, and breeding females within those camps. Identified roosting camps outer perimeters were mapped using GPS coordinates. Active searches for evidence of roost camps and opportunistic observations and targeted 20-minute census were conducted at dusk at each bridge site.

There is no NSW species-specific guideline for the Grey-headed Flying-fox so field survey methodologies were conducted in accordance with the CSIRO's 'A monitoring method for the for the grey-headed flying-fox, *Pteropus poliocephalus*' (Westcott, et al 2011).

Spotlighting surveys

Spotlighting was conducted around the Project footprint and broader Project area each night. Spotlighting involved walking along the riparian zone and waterway, as well as the interface between forest/woodland vegetation and cleared areas and scanning trees and vegetation for fauna species. Any eye shine was checked using binoculars to identify the species, as necessary. Any fauna species observed flying over or foraging within vegetation within the study area was identified and counted where possible.

Opportunistic observations

Opportunistic observations of fauna species were recorded at all times during field surveys.

2.3.2.3 Amphibian and reptile surveys

Targeted Giant Barred Frog (*Mixophyes iteratus)* field survey methodology

Visual and aural frog surveys were undertaken within suitable habitat identified at each of the watercourse crossings. At each location, a one hour period was spent in the nighttime conducting visual and aural surveys for the target species (refer Figure 2.1, Figure 2.2, Figure 2.3 and Figure 2.4). Visual surveys involved looking for frogs within suitable microhabitats at the shoreline of the waterway, around the base of sedges, rushes and grasses, under leaf litter and in the shallows of standing water. Opportunistic observations of non-target frog and tadpole species were also recorded.

Call playback was used to target Giant Barred Frog and encourage additional calling activity of common amphibian species. Call playback is regarded as having a low impact on the targeted species, as the individuals are responding to a natural situation (DEWHA, 2010). Call playback involved broadcasting a pre-recorded call of each of the targeted species, through a handheld speaker at each monitoring location. Each species call was broadcast for two minutes and followed by two minutes of silence, listening for a response call from the target species. This technique was used in conjunction with five minutes of active searching during and following call play back. During the field surveys, the number of frogs of each species calling was estimated. It should be noted that this is an unreliable method of assessing abundance but is the best method available in a rapid assessment, provided environmental conditions are suitable for response calling. While useful in assessing the extent of breeding habitat and the presence or absence of the targeted species, this approach is likely to underestimate the extent of habitat used by non-calling or non-breeding individuals.

2.3.2.4 Diurnal bird surveys

Targeted Wompoo Fruit-dove (*Ptilinopus magnificus*) and Suburb Fruit-dove (*Ptilinopus superbus*) field survey methodology

Surveys for these rainforest dwelling doves were conducted in the late afternoon. As there are no New South Wales species-specific guidelines, surveys were conducted in accordance with Survey Guidelines for Australia's Threatened Birds (DEWHA, 2010). Area searches targeting all bird species were performed in the late afternoon within and around riparian vegetation associated with Bellinger River and Kalang River. The survey comprised an area search of at least 30 min duration (refer Figure 2.1, Figure 2.2, Figure 2.3 and Figure 2.4). Species were identified by sight and call. Incidental observations of all birds were also recorded throughout the day during general surveys.

Targeted White-bellied Sea-Eagle (Haliaeetus leucogaster) Eastern osprey (Pandion cristatus) field survey **methodology**

Surveys for this large raptor species were conducted in the late afternoon at each bridge site. Ecologists were looking for large stick nests within tree canopies, the presence of an adult with nest material or adults observed duetting. There are no NSW species-specific guidelines, so surveys were conducted in accordance with Survey Guidelines for Australia's Threatened Birds (DEWHA, 2010).

2.3.3 Flora field survey methods

A terrestrial flora survey was undertaken on 12 July 2023 by a suitably qualified ecologist from Idyll Spaces Environmental Consultants by involving a flora assessment as described in Table 2.5.

Table 2.5 Flora field survey methodology

Survey method	Detailed survey methodology
Threatened Ecological Communities (TEC) assessments	TEC assessments were conducted within areas of vegetation with the potential to conform with Commonwealth-listed TECs. Assessments were conducted in accordance with the diagnostic criteria and conditions thresholds outlined in the individual Conservation Advice for individual TECs. Variables included: – Canopy crown cover – Dominance of non-native species (% in 1 m quadrats) – Groundcover species diversity – Canopy species dominance. – Canopy cover species diversity Abundance of large trees (per hectare).
Vegetation mapping	Plant Community Types (PCT) held in the BioNet Vegetation Classification database (DPE 2023a) were ground-truthed during field surveys. Field surveys were undertaken in accordance with the methodologies outlined in the Biodiversity Assessment Method (BAM) manual (DPIE 2020). Based on the assessment of the floristic assemblage, vegetative strata, landscape position, soil type and other diagnostic features, vegetation communities were assigned to the most likely PCT.
Identification of plant species	All plant species were identified to the species level in the field.
Threatened flora searches	Opportunistic surveys were conducted for threatened flora species shortlisted during desktop assessments.
Recording of invasive species	The field survey involved traversing the survey areas identifying any introduced plant species visible listed under the NSW *Biosecrutiy Act* 2015. The identity, precise location and relative abundance was recorded.

3. Flora

3.1 Vegetation communities

3.1.1 Existing habitat

Joyces Bridge

The vegetation surrounding Joyces Bridge is mostly comprised of exotic weeds and grasses, with isolated individuals of *Lomandra hystrix* and occasional stands of *Casuarina cunninghamiana.* Two mature *Casuarina c.* (15 m in height) with fissures and/or hollows are within two metres of the proposed works and may be impacted either directly (removal) or indirectly (earthworks within critical root zone). The bed and bank composition are a combination of cobble and moist soil with perennial water sources present. Intensive cattle grazing is also present in the area. The vegetation surrounding Joyces Bridge occurs in hinterland riparian. The proposed Project footprint will impact approximately 200 m^2 of native vegetation (Idyll Spaces Environmental Consultants 2023). The existing environment at Joyces Bridge is presented in Figure 3.1. Refer to Appendix I for a full species list of Joyces Bridge.

Hobarts Bridge

The vegetation surrounding Hobarts Bridge is dominated by flood-affected juvenile *Casuarina cunninghamiana* (approximately 3 m tall) on shallow rocky soils, indicating alluvial substrates. *Lomandra h.* and other exotic weeds were present along the banks. Hobarts Bridge occurs in hinterland riparian vegetation, with the proposed Project Footprint impacting approximately 250 m^2 of native vegetation (Idyll Spaces Environmental Consultants 2023). The bed and bank composition are made up of bedrock cobble and moist soil, with perennial water sources being present. The existing environment at Hobarts Bridge is presented in Figure 3.2. Refer to Appendix I for a full species list of Hobarts Bridge.

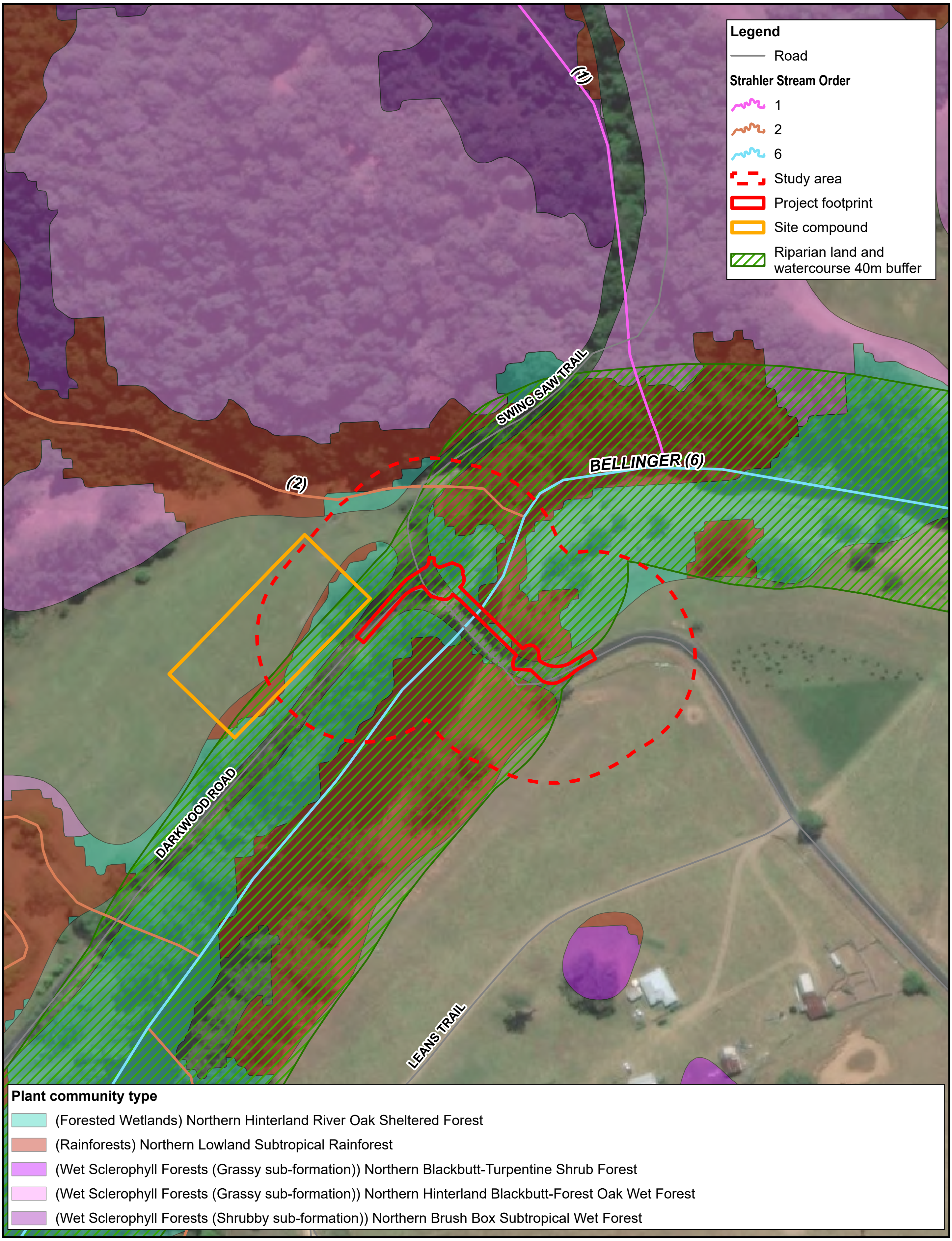
Justin's Bridge

Justins Bridge is a timber bridge supporting cracks and crevices. The bed and bank composition are similar to Joyces and Duffys Bridge with a combination substrate of cobble and moist soil with permanent water sources present. Cattle grazing was observed during the survey. The habitat identified in Justins Bridge is dominated by *Casuarina c.* (up to 15 m tall). Other vegetation is limited to weeds and isolated tufts of non-woody plants such as *Lomandra h.* and *Solanum mauritianum*. Similar to the other three bridges, Justin's Bridge occurs in hinterland riparian with the proposed Project footprint impacting approximately 100m^2, mostly occupied by exotic grasses. It is likely a large *Casuarina c.* maybe be removed on the eastern approach (Idyll Spaces Environmental Consultants 2023). The existing environment at Justins Bridge is presented in Figure 3.3. Refer to Appendix I for a full species list of Justin's Bridge.

Duffys Bridge

The vegetation observed around Duffys Bridge has high density of exotic species, dominated by *Ligustrum sinense, Paspalum mandiocanum* and *Ageratum houstonianum.* The native vegetation present consists of occasional small plants of *Casuarina c.*, *Ficus coronata, Leptospermum brachyandrum*, and *Lomandra h*. Duffys Bridge occurs in hinterland riparian with the proposed Project footprint will impacting approximately 200 m^2 of vegetation (Idyll Spaces Environmental Consultants 2023). The bed and bank composition is comprised of a mixed substrate of cobble and moist soil and perennial water sources. Intensive cattle grazing is also present in the broader Study Area. The existing environment at Duffys Bridge is presented in Figure 3.4. Refer to Appendix I for a full species list of Duffys Bridge.

A summary of the PCT identified from the flora survey and vegetation communities is detailed in Section 3.1.2.



Paper Size ISO A4

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River Species Impact Statement
Joyces Bridge

Project No.	**12611463**
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Existing environment

FIGURE 3.1

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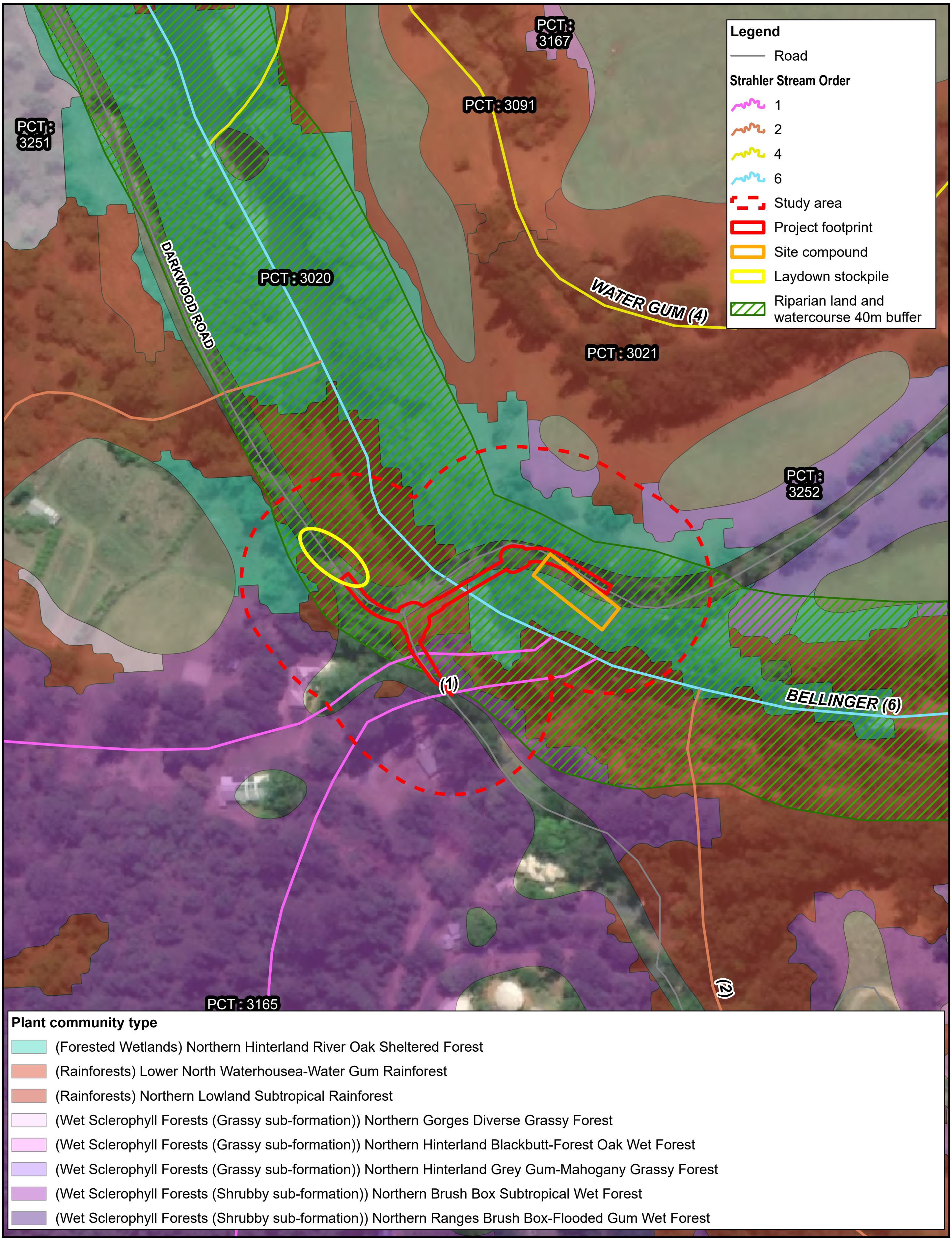
Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: riparian buffer (2023), study area, project footprint (2024); NSWSS: roads, watercourse, suburbs (2023); DPE: plant community (2023).
Created by: mvandermerwe



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Bellingen Shire Council
Bellinger River Species Impact Statement
Hobarts Bridge

Project No.	**12611463**
Revision No.	**0**
Date	**29/07/2024**

Existing environment

FIGURE 3.2

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_SpeciesImpactStatement.aprx - 12611463_003_ExistingEnvironment
Print date: 29 Jul 2024 - 12:03

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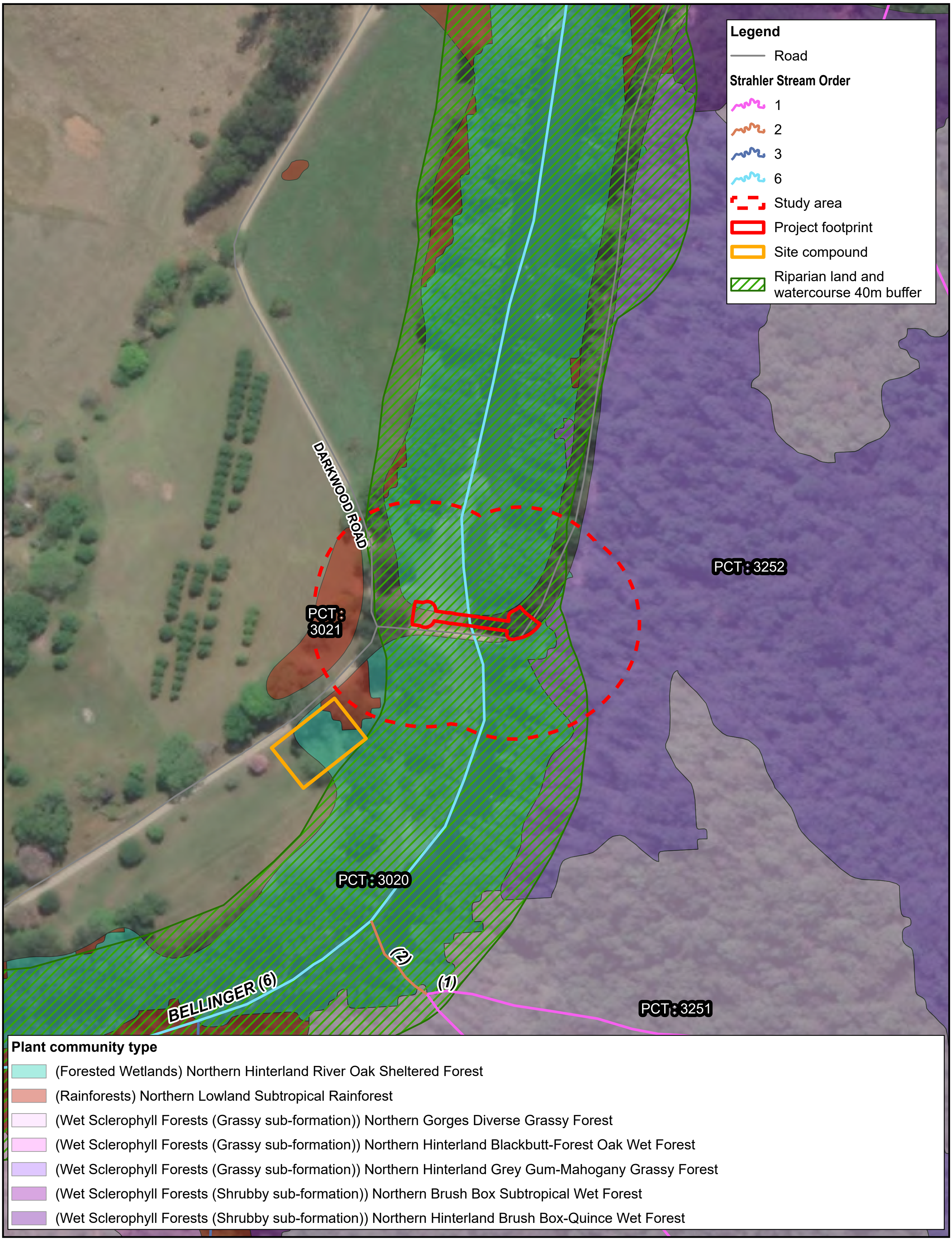
Created by: mvandermerwe



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Bellingen Shire Council
Bellinger River Species Impact Statement
Justins Bridge

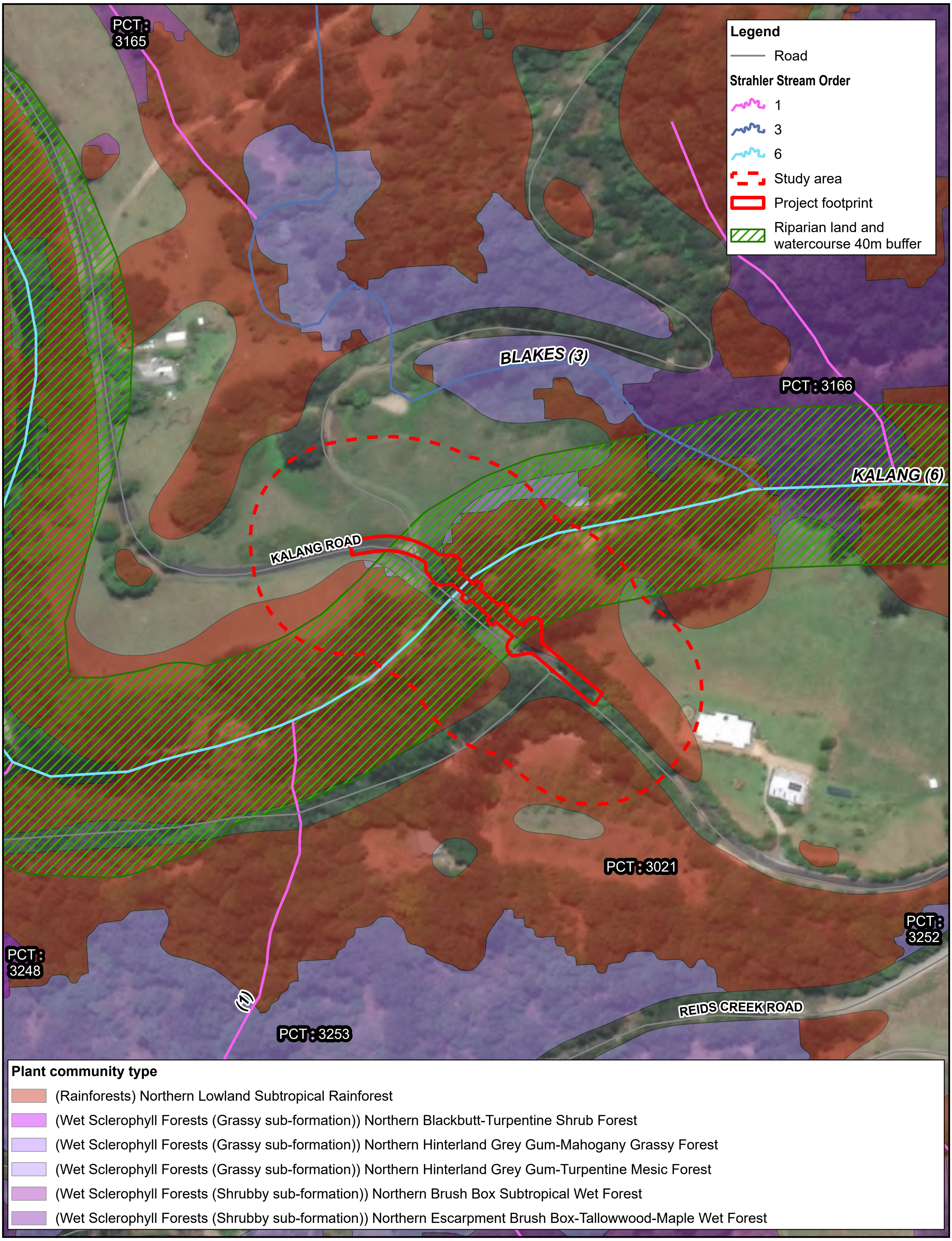
Project No.	**12611463**
Revision No.	**0**
Date	**29/07/2024**

Existing environment

FIGURE 3.3

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_SpeciesImpactStatement.aprx - 12611463_003_ExistingEnvironment
Print date: 29 Jul 2024 - 12:04

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: riparian buffer (2023), study area, project footprint (2024); NSWSS: roads, watercourse, suburbs (2023); DPE: plant community (2023).
Created by: mvandermerwe



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River Species Impact Statement
Duffys Bridge

Existing environment

Project No. **12611463**
Revision No. **0**
Date **29/07/2024**

FIGURE 3.4

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Print date: 29 Jul 2024 - 12:04

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: riparian buffer (2023), study area, project footprint (2024); NSWSS: roads, watercourse, suburbs (2023); DPE: plant community (2023).
Created by: mvandermerwe

3.1.2 Plant Community Type Classification (PCT)

Idyll Spaces Environmental Consultant conducted a flora survey to identified vegetation communities across Joyces, Hobarts, Justins and Duffys Bridge. The purpose of this survey was to assist in the quantification of any potential impacts that could occur from the proposed remediation works. Idyll Spaces Environmental Consultants deemed the PCT for the four bridges to be remnants of NSW plant community type classification (PCT) 3020 Northern Hinterland River Oak Sheltered Forest (Idyll Spaces 2023).

In alignment with the characteristics for the PCT 3020, the vegetation communities at all four bridges were dominated by juvenile *Casuarina c.* individuals. Duffys Bridge also supported exotic species, with a notably less abundance of *Casuarina c.* The vegetation around Duffys Bridge also comprised of native *Ficus coronata*, and *Lomandra h.* Based on of the observed vegetation communities and the location of the four bridges on alluvial substrates, the PCT has been classified as 3020 Northern Hinterland River Oak Sheltered Forest (DPIE 2023).

3.2 Threatened Ecological Communities

The PCT identified within the study area (3020 Northern Hinterland River Oak Sheltered Forest) is not commensurate with any listings of Threatened Ecological Communities (TEC) under the BC or EPBC Act.

Desktop assessments did not identify any other TECs listed under the NSW BC Act as relevant to the study area.

3.3 Threatened flora species

Database searches identified 14 flora species listed under the BC Act as relevant to the study area Appendix J. A likelihood of occurrence assessment determined that there is potential habitat for nine of these species at one or more of the four bridge locations (Table 3.1).

Targeted flora surveys were undertaken for flora species identified as having the potential to occur. No threatened flora species were detected within the study area during the targeted flora survey. As no threatened flora species were recorded within or adjacent to any of the Project sites, none are considered candidate species within this SIS.

A complete inventory of flora species identified for each bridge site are provided in Appendix I.

Table 3.1 Threatened flora identified as having potential habitat within the Project areas.

Species	Conservation status		Source	Likelihood of occurrence			
	EPBC Act	BC Act					
				Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Native Guava, *Rhodomyrtus psidioides*	CE	CE	PMST, BioNet	Unlikely to occur	Unlikely to occur	Unlikely to occur	May occur
Scrub Turpentine, *Rhodamnia rubescens*	CE	CE	PMST, BioNet	May occur	May occur	May occur	May occur
Slender Marsdenia, *Marsdenia longiloba*	E	V	PMST, BioNet	May occur	Unlikely to occur	Unlikely to occur	May occur
Milky Silkpod, *Parsonsia dorrigoensis*	E	V	PMST, BioNet	May occur	May occur	May occur	May occur

Species	Conservation status		Source	Likelihood of occurrence			
	EPBC Act	BC Act					
Clear Milkvine, *Leichhardtia longiloba* (Note: listed as *Marsdenia longiloba* under EPBC)	V	E	PMST, BioNet	Unlikely to occur	Unlikely to occur	Unlikely to occur	May occur
Red Boppel Nut, *Hicksbeachia pinnatifolia*	V	V	PMST, BioNet	May occur	Unlikely to occur	Unlikely to occur	May occur
Hairy Jointgrass, *Arthraxon hispidus*	V	V	PMST, BioNet	Unlikely to occur	May occur	May occur	May occur
Rainforest cassia, *Senna acclinis*	-	E	BioNet	May occur	May occur	May occur	May occur
Rusty Plum, Plum Boxwood, *Niemeyera whitei*	-	V	BioNet	May occur	Unlikely to occur	Unlikely to occur	May occur

3.4 Introduced flora species

There were three exotic flora species under the *NSW Biosecurity Act 2015* that were confirmed present at Joyces bridge and Duffys Bridge. Hobarts bridge did not contain any flora species under the NSW Biosecurity Act 2015.

Joyces Bridge contained Giant Parramatta Grass (*Sporobolus fertilis*) while Duffys Bridge had Camphor Laurel (*Cinnamomum camphora*) and Small-leaved Privet (*Ligustrum sinense*). All of these species are declared noxious weeds under the *NSW Biosecurity Act 2015.*

All species are relatively common and observed in scattered locations through the Study area.

4. Fauna

4.1 Fauna species

A total of 87 fauna species were recorded during the survey, comprising 55 birds, 12 mammals, 12 frogs, five reptiles and two fish. (Appendix H). Two introduced species were recorded.

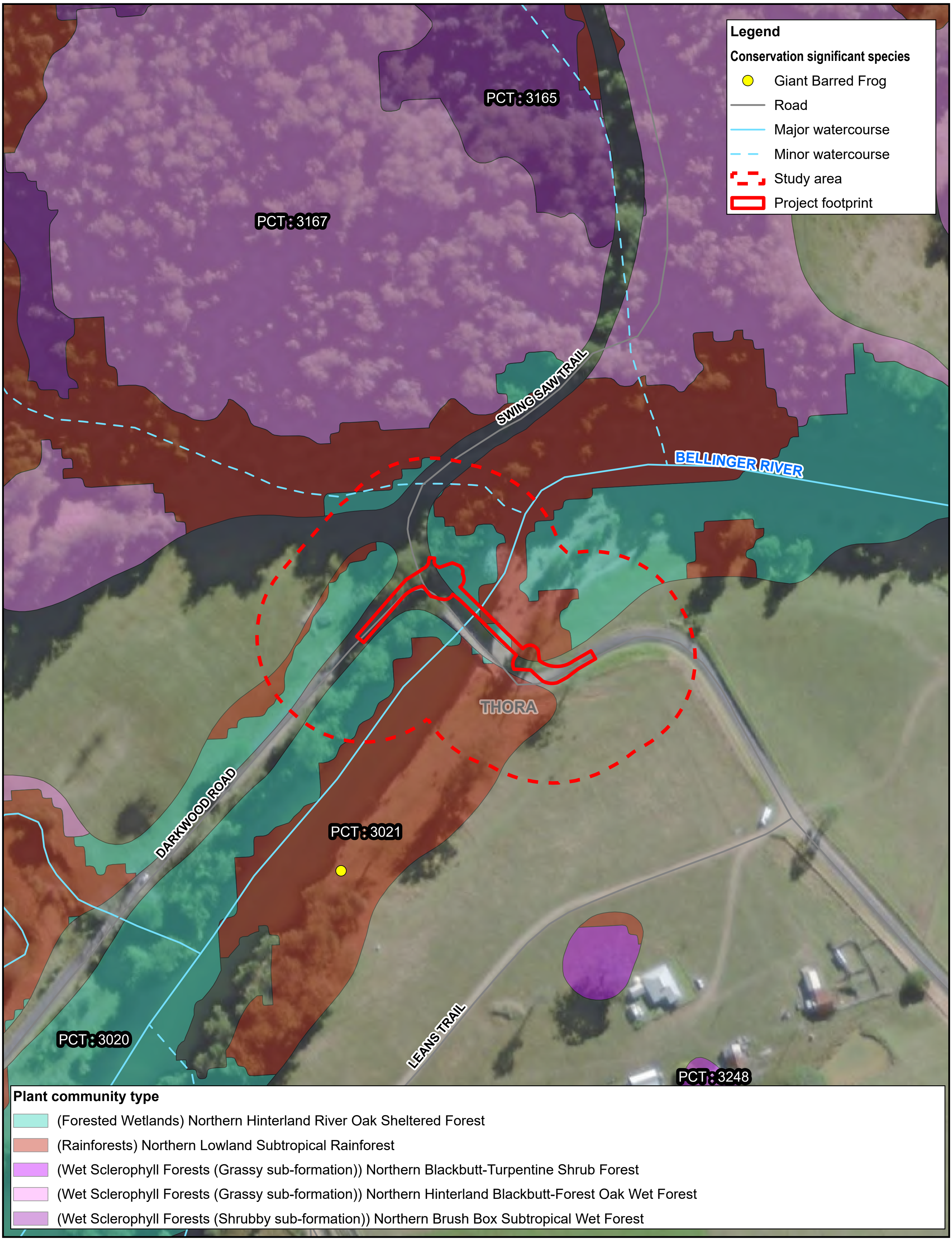
The majority of species recorded were common, widespread and adaptable species, characteristic of agricultural and rural habitats however other species was associated with rainforest habitats.

One threated fauna species was observed within the Project Footprint and Study Area at each site; Giant Barred Frog (*Mixophyes iteratus*).

Several threatened microbat species may be roosting within the structures though this can't be confirmed and as a minimum are expected to be roosting nearby.

An account of threatened fauna species is presented in Section 4.3.

Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4 illustrates the conservation significant fauna recorded during field surveys at each bridge.



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River Species Impact Statement
Joyces Bridge

Project No. **12611463**
Revision No. **0**
Date **24/01/2024**

Survey field results

FIGURE 4.1

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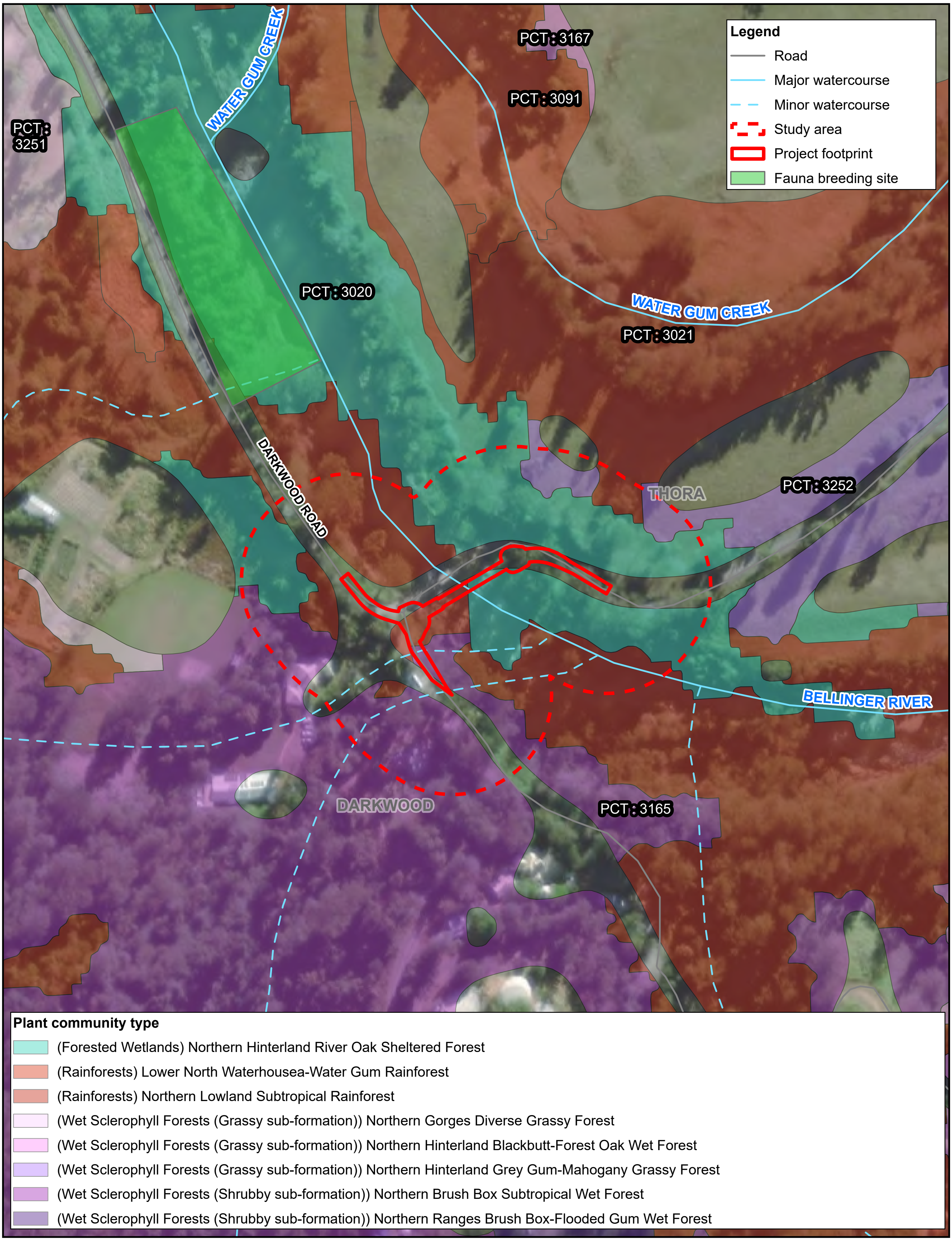
Print date: 24 Jan 2024 - 14:57

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: project area, project footprint, survey data (2024); NSWSS: roads, watercourse, suburbs (2023).
Created by: thunt2



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River Species Impact Statement
Hobarts Bridge

Project No. 12611463
Revision No. 0
Date 24/01/2024

Survey field results

FIGURE 4.2

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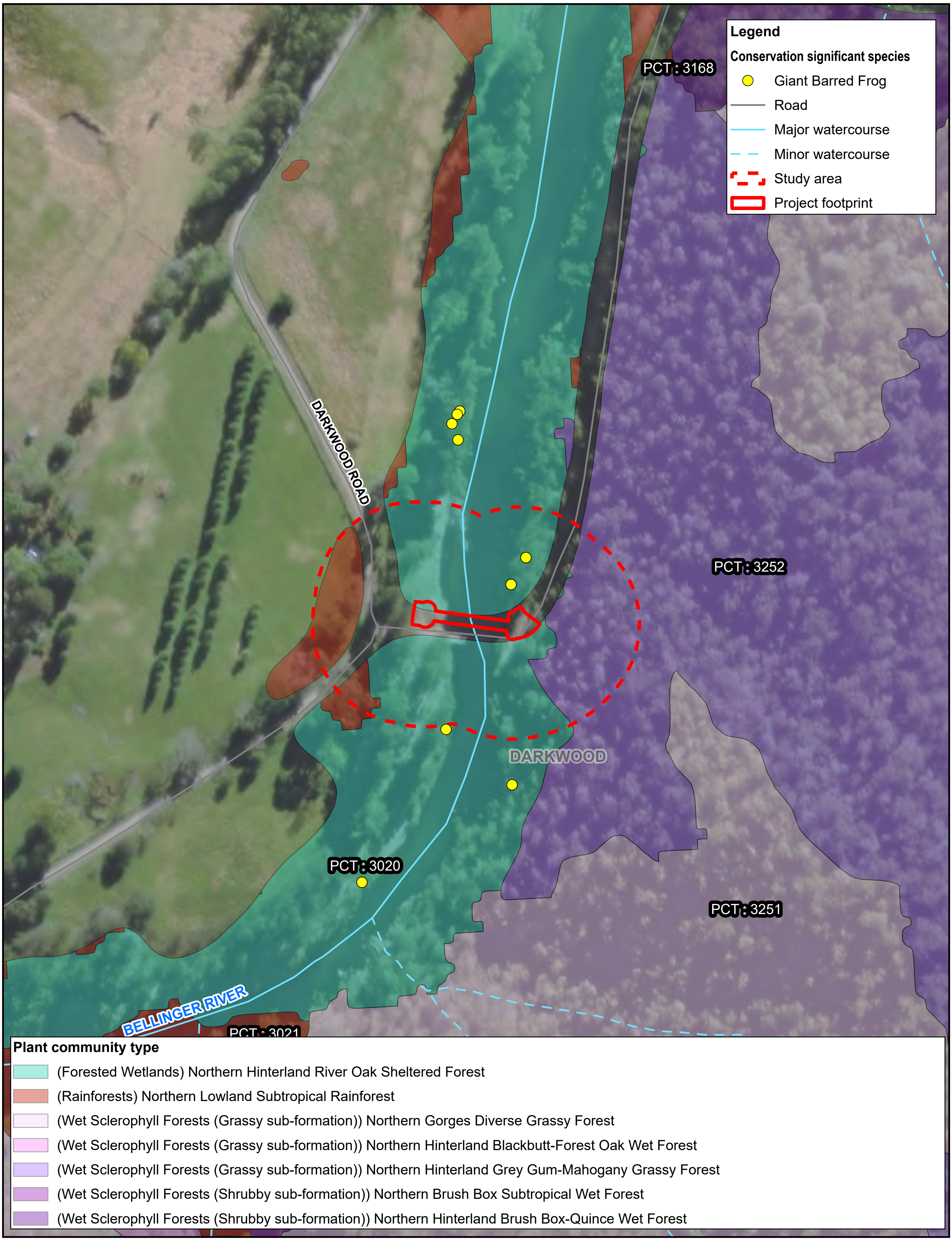
Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: project area, project footprint, survey data (2024); NSWSS: roads, watercourse, suburbs (2023).
Created by: thunt2



Paper Size ISO A4

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Metres

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Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River Species Impact Statement
Justins Bridge

Project No. **12611463**
Revision No. **0**
Date **24/01/2024**

Survey field results

FIGURE 4.3

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_SpeciesImpactStatement.aprx - 12611463_005_SurveyResults
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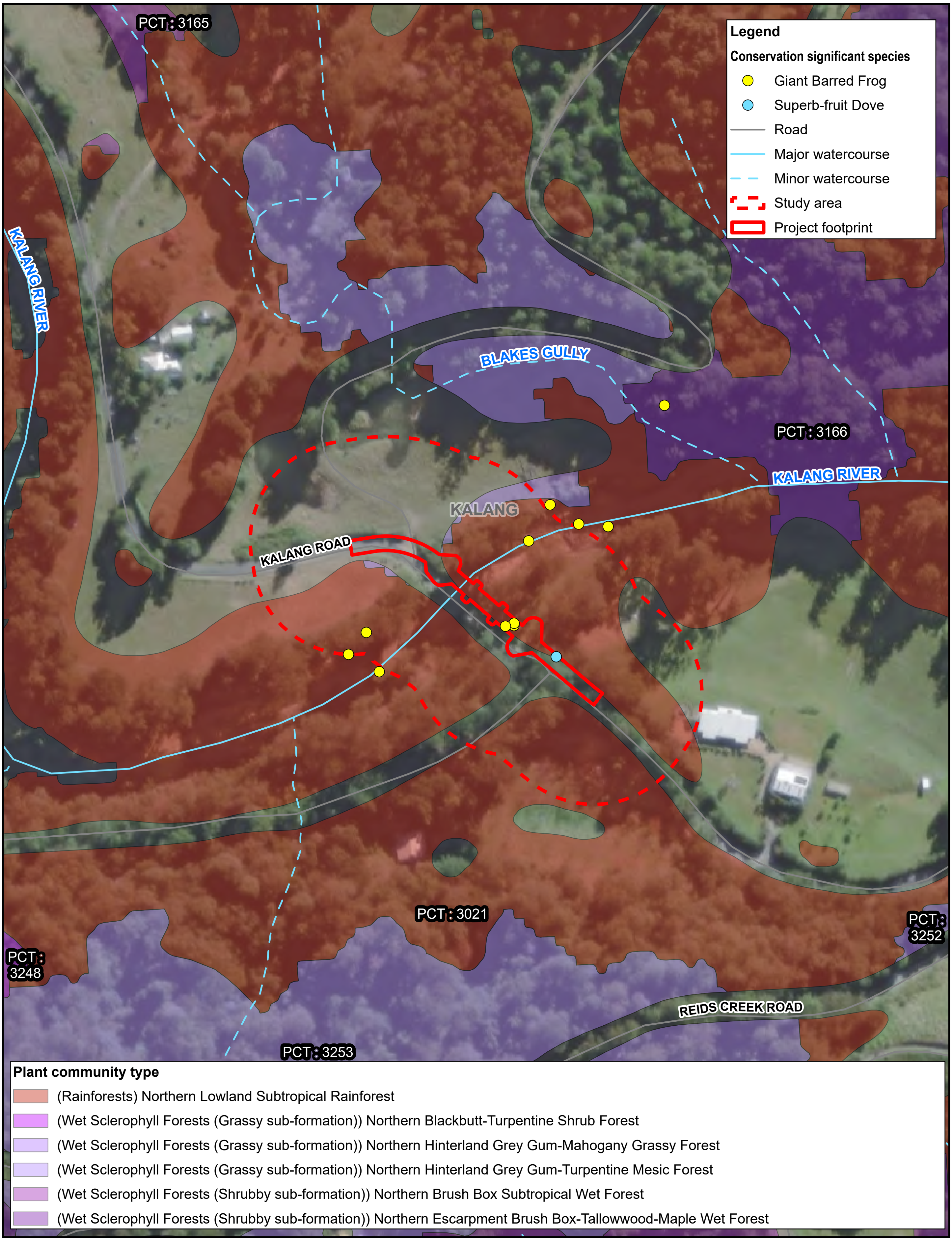
Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: project area, project footprint, survey data (2024); NSWSS: roads, watercourse, suburbs (2023).
Created by: thunt2



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GHD

Bellingen Shire Council
Bellinger River Species Impact Statement
Duffys Bridge

Project No. **12611463**
Revision No. **0**
Date **24/01/2024**

Survey field results

FIGURE 4.4

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Created by: thunt2

4.2 Habitat assessment

Habitat values within the Project footprint at each site varied.

Historically, the land within each bridge Project footprint has been subject to low intensity clearing or grazing, though much of the area still retains high ecological value. The Project area occurs within two valley's in the Bellingen hinterland. These areas contain large tracts of native vegetation which connect north to Bellinger River National Park, south to New England National Park and east and west to various state forests and conservation reserves.

Potential habitat for threatened species within the Project footprint comprises some disturbed and roadside vegetation in a narrow road reserved, generally within 30 m of Darkwood Road and Kalang Road as well as existing agricultural pastures and regenerating PCT 3020 Northern Hinterland River Oak Sheltered Forest. The canopy vegetation within the study area is present as regenerating PCT 3020 with mature trees up to 25 m tall.

Threatened species are also likely to utilise the cracks and crevices within the existing bridge structures.

PCT 3020 Northern Hinterland River Oak Sheltered Forest occurring within riparian vegetation along both waterways provide suitable habitat for rainforest dwelling amphibians (including Giant Barred Frog) by providing a dense cover of Casuarina needle leaf-litter.

The alluvial flats contain mature woodland and open woodland, often with a weedy understory. Permanent waterbodies and large pools with fringing riparian woodland occur along both waterways. These watercourses and adjoining riparian vegetation provide drinking, breeding and foraging habitat for a range of birds, mammals, amphibians and reptiles. Remnant canopy vegetation remains largely intact. There are occasional hollow-bearing trees which provide roosting and foraging habitat for a variety of hollow-dependent fauna species.

The lower alluvial flats experienced low density livestock grazing at Joyce Bridge, resulting in degradation of ground-level microhabitats. At all other bridge's there are areas subject to exotic weeds (i.e. *Lantana camara)* which have reduced habitat values in those areas for ground-dwelling birds, mammals, reptiles and amphibians. The riparian corridors were observed to be relatively intact, particularly those in the upper reaches towards Justins Bridge, providing valuable foraging, breeding and connecting habitat for a range of fauna.

The broader landscape has been impacted by historical agriculture, particularly low intensity cattle grazing, exotic pasture sowing, vegetation clearing and intrusion by invasive weeds. These processes have impacted local ecosystem composition and processes, reducing in places the density of native vegetation. Subject to climate change, the region may experience predicted increases in the frequency, magnitude and duration of heatwaves, conditions which may result in fire becoming more frequent within the region (New South Wales Government 2024). Nonetheless, the prevalence of large tracts of remnant vegetation within which disturbance is relatively limited does provide the foundations for a system of high ecological integrity, where essential processes like connectivity and resilience are supported. On the latter and noting the potential for increased fire impacts as the climate continues to change, the connected and heterogeneous nature of the landscape embeds an inherent resilience – in other words, flora and fauna of this landscape are more likely to respond or adapt to change and recover after catastrophic disturbance (e.g. wildfire).

The Project footprint does not contain any caves or substantial rock outcrops, sandstone escarpment, beaches, rocky shoreline or marine environments and does not contain any habitat resource for threatened fauna of these environments.

Aquatic habitat include deep waterholes (> 2 m), permanent water sources, rocky substrates and ample vegetation cover. There are plenty of fallen wooden debris along the banks and within the main channel of both the Bellinger River and Kalang River. This aquatic habitat provides suitable foraging and sheltering habitat for amphibians and reptiles.

Five broad habitat types were identified across each bridge Project footprint:

- Permanent watercourse
- Fringing riparian vegetation
- Cleared grazing land
- Bamboo plantation

– Bridge structure

Habitat types are described in Table 4.1 and presented in Figure 4.5, Figure 4.6, Figure 4.7and Figure 4.8.

Table 4.1 Habitat types observed at each bridge

Habitat types	Characteristics	Ecological value
Joyces Bridge		
Permanent watercourses		
	Permanent water sources Cobble and rocky substrate, suitable for burrowing Cobble and soil banks Fallen wooden debris within the waterway	Drinking sites for birds and mammals Refuges and breeding habitat for Giant Barred Frog and other amphibians Foraging habitat and flyway for Southern Myotis Flyway for Large Bent-wing Bat, Little Bent-wing Bat, Eastern Coastal Free-tailed Bat, Eastern False Pipistrelle and other bats Flyway for Grey-headed Flying-fox and Superb Fruit-dove and other flying mammals Foraging habitat for Bellinger River Snapping Turtle and other aquatic fauna Movement corridors for fish, amphibians and aquatic fauna
Fringing riparian vegetation		
	Mature canopy trees present in low to moderate abundance Low abundance of hollow bearing trees Patches of dense shrubs Casuarina needle leaf-litter Small tree hollows and fissures suitable for roosting Fallen trees and woody debris	Roosting sites for arboreal mammals Roosting habitat for Southern Myotis, Large Bent-wing Bat, Little Bent-wing Bat, Eastern Coastal Free-tailed Bat and Eastern False Pipstrelle Refuges and breeding for Giant Barred Frog and other amphibians Foraging and roosting habitat for Grey-headed Flying-fox and Superb Fruit-dove and other flying mammals Sheltering and hunting habitat for Stephens's Banded Snake and other snakes and reptiles Foraging habitat for Bellinger River Snapping Turtle and other aquatic fauna Nesting and foraging habitat for canopy, shrub and ground-dwelling birds Movement corridors for other terrestrial fauna
Bridge structure		
	Cracks, crevices and fissures within wooden logs Double layer bridge decking creating larger crevices	Suitable roosting habitat for Southern Myotis Suitable diurnal and temporary roosting habitat for Large Bent-wing Bat Suitable diurnal and temporary roosting habitat for Little Bent-wing Bat Suitable diurnal and temporary roosting habitat for Eastern Coastal Free-tailed Bat

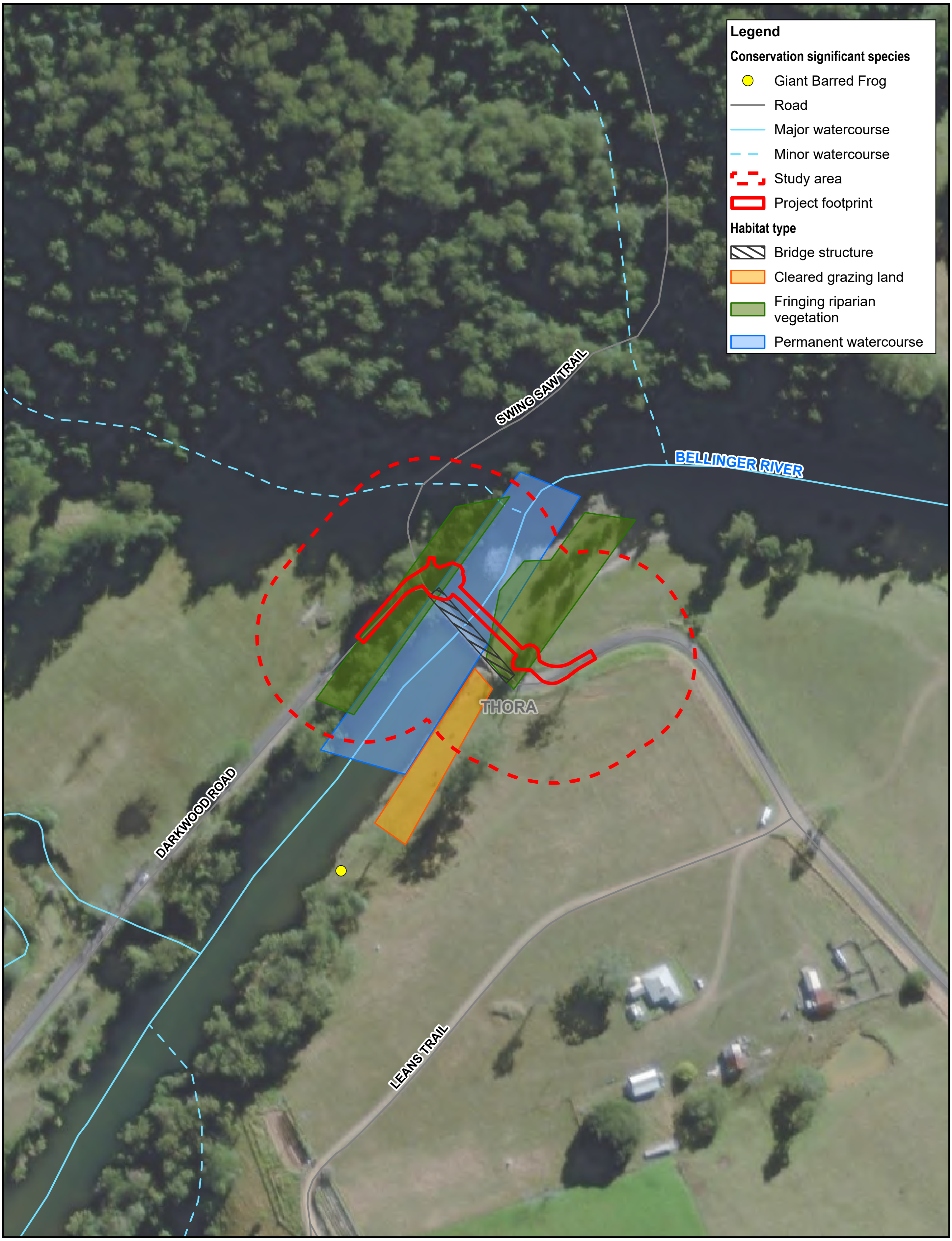
Habitat types	Characteristics	Ecological value
Cleared grazing land		
	Canopy and shrub-level vegetation generally cleared Occasional isolated trees Ground-level habitats cleared and lacking structural complexity Ground layer dominated by exotic pasture grasses Fallen trees and woody debris	Foraging habitat for raptors Refuge for quails and other ground-dwelling birds Suitable foraging habitat for all microbats
Hobarts Bridge		
Permanent watercourses		
	Permanent water sources Bedrock and cobble substrate Bedrock and cobble banks Watercourse is shallow with deep pools with fast flow Fallen wooden debris within the	Drinking sites for birds and mammals Refuges and breeding habitat for Giant Barred Frog and other amphibians Foraging habitat and flyway for Southern Myotis Flyway for Large Bent-wing Bat, Little Bent-wing Bat, Eastern Coastal Free-tailed Bat, Eastern False Pipistrelle and other bats Flyway for Grey-headed Flying-fox and Superb Fruit-dove and other flying mammals Foraging habitat for Bellinger River Snapping Turtle and other aquatic fauna Movement corridors for fish, amphibians and aquatic fauna
Fringing riparian vegetation		
	Mature canopy trees present in low to moderate abundance Low abundance of hollow bearing trees Patches of dense shrubs Casuarina needle leaf-litter	Roosting sites for arboreal mammals Roosting habitat for Southern Myotis, Large Bent-wing Bat, Little Bent-wing Bat, Eastern Coastal Free-tailed Bat and Eastern False Pipstrelle Refuges and breeding for Giant Barred Frog and other amphibians Foraging and roosting habitat for Grey-headed Flying-fox and Superb Fruit-dove and other flying mammals Sheltering and hunting habitat for Stephens's Banded Snake and other snakes and reptiles Foraging habitat for Bellinger River Snapping Turtle and other aquatic fauna Nesting and foraging habitat for canopy, shrub and ground-dwelling birds Movement corridors for other terrestrial fauna

Habitat types	Characteristics	Ecological value
Bridge structure		
	Cracks, crevices and fissures within wooden logs Double layer bridge decking creating larger crevices suitable for roosting	Suitable roosting habitat for Southern Myotis Suitable diurnal and temporary roosting habitat for Large Bent-wing Bat Suitable diurnal and temporary roosting habitat for Little Bent-wing Bat Suitable diurnal and temporary roosting habitat for Eastern Coastal Free-tailed Bat
Bamboo plantation		
	Dense stands of bamboo Low abundance of hollow bearing trees Low abundance of mature canopy species Close proximity to permanent water source	Suitable roosting habitat for Grey-Headed Flying-Fox which was observed approximately 120 m up from the existing bridge Black Flying-Foxes were also observed
Justins Bridge		
Permanent watercourses with fringing riparian vegetation		
	Permanent water sources Bedrock and cobble substrate Bedrock cobble and soil banks Watercourse is shallow with deep pools with fast flow Fallen wooden debris within the	Drinking sites for birds and mammals Refuges and breeding habitat for Giant Barred Frog and other amphibians Foraging habitat and flyway for Southern Myotis Flyway for Large Bent-wing Bat, Little Bent-wing Bat, Eastern Coastal Free-tailed Bat, Eastern False Pipistrelle and other bats Flyway for Grey-headed Flying-fox and Superb Fruit-dove and other flying mammals Foraging habitat for Bellinger River Snapping Turtle and other aquatic fauna Movement corridors for fish, amphibians and aquatic fauna

Habitat types	Characteristics	Ecological value
Fringing riparian vegetation		
	Mature canopy trees present in low to moderate abundance Low abundance of hollow bearing trees Patches of dense shrubs Casuarina needle leaf-litter	Roosting sites for arboreal mammals Roosting habitat for Southern Myotis, Large Bent-wing Bat, Little Bent-wing Bat, Eastern Coastal Free-tailed Bat and Eastern False Pipstrelle Refuges and breeding for Giant Barred Frog and other amphibians Foraging and roosting habitat for Grey-headed Flying-fox and Superb Fruit-dove and other flying mammals Sheltering and hunting habitat for Stephens's Banded Snake and other snakes and reptiles Foraging habitat for Bellinger River Snapping Turtle and other aquatic fauna Nesting and foraging habitat for canopy, shrub and ground-dwelling birds Movement corridors for other terrestrial fauna
Bridge structure		
	Cracks, crevices and fissures within wooden logs	Suitable roosting habitat for Southern Myotis Suitable diurnal and temporary roosting habitat for Large Bent-wing Bat Suitable diurnal and temporary roosting habitat for Little Bent-wing Bat Suitable diurnal and temporary roosting habitat for Eastern Coastal Free-tailed Bat
Cleared grazing land		
	Canopy and shrub-level vegetation generally cleared Occasional isolated trees Ground-level habitats cleared and lacking structural complexity Ground layer dominated by exotic pasture grasses Casuarina needle leaf-litter	Foraging habitat for raptors Refuge for quails and other ground-dwelling birds Giant Barred Frog were observed in pasture grass stands, as long as they were nearby Casuarina needle leaf-litter

Habitat types	Characteristics	Ecological value
Duffys Bridge		
Permanent watercourse		
	Permanent water sources Cobble substrate Watercourse is shallow with deep pools and slow flow Fallen wooden debris within the waterway	Drinking sites for birds and mammals Refuges and breeding habitat for Giant Barred Frog and other amphibians Foraging habitat and flyway for Southern Myotis Flyway for Large Bent-wing Bat, Little Bent-wing Bat, Eastern Coastal Free-tailed Bat, Eastern False Pipistrelle and other bats Flyway for Grey-headed Flying-fox and Superb Fruit-dove and other flying mammals Foraging habitat for Bellinger River Snapping Turtle and other aquatic fauna Movement corridors for fish, amphibians and aquatic fauna
Fringing riparian vegetation		
	Mature canopy trees present in low to moderate abundance Low abundance of hollow bearing trees Patches of dense shrubs Casuarina needle leaf-litter	Roosting sites for arboreal mammals Roosting habitat for Southern Myotis, Large Bent-wing Bat, Little Bent-wing Bat, Eastern Coastal Free-tailed Bat and Eastern False Pipstrelle Refuges and breeding for Giant Barred Frog and other amphibians Foraging and roosting habitat for Grey-headed Flying-fox and Superb Fruit-dove and other flying mammals Sheltering and hunting habitat for Stephens's Banded Snake and other snakes and reptiles Foraging habitat for Bellinger River Snapping Turtle and other aquatic fauna Nesting and foraging habitat for canopy, shrub and ground-dwelling birds Movement corridors for other terrestrial fauna
Bridge structure		
	Cracks, crevices and fissures within wooden logs Double layer bridge decking on some bridges creating larger crevices	Suitable roosting habitat for Southern Myotis Suitable diurnal and temporary roosting habitat for Large Bent-wing Bat Suitable diurnal and temporary roosting habitat for Little Bent-wing Bat Suitable diurnal and temporary roosting habitat for Eastern Coastal Free-tailed Bat

Habitat types	Characteristics	Ecological value
Cleared grazing land		
	Canopy and shrub-level vegetation generally cleared Occasional isolated trees Ground-level habitats cleared and lacking structural complexity Ground layer dominated by exotic pasture grasses	Foraging habitat for raptors Refuge for quails and other ground-dwelling birds Giant Barred Frog was observed on the fringe of a cleared paddock and the riparian vegetation



Paper Size ISO A4

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Bellinger River Species Impact Statement
Joyces Bridge

Project No. **12611463**
Revision No. **0**
Date **24/01/2024**

Habitat type

FIGURE 4.5

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_SpeciesImpactStatement.aprx - 12611463_006_HabitatTypes
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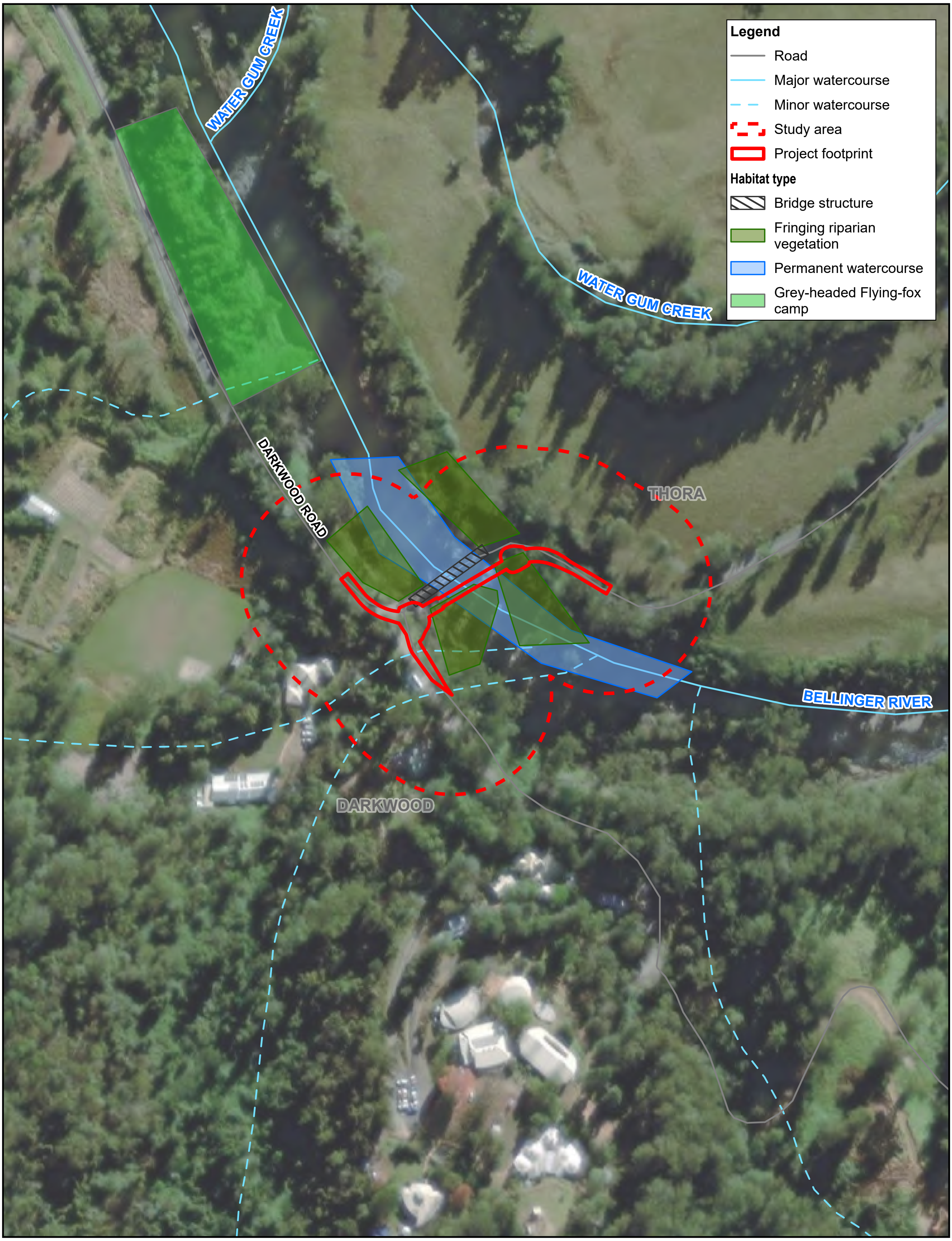
Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: project area, project footprint, habitat type (2024), survey data (2023); NSWSS: roads, watercourse, suburbs (2023). Created by: thunt2



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellinger River Species Impact Statement
Hobarts Bridge

Project No. 12611463
Revision No. 0
Date 24/01/2024

Habitat type

FIGURE 4.6

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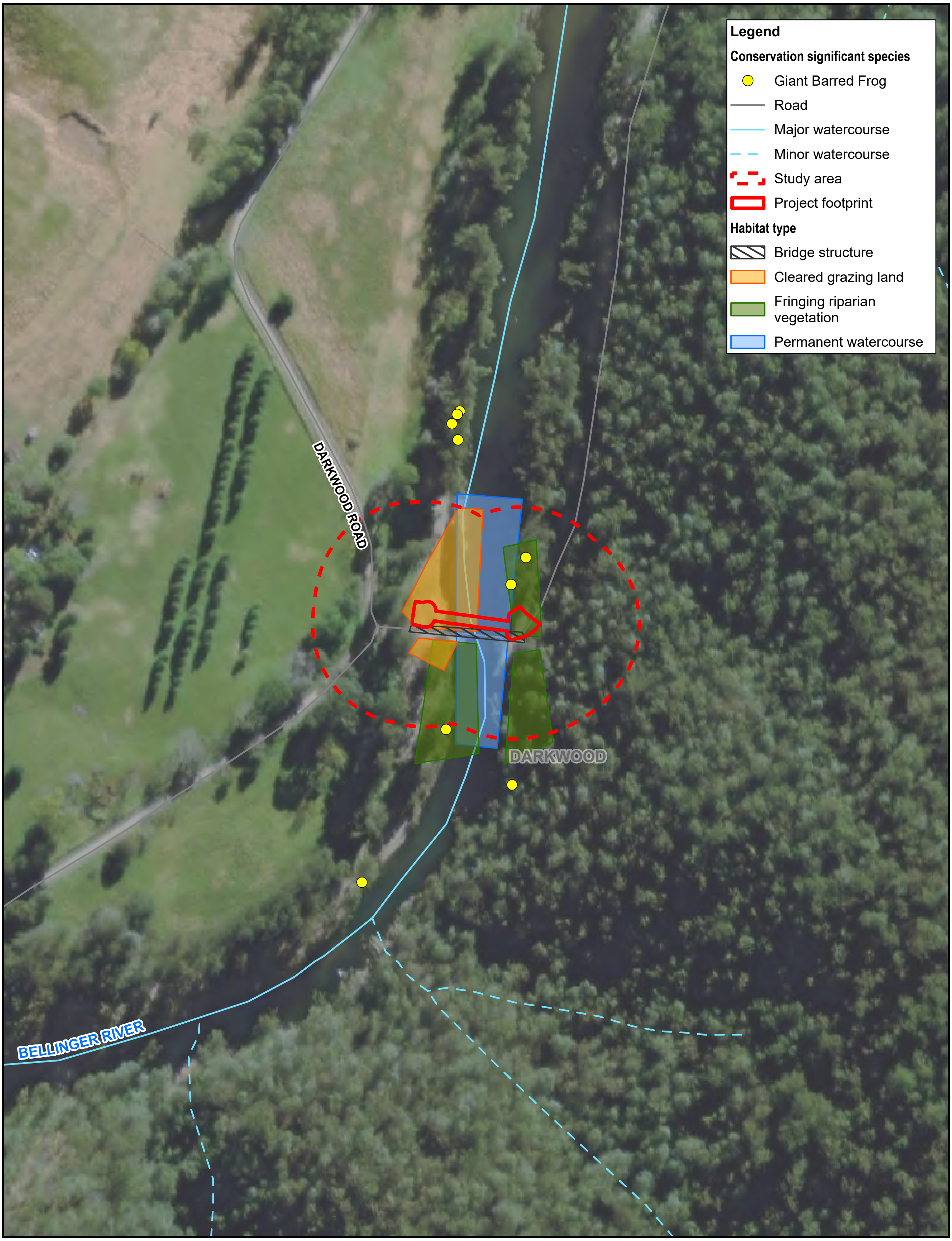
Created by: thunt2



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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Bellinger River Species Impact Statement
Justins Bridge

Habitat type

Project No. **12611463**
Revision No. **0**
Date **24/01/2024**

FIGURE 4.7

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_SpeciesImpactStatement.aprx - 12611463_006_HabitatTypes
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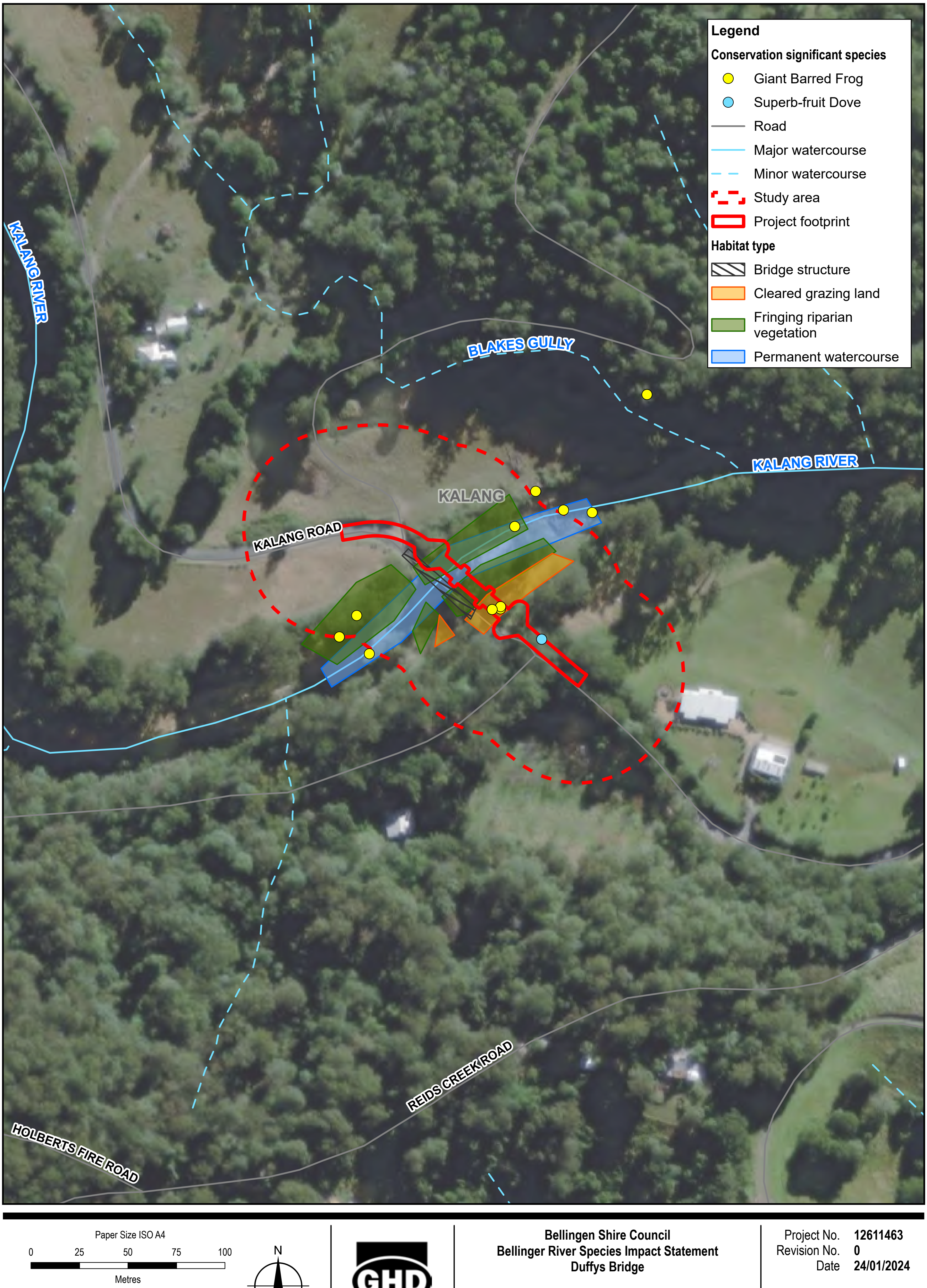
Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: project area, project footprint, habitat type (2024), survey data (2023); NSWSS: roads, watercourse, suburbs (2023).
Created by: thunt2



Bellingen Shire Council
Bellinger River Species Impact Statement
Duffys Bridge

Project No. 12611463
Revision No. 0
Date 24/01/2024

Habitat type

FIGURE 4.8

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_SpeciesImpactStatement.aprx - 12611463_006_HabitatTypes
Print date: 24 Jan 2024 - 14:58

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: project area, project footprint, habitat type (2024), survey data (2023); NSWSS: roads, watercourse, suburbs (2023).
Created by: thunt2

4.3 Threatened fauna species

Based on the results of the desktop review, 48 fauna species listed under the NSW BC Act as relevant to the study area, including 18 birds, 21 mammals, three reptiles, four frogs and two invertebrates have been previously recorded in the Project Area or are predicted to occur. A likelihood of occurrence assessment determined that these threatened fauna species has the potential to occur at one or more of the four bridge locations including:

- 38 fauna species that ”may occur” within the Project footprint. These species were classified as “may occur” if suitable habitat was present within the Project footprint but the species were known to be highly mobile, or they have large home range. Any impacts to these species are negligible and therefore classified as ‘may occur’.
- Two fauna species that are considered “likely to occur” within the Project footprint.
- Eight fauna species that were “confirmed present” within the Project footprint during the assessment.

The full likelihood of occurrence assessment is shown in Appendix J.

A large number of the species known or predicted to occur in the Project Area can be excluded from occurring in the Project footprint, given their specific habitat requirements (refer Appendix J). Many previous records of threatened species in the Project Area are associated with Dorrigo National Park, the Bellinger River National Park, Baalijin Nature Reserve, Oaks State Forest, Diehappy State Forest and Scotchman State Forest, including vegetated creek lines outside the Project footprint elsewhere in the Project Area.

Eight fauna species previously recorded or predicted to occur in the Project Area could occur in habitats associated with the Project footprint (Table 4.2). The Project footprint has suitable habitat, local records in close proximity to the Project and/or is closely associated with specific habitat resources that are present for 10 species. As such, these species have been considered as present or likely to occur in the study area. Assessments of Significance have been prepared for these species (see Section 5 and Appendix J).

A summary of the 10 species that were confirmed present or were considered “likely to occur” at one or more of the four bridge locations is presented within Table 4.2. These species are discussed further below in Sections 4.3 to 5.6.1.5.

Table 4.2 Threatened fauna confirmed present or likely to occur in the study area

Species	Conservation status		Likelihood of occurrence			
	EPBC Act	BC Act				
			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Mixophyes iteratus Giant Barred Frog	E	V	**Confirmed present**	**Confirmed present**	**Confirmed present**	**Confirmed present**
Myotis macropus Southern Myotis	-	V	**Confirmed present**	**Likely to occur**	**Confirmed present**	**Likely to occur**
Miniopterus orianae oceanensis Large Bent-winged Bat	-	V	**Confirmed present**	**Likely to occur**	**Likely to occur**	**Likely to occur**
Miniopterus australis Little Bent-winged Bat	-	V	**Confirmed present**	**Likely to occur**	**Likely to occur**	**Likely to occur**

Species	Conservation status		Likelihood of occurrence			
	EPBC Act	BC Act				
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	-	V	**Confirmed present**	**May occur**	**Confirmed present**	**May occur**
Falsistrellus tasmaniensis Eastern False Pipistrelle	-	V	**Confirmed present**	**Likely to occur**	**Likely to occur**	**Likely to occur**
Pteropus poliocephalus Grey-headed Flying-fox	V	V	**May occur**	**Confirmed present**	**May occur**	**May occur**
Ptilinopus superbus Superb Fruit-dove	-	V	**May occur**	**Confirmed present**	**May occur**	**May occur**
Hoplocephalus Stephens'sii Stephens's Banded Snake	-	V	**Likely to occur**	**Likely to occur**	**Likely to occur**	**Likely to occur**
Myuchelys georgesi Bellinger River Snapping Turtle	CE	E	**Likely to occur**	**Likely to occur**	**Likely to occur**	**Likely to occur**

Key: red = confirmed present, orange = likely to occur, yellow = may occur

4.3.1 Giant Barred Frog (*Mixophyes iteratus*)

4.3.1.1 Species description

The Giant Barred Frog (*Mixophyes iteratus*) is a powerful large frog that is up to 115 mm in length (OEH 2017). The species is well-camouflaged in leaf litter with botched dark olive green, light to dark brown, and black colourings (OEH 2017) (DCCEEW 2023). The limbs have dark crossbars, and the thighs hind side are black with yellow spots. The snout is pointed, and dark spots are present as a broad lateral band dividing the white from the dark dorsal and the pale yellow ventral surface (DCCEEW 2023). Compared to other barred frog, the Giant Barred Frog can be distinguished by its golden iris eyes with vertical pupils (OEH 2017).

4.3.1.2 Conservation status

The Giant Barred Frog conservation status is listed 'endangered' under the EPBC Act (DCCEEW 2023) and Vulnerable under the BC Act (TSSC 2024). Populations of the species are now recognisably small and are isolated to patches of forest. Due to genetic variation, threat response, and general health, the species viability has continued to decline (DCCEEW 2023). The Giant Barred Frog is a Category 2 species on the NSW Sensitive Species Data Policy. For species in this category, known records will be supplied 'denatured', to generalise the Project Area.

4.3.1.3 Habitat utilisation

The Giant Barred Frog is usually found at low altitudes with a preference for riparian habitats and is usually associated with wet sclerophyll forest or rainforest where clean, flowing streams occur (Robinson 1993; White 1994). The Giant Barred Frog deposits its eggs out of the water, under overhanging banks or on steep banks of large pools (Knowles et al. 1998). Tadpoles are present throughout the year and probably over-winter in streams (Hero and Fickling 1996).

The Giant Barred Frog forages in riparian and adjacent forest habitats (White 1994). Individuals are known to shelter during the day either inactive under leaf litter or alert but sheltered under vegetation where frogs could avoid predators by jumping away. The species tends to move within a 20 m wide band either side of streams and has been recorded moving over 100 m in a night (Lemckert and Brassill 2007). In Queensland, the species has been recorded moving a maximum distance of 268 m along a stream and 50 m away from a stream (Streatfield 1999). The breeding season occurs from Spring to Autum with peak activity in November and February (TSSC 2024).

4.3.1.4 Results of targeted survey

This species has been recorded within 10 km of the Project footprint and is considered 'likely to occur' at each of the four sites. Habitat for the Giant Barred Frog was found to occur at each of the four Project footprints in the form of abundant leaf litter, considered suitable for both sheltering and foraging and suitable breeding habitat (represented in Plate 4.1, Plate 4.2, Plate 4.3, Plate 4.4) (pools in larger streams) (TSSC, 2021). Relatively low levels of disturbance were observed at each watercourse (excluding Joyce's Bridge which support cattle grazing on the south-eastern bank), despite evidence of infestation of weeds (Plate 4.3).

Plate 4.1 ***Aquatic habitat across Joyces Bridge Project footprint (L: southeastern bank looking west to bridge. R: south bank looking east to bridge)***

Plate 4.2 ***Aquatic habitat across Hobarts Bridge Project footprint (L: eastern bank looking south. R: western bank looking north).***

Plate 4.3 ***Aquatic habitat across Justins Bridge Project footprint (L: western bank looking south to bridge. R: vegetation and leaf litter on eastern bank, south of the bridge).***

Plate 4.4 *Aquatic habitat across Duffys Bridge Project footprint (L: northeastern bank looking south to bridge. R: northeastern bank, behind riparian vegetation and in cattle paddock . Looking south to bridge).*

A total of 19 Giant Barred Frog individuals were found across the four sites, with a minimum of three sightings each night. This species was recorded in a variety of habitats along the Bellinger River and Kalang River, with the consistent habitat niche across each bridge site being heavy leaf litter (refer Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4).

– **Justins Bridge -** Giant Barred Frog (adults only) recorded on all four nights of frog aural/visual surveys on both sides of the river. Giant barred frogs recorded atop leaf litter of River Oak (*Casuarina cunninghamiana)* needles. The Bellinger River in this location is likely to also provide breeding habitat for the species.
– **Hobarts Bridge –** One Giant Barred Frog (metamorph only) recorded on only one nights of frog aural/visual surveys, on the water's edge. The Bellinger River in this location provides occupied breeding habitat for the species. While no adults were detected (likely due high noise levels from rapids and inaccessibility issues to areas around the existing bridge) the location is also likely to provide foraging and refuge habitat for the species.
– **Joyce Bridge -** One Giant Barred Frog (adult only) recorded on one nights of frog aural/visual surveys. Giant Barred Frogs recorded atop leaf litter of Lantana camara and broad-leaved privet (Ligustrum lucidum). The Bellinger River in this location is likely to also provide breeding habitat for the species.
– **Duffys Bridge -** Giant Barred Frog (adults only) recorded on all four nights of frog aural/visual surveys on both sides of the river. Giant Barred Frogs recorded atop leaf litter of river oak (Casuarina cunninghamiana) needles and also in a paddock on the edge of the bridge. The Bellinger River in this location is likely to also provide breeding habitat for the species.

4.3.2 Southern Myotis (*Myotis macropus*)

4.3.2.1 Species description

The Southern Myotis (*Myotis macropus*) is a large, disproportionately, footed bat, with its feet being approximately between 8 to 12 mm in size (OEH 2020a). The species is currently referred to as Southern Myotis, however, it previously has been known as the large-footed myotis. It is roughly 50 mm in body length and 28 cm in wingspan, with the dark grey to reddish brown on the back and grey on the belly (OEH 2020a).

4.3.2.2 Conservation status

The Southern Myotis (*Myotis macropus*) is listed as 'vulnerable' under the BC Act 2016. However, the species is not listed under the EPBC Act (OEH 2020a). Although the species distribution appears to be widespread, the population has continued to decline. Females can produce up to two young each year, one in early October and the other in late January (OEH 2020a; Australian Museum 2020; BCD pers. comm.). The latter young are likely non-volant until March (BCD pers. comm.) The conservation of roosting and foraging sites is essential in the species longevity (OEH 2020a).

4.3.2.3 Habitat requirements

The Southern Myotis is typically found in close proximity of suitable waterways for foraging (Campbell 2009). They have high intensity utilisation of flyways, reflecting their specialised foraging habitat (Lam 2021). This species has been known to inhabit caves and other artificial structures including disused railway tunnels and bridges and tree hollows (Lam 2021).

Riparian vegetation and their associated waterways significantly influence the population size of Southern Myotis due to their diet (Lam 2021). The Southern Myotis forages along waterways as their predominately prey on small vertebrate, lepidoptera and diptera (Lam 2021).

4.3.3 Large Bent-wing Bat (*Miniopterus orianae oceanensis*)

4.3.3.1 Species description

The Large Bent-wing bat (*Miniopterus orianae oceanensis*) has chocolate to reddish brown fur on its back with lighter fur on its belly (OEH 2019). The species has a wing span of between 30 – 35 cm with a short snout and domed head. Its body is approximately 6 cm long. It has recently been renamed from the Eastern Bent-wing Bat (*Miniopterus schreibersii subsp. oceanensis*).

4.3.3.2 Conservation status

The Large Bent-wing Bat (*Miniopterus orianae oceanensis*) is listed as ‘vulnerable’ under the BC Act 2016 and the species is not listed under the EPBC Act (OEH 2019). This species has been declining by loss of high productivity foraging habitat and disturbance to roosting habitat. The species needs very specific temperature and humidity regimes in maternity caves. The conservation of roosting and foraging sites is essential in the species longevity (OEH 2019).

4.3.3.3 Habitat requirements

The Large Bent-wing Bat is primarily a cave dwelling species, as they prefer a steady microclimate without significant temperature fluctuations (Lam 2021). Roosting in caves is particularly important for breeding females which create large maternity roosting colonies throughout its known range in spring and summer (Mills 2021). This bat is known to continuously move between several nearby roosting sites due to external disturbance and bad weather conditions during autumn, winter and spring (Lam 2021). During this activity, the bats are either searching for new roosting sites or looking for social interactions (Lam 2021),

The Large Bent-Wing Bat are known to mate but not give birth in Transport for New South Wales structures (i.e. culverts and bridges) and need to be considered when construction/demolition or maintenance occurs within these structures) (TfNSW 2023).

The Large Bent-wing Bat feeds on insects so is known to forage along flyways above waterways, forest clearings and above forest canopies (Roberts 2012).

4.3.4 Little Bent-wing Bat (*Miniopterus australis*)

4.3.4.1 Species description

The Little Bent-wing Bat (*Miniopterus australis*) is a small insectivorous bat up to 45 mm in length (OEH 2020b). The species has chocolate brown, long and thick fur, more obvious around the neck and on the crown of the head. They have short muzzles and rounded, triangular shaped ears. At rest, their long third finger is folded back and bent under their wing (OEH 2020b).

4.3.4.2 Conservation status

The Little Bent-wing Bat is listed as ‘vulnerable’ under the BC Act 2016 and not listed under the EPBC Act (OEH 2020b). Only five known nursery sites / maternity colonies are known in Australia and the disturbance of known colonies may be catastrophic to the survival of this species (OEH 2020b).

4.3.4.3 Habitat requirements

The Little Bent-wing Bat the species has been observed to increasingly favour man-made structures as roosting sites in peri-urban areas (Lam 2021). However, this species has also been found roosting in caves and tree-hollows (Australian Museum 2020). This species has been found roosting in tunnels between February and April (Lam 2021). The breeding season extends from November to March.

The Little Bent-wing Bat is insectivorous and typically forages in densely vegetated areas, undulating between canopy and shrub layers (Lam 2021).

4.3.5 Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)

4.3.5.1 Species description

The Eastern coastal free-tailed bat (*Micronomus norfolkensis*) is a small bat with a hairless face and long bare tail protruding from its tail membrane (OEH 2022). The species weighs up to 10 g and has dark brown/reddish fur on its back with paler fur below.

4.3.5.2 Conservation status

The Eastern Coastal Free-Tailed Bat is listed as 'vulnerable' under the BC Act 2016 and is not listed under the EPBC Act (OEH 2022). This species roosts predominately in tree hollows but is known to roost under bark or in man-made structures. The conservation of roosting sites is essential in the species longevity (OEH 2022).

4.3.5.3 Habitat requirements

The Eastern Coastal Free-Tailed Bat is found in productive floodplain areas, and they typically favour dry sclerophyll forest and woodland where they can use flyways and upper slopes (McConnville 2013). This species has been recorded in other habitat types including wet sclerophyll forest. The Eastern Coastal Free-Tailed Bat has been observed roosting in hollows singularly, or in small groups because they offer a stable microclimate (McConville et al 2013). The limited data available suggests the Eastern Coastal Free-Tailed Bat roosts in tree hollows, buildings, telegraphs poles (McConnville 2013).

Studies have surmised that the Eastern Coastal Free-Tailed Bat is insectivorous and will forage above tree canopies and the edges of forests. They are adapted to open and edge microhabitats which suite their foraging and dietary requirements i.e. area where capturing insect/prey by aerial inception (McConnville 2013). Females are thought to give birth from November to December.

4.3.6 Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)

4.3.6.1 Species description

The Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) is a relatively large microbat, up to about 65 mm in length (OEH 2017a). It weighs up to approximately 30 g and has long pointed ears and sparse hair on its nose. It has dark to reddish-brown fur above with paler grey on its underside (Taylor et al 1987).

4.3.6.2 Conservation status

The Eastern False Pipistrelle is listed as 'vulnerable' under the BC Act 2016 and is not listed under the EPBC Act (OEH 2017a). Thie species typically roosts in hollow-bearing eucalypt trees but is also known to roost under loose bark on trees or in buildings. The conservation of roosting and foraging sites is essential in the species longevity (OEH 2017a).

4.3.6.3 Habitat requirements

The Eastern False Pipistrelle typically roost in hollows or large eucalypts in tall, wet forests and coastal mallee has been found roosting in tree hollows (Australian Museum 2020, Taylor et al 1987).

The Eastern False Pipistrelle is a selective insectivorous feeder, favouring Coleopterans (Taylor et al 1987). They typically feed in the upper layers of a forest canopy, or above the top of the canopy (O'Neill & Taylor 1989).

4.3.7 Results of targeted microbat survey

Five threatened microbat species were detected on Anabats during the field surveys:

- Southern Myotis (*Myotis macropus)*
- Large Bent-wing Bat (*Miniopterus orianae oceanensis*)
- Little Bent-wing Bat *(Miniopterus australis)*
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), and
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)

Unidentified microbats were observed at each bridge site during roost watch. Detailed Anabat analysis confirmed records at Joyce and Justins Bridge however Anabat detectors at Duffys and Hobarts Bridge suffered from technical issues (e.g. faulty power supply or possible faulty microphone) so no suitable data was captured at these sites.

All bridges may comprise potential roosting habitat for the Southern Myotis, Large Bent-winged Bat and Little Bent-winged Bat. The Eastern Coastal Free-Tailed Bat and Southern Myotis may roost in hollow-bearing trees within the study area. All threatened microbat species (with the exception of Southern Myotis) are likely to forage along the Bellinger River and Kalang River in riparian vegetation and amongst other patches of native vegetation and also vegetation along Darkwood Road and Kalang Road. The Southern Myotis would forage over pools of water within Bellinger River and Kalang River and adjacent farm dams in the broader study area.

Southern Myotis

- Justins Bridge - A small number of calls (< 15) each night was recorded for the evening emergence period for two of the four survey nights (27-28/11/23) including calls from the species group *Myotis macropus/Nyctophilus sp.* No calls were recorded for this same period for the 29-30/11/23. A small number of calls (< 10) each night was also recorded for the early morning re-entry period near sunrise for three of the four survey nights (28, 29, 30/11/23). This data suggests some bat species may be roosting within the bridge, most likely at a location nearby the site of the detector, for the detector dates 27-28/11/23 or between the two detector sites.
- Joyces Bridge - A small number of calls (< 3) each night were recorded for the evening emergence period for two non-consecutive nights of the four survey nights (27 and 30/11/23) including calls from the species group *Myotis macropus/Nyctophilus* sp. No calls were recorded or the early morning re-entry period near sunrise for any survey night. The few calls recorded indicate emergence from a nearby roost however the source of the calls cannot be confidently placed within bridge structure.

Large Bent-Wing Bat

- Joyces Bridge - A small number of calls (< 3) each night were recorded for the evening emergence period for two non-consecutive nights of the four survey nights (27 and 30/11/23) including calls from *M.o.oceanensis/Vespadelus* sp. No calls were recorded or the early morning re-entry period near sunrise for any survey night. The few calls recorded indicate emergence from a nearby roost however the source of the calls cannot be confidently placed within bridge structure.

Little Bent-Wing Bat

- Joyces Bridge - This species was recorded from approximately 28 definite call records Joyces Bridge across three consecutive nights of 27/11/23- 29/11/2023.

Eastern Coastal Free-tailed Bat

- Joyces Bridge - Recorded from approximately 145 (definite and probable combined) files across four consecutive survey nights (27/11/23-30/11/2023).
- Justins Bridge – Recorded from approximately 145 (definite and probable combined) files across three consecutive survey nights (28/11/23-30/11/2023).

Eastern False Pipistrelle

– Justins Bridge - A small number of calls (< 15) each night were recorded for the evening emergence period for two of the four survey nights (27-28/11/23) including calls from the species group *Myotis macropus/Nyctophilus sp.*and two probable *Falsitrellus tasmaniensis* calls. No calls were recorded for this same period for the 29-30/11/23.
– Justins Bridge - A small number of calls (< 15) each night were recorded for the evening emergence period for two of the four survey nights (27-28/11/23) including two probable *Falsitrellus tasmaniensis* calls. No calls were recorded for this same period for the 29-30/11/23. A small number of calls (< 10) each night were also recorded for the early morning re-entry period near sunrise for three of the four survey nights (28, 29, 30/11/23). This data suggests some bat species may be roosting within the bridge, most likely at a location nearby the site of the detector, for the detector dates 27-28/11/23 or between the two detector sites.

A detailed bat call analysis report is presented in Appendix G.

4.3.8 Grey-headed Flying-fox (*Pteropus poliocephalus*)

4.3.8.1 Species description

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is Australia's largest bat, with a wing span up to 1 m and a body up to 29 cm in length (Menkhorst & Knight 2011; OEH 2020). Males can weight up to 1000 g while females can weigh up to 800 g (DAWE 2021). The species has long dark grey fur on their body and their fur on the head is also grey but varies in shade from near black to silver (DAWE 2021). They have a distinct, broad and complete collar of golden-orange fur (Menkhorst & Knight 2011). Compared to other fly-fox species, it is distinguished by its black wing membranes and leg fur extending to the ankle (OEH 2020).

4.3.8.2 Conservation status

The Grey-headed Flying-fox (*Pteropus poliocephalus)* is listed as 'vulnerable' under the BC Act 2016 and 'vulnerable' under the EPBC Act (OEH 2020b). Although the species distribution appears to be widespread, the population has continued to decline. The protection of roost sites, avoidance of disturbance to camps between September and November, protecting key foraging areas and managing licenced shooting is essential in the species longevity (OEH 2020b).

4.3.8.3 Habitat requirements

Grey-headed Flying-foxes forage on the nectar and pollen of native trees and roost in large aggregations of up to tens of thousands of animals (OEH 2020). Females give birth to a single young each October/November after a 6-month gestation. At around 3 months, young are able to fly and forage outside the camp (OEH 2020b).

Within the Project Area there are estimated to be several thousand Grey-headed flying fox that utilise the Study area for foraging and roosting. There is one known Nationally Important Flying-fox camp (ID 10) and a second known camp (ID 783) occurring within the broader Project Area in Bellingen, approximately 20 km from Joyces Bridge, 22 km from Hobarts Bridge, 40 km from Justins Bridge and 6 km from Duffys Bridge.

There are 40 records of Grey-headed Flying-fox recorded within 10 km of Joyce Bridge (ALA 2023). The nearest records are within 2 km.

There are 43 historical records of Grey-headed Flying-fox within 10 km of Hobarts Bridge (ALA 2023). Grey-headed Flying-fox were observed flying overhead at dusk as they were leaving the roost during the site assessment. However, this is likely to be a drastic underestimate of the number of individuals as an active maternity roost of Grey-headed Flying-fox and Black Flying-fox was recorded approximately 120 from Hobarts Bridge which is known to support at least 1000 individuals.

There are 12 records of Grey-headed Flying-fox within 10 km of Justins Bridge (ALA 2023). The nearest record is approximately 3 km.

4.3.8.4 Within 10 km of Duffys Bridge are 195 records of Grey-headed Flying-fox, however a large proportion of these records occur in Bellingen where there are known camps (including one Nationally Important Flying-fox camp) (ALA 2023; DCCEEW 2023b). The nearest record to Duffys Bridge is approximately within 3 km. Results of targeted survey

This species has been recorded in large numbers in the Project Area and was recorded at Hobarts Bridge during the field surveys. A camp of grey-headed flying-fox was recorded within 120 m of the existing bridge along Darkwood Road. Black flying-foxes (*Pteropus alecto*) were also recorded in this camp. This is a maternity camp (for both species; dependant young observed) comprising at least 1000 individuals and restricted to a bamboo plantation (Plate 4.5). The indicative extent of this camp is presented in Figure 4.2. The Project footprint at Hobarts Bridge would provide foraging habitat for this species when shrubs and trees are in flower.

Plate 4.5 ***Top Left: Grey-headed Flying-fox nursing mother. Top Right: Black Flying-fox amongst roosting Grey-headed Flying-fox. Bottom: Snapshot of population roosting in bamboo plantation***

4.3.9 Superb Fruit-dove (*Ptilinopus superbus*)

4.3.9.1 Species description

The Superb Fruit-dove (*Ptilinopus superbus)* is a small, brightly coloured pigeon with a purple crown, pale green cheeks, an orange collar on its hind neck, spotted black tail with a white tip and green on its upper wings with green barred flanks (OEH 2022; Simpsons & Day, 2010). The throat and breast are blue-grey with a black breast-band and white belly (Simpsons & Day 2010). The bird is approximately 24 cm in length.

4.3.9.2 Conservation status

The Superb Fruit-dove (*Ptilinopus superbus)* is listed as 'vulnerable' under the BC Act 2016. However, the species is not listed under the EPBC Act (OEH 2022). The species distribution is restricted to north-eastern Queensland to north-eastern New South Wales however clearing and fragmentation of low-elevation rainforest resulting in irregular food availability has caused the species to decline (OEH 2022). The retention and protection of remnant patches of rainforest is essential in the species longevity (OEH 2022).

4.3.9.3 Habitat requirements

The Superb Fruit-dove habitat preferences include rainforest, adjacent mangroves, eucalypt forest and scrubland with native fruits (Simpsons & Day 2010). They are arboreal and feed almost exclusively on fleshy fruits (Birdlife Australia 2023). In New South Wales they are associated with several vegetation formations including (OEH 2022):

- Dry sclerophyll forests (shrub/grass and shrubby sub-formation).
- Forested wetlands.
- Grassy woodlands.
- Heathlands.
- Rainforest.
- Wet sclerophyll forests (grassy and shrubby sub-formation).

Part of the population is known to be nomadic or migratory (OEH 2022). Superb Fruit-doves build a nest of twigs in bushy trees from 5 m - 30 m above the ground with the breeding season occurring from September to January (Australian Museum 2022).

4.3.9.4 Results of targeted survey

This species was recorded during the diurnal bird survey calling in the vicinity of Hobarts Bridge (Figure 4.2). The bird was unable to be visually recorded due to the dense surrounding vegetation however this species is known to forage in rainforest and other closed forest habitats. This species may forage within the Study Area of each bridge site.

4.3.10 Stephens's Banded Snake (*Hoplocephalus stephensii*)

4.3.10.1 Species description

The Stephens's Banded Snake (*Hoplocephalus stephensii)* is a medium size, slender and venomous snake growing up to 1 m in length (Fitzgerald, et al 2005). It can be brown or yellow-brown with a series of broad, dark crossbands (OEH 2018). The head is typically black with a brown crown with brown or cream path on either side of the nape. The lips are barred with black and cream (OEH 2018).

4.3.10.2 Conservation status

The Stephens's Banded Snake (*Hoplocephalus stephensii)* is listed as 'vulnerable' under the BC Act 2016 and not listed under the EPBC Act. The species distribution is restricted to the coast and ranges from south-east Queensland with ongoing threats and reduction of suitable habitat linked to the decline in population. The retention and protection of stands of native vegetation, particularly with old and dead trees, retention of hollow bearing trees and large, mature trees and management of grazing are all essential actions for the species longevity (Fitzgerald et al 2005; OEH 2018).

4.3.10.3 Habitat requirements

This partly tree-dwelling snake is found in rainforest and eucalypt forests and rocky areas up to 950 m in altitude (OEH 2018). It uses loose bark and tree trunks amongst vines, or in hollow trunk limbs, rocky crevices to shelter during the day. Studies have found they can be almost entirely arboreal, spending nearly 50% of their time inside hollow limbs or trunks of standing trees (Fitzgerald et al 2005). They are typically found within 1 km of forested habitat and have been observed utilising a variety of habitats with the one common requirement for hollow standing trees (Fitzgerald et al 2005). It has a broad tolerance to other habitat factor is (i.e. climate, vegetation communities, food types) which allows a population to persist in larges of forest as long as there are high numbers of hollow bearing trees (Fitzgerald, et al 2005). Mating is thought to occur in Spring with females only gravid every two years (ALA 2024).

4.3.10.4 Results of targeted survey

This species was recorded along Darkwood Road approximately 1.8 km north-east of Hobarts Bridge (not shown on survey results figure as record is outside survey area). This species inhabits wet sclerophyll forest and rainforest which occurs at and around all bridge sites.

4.3.11 Bellinger River Snapping Turtle *(Myuchelys georgesi)*

4.3.11.1 Species description

The Bellinger River Snapping Turtle (*Myuchelys georgesi*) is a medium sized, short necked, freshwater turtle (NSW Scientific Committee 2016) . The species, in particularly their young, are mostly distinguished by a distinct yellow stripe travelling angularly down their jawline (NSW Scientific Committee 2016). The plastrons bridge tapers to the rear and front lobes, with the plastron being long yet not as broad in size. The neck and head are significantly shorter than the shell and the tails are absent of any bright colourings. The Bellinger River Snapping Turtle tails are short; however, adult males can be identified by having sustainably longer tails than the adult female (TSSC 2016; NSW Scientific Committee 2016).

The Bellinger River Snapping Turtle utilises cloacal respiration through cloacal burse, allowing partial respiration through the use of aquatic oxygen (TSSC 2016). The Bellinger River Snapping Turtle is mainly an omnivore although does have aspects of carnivory preferences (Cann et al. 1997). The species food source is mostly communities of benthic macro-invertebrates, although the turtle does consume some types of aquatic vegetation and terrestrial fruit (Spencer et al 2014; Cann et al. 1997). The diet can vary depending on prey availability and competition between other Australian freshwater turtles that adapt their diets to water quality and various habitats (NSW Scientific Committee 2016). According to Blamires et al. (2005), a model and table analysis was integrated to determine the life expectancy and the reproductive age of the Bellinger River Snapping Turtle. The results indicated that the species is expected to live 28.9 years, while the minimum reproductive age was 7.9 years (Blamires et al. 2005; TSSC 2016).

4.3.11.2 Conservation status

The Bellinger River Snapping Turtle currently listed as critically ‘endangered’ under the NSW Biodiversity Conservation Act 2016 (BC) and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (DCCEEW 2023). The Bellinger River Snapping Turtle follows the type III survivorship with fatalities reducing with age resulting in populations with a higher number of large adults (Blamires et al. 2005). Consequently, the turtle population is sensitive to changes in adult survivorship.

It is evident that since 2015, a major decline of population has occurred due to an unknown disease that impacted the Bellinger River Snapping Turtle by causing a mass mortality of individuals in the autumn and summer months of 2015 (Chessman et al. 2020). These fatalities resulted in a significant reduction in the abundance and distribution of the species throughout the catchment.

The Bellinger River Snapping Turtle is a Category 2 species on the NSW Sensitive Species Data Policy. For species in this category, known records will be supplied ‘denatured’, in order to generalise the Project Area.

4.3.11.3 Habitat requirements

The preferred habitat of the Bellinger River Snapping Turtle is moderate to deep pools with rock substrates (Spencer et al 2007). Their habitat is patchily distributed within their distribution; however, the species can disperse up and downstream during standard river flow and flood conditions (Cann et al. 2015; NSW Scientific Committee 2016; TSSC 2016; Blamires and Spencer 2013). The Bellinger River Snapping Turtle rarely disperses overland as the species is primarily aquatic, however, the turtle has been observed to utilise fallen trees on the river and the bank to bask (Cann et al. 2015; NSW Scientific Committee 2016).

4.3.11.4 Results of targeted survey

Surveys for Bellinger River Snapping Turtle have been undertaken in the Bellinger River since 2015 by the New South Wales Biodiversity and Conservation Division (BCD) of the Department of Planning and Environment (DPE 2022). BCD estimates there are approximately 200 wild Bellinger River Snapping Turtle within 60 – 70 km of the Bellingen River (DPE 2022). There is an active captive-bred program where immature turtles are released into the river. DPE believe that there is a Bellinger River Snapping Turtle population persisting in the Kalang River, albeit it small (DPE 2022). Since 2018, 179 captive-bred immature Bellinger River Snapping Turtle have been released into Bellinger River. The location, health and movement of some of these turtles are monitored by DPE through radio tracking (DPE 2022). Two wild Bellinger River Snapping Turtle have been caught within the Project area, the most recent being in 2020 (DPE 2022). NSW BCD has advised they are unsure how many wild or captive-bred turtles occur near the Project area as they can be cryptic and difficult to locate (DPE 2022).

5. Assessment of likely impacts on threatened species

5.1 Giant Barred Frog (*Mixophyes iteratus*)

5.1.1.1 Local and regional abundance and distribution

In New South Wales, the Giant Barred Frog is sparsely distributed south from the border of Queensland to Warrimoo in the Blue Mountains (TSSC 2021). They are more populous around northeastern New South Wales, particularly in the Coffs Harbour to Dorrigo Catchment (TSSC 2021). Subpopulations have been gradually increasing in this region (TSSC 2021).

Habitat utilisation

The Giant Barred Frog was observed at each of the four bridge locations. At Hobarts Bridge a metamorph of the species was observed, indicating some recruitment around the Project footprint. Both foraging and breeding habitat have the potential to be present at each bridge location Across the four sites a variety of suitable habitats occurred along the Bellinger River and Kalang River, with the consistent habitat niche across each bridge site being heavy leaf litter. The field survey habitat results are summarised below:

– **Joyces Bridge:** *Lantana camara* and broad-leaved privet leaf litter. This site is likely to also provide breeding habitat for the species.
– **Hobarts Bridge:** This site provides breeding habitat for the species. The location is also likely to provide foraging and refuge habitat for the species.
– **Justins Bridge:** Leaf litter of *Casuarina cunninghamiana* needles. This site is likely to provide breeding habitat for the species.
– **Duffys Bridge:** Leaf litter of *Casuarina cunninghamiana* needles and in a paddock on the edge of the bridge. This site is likely to provide breeding habitat for the species.

5.1.1.2 Key threatening processes

The following key threatening processes are listed in NSW under the BC Act for the Giant Barred Frog and may be relevant for the Project works (OEH 2017):

– Clearing of vegetation is a major threat as the species inhabits the lower reaches of streams have been subject to development pressures including clearing for residential development and agricultural practices
– Dense, tall weed infestations (in particularly *Lantana* spp. and exotic grasses) can decrease the habitat quality and its availability, affecting habitat suitability for the species
– Water quality reduction and flow patterns alterations can cause tadpoles and embryos to be vulnerable to siltation
– Insufficient protection of riparian habitat through clearing activities
– The fungal pathogen *Batrachochytrium dendrobatidis*, is a threat to the species that causes chytridiomycosis, which has the potential to cause population decline
– Predation from feral pigs consuming eggs, individuals, or disturbing habitat
– Grazing and movement of domestic livestock causing disturbance in riparian habitat, and
– Stochastic event susceptibility and loss of genetic variation

5.1.1.3 Recovery plans

The Giant Barred Frog was included in the recovery plan for stream frogs of south-east Queensland 2001-2005 developed by the Queensland state government and adopted under the EPBC Act in 2003. However, the recovery plan has since expired in 2022. The Committee recommended that following expiry of the existing recovery plan, a new national recovery plan for Giant Barred Frog is not required as it would not have a significant conservation benefit above existing mechanisms. The approved conservation advice provides sufficient direction to implement priority actions and mitigate against key threats. The conservation advice identified several key actions for the preservation of the species. These include (TSSC 2021):

Habitat loss, disturbance and modifications

– Minimise human disturbance to the Giant Barred Frog and its habitat. Designate protection zones around known site locations to ensure habitat is not fragmented by roads, timber harvesting or clearing of freehold land. Activities permitted in protection zones should be dictated by further research into the effects of disturbance on the Giant Barred Frog.
– Assess the effectiveness of current forestry management practices in ameliorating disturbance to the habitat of the Giant Barred Frog, and revise management practices if necessary.
– Identify key sites and implement a program ensuring enough suitable habitat is maintained to ensure the species' viability in the wild.
– Identify and conserve landscape characteristics that facilitate movement between subpopulations.
– Educate landowners and managers of the importance of maintaining riparian habitat, and the integration of habitat protection into land management regulations.
– Manage flow regimes to enhance breeding opportunities for the Giant Barred Frog to minimise impacts from any potential stream works (diversions and impoundments) and maintenance works (de-silting of water storages) impinging upon Giant Barred Frog habitat, do not degrade water quality, and do not substantially affect current flow regimes.

Invasive species

– Monitor and control damage to riparian areas by feral pigs. This may require a collaborative strategy with land holders and local government authorities to control numbers and potentially fence key sites, where feasible.
– Use fencing, or other measures where applicable, to reduce the access of domestic stock to stream banks.
– Assess the impact of exotic weeds on habitat suitability for the Giant Barred Frog. If impact is shown to be significant, develop a strategy for control or elimination of the invasive weeds. Note: cutting and pasting/painting methods should be used to control weeds as herbicide formulations can be toxic to frogs and tadpoles, particularly if they contain glyphosate and surfactants.

Disease

– Minimise the spread of *Batrachochytrium dendrobatidis* (Bd):
  - Implementing suitable hygiene protocols.
  - Provide disease identification and prevention protocols (methods of handling, diagnostic keys, etc.) to researchers and land managers for use in the field.

5.1.1.4 Long term viability

Both foraging and breeding habitat has the potential to be present at each bridge location. In the absence of mitigation measures, there is the potential for the species to be displaced due to disrupted connectivity terrestrial during construction, however, waterway connectivity is expected to be maintained through implementing mitigation measures outlined in Section 6.

Potential impacts to the species life cycle will be minimised through permitting construction activities outside of the species known breeding season (approximately spring to autumn, after rain) (Frog ID 2024). Adhering to these measures will prevent any impacts to the life cycle of the species to the degree that it would jeopardise the viability of the local population.

Design of the new bridge will span the river and piers will be located outside or on the margins of the low flow channels. The construction of the bridges has potential to disrupt the banks of the river which provide habitat for the species. To mitigate this, alignment of the new bridges will utilise existing disturbed areas such that vegetation and disturbances of the river banks will be minimal. This will also mean no major changes are expected to the riparian zones or the river banks which allows for foraging habitat of the frog to be maintained. Based on these avoidance and mitigation measures, habitat removal and disturbance are expected to be minimal and limited to areas of existing disturbance.

The proposed works are not expected to result in fragmentation or isolation of habitat for the Giant Barred Frog as the works do not result in permanent change to the movement of this frog. During construction this species may be less inclined to visit the construction zone due to noise, presence of people and machinery. Construction will be kept to daylight hour to avoid disturbance at night when adults are active.

Key threatening processes most relevant to the proposed work include a reduction in water quality, clearing of vegetation and the introduction or spread of *Batrachochytrium dendrobatidis*. The Project is expected to manage the potential for any key threatening processes (i.e. a reduction in water quality, clearing of vegetation and the introduction or spread of *Batrachochytrium dendrobatidis*) by keeping works to within existing cleared areas. While individuals were found in cleared areas at Justins Bridge, there was better quality habitat further up or downstream. The species are likely to leave the construction zone to avoid activities through the implementation of best practise management and mitigation measures to manage water quality degradation and pathogen control (as outlined within Section 6 and 7).

The proposed Project works are not expected to impact habitat important to the long-term survival of the species.

5.2 Microbats

5.2.1 Southern Myotis (*Myotis macropus*)

5.2.1.1 Local and regional abundance and distribution

The Southern Myotis is found in the broad coastal band from in the northern and eastern areas of Australia. It is rare for the species to be found over 100 km inland except along major rivers (OEH 2020). The species is closely connected with areas that contain waterways due to their preferred roosting and foraging behaviours. The Southern Myotis has been recorded in 2003 in DieHappy Creek, near one of the entrance passages of the Bellinger River, approximately 3km from Hobarts Bridge (ALA 2023).

Habitat utilisation

The Southern Myotis is likely to utilise each bridge structure for roosting and/or breeding. The following habitat niches were observed across the four bridge sites:

– **Joyces Bridge -** The bridge has a few observable cracks, crevices and fissures within wooden logs. No microbats recorded during diurnal roost inspection and dusk roost emergence watch however data from the Anabats placed at this bridge collected calls from the Southern Myotis which indicate they are foraging in the area. As this species is a hollow-obligate species, it often roosts in bridge structures in the absence of suitable hollow-bearing trees. The bridge may comprise roosting and breeding habitat for Southern Myotis. There are historical records of Southern Myotis occurring within 10 km of the site, with the nearest being approximately 8 km to the west.

– **Hobarts Bridge** - Up to 10 microbats were recorded flying under bridge during dusk roost emergence watch. There are cracks and fissures in the wooden logs comprising the underside of the bridge which may comprise occupied roosting habitat. Technical issues with the Anabat at this site restricted data collection. They have the potential to roost and breed in this bridge. There are historical records of Southern Myotis occurring within 10 km of the site, with the nearest being approximately 1 km to the west.

– **Justins Bridge –** No microbats were recorded during diurnal roost inspections and roost emergence watch at dusk, however data from Anabats indicate the species is known to forage and potentially roosting at this site. The bridge may comprise temporary roosting habitat for Southern Myotis. There are historical records of Southern Myotis occurring within 10 km of the site, with the nearest being approximately 8 km to the east.

– **Duffys Bridge -** A microbat was recorded flying under bridge during dusk roost emergence watch. There are cracks and fissures in the wooden logs comprising the underside of the bridge which is likely to be comprise occupied roosting and breeding habitat. Technical issues with the Anabat at this site restricted data collection. There are historical records of Southern Myotis occurring within 10 km of the site, with the nearest being approximately 1 km to the south.

5.2.1.2 Key threatening processes

The following key threatening processes are listed in NSW under the BC Act for the Southern Myotis (*Myotis macropus*) and may be relevant for the proposed activities (OEH 2020a):

– Loss or disturbance of roosting sites
– Clearing adjacent to foraging areas
– Application of pesticides in or adjacent to foraging areas, and
– Reduction in stream water quality affecting food resources

The Southern Myotis is most susceptible to threats associated with clearing and fragmentation that will impact roosting and foraging areas (DCCEEW 2023). The species roosts under bridges, hollow-bearing trees, caves culverts, mines, dense foliage, and are often nearby water features (Australian Museum 2020) (OEH 2020a). This is a hollow-obligate species which relies upon hollows. In the absence of hollows, it readily uses bridge structures. The Southern Myotis relies on riverine environments for food sources. In a highly productive environment (Campbell 2012), Southern Myotis have been known to have more than one breeding event per year. The species has the potential to roost and breed in each structure. This species has been known to breed in bridges, culverts and other assets associated with road infrastructure (TfNSW 2023). The proposed activities will result in all four bridges being modified, potentially impacting the roosting, breeding and foraging for the species. The impacts are outlined below for each proposed bridge remediation works:

– **Joyces Bridge -** There are two mature Casuarina trees with hollows and/or fissures that are within two metres of the proposed activities which are likely to be impacted during construction either directly (removal) or indirectly (impact of root zones) (Idyll Spaces Environmental Consultants 2023). The roosting for the Southern Myotis has the potential to be affected by the disturbance to the hollow-bearing trees and from removal of the bridge. The species feeds on small fish and aquatic insects by flying close to water features, so the construction works has the potential to impact flyways for this species foraging activity. Data was captured from Anabats from this site which may indicate this species may be roosting nearby.
– **Hobarts Bridge -** Potential impacts of the Hobarts Bridge remediation work include approximately 200 m^2 of terrestrial fauna habitat being disturbed (Idyll Spaces Environmental Consultants 2023). Within this area of impact, removal of hollow bearing trees and/or suitable habitat (e.g. cracks, crevices or holes) in the bridge structure can possibly affect the roosting of the Southern Myotis (Idyll Spaces Environmental Consultants 2023). There will be impacts to this species roosting habitat and foraging habitat during the construction period but otherwise the overall impact will be limited during operational phase. The species feeds on small fish and aquatic insects by flying close to water features, consequently any construction works on the Hobarts Bridge has the potential to impact food resources and flyways during construction.
– **Justins Bridge -** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 100 m^2 (Idyll Spaces Environmental Consultants 2023). Depending on confirmed Project footprint this may include the removal of several Casuarina trees that may provide crevices or hollows for roosting microbats. The bridge structure may be utilised by this species however it would only constitute temporary roosting habitat. Data collected from echolocators at this site indicate that some of this species may be roosting within the bridge.
– **Duffys Bridge -** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 200 m^2 (Idyll Spaces Environmental Consultants 2023). Within this impact area there are potential hollow-bearing trees which the Southern myotis may inhabit. The removal of hollow-bearing trees and bridge structures has the potential to impact the species roosting behaviours.

5.2.1.3 Recovery plans

There are no current Recovery Plans or Threat Abatement Plan for the Southern Myotis. However, the species is managed under the Saving our Species (SoS) program (NSW Government 2023). The SoS for the Southern Myotis aims to extend or maintain its geographic range, secure the species longevity in the wild, and maintain or improve its conservation status listed under the BC Act. The SoS program by the NSW Government (2023) have identified several priority actions to help recover the species, these include:

– Preserve and protect live and dead hollow bearing trees

- Facilitate future tree replacement by regeneration processes or replanting in areas the species are known to occur
- When undertaking major works, replace wooden bridges with concrete bridges, and a wooden structure should be placed under the new bridge constructions where bats have been known to roost
- Encourage land management agreements to restore, protect, and retain suitable hollow bearing trees
- Ensure caves entrances are free from blockages that are utilised by bats and monitor vegetation densities nearby the entrance to maintain access
- Discourage recreational personnel utilising roosting areas such as culverts, caves, and storm water drain with appropriate signage
- Integrate and promote artificial roosting habitat structures within the species range and monitor
- Remove and control exotic weeds that can degrade and alter the habitat and communities
- Liaise with relevant personal to discourage destruction on caves. If bats are found in the caves, the species should not be removed during breeding season
- Raise awareness amongst landholders of the impacts of using harmful chemical and pesticides preventing the species to forage
- Promote land management that minimises disturbances on foraging habitat and monitor water quality in areas the species are known to forage within, and
- Remove aquatic weeds within foraging areas

5.2.1.4 Long term viability

The Southern Myotis predominately roosts in hollow-bearing trees, however in the absence of these, they readily roost in bridge structures (Campbell 2009). The removal of these bridges may lead to the destruction of available habitat, however there are large numbers of hollow-bearing trees in the broader Project Area which present suitable roosting habitat for this species. Southern Myotis may recolonise the new bridge structures following the completion of construction.

Construction activities are likely to temporarily impact foraging habitat and flyways for Southern Myotis. The Bellinger and Kalang River systems are long which allows for alternat foraging opportunities during construction.

The replacement of the bridge will involve two phases; the construction of the new bridge and the decommission of the existing bridge. The removal will have the largest impact on this species as it will remove a specific habitat that is utilised. To minimise this impact, demobilisation of the existing bridges will occur outside of the breeding season of the Sothern Myotis (refer to Section 6.3) and replacement roosting habitat features, such as wooden structures, will be installed under the new bridges to incorporate purpose-built breeding and roosting habitat to provide long-term habitat for threatened microbat species.

Due to the high mobility of these species, it is unlikely that the bridge replacements will result in fragmentation or isolation of their habitat. A temporary non-physical barrier may occur during construction which could temporarily reduce flyway and foraging habitat. This may temporarily displace the Southern Myotis, resulting in them needing to fly further to access food.

The Project has the potential to impact key threatening processes of this bat species through roosting habitat modification, adjacent habitat modification as well as nearby water modification resulting in food loss. The footprint at each study site is in the vicinity of 100 – 250 m^2 (Idyll Spaces Environmental Consultants 2023) however alternative habitat (i.e. hollow-bearing trees) occurs in the broader Project Area. Key threatening processes are not expected to be exacerbated to the point that it impacts at a species level.

Given the large distribution of this species, it is unlikely that any long-term impacts will be placed on the Southern Myotis due to the replacement of these bridges.

5.2.2 Large Bent-wing Bat (Miniopterus orianae oceanensis)

5.2.2.1 Local and regional abundance and distribution

The Large Bent-wing Bat occurs along the eastern coast of New South Wales, with its distribution in northern New South Wales reaching from the coast to as far west as Bingara (Australia Bat Society 2024).

5.2.2.2 Habitat utilisation

– **Joyces Bridge -** No microbats recorded during diurnal roost inspection and dusk roost emergence watch, however data collected from the Anabat at this site captured calls from Large Bent-wing Bat. As no calls were recorded during the re-entry period near sunrise, the data indicates the species are likely roosting nearby and/or utilising this site for foraging activity. There are historical records of the Large Bent-wing bat occurring within 10 km of this site, with the nearest record being approximately 6 km to the north.

– **Hobarts Bridge** - Up to 10 microbats were recorded flying under bridge during dusk roost emergence watch. Technical issues with the Anabat at this site restricted data collection. This species is less likely to roost in bridges however they may use a bridge as a temporary diurnal roost. There are records of Large Bent-wing Bat occurring within 10 km of this site, with the closest being approximately 6 km to the north.

– **Justins Bridge –** No microbats were recorded during diurnal roost inspections and roost emergence watch at dusk. The Anabat at this site was functional during the survey period, however this species was not recorded. This species is less likely to roost in bridges however they may use a bridge as a temporary diurnal roost. There are records of Large Bent-wing bat occurring within 10 km of this site, with the closest being approximately 8 km to the east.

– **Duffys Bridge -** A microbat was recorded flying under bridge during dusk roost emergence watch. Technical issues with the Anabat at this site restricted data collection. They have the potential to roost and breed in this bridge. There are cracks and fissures in the wooden logs comprising the underside of the bridge which is likely to be comprise occupied roosting habitat. This species is less likely to roost in bridges however they may use a bridge as a temporary diurnal roost. There are records of Large Bent-wing Bat occurring within 10 km of this site, with the closest being approximately 4 km to the east.

5.2.2.3 Key threatening processes

The following key threatening processes are listed in NSW under the BC Act for the Large Bent-Wing Bat and may be relevant for the proposed activities (OEH 2019):

– Loss of foraging habitat and roosting sites

– Introduction of exotic pathogens

The Large Bent-wing Bat primarily roost in caves but are known to roost in other man-made structures (OEH 2019). Bridges are typically used for diurnal roosting for this species. They are highly unlikely to use a bridge structure as a maternity roost. If they are known to roost within a bridge structure, it is likely they will be roosting in low numbers (Lam 2012). This species forages above canopy trees while hunting for flying insects (Australian Museum 2022). The proposed activities will result in all four bridges being modified, potentially impacting the roosting and foraging habitat for the species. The impacts are outlined below for each proposed bridge remediation works:

– **Joyces Bridge -** Roosting for the large bent-wing bat has the potential to be affected by the removal of the bridge structure that may be utilised by the species. Impacts to native vegetation and terrestrial fauna habitat extend over 200 m^2 (Idyll Spaces Environmental Consultants 2023). Data collected from this site indicate this species may be roosting near the Project footprint. During the construction phase, foraging habitat for this species may be temporarily impacted.

– **Hobarts Bridge** – Potential impacts of the Hobarts Bridge remediation work include approximately 200 m^2 of terrestrial fauna habitat being disturbed (Idyll Spaces Environmental Consultants 2023). Within this area of impact, removal of cervices in the bridge structure can possibly affect the roosting of the Large Bent-Wing Bat. During the construction phase, foraging habitat for this species may be temporarily impacted.

– **Justins Bridge -** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 100 m^2 (Idyll Spaces Environmental Consultants 2023). The removal of the bridge structure has the potential to impact the species roosting behaviours. During the construction phase, foraging habitat for this species may be temporarily impacted.

– **Duffys Bridge -** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 200 m^2 (Idyll Spaces Environmental Consultants 2023). The removal of the bridge structure has the potential to impact the species roosting behaviours. During the construction phase, foraging habitat for this species may be temporarily impacted.

5.2.2.4 Recovery plans

There are no current Recovery Plans or Threat Abatement Plan for the large bent-wing bat, however, the species is managed under the Saving our Species (SoS) program (NSW Government 2023). The SoS for the large bent-wing bat aims to minimise impacts of recreational activities on roosting habitat, ensure unrestricted access to appropriate species habitat and reduce impacts of pest species. The SoS program by the NSW Government (2023) have identified several priority actions to help recover the species, these include:

– Minimise impacts to recreational activities in caves.
– Ensure cave entrances and other roosting habitat is not restricted by humans or exotic species.
– Reduce impacts of predation by feral cats.
– Track species abundance and condition over time by doing flyout counts at cave entrances of known roosting sites.

5.2.2.5 Long term viability

The Large Bent-wing Bat predominately roosts in caves, old mines, stormwater tunnels and occasional man-made structures (Australian Museum 2022). They are less likely to roost in bridges however they are often considered when planning activities around road infrastructure in New South Wales (i.e. culverts, bridges) (TfNSW 2023). The removal of these bridges may lead to the removal of potential temporary roosting habitat. As the species was recorded, at Joyces Bridge, they are likely roosting nearby which indicate there is suitable habitat in the broader Project Area.

Construction activities are likely to temporarily impact foraging habitat and flyways for Large Bent-wing Bat. The Bellinger and Kalang River systems are long which allows for alternat foraging opportunities during construction.

The replacement of the bridge will involve two phases; the construction of the new bridge and the decommission and removal of the existing bridge. The removal may have an impact on this species if they are utilising any bridge structures. To minimise this impact replacement roosting habitat features, such as wooden structures, will be installed under the new bridges to incorporate purpose-built breeding and roosting habitat to provide long-term habitat for threatened microbat species.

Due to the high mobility of these species, it is unlikely that the bridge replacements will result in fragmentation or isolation of their habitat. A temporary non-physical barrier may occur during construction which could temporarily reduce flyway and foraging habitat. This may temporarily displace the Large Bent-wing Bat, resulting in them needing to fly further to access food.

The Project has the potential to impact key threatening processes of this bat species through roosting habitat modification, adjacent habitat modification as well as nearby water modification resulting in food loss. The footprint at each study site is in the vicinity of 100 – 250 m^2 (Idyll Spaces Environmental Consultants 2023) however this species is likely roosting in the broader Project Area. Key threatening processes are not expected to be exacerbated to the point that it impacts at a species level.

Given the large distribution of this species, and its specific requirements of caves for breeding habitat, it is unlikely that any long-term impacts will be placed on Large Bent-wing Bat due to the replacement of these bridges.

5.2.3 Little Bent-wing Bat (*Miniopterus australis*)

5.2.3.1 Local and regional abundance and distribution

The Little Bent-wing Bat is typically confined to the subtropical coastal belt of the east coast of Australia (Dwyer 1968). In New South Wales they are distributed south from the border of Queensland to approximately

Wollongong (OEH 2020b). In New South Wales the largest maternity colony of the Little Bent-wing Bat is associated with a large maternity colony of Eastern Bent-wing Bat (*Miniopterus schreibersii*), which help thermoregulate the colony during birthing and nursing (OEH 2020b).

Habitat utilisation

- **Joyces Bridge -** The bridge has a few observable cracks, crevices and fissures within wooden logs. No microbats recorded during diurnal roost inspection and dusk roost emergence watch. The bridge may comprise temporary roosting habitat for microbats. There are historical records of Little Bent-wing Bat within 10km of this site, with the closest being approximately 5 km to the east of the site.
- **Hobarts Bridge -** Up to 10 microbats were recorded flying under bridge during dusk roost emergence watch. Technical issues with the Anabat at this site restricted data collection. They have the potential to roost and breed in this bridge. There are cracks and fissures in the wooden logs comprising the underside of the bridge which is likely to be comprise occupied roosting habitat. There are historical little bent-wing bat records occurring within 10 km of this site, with the closest record being approximately 1 km to the north.
- **Justins Bridge –** No microbats were recorded during diurnal roost inspections and roost emergence watch at dusk, however data from Anabats indicate the species is known to forage and potentially roosting at this site. The wooden logs comprising the bridge are not sufficiently degraded to create cracks and fissures which microbats may roost in. The bridge may comprise temporary roosting habitat for microbats. There are historical Little Bent-wing Bat records occurring within 10km of this site, with the closest record being approximately 7 km to the west.
- **Duffys Bridge -** A microbat was recorded flying under bridge during dusk roost emergence watch. Technical issues with the Anabat at this site restricted data collection. They have the potential to roost and breed in this bridge. There are cracks and fissures in the wooden logs comprising the underside of the bridge which is likely to be comprise occupied roosting habitat. There are historical Little Bent-wing Bat records occurring within 10 km of this site, with the closest record being approximately 2 km to the north and east.

5.2.3.2 Key threatening processes

The following key threatening processes are listed in NSW under the BC Act for the Little Bent-wing Bat and may be relevant for the proposed activities (OEH 2020b):

- Changes to habitat, especially surrounding maternity or nursery caves and winter roosts
- Introduction of exotic pathogens
- Infestation of woody weeds which may block flight path access
- Disturbance to roosting habitat (i.e. man-made structures)

The Little Bent-wing Bat forage for small insects beneath densely vegetated canopies and may roost under bridges, culverts and hollow-bearing trees (OEH 2020b). This species forages beneath the canopy layer of forested areas (Australian Museum 2022). The proposed activities will result in all four bridges being modified, potentially impacting the roosting habitat for the species. The impacts are outlined below for each proposed bridge remediation works:

- **Joyces Bridge -** Impacts to native vegetation and terrestrial fauna habitat extend over 200 m^2 (Idyll Spaces Environmental Consultants 2023). Roosting for the Little Bent-Wing Bat has the potential to be affected by the disturbance to the hollow-bearing trees and from removal of bridge structure that has been utilised by the species.
- **Hobarts Bridge -** Potential impacts of the Hobarts Bridge remediation work include approximately 200 m^2 of terrestrial fauna habitat being disturbed (Idyll Spaces Environmental Consultants 2023). Within this area of impact, removal of hollow bearing trees or cervices in the bridge structure may impact roosting habitat for this species.
- **Justins Bridge –** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 100 m^2 (Idyll Spaces Environmental Consultants 2023). Depending on confirmed Project footprint this may include the removal of several Casuarina trees that may provide crevices or hollows for roosting microbats. The bridge structure may be utilised by this species however it would only constitute temporary roosting habitat.

– **Duffys Bridge** - The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 200 m^2 (Idyll Spaces Environmental Consultants 2023). Within this impact area there are potential hollow-bearing trees the little bent-wing bat may inhabit. The removal of hollow-bearing trees and bridge structures has the potential to impact the species roosting behaviours.

5.2.3.3 Recovery plans

There are no current Recovery Plans or Threat Abatement Plan for the little bent-wing bat. However, the species is managed under the Saving our Species (SoS) program (NSW Government 2023). The SoS for the Little Bent-wing Bat aims to protect and conserve roosting and foraging habitat.

The SoS program by the NSW Government (2023) have identified several priority actions to help recover the species, these include:

– Monitor density of vegetation at roosting sites to ensure species access to suitable roosting habitat is not impacted.
– Identify important maternity or hibernation roost sites (including bridges, drains and culverts) and protect from disturbance or degradation.
– Discourage recreational users (i.e. cavers) from known roosting sites.
– Ensure location and sensitivity of roosting and key foraging areas are known so that existing lighting impacting these areas can be modified or managed.
– Investigate if species wintering roosting habitat (i.e. banana trees and tree hollows).
– Encourage private land owners to protect and restore key areas (i.e. swamps and habitat adjacent to caves and other known roosting sites).
– Facilitate future tree replacement by regeneration processes or replanting in areas the species are known to occur.
– When undertaking major works, replace wooden bridges with concrete bridges, and a wooden structure should be placed under the new bridge constructions where bats have been known to roost.
– Encourage land management agreements to restore, protect, and retain suitable hollow bearing trees.

5.2.3.4 Long term viability

The Little Bent-wing Bat is known to predominantly roost in caves, old mines, stormwater tunnels, and occasionally in man-made structures (Australian Museum, 2022). While they are less likely to roost in bridges, they are still considered when planning activities around road infrastructure in New South Wales, such as culverts and bridges (TfNSW, 2023). Removing these bridges may lead to the loss of potential temporary roosting habitats. The presence of this species at Joyces Bridge indicates that there is suitable habitat in the broader Project Area nearby.

Construction activities during the bridge replacement Project are likely to temporarily impact the foraging habitat and flyways for the Little Bent-wing Bat. However, the Bellinger and Kalang River systems are long enough to allow for alternative foraging opportunities during construction.

The bridge replacement will involve two phases: the construction of the new bridge and the decommission and removal of the existing bridge. The removal of the existing bridge may have an impact on this species if they are using any bridge structures for roosting. To minimise this impact, replacement roosting habitat features, such as wooden structures, will be installed under the new bridges to incorporate purpose-built breeding and roosting habitat to provide long-term habitat for threatened microbat species.

Although there may be a temporary non-physical barrier during construction that could temporarily reduce flyway and foraging habitat, it is unlikely that the bridge replacement will result in fragmentation or isolation of their habitat. If the Little Bent-wing Bat is displaced, it may need to fly further to access food.

The bridge replacement Project has the potential to impact key threatening processes of this bat species through roosting habitat modification, adjacent habitat modification, as well as nearby water modification, which could result in food loss. Although the footprint at each study site is in the vicinity of 100 – 250 m^2 (Idyll Spaces Environmental Consultants 2023), this species is likely roosting in the broader Project Area. However, key threatening processes are not expected to be exacerbated to the point that it impacts the species level.

Considering the large distribution of this species and its specific breeding habitat requirements (i.e. caves), it is unlikely that any long-term impacts will be placed on the Little Bent-wing Bat due to the replacement of these bridges.

5.2.4 Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)

5.2.4.1 Local and regional abundance and distribution

The Eastern Coastal Free-tailed Bat is distributed along the coastal region of New South Wales (OEH 2022). They are known to occur within the Coffs Coast and Escarpment IBRA sub-region (OEH 2022). The species is rarely captured and most available information on their distribution and ecology is based on observations and limited data (McConville 2013).

Habitat utilisation

- **Joyces Bridge –** No microbats were observed during the roost watch at this bridge. However, data collected from the Anabat captured calls from the Eastern Coastal Free-tailed Bat each night. They prefer to roost in hollows or under loose bark, however they may roost in bridge structures. The Eastern Coastal Free-tailed Bat is likely foraging in the area and may temporarily roost in the bridge. There are no historical records within 10 km of the bridge.
- **Hobarts Bridge -** Up to 10 microbats were recorded flying under bridge during dusk roost emergence watch. Technical issues with the Anabat at this site restricted data collection. This species preference is to roost in hollows or under loose bark however they may roost temporarily in bridge structures. The Eastern Coastal Free-tailed Bat is likely foraging in the area and may temporarily roost in the bridge. There are no historical records within 10 km of the bridge.
- **Justins Bridge –** No microbats were recorded during diurnal roost inspections and roost emergence watch at dusk, however data from Anabats indicate the species is known to forage in the area. They prefer to roost in hollows or under loos bark, however they may roost in bridge structures temporarily. There are no historical records within 10 km of the bridge.
- **Duffys Bridge -** A microbat was recorded flying under bridge during dusk roost emergence watch. Technical issues with the Anabat at this site restricted data collection. There is a low have the potential to roost and breed in this bridge. The Eastern Coastal Free-tailed Bat is likely foraging in the area and may temporarily roost in the bridge. There are historical records of Eastern Coastal Free-tailed Bat occurring within 10 km of the site, with the nearest being approximately 10 km to the northeast.

5.2.4.2 Key threatening processes

The following key threatening processes are listed in NSW under the BC Act for the Eastern Coastal Free-tailed Bat and may be relevant for the proposed activities (OEH 2022):

- Loss of hollow-bearing trees
- Loss of foraging habitat during the construction phase
- Artificial light sources spilling onto foraging and/or roosting habitat

The species roosts under bridges, hollow-bearing trees, culverts. The Eastern Coastal Free-tailed Bat forages above the canopy of forested areas hunting flying insects (Australian Museum 2022). The proposed activities will result in all four bridges being modified, potentially impacting the roosting and foraging habitat for the species. The impacts are outlined below for each proposed bridge remediation works:

– **Joyces Bridge -** Impacts to native vegetation and terrestrial fauna habitat extend over 200 m^2 (Idyll Spaces Environmental Consultants 2023). Roosting for the Eastern Coastal Free-tailed Bat has the potential to be affected by the disturbance to the hollow-bearing trees and from removal of bridge structure that has been utilised by the species. During the construction phase, foraging habitat for this species may be temporarily impacted.
– **Hobarts Bridge -** Potential impacts of the Hobarts Bridge remediation work include approximately 250 m^2 of terrestrial fauna habitat being disturbed (Idyll Spaces Environmental Consultants 2023). Within this area of impact, removal or disturbance of hollow bearing trees or cervices in the bridge structure may impact roosting habitat for this species. During the construction phase, foraging habitat for this species may be temporarily impacted.
– **Justins Bridge -** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 100 m^2 (Idyll Spaces Environmental Consultants 2023). Depending on confirmed Project footprint this may include the removal of several Casuarina trees that may provide crevices or hollows for roosting microbats. The bridge structure may be utilised by this species however it would only constitute temporary roosting habitat. During the construction phase, foraging habitat for this species may be temporarily impacted.
– **Duffys Bridge -** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 200 m^2 (Idyll Spaces Environmental Consultants 2023). Within this impact area there are potential hollow-bearing trees which may be utilised by the Eastern coastal free-tailed bat. The removal of hollow-bearing trees and bridge structures has the potential to impact the species roosting behaviours. During the construction phase, foraging habitat for this species may be temporarily impacted.

5.2.4.3 Recovery plans

There are no current Recovery Plans or Threat Abatement Plan for the Eastern Coastal Free-tailed Bat. However, the species is managed under the Saving our Species (SoS) program (NSW Government 2023). The SoS program by the NSW Government (2023) have identified several priority actions to help recover the species, these include:

– Raise public awareness of the importance of hollow-bearing trees.
– Negotiate with landowners that promote the retention, connectivity and restoration and sensitive management of suitable habitat.
– Raise public awareness of the damage that can be caused to habitat by slashing, under scrubbing, thinning, weed encroachment and inappropriate grazing.
– Implement bush regeneration to projected known roosting and foraging habitat.
– Liaise with appropriate land managers to ensure there are no artificial light sources close to known roosting or foraging areas.
– Conduct targeted research into the species.

5.2.4.4 Long term viability

The Eastern Coastal Free-tailed Bat is a hollow-roosting species, favouring tree hollows, most commonly in Eucalyptus species (McConville 2013). The removal of the bridge structures and a few hollow-bearing Casuarinas at some of the sites may temporarily displace any Eastern Coastal Free-tailed Bat that might be using these habitats as roosts. The availability and abundance of hollow-bearing trees within the broader Project Area present more suitable and widely available habitat for this species.

As these species as ‘open space foragers’ and ‘edge and gap foragers’ (McConville 2013), construction activities may temporarily restrict or impact foraging habitat and flyways for the Eastern Coastal Free-tailed Bat. The Bellinger and Kalang River systems are expansive which allows for alternative foraging opportunities during construction.

The replacement of the bridge will involve two phases; the construction of the new bridge and the decommission and removal of the existing bridge. If roosting within any of the bridge structures, the removal will have the largest impact on this species. To minimise this impact, demobilisation of the existing bridges will occur outside of the breeding season of the species (refer to Section 6.3) and replacement roosting habitat features, such as wooden structures, will be installed under the new bridges to incorporate purpose-built breeding and roosting habitat to provide long-term habitat for threatened microbat species.

Due to the high mobility of these species, it is unlikely that the bridge replacements will result in fragmentation or isolation of their habitat. A temporary non-physical barrier may occur during construction which could temporarily reduce flyway and foraging habitat. This may temporarily displace the Eastern Coastal Free-tailed Bat, resulting in them needing to fly further to access food.

The Project has the potential to impact key threatening processes of this bat species through the loss of hollow-bearing trees, temporary impact to foraging habitat during the construction phase and artificial light sources impacting foraging and/or roosting habitat. The removal of hollow-bearing trees will be limited where possible. The Project Footprint at each site ranges between 100 – 250 m^2 (Idyll Spaces Environmental Consultants 2023), however there is abundance suitable habitat available for the species to utilise in the broader Project Area. Key threatening processes are not expected to be exacerbated to the point that it impacts at a species level.

Given the large distribution of this species, it is unlikely that any long-term impacts will be placed on the Eastern Coastal Free-tailed Bat due to the replacement of these bridges.

5.2.5 Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)

5.2.5.1 Local and regional abundance and distribution

The Eastern False Pipstrelle distribution within New South Wales ranges predominately along the coastal and marginally inland regions of New South Wales (Australasian Bat Society 2024). They range from the border of Queensland, south along to the border of Victoria (OEH 2017a). The species has been recorded on the south coast and ranges of the Shoalhaven region in New South Wales (Daly & Hoye 2023).

5.2.5.2 Habitat utilisation

– **Joyces Bridge -** No microbats were observed during the roost watch at this bridge. However, data collected from the Anabat captured calls from the Eastern False Pipstrelle on one night across the four consecutive survey nights. There is no data to support this species roosts in bridges as they prefer to roost in hollows. The Eastern False Pipstrelle is likely foraging in the area. There are no historical records within 10 km of the bridge.
– **Hobarts Bridge -** Up to 10 microbats were recorded flying under bridge during dusk roost emergence watch. Technical issues with the Anabat at this site restricted data collection. This species preference is to roost in hollows and is unlikely to be roosting in the bridge. The Eastern Coastal Free-tailed Bat may forage in the area. There are no historical records within 10 km of the bridge.
– **Justins Bridge** - No microbats were recorded during diurnal roost inspections and roost emergence watch at dusk, however data from Anabats indicate the species may forage in the area. This species preference is to roost in hollows and is unlikely to be roosting in the bridge. There are no historical records within 10 km of the bridge.
– **Duffys Bridge -** A microbat was recorded flying under bridge during dusk roost emergence watch. Technical issues with the Anabat at this site restricted data collection. There is a low have the potential to roost and breed in this bridge. The Eastern Coastal Free-tailed Bat may forage in the area. There are no historical records within 10 km of the bridge.

5.2.5.3 Key threatening processes

The following key threatening processes are listed in NSW under the BC Act for the Eastern False Pipistrelle and may be relevant for the proposed activities (OEH 2017a):

– Disturbance to winter roosting and breeding sites

- Loss of roosting habitat
- Loss and fragmentation of foraging habitat

The species roosts in hollow-bearing trees, under loose barks on trees or in buildings. There is no information to support or suggest this species would readily roost in bridges as they are hollow-obligate species c The proposed activities will result in all four bridges being modified, potentially impacting the roosting and foraging for the species. The impacts are outlined below for each proposed bridge remediation works:

- **Joyces Bridge -** Impacts to native vegetation and terrestrial fauna habitat extend over 200 m^2 (Idyll Spaces Environmental Consultants 2023). Roosting habitat may be impacted by the disturbance to the hollow-bearing trees. During the construction phase, access to foraging habitat for this species may be temporarily impacted.
- **Hobarts Bridge -** Potential impacts of the Hobarts Bridge remediation work include approximately 250 m^2 of terrestrial fauna habitat being disturbed (Idyll Spaces Environmental Consultants 2023). Within this area of impact, removal of hollow bearing may possibly affect the roosting habitat. During the construction phase, access to foraging habitat for this species may be temporarily impacted.
- **Justins Bridge -** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 100 m^2 (Idyll Spaces Environmental Consultants 2023). Depending on confirmed Project footprint this may include the removal of several Casuarina trees that may provide crevices or hollows for roosting. During the construction phase, foraging habitat for this species may be temporarily impacted.
- **Duffys Bridge -** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 200 m^2 (Idyll Spaces Environmental Consultants 2023). Within this impact area there are potential hollow-bearing trees which may be utilised by this species. The removal of hollow-bearing trees has the potential to impact the species roosting behaviours. During the construction phase, foraging habitat for this species may be temporarily impacted.

5.2.5.4 Recovery plans

There are no current Recovery Plans or Threat Abatement Plan for the Eastern false pipistrelle. However, the species is managed under the Saving our Species (SoS) program (NSW Government 2023). The SoS program by the NSW Government (2023) have identified several priority actions to help recover the species, these include:

- Ensure roosting bats are not present before removing or disturbing hollow-bearing trees in winter.
- Protect and maintain areas of high quality habitat, particularly areas of extensively tall (>20 m) forests which include areas of high productivity foraging habitat around creeks, rivers and wetlands.
- Encourage landowners to retain and protected hollow-bearing trees in suitable habitat.
- Undertake revegetation programs to develop tall forests.

5.2.5.5 Long term viability

The Eastern False Pipstrelle is a hollow-obligate species, typically roosting in tree hollows (Australian Museum 2022) and there is no information to support that the species is known to roost in bridges (O'Neil & Taylor 1898). Impacting the few hollow-bearing Casuarinas at some of the sites may temporarily displace any Eastern False Pipstrelle that might be using these habitats as roosts. The availability and abundance of hollow-bearing trees within the broader Project Area present more suitable and widely available habitat for this species.

As these species diet is primarily insects in the upper layers of the forest canopy (Taylor et al 1987), construction activities are unlikely to significant restrict or impact foraging habitat however there may be minor impacts to flyways for the Eastern False Pipstrelle. The expansive Bellinger and Kalang River systems allow for alternative foraging opportunities during construction.

It is unlikely that the replacement of the bridges will cause any fragmentation or isolation of the habitat of these species, as they are highly mobile. However, during the construction, there may be a temporary barrier that may limit their flyway and reduce access to foraging habitat. This could lead to a temporary displacement of the Eastern False Pipistrelle, which would need to fly further to access food.

The Project has the potential to impact key threatening processes of this bat species through the potential disturbance of winter roosting habitat, loss of roosting habitat and fragmentation of foraging habitat. The Project Footprint at each site ranges between 100 – 250 m^2 (Idyll Spaces Environmental Consultants 2023). however, there is an abundance suitable habitat available for the species to utilise in the broader Project Area. Key threatening processes are not expected to be exacerbated to the point that they impact at a species level.

Given the large distribution of this species, it is unlikely that any long-term impacts will be placed on the Eastern False Pipstrelle due to the replacement of these bridges.

5.3 Grey-headed Flying-fox (*Pteropus poliocephalus*)

5.3.1.1 Local and regional abundance and distribution

The Grey-headed Flying-fox is endemic to Australia with populations ranging from Ingman in Queensland down to Adelaide in South Australia (DAWE 2021). They are typically found in coastal lowlands and the slopes of eastern Australia below 200 m altitude (DAWE 2021). In New South Wales they are found from the coastal, to tablelands and western slopes. Their distribution and relative abundance varies seasonally and temporally, depending on seasons of flowering and fruiting species within their diet (DAWE 2021).

The National Flying-fox Monitoring Viewer (DCCEEW 2023b) present other known camps within the Project Area (Figure 5.1). The camp near Hobarts Bridge is mapped as an ‘Other’ Flying-fox camp however there are two camps at Bellingen (one Nationally Important Flying-fox Camp).

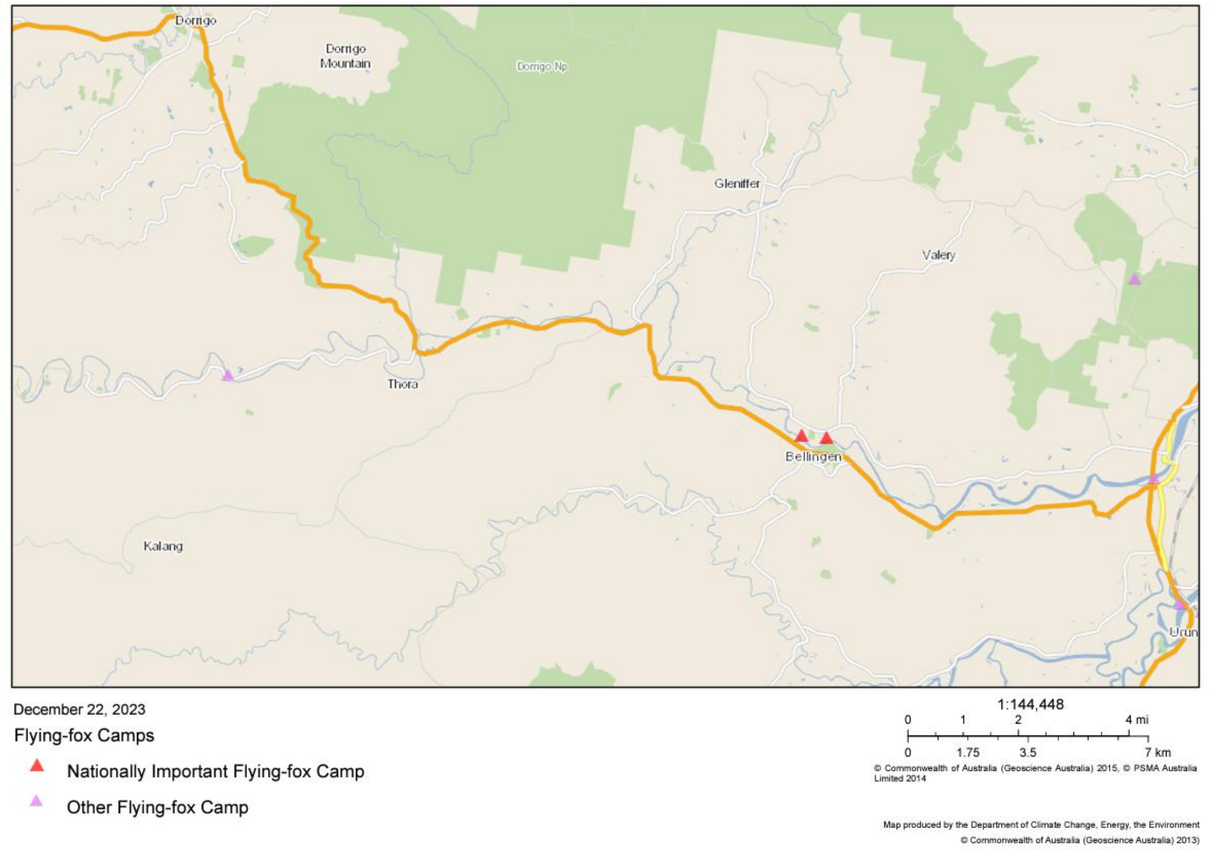


Figure 5.1 National Flying-fox Monitoring Viewer (DCCEEW 2023b)

5.3.1.2 Habitat utilisation

Foraging habitat

The foraging habitat values of the Grey-headed Flying-fox vary in response to native food sources. They migrate in response to the changes in quantity and location of food (DAWE 2021). They forage at dusk and into the night over expansive areas, with records showing they have flown over 40 km one way to find food before returning to roost. The average Grey-headed Flying-fox foraging distance per night, including its return trip to its roosting camp is reported as 10.9 km (DAWE 2021). Their preferred food source is eucalypt blossom and rainforest fruits.

Two foraging periods of the year are identified as particularly important for the Grey-headed Flying-fox. The breeding period, which occurs from October to January, includes the final weeks of gestation, and the weeks of birth, lactation, and conception. The 'food bottle neck', which occurs during the May to August period, is a time where foraging resources are limited. Resource demands during these periods are important to the Grey-headed Flying-fox.

Roosting habitat

Grey-headed Flying-fox roost in large camps which provide resting habitat, social interaction exchanges and refuge for individuals during significant phase of their annual cycle (i.e. birth, lactation and conception) (DAWE 2021). These camps often occur in dense riparian habitat.

The Grey-headed Flying-fox uses temporary and permanent camps. Temporary camps are not occupied throughout the year and are typically established during the summer period to access habitat resources as they become available. These camps may coincide with breeding activity. Permanent camps are occupied throughout the year and are generally central to all necessary foraging resources, particularly those that occur during the winter food bottlenecks.

There is a wide variety of known preferred vegetation for a camp ranging from continuous tracts of native vegetation to patches less than 1 hectare (DAWE 2021).

A Grey-headed Flying-fox camp occurs approximately 120 m from the existing Hobarts Bridge and there are historical records scattered through the Project Area. The species is likely to forage in flowering eucalypts and fruit trees throughout this area. Grey-headed Flying-fox are seasonal breeders, with a single breeding event occurring each year and births ensue from October to December. This species is prone to aborting foetuses, mass abortion events and premature births in response to environmental stress, particularly anthropogenic stress such as disturbance to camps and habitat clearing (DAWE 2021).

5.3.1.3 Key threatening processes

The following key threatened process are listed in the *Commonwealth Grey-headed Flying-fox recovery plan* (DAWE 2021) under the EPBC Act and may be relevant for the proposed activities:

– Loss and degradation of foraging and roosting habitat
– Camp disturbance – becoming surrounded by urban and rural residential development
– Heat stress

The following key threatening processes are listed in NSW under the BC Act for the Grey-headed Flying-fox and may be relevant for the proposed activities (OEH 2020c):

– Habitat loss and degradation of habitat
– Heat stress caused by disturbance of maternity roost during construction activities

The Grey-headed Flying-fox is most susceptible to threats associated with clearing and habitat loss and camp disturbance that will impact their roosting and potential foraging areas (DAWE 2021). This species roost in exposed branches of trees in areas from continuous forest to patches less than a hectare. The proposed activities at Hobarts Bridge (which is within 120 m of a Grey-headed Flying-fox camp) may result in temporary disturbance to the camp during the day while construction activities are underway. The proposed works at Joyces Bridge, Justins Bridge and Duffys Bridge are each in excessive between 3 – 27 kms from the camp and consequently construction is not expected to impact the camp during the proposed works. Works at these locations are expected to be limited to negligible amounts of foraging habitat. The impacts are outlined below for the proposed works at Hobarts Bridge.

Hobarts Bridge

Potential impacts of the Hobarts Bridge remediation work include the disturbance of the maternity roost camp during diurnal construction activities. This has the potential to cause individual Grey-headed Flying-fox to leave camp during the day. The laydown area for the construction is within 120 m of the roosting camp and the increased heavy vehicle traffic associated with construction has the potential to result in temporary disturbances to the camp during construction, which persists approximately 3 - 5 m from the edge of Darkwood Road. Due to the rural nature of the area, the existing low traffic along Darkwood Road don’t seem to impact the species. The increased traffic during the construction period may impact the roost during the day.

5.3.1.4 Recovery plans

There is a commonwealth *National Recovery Plan for the Grey-headed Flying-fox* (DAWE 2021) and a New South Wales Saving our Species (SOS) program for the Grey-headed Flying-fox. The recovery plan for the Grey-headed Flying-fox has identified several priority actions to help record the species, which include:

– Identify protect and increase native foraging habitat that is critical to the survival of the species.
– Identify, protect and increase roosting habitat for Grey-headed Flying-fox.
– Determine trends in the Grey-headed Flying-fox population to monitor species national distribution, habitat use and conservation status.
– Build community capacity to coexist with flying-foxes and minimise the impacts on human settlements from new and existing camps while avoiding interventions to move on or relocate entire camps.
– Increase public awareness and understanding of the Grey-headed Flying-fox and the recovery program and involve the community in the recovery program where appropriate.
– Improve management of Grey-headed Flying-fox camps in areas where interaction with humans is likely.
– Significantly reduce licenced harm to Grey-headed Flying-fox associated with commercial horticulture.
– Support research activities that will improve the conservation status and management of Grey-headed Flying-fox.
– Reduce the impact on Grey-headed Flying-fox of electrocution on powerlines and entanglement in netting and on barbed-wire.

5.3.1.5 Long term viability

Only one of the four bridges (Hobarts Bridge) was reported to be in close proximity (120 m) to a Grey-headed Flying-fox camp. This camp is used as roosting and maternity/nursery habitat during diurnal periods. The Grey-headed Flying-fox will leave during the night to forage in surrounding habitat. It is unlikely that any existing roosting trees will be removed. The largest issue is the use of loud machinery which has the potential to displace the population from the camp which may impact on nursing mothers within this camp. No construction works will occur during extreme temperatures (>40 °C) to avoid disturbance to heat stressed individuals.

The design and alignment of the bridges have been implemented in such a way to minimise effects on threatened species including the Grey-headed Flying-fox. The Project is utilising already cleared areas for works and laydown areas, it is unlikely that the roosting habitat will be removed or modified.

The proposed works will not result in the fragmentation or isolation of habitat for the Grey-headed Flying-fox. The proposed works will have no permanent change to flying fox movement. Construction works will be restricted to daylight hours to allow periods of non-disturbance at night which limits interaction with these species as they are predominately nocturnal.

The Project has the potential to impact key threatening processes of the Grey-headed Flying-fox through camp disturbance and heat stress. This is likely to be caused by loud noise during construction which may disrupt diurnal roosting, resulting in possible heat stress. Implementing known avoidance measures (outlined in Section 6) will limit this disturbance occurring.

Given the large distribution of the Grey-headed Flying-fox it is unlikely that any long-term impacts will be placed on this flying fox due to the replacement of these bridges.

The potential impacts to the breeding colony of Grey-headed Flying-fox include impacts of construction of the proposed bridge upgrade near the camp site and its habitants. It is considered that the impacts will be limited to negligible amounts of removal of foraging habitat and potential disruption of roosting habitat during construction. The existing traffic light along Darkwood Road, typical of a rural area, does not appear to disrupt the colony (as observed during field surveys). Traffic relating to the construction of the bridge will slightly increase daily traffic. The turnaround area for heavy machinery will be required to be a sufficient distance from the camp to prevent unnecessary disturbance. The proposed works are expected to be constrained to daytime hours when the species is roosting so impacts to foraging activity is expected to be limited.

The activity is not likely to reduce the long-term viability for the Grey-headed Flying-fox at the local or bioregional scales.

5.4 Superb Fruit-dove (*Ptilinopus superbus*)

5.4.1.1 Local and regional abundance and distribution

The Superb Fruit-dove is found in rainforest habitat in New Guinea, Solomon Islands, Philippines, Sulawesi of Indonesia and Australia. In Australia it is found in lowland subtropical rainforest from Queensland to New South Wales (OEH 2022). They are found along the coast and nearby ranges in their preferred habitat which may include rainforest margins, mangroves, wooded stream-margins and isolated plantings of figs, lilly pillies, black-berries and pittosporums (Birdlife Australia 2023). The Superb fruit-dove is known to occur within the IBRA sub-region of Coffs Coast and Escarpment (OEH 2022).

5.4.1.2 Habitat utilisation

The Superb Fruit-dove are likely to be foraging in large tracts of rainforest within the Bellinger River National Park, New England National Park and the surrounding state forest and private forest supporting fruit-bearing tree species. These large tracts of vegetation supporting food resources provides connectivity for this species to move about easily. They are likely to utilise this habitat during breeding season between September to January (Birdlife Australia 2023).

Joyces Bridge – The Superb Fruit-dove is likely to be foraging within the Project Area of this bridge. There is a large tract of rainforest vegetation approximately 150 m to the northeast, which backs onto the Bellinger River National Park. The species is likely to utilise this stand of vegetation for foraging. There are seven records of Superb Fruit-dove within 10 km of Joyces Bridge (ALA 2023). The nearest records are approximately 1 km north of the Project footprint.

Hobarts Bridge - The Superb Fruit-dove was heard calling northwest along Darkwood Road of within the vicinity of Hobarts Bridge. The species is likely to utilise large stands of native vegetation occurring within private property along Darkwood Road as foraging habitat. There are five historical records of Superb Fruit-dove within 10 km of Hobarts Bridge, with the closest record being approximately 4 km from the Project footprint (ALA 2023).

Justins Bridge – New England National Park beings approximately 200 m to the south of the Project Footprint. While there are no records of Superb Fruit-dove within 10 km of Justins Bridge (ALA 2023), the species may forage within this national park and may occur temporarily within the Project Area in response to available food resources.

Duffys Bridge – There are large stands of rainforest vegetation occurring within private properties within the Study Area of this bridge. While no Superb Fruit-dove were recorded during surveys, there are four records of Superb Fruit-dove within 10 km of Duffys Bridge (ALA 2023). The nearest records are approximately 4 km from the Project footprint. The species is likely to utilise the large tracts of vegetation in the Project Area for foraging.

5.4.1.3 Key threatening processes

The following key threatening processes are listed in New South Wales under the BC Act for the Superb Fruit-dove (*Ptilinopus superbus)* and may be relevant for the proposed activities (OEH 2022):

– Clearing and fragmentation of low-elevation rainforest

The Superb Fruit-dove is most susceptible to threats associated with clearing and fragmentation of preferred rainforest habitat that impact food availability within the Project Area. The species forages in rainforest and similar closed forests, eating fruits of many trees including figs and palms. They are also known to forage in eucalypt or acacia woodland where there are fruit-bearing trees (OEH 2022). They are considered important species for seed dispersal in tropical and subtropical forests (Birdlife Australia 2023).

The proposed activities will result in the clearing of 100 – 250 m^2 vegetation across easy site, although this vegetation is analogous with PCT 3020: Northern Hinterland River Oak Sheltered Forest and unlikely to contain many fruit-bearing tree species. The proposed activities are unlikely to impact foraging habitat for the species.

5.4.1.4 Recovery plans

There are no current Recovery Plans or Threat Abatement Plan for the Superb fruit-dove. However, the species is managed under the Saving our Species (SoS) program (OEH 2022). The SoS for the Superb fruit-dove aims to identify and protect breeding habitat and foraging habitat, increase abundance of preferred native food tree species through bush regeneration, remove invasive weeds from core habitat sites and monitoring the threat of climate change to the species (i.e. from rainforest drying) (OEH 2022).

5.4.1.5 Long term viability

The design and alignment of the bridges have been implemented in such a way to minimise effects on threatened species including the Superb Fruit-dove. The Project has the potential to impact key threatening processes of the Superb Fruit-dove through the clearing of vegetation. Potential foraging may be impacted as a small stand (100 – 250 m^2 across each site) of vegetation will be removed (Idyll Spaces Environmental Consultants 2023). However, due to the abundance of suitable habitat within the Project Area and the highly mobile nature of this species, isolation and fragmentation are unlikely to occur.

The removal of vegetation may impact foraging habitat however due to the connectivity and abundance of suitable foraging habitat within the broader Project Area of each bridge, the impact from the loss of these trees is likely to be negligible. The proposed works will not result in the fragmentation or isolation of habitats for this species.

Due to the extensive distribution of the Superb Fruit-dove along the New South Wales coastline, it is unlikely that any long term impacts will be placed on this bird due to the replacement of this bridge.

5.5 Stephens's Banded Snake (*Hoplocephalus stephensii*)

5.5.1.1 Local and regional abundance and distribution

Stephens's Banded Snake is discontinuously distributed along the eastern part of the Great Dividing Range, found in the forested habitats in north-eastern New South Wales and south-east Queensland (Fitzgerald, et al 2004; 2004). They are known in cool escarpment areas near Tenterfield and Glen Innes, east of the dry New England Plateau to the cool, moist southern forests (Fitzgerald, et al 2005).

Stephens's Banded Snake is largely restricted to remnant forest in eastern Australia and is known to persist over a wide range of eastern New South Wales although the remaining populations are highly disjunct (Fitzgerald, et al 2005). Typically, they are found within relatively large forest patches with hollow trees.

They are widely distributed in areas without strong influence of local factors (i.e. climate or vegetation type) as long as they have shelter-sites, which is more important than a particular species of tree or plant community type (Fitzgerald, et al 2005).

5.5.1.2 Habitat utilisation

The Stephens's Banded Snake has been observed using a variety of habitats, however typically found within 1 km of forest habitat. Apart from a specific requirement for hollow standing trees, the Stephens's Banded Snake habitat preference is relatively generalised (Fitzgerald, et al 2005). They are known to inhabit different forest types and under a wide range of climatic conditions. To maintain connectivity, it is important to maintain and preserve large, interconnected patches of forest habitat with abundant hollow trees for the species to persist (Fitzgerald, et al 2005).

The Stephens's Banded Snake are likely to be residing in the large tracts of vegetation in Bellinger River National Park and all the surrounding state forest. They are likely to be foraging and hunting within the Project footprint temporarily as they move through the landscape. Individuals within proximity of the Project footprints may use the understorey vegetation and hollow trees for foraging and sheltering.

Joyces Bridge – Stephens's Banded Snake is likely to be sheltering and hunting within the Project Area of this bridge. There is a large tract of rainforest vegetation approximately 150 m to the northeast, which backs onto the Bellinger River National Park. The species is likely to utilise this stand of vegetation. There are 11 records of this species within 10 km of Joyces Bridge, with the closest being within 1 km (ALA 2023).

Hobarts Bridge - Stephens's Banded Snake was recorded on Darkwood Road, approximately 1.8 km north of Hobarts Bridge crossing the road. The species is likely to utilise large stands of native vegetation occurring within private property along Darkwood Road as sheltering and hunting habitat. There are 10 records within 10 km of Hobarts Bridge, the nearest being approximately 2 km from the Project footprint (ALA 2023).

Justins Bridge – New England National Park beings approximately 200 m to the south of the Project Footprint. The species may hunt and shelter within this national park and may occur temporarily within the Project Area in response to available arboreal habitat and prey. There are three records of Stephens's Banded Snake within 10 km of Justins Bridge, with the nearest being approximately 7 km to the east (ALA 2023).

Duffys Bridge – There are large stands of rainforest vegetation occurring within private properties within the Study Area of this bridge. While no Stephens's Banded Snake were recorded during surveys, there are four records within 10 km of Duffys Bridge, the nearest being approximately 4 km away (ALA 2023). The species is likely to utilise the large tracts of vegetation in the Project Area for hunting and sheltering.

5.5.1.3 Key threatening processes

The following key threatening processes are listed in NSW under the BC Act for Stephens's' banded snake and may be relevant for the proposed activities (OEH 2018):

- Clearing and fragmentation of vegetation is a threat as the species inhabits rainforest and eucalypt forests which occurs in the broader Project area. They favour forested rocky areas with intact ground and mid-storey vegetation, stags, tree hollows and recruiting hollow-bearing trees.
- The removal of old or dead trees.
- Grazing management which remove or disturb old or dead trees and understorey vegetation.

The impacts are outlined below for each proposed bridge remediation works:

- **Joyces Bridge -** There are two mature Casuarina trees with hollows within two metres of the proposed activities which are likely to be impacted during construction either directly or indirectly (Idyll Spaces Environmental Consultants 2023). Large hollows may be utilised by this species as a shelter-site.
- **Hobarts Bridge -** Potential impacts of the Hobarts Bridge remediation work include approximately 250 m^2 of terrestrial fauna habitat being disturbed (Idyll Spaces Environmental Consultants 2023). Within this area of impact, removal of hollow bearing trees can possibly impact safe arboreal crevices for this species to shelter in.

– **Justins Bridge** - The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 100 m^2 (Idyll Spaces Environmental Consultants 2023). There are hollow bearing trees and woody debris along each bank of the river at this site. These may act as shelter sites for this species. The removal of these has the potential to impact the species foraging and hunting behaviours.
– **Duffys Bridge -** The impact on native vegetation and terrestrial fauna habitat has been identified to extend over approximately 200 m^2 (Idyll Spaces Environmental Consultants 2023). Within this impact are potential hollow-bearing trees which may be utilised by this species for shelter. The removal of hollow-bearing trees has the potential to impact the species foraging and hunting behaviours.

5.5.1.4 Recovery plans

There are no current Recovery Plans or Threat Abatement Plan for Stephens's Banded Snake. However, the species is managed under the Saving our Species (SoS) program (NSW Government 2023). The SoS for the Stephens's' Banded Snake aims to promote retention and connectivity of suitable native vegetation, promote management practices minimising the removal of understorey vegetation, dead wood and litter and improve knowledge to better inform protection and management of appropriate habitat.

The SoS program by the NSW Government (2023) have identified several priority actions to help recover the species, these include:

– Conduct research into the distribution, population dynamics and habitat preferences to improve knowledge about the species.
– Liaise with land and fire managements to know where known population or habitat occurs to recommend that prescribed burns are conducted to limit impact to Stephens's Banded Snake habitat and keep patches of understorey structurally intact throughout the landscape.
– Negotiate agreements with relevant landholders to promote retention and connectivity of suitable native vegetation and appropriate habitat for the species.

5.5.1.5 Long term viability

Some habitats may be impacted as a small amount of habitat will be removed which may limit hunting and foraging habitat.

The design and alignment of the bridges have been implemented in such a way to minimise impacts to all threatened species, including the Stephens's Banded Snake. As this is an arboreal sheltering snake, some potential habitat, including hollow bearing trees may be removed. There may also be temporary impacts to hunting habitat during the construction period. The removal of vegetation may impact foraging habitat however due to the connectivity and abundance of suitable foraging habitat within the broader Project Area of each bridge, the impact from the loss of these trees is likely to be negligible. The proposed works will not result in the fragmentation or isolation of habitats for this species.

A key threatening process of the Stephens's Banded Snake is the clearing of habitat to allow for the new bridge alignment. If this clearing encompasses dead and larger trees, it may remove key habitat for this snake. However, the proposed Project Footprint at each site is relatively small, between 100 – 250 m^2 (Idyll Spaces Environmental Consultants 2023) without a large abundance of known hollow-bearing trees. Given the close proximity to more suitable habitat, the removal of this vegetation is likely to be negligible.

Given the distribution of the Stephens's Banded Snake it is unlikely that any long-term impacts will be placed on this snake due to the replacement of these bridges.

5.6 Bellinger River Snapping Turtle *(Myuchelys georgesi)*

5.6.1.1 Local and regional abundance and distribution

The Bellinger River Snapping Turtle is endemic to the Bellinger River catchment in the coastal north of New South Wales, Australia. Within the catchment, bordering the Bellinger River and Dorigo National Parks, the species is restricted to Bellinger River, Kalang River, and the lower parts of Rosewood and Never Never Rivers (Blamires et al. 2005; NSW Scientific Committee 2016). During the winter season, the species activity is substantially reduced with individuals being rarely recorded (NSW Scientific Committee 2016).

5.6.1.2 Habitat utilisation

There is limited record data for the Bellinger River Snapping Turtle within public databases.

In the last five years between 2018 and 2022, the Bellinger River Snapping Turtle has been recorded during 48 different survey events within the catchment. Records were highest in 2018, with 23 sightings, while in 2019, turtle records significantly decreased to only three sightings (ALA 2023). Immature Bellinger River Snapping Turtles can be cryptic and hard to locate e.g. they hide under rocks, in banks, in water weed, in crevices, in leaf litter, buried under sand, under Casuarina sp. root balls, in flood debris etc (BCD 2022).

Since 2015, targeted surveys undertaken by the NSW Biodiversity Conservation Division (BCD) of the Biodiversity, Conservation and Science Directorate in the Environment and Heritage Group of the Department of Planning and Environment, have caught two wild Bellinger River Snapping Turtle within the Project area (BCD 2022). A radio-tracked captive-bred juvenile (released Spring 2019) was caught approximately 30 m downstream of the bridge in November 2019. This turtle has since moved upstream away from the area. Another captive-bred juvenile (released Spring 2018) has been tracked in the area around Justins Bridge since October 2020. This animal was last caught in the waterhole directly above the bridge in May 2022, although radio-tracking since then has located its signal approximately 5 m downstream of the bridge in mid-June 2022. Further radio-tracking has located its signal at approximately 15 m above the bridge from late June 2022 to when it was last tracked on 15 September 2022 (BCD 2022). There is limited information available on the nesting and breeding patterns of the Bellinger River Snapping Turtle; however, it has been recognised that females can be gravid (with eggs) from September/October to December (Cann et al. 2015; NSW Scientific Committee 2016; TSSC 2016). Including courtship and an egg incubation period of a 60 -72-days, the full breeding season of the species extends from July to February inclusive. Based on the few nesting sites studied, eggs are thought to be laid in excavations on sandy river banks typically within 10 m of the water's edge in heavily vegetated areas (Blamires et al. 2005) . The species lays approximately 1-2 clutches per year with the eggs weight ranging between 4 to 6.1 grams (g) (Cann et al. 2015). The clutch size averages between 10 – 25 eggs.(Blamires et al. 2005; TSSC 2016; Coggers 2014).

Targeted surveys undertaken by BCD, have not caught any gravid females since surveys started in 2015 and there has been no evidence of any natural recruitment occurring during the survey period (BCD 2022). Although low levels of natural recruitment may be occurring, ongoing population recovery is thought to be currently dependent on captive breeding (BCD 2022).

5.6.1.3 Key threatening processes

The species' main threat has been a disease outbreak that caused mass mortality in 2015 and resulted in a substantial decline in the Bellinger River Snapping Turtle population and distribution (Zhang et al. 2018). Four hundred and thirty-three individuals are confirmed to have died following the outbreak (New South Wales Scientific Committee 2016), although the actual number is unknown and likely much higher as a majority of the infected individuals were found on shore close to the river. According to Chessman et al. (2020), an unknown virus now recognised as the 'Bellinger River virus', was responsible for the high mortality rate of the species and lead to the species being listed as critically endangered under the EPBC Act (DCCEEW 2023) and the BC Act.

Infected individuals (Plate 5.1) display symptoms of blindness resulting from growths around the eye (septicaemic cutaneous ulcerative disease) with a 100% mortality rate. No other animals, including the Murray River Turtle (*Emydura macquarii*), appeared to be affected. Nucleic acid sequencing of the virus isolate has identified the entire genome and indicates that this is a novel nidovirus (Zhang et al. 2018). While sources of the outbreak are unknown and difficult to determine with certainty, river conditions in the lead up to the event were reported to be 'extremely low flow rates' with rainfall well below average. A severe heat episode also occurred in early December 2014 resulting in elevated water temperatures (Moloney et al. 2015).

Plate 5.1 Infected individual from the Bellinger River virus (Rowan Simon 2015)

Prior to the outbreak, the turtle was considered 'locally abundant'. It is estimated that the population size was previously in the order of 2500 individuals. After the spread of the disease, it is now unclear how many turtles remain within the population. Targeted surveys of the species over five years has indicated a large decrease in recorded sightings. New estimates show the population size is likely to be less than 100 – 200 animals present in the wild (Zhang et al. 2018; ALA 2023). Approximately 60 km of the Bellinger River is known to be affected by the disease, representing 100 percent of the known range of the species in Bellinger River (TSSC 2016). Survival of the species may be dependent on captive breeding programs due to the very small number of mature adults that have survived in the wild (Chessman et al. 2020).

Prior to the disease outbreak and the species being listed as critically endangered, the species main threats consisted of specific habitat requirements, predation, alteration to the quality of water, and competition with the Murray River Turtle (TSSC 2016). Interspecific competition and hybridisation are known to occur with Murray River turtle particularly in the Kalang River and is a threat to the Bellinger River Snapping Turtle. Alongside the continuation of the disease, these interactions with the Murray River turtle are identified as a significant threat that could lead to further declines in the species population (Chessman et al. 2020).

Additional threatening processes impacting the species including habitat modification from developments, pollution, other diseases, and predators (Cann et al. 2015; Chessman et al. 2020). Project

The introduced red fox (*Vulpes vulpes*) are a major contributor to the predation of nests and nesting females. Blamires et al. (2005) reported a turtle nest predation rate of 72% from foxes and goannas (*Varanus varius*) along the Bellinger River. As there are limited numbers of the species remaining, studies have projected the importance of conservation management plans that protect the species where risks of impact occur from habitat degradation, disturbances and increased threat of predators (Cann et al. 2015).

Due to the impact of the disease, the species is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals.

5.6.1.4 Recovery plans

There is currently no recovery plan in place for the Bellinger River Snapping Turtle. A captive breeding program was established after the disease outbreak with 17 individuals placed into the program. Since 2018, turtle breeding has been successful and the NSW Government has managed the trial release and monitoring of 179 captive-bred juveniles into the river. One of the release sites is upstream of Justins Bridge and has had 41 captive-bred turtles released there since 2018 (BCD 2022). Results have been positive with majority of the turtles surviving in good health in the river (NSW DPE 2021). Radio transmitters attached to the released turtles are used to assist with monthly monitoring.

5.6.1.5 Long term viability

There have been no gravid female Bellinger River Snapping Turtles caught since targeted surveys began in 2015, and there is no evidence of any natural breeding happening within the population (BCD 2022). The viability of the population currently depends on captive breeding, and although low levels of natural breeding may be occurring, it is yet to be confirmed.

Considering the extremely small population size of the Bellinger River Snapping Turtle, any decrease in turtle numbers has the potential to impact the overall viability of the population. The risks of the Project include injury or death of individuals from works within the river channel, habitat degradation, and disturbance. To protect the species and its habitat, strict avoidance and mitigation/management controls will be implemented. Pre-clearance surveys will be conducted by experienced Bellinger River Snapping Turtle ecologists to ensure no turtles are present within the works' footprint. Project.

The design and alignment of the bridges have been selected to avoid and minimise direct and indirect impacts to the habitat of the Bellinger River Snapping Turtle. The alignment of the new bridges utilises existing disturbed areas such that vegetation clearing, and disturbance of river banks will be minimal. Design of the new bridges will span the river and piers will be located outside, or on the margins, of the low flow channel. The low flow channel concentrates flow allowing for ecological, during periods of low-flow to avoid permanent direct impact to the aquatic habitat and minimise temporary habitat disturbance during construction. Aquatic habitat loss will be restricted to the immediate footprint of the bridge piers.

The Project area contains potential nesting habitat for the Bellinger River Snapping Turtle, and the captive breeding program releases hatchlings throughout the Bellinger River. As such, embankment works on the river banks will only take place outside of the nesting season of the species, which takes place from September/October to December inclusive. As such, the Project is not expected to directly impact any breeding that may occur naturally in the Bellinger River. No substantial changes to the composition or quality of the riparian zone or river banks are expected and, as such, changes to foraging and sheltering resources for the Bellinger River Snapping Turtles are unlikely to occur. Best construction practices and equipment will be used to minimize the risks of noise and vibration disturbance and to protect water quality and habitat conditions within and downstream of the footprints. Temporary impacts to Bellinger River Snapping Turtle habitat during construction have been minimised through the use of rock bags, liners and blinding construction to create safe and dry work areas that prevent any discharge of sediment, drilling fluid or concrete into the waterway. This approach avoids the need for earth fill and minimises the need for sediment and erosion controls in the immediate area. Reducing the impact of adverse effects on the Bellinger River Snapping Turtle habitat within and downstream of each of the Project footprints.

Temporary disturbance as a result of noise and vibration from traffic, pier boring, rock anchoring and general construction machinery has been minimised through the selection of an excavator mounted boring machine and air rock anchoring machine.

A Project specific EMP and erosion and sediment control plan will be developed to outline management requirements during construction. Monitoring against the EMP will occur throughout construction to allow for adaptive management if required. Overall, based on the avoidance, mitigation and management measures proposed for the protection of Bellinger River Snapping Turtle habitat, the extent of habitat that will be impacted by the Project is not expected to result in adverse impacts to the species.

The Project has the potential to impact key threatening processes of the Bellinger River Snapping Turtle through the exacerbation of disease and habitat modification/degradation. Due to the impact of the disease, the species is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals. As such, a precautionary approach has been taken for the Project with regard to the design of the bridge structures and the proposed construction methodology, equipment and program. Best practice techniques have been selected for avoidance, mitigation and management of potential impacts. The methods proposed are known to be effective at protecting aquatic environment and species. Monitoring will be conducted throughout the construction works to assess actual risks against those expected and allow for adaptive management if required. Given the susceptibility of the species to disease and the risk that any impact on the species can have on the viability of the population, this SIS has been prepared to support the active management of risks throughout Project construction. Consequently, key threatened process is expected to be appropriately managed. Overall, the Project is not likely to have any adverse effects on the abundance of the Bellinger River Snapping Turtle or its habitat. Therefore, the Project is not expected to threaten the viability of the population or result in any extinction risk.

6. Avoidance measures

6.1 Feasible alternatives

The replacement of the bridges has been identified as the preferred option based on previous cost benefit analysis completed by BSC. The 'do nothing' option is not acceptable to Council or the community, as the site poses as a risk to users. Further damage can be expected if no action is undertaken.

6.2 Design

Throughout the design phase, consideration has been placed on reduction of impacts to surrounding environmental values through the selection of optimal bridge locations and improved bridge designs.

6.2.1 Bridge alignment

At all four sites, the new structures will be located on an elevated, improved alignment adjacent to the existing wooden bridge structures. This approach will allow continued access for residents during construction, avoiding the need for instream temporary crossings and providing an increase in flood immunity for the route.

The Project footprint for the bridges will be generally restricted to include the existing cleared road easement, reducing the area of impact to habitat and minimising degradation of habitat and associated runoff.

The environment within the Project footprint is currently subject to disturbance from the approach road, existing bridge structure including modified bank morphology and degraded riparian vegetation characteristics.

6.2.2 Bridge design

Designs for all four sites have been modified throughout the design process to reduce environmental impacts.

As far as practical with restricted access on Darkwood and Kalang Road, bridge spans have increased in all four bridge designs. Through the addition of longer spans, the low flow channel area can be generally spanned, reducing instream works. Additionally, increasing the length of the bridge spans and relocating the bridge piles to the outside margins of the low flow channel will substantially reduce the risk of habitat degradation and disturbance from noise and vibration, as well as potential impacts to hydrology and aquatic fauna movement following construction.

Areas of investigation and design consideration for each bridge are discussed below.

Joyces Bridge

– Piers one and two for Joyces Bridge have been relocated from within the low flow channel to the outside margins.
– To increase flood immunity, the bridge will be raised approximately 2 m in height.

Hobarts Bridge

– Piers for Hobarts Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin.
– Piers two and three for Hobarts Bridge have been relocated from within the low flow channel to the outside margins.
– Bridge design to increase height by 2 m to improve flood immunity.
– Works also involves removing some vegetation on banks, this will be minimised where possible.

Justins Bridge

– Piers for Justins Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin.

– Bridge raise of approximately 1.3 m to increase flood immunity.
– Works also involve removing some vegetation on banks, this will be minimised where possible.

Duffys Bridge

– Piers for Duffys Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin.
– Increase of 1.7 m in bridge height to increase flood immunity.

6.2.3 Foundation design

An assessment was undertaken to identify the various foundation options available, based on the likely ground borne vibrations and underwater noise levels associated with installation methods. The combination of large cobbles and high strength rock at all sites requires bored piles and/or rock anchors.

To reduce impact during piling works the following is proposed:

– A condensed piling program reduced to 1-2 weeks of piling works.
– Avoidance of instream granular fill construction platforms through use of rock bags reducing the risk of introduced sediment and degradation of habitat.
– The use of pneumatic rock anchor installation has been identified as the preferred option for construction due to the smaller size of the machinery, increased efficiency and reduced noise.
– A foundation design (600 m bored piles) that can be constructed with an excavator mounter auger greatly reducing the piling pad for access of a conventional piling rig.

6.2.4 Bridge elements

Where practical, many elements of the bridges will be precast offsite, reducing potential impacts associated with onsite concrete works.

6.3 Construction methodology

Best practice construction techniques have been specifically selected to avoid direct works within Bellinger River wherever possible.

Construction access

Installation of the bridge superstructure will preferentially occur from existing banks, constructed road embankment or bridge spans, rather than working from constructed earth-fill/ rock fill pads within the river channel. Where this is not possible, contained rock bags are proposed to be used. These bags allow the placement and removal of rock with minimal impact to the underlying substrate or water quality. This approach will have a significantly lower impact than that associated with the construction of an instream pad whereby the placement of rock and other fill material within the low flow channel is required.

The use of existing structures and general restriction of works footprint to within previously disturbed areas will avoid direct impacts to the Bellinger and Kalang Rivers during superstructure construction and will minimise the clearing of adjacent native riparian vegetation.

Timing

Construction will occur concurrently between April 2024 and June 2025. All high-risk works will be completed within the dry season and/or a period of low rainfall and minimal flow. This period will minimise the risk of erosion, run-off and transport of sediment downstream during flooding events. High risk works include instream works for piling access and approaches and works to construct the bridge substructure.

The construction schedule has also been designed to avoid high and medium risk works during key threatened fauna breeding seasons as outlined in Table 6.1. In summary, the construction schedule will include:

- High risk works – Vegetation clearing / earthworks on river bank, installation of piers and rock anchors, instream substructure works. Works to be outside full breeding season of the Bellinger River Snapping Turtle (including courtship, incubation and hatching - July to February inclusive) and outside key breeding of the Giant Barred Frog (November and February). Works allowable March – June inclusive (4 months).
- Medium risk works – Construction of abutments outside of waterway low flow channel, construction of superstructure and road approaches. All construction Works to be outside nesting season of the Bellinger River Snapping Turtle (October to January inclusive) and outside key breeding of the Giant Barred Frog (November and February). Works allowable March-September inclusive (7 months).
- Low risk works - Finishing works - Construction of roads and ancillary bridge components at road level only including barriers signage, road sealing, concreting. No works on embankments or instream. Works allowable during any period.

Construction works will not occur during times of extreme heat (> 40°C) to avoid disturbance to heat stressed individuals such as the Grey-headed Flying-fox. Demolishing of the existing bridges will not occur during the breeding season of the Southern Myotis (October to March).

Table 6.1 Construction schedule avoidance of threatened fauna breeding seasons

Species	Description of Breeding	Breeding Period											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bellinger River Snapping Turtle	Females can be gravid (with eggs) from September/ October to December with an incubation time of 60 day. Full breeding season including courtship/mating extends from July to February inclusive.												
Giant Barred Frog	Breeding season occurs from spring to autumn with peak periods in November and February.												
Southern Myotis	Females produce up to two young each year, one in early October and the other in late January. The latter young are likely non-volant until March .												
Large Bent-wing Bat*	Maternity caves are used annually in spring and summer for the birth and rearing of young.												
Little Bent-wing Bat*	Maternity caves are used from November to March for the birth and rearing of young.												
Eastern Coastal Free-tailed Bat	Relatively unknown. Females are thought to give birth in November and December.												
Eastern False Pipistrelle	Relatively unknown. Females are pregnant late Spring and early Summer.												
Grey-Headed Flying-Fox	Females give birth to a single young each October/November after a 6-month gestation. At around 3 months, young are able to fly and forage outside the camp.												
Fruit Doves	Nests in bushy trees from 5 m – 30 m above the ground between September and January.												
Stephens's Banded Snake	Mating is thought to occur in Spring with females only gravid every two years.												
Construction Activity	**Description of Works**	**Construction Schedule**											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High Risk	Instream work - Vegetation clearing / earthworks on river bank, installation of piers and rock anchors, instream substructure works.												
Medium Risk	Embankment and superstructure works - Construction of abutments outside of waterway low flow channel, construction of superstructure and road approaches.												
Low Risk	Finishing works - Construction of roads and ancillary bridge components at road level only including barriers signage, road sealing, concreting.												
High Risk	Demolition - Demolition of existing timber bridges.												

Black shading = peak breeding period. Back +grey shading = full breeding period. Red shading = construction works prohibited. Green shading = construction works permissible. * = no breeding habitat present within Project area.

7. Impact assessment, mitigation, and management measures

7.1 Overview of impacts

The proposed works will involve vegetation clearing, installation of piers and rock anchors, construction of abutments and placement of decking units, installation of rock scour protection, realignment of approach roads, demolition of existing timber bridges and rehabilitation. Construction works are expected to be carried out over a 7- month period. Instream and associated bank footprints are estimated to impact approximately 0.41 ha.

Potential impacts from the Project include:

– Loss or degradation of habitat (including potential foraging, roosting and breeding habitat).
– Injury/mortality of fauna.
– Noise and vibration disturbance.
– Water quality degradation.
– Restriction of instream connectivity.
– Exacerbation of infectious disease.

These potential impacts are discussed in detail in Sections 7.2 to Section 7.8. Potential impacts have been assessed based on the works described in Section 1.6 and the design and construction methodologies provided by BSC (Appendix C, Appendix D and Appendix E). In addition to the avoidance measures detailed in Section 6, mitigation measures are detailed for each potential impact to achieve further protection of the surrounding environment during Project construction and operation.

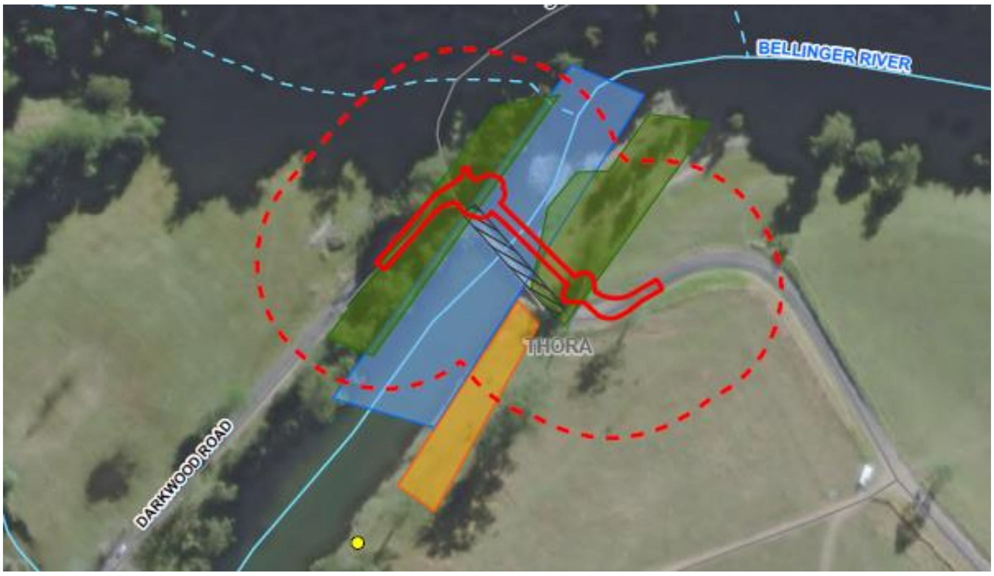
7.2 Loss or degradation of habitat

As discussed in Section 6.2, optimal bridge design and construction methodologies have been selected to avoid and minimise direct impacts to the surrounding habitat. With the implementation of these measures, direct works within the Bellinger and Kalang Rivers will be restricted to two piles located on the outside margins of the low flow channel at Joyces and Hobarts bridges respectively. Piers are located completely outside the low flow channel at Justins and Duffys Bridges.

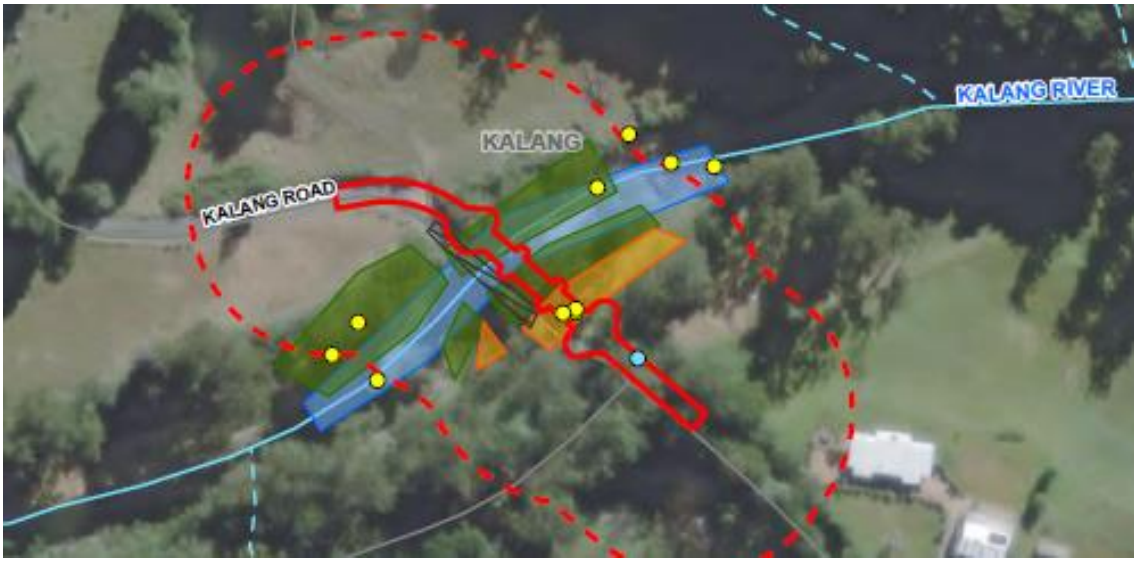
Vegetation clearing, substrate disturbance and movement of equipment within the Project footprint of the bridges have the potential to result in habitat loss, degradation, and disturbance. A change in habitat conditions through the alteration of river bank and river bank profiles, substrate composition and loss of riparian vegetation can degrade foraging and habitat resources in the immediate area of the bridge construction sites. Vegetation clearing can create favourable conditions for weed growth and has the potential for introduction of weeds to site from construction machinery (harbouring seeds from previous projects). This increased risk of weeds has the potential to degrade foraging, sheltering, and breeding habitat available for local fauna (i.e. Giant Barred Frog, Bellinger River Snapping Turtle, Stephens’s Banded Snake and threatened microbats).

Strict environmental controls and management actions are proposed to avoid and minimise the potential for proposed construction works to degrade the surrounding environment. Habitat impacts associated with each of the four proposed bridges are detailed below (Table 7.1).

Table 7.1 Potential habitat impacts associated with Joyces, Hobarts, Justins and Duffys Bridge replacements

Bridge	Potential habitat impacts
Joyces Bridge	The Project footprint will mainly cover the existing road easement, reducing vegetation and habitat loss. Some mixed native and non-native ground covers along the left and right banks are to be removed with extra vegetation to be cleared on the right bank for an access track. Approximately 16 m of river bank is planned to be disturbed on the left side of the river from high bank to toe. Approximately 16 m of high bank on right side of the river will be disturbed in addition to the gravel bar that forms the low bank. Direct impacts to aquatic vegetation will be limited to disturbance of several small clumps of *Vallisneria nana* downstream of the existing bridge with a total area of approximately 1-2 m^2. Disturbance to the benthic substrate will be limited to footprints of the bridge piers, which is comprised of consolidated and unconsolidated rock, gravel, and sediment. Piers one and two have been relocated from within the low flow channel to the outside margins, minimising instream activities and impact to aquatic habitat. Snag removal within the Project footprint is unlikely to be required and therefore will not impact habitat resources for the species. The impact to river banks and riparian vegetation may remove habitat resources including trees, shrubs, logs, leaf litter, rocks and large debris which may provide foraging, sheltering, roosting and breeding habitat for fauna. Conservation significant species that may be impacted by this include the Giant Barred Frog (riparian habitat specialist), microbats (roost habitat in hollow-bearing trees, under tree bark and in existing bridge), Stephens's Banded Snake (shelter habitat in hollow-bearing trees), Superb Fruit-dove (sheltering and foraging habitat), Grey-headed Flying-fox (foraging resources), and Bellinger River Snapping Turtle (nesting habitat). Timing of construction works has been designed to avoid breeding periods for relevant conservation significant species.
	
Hobarts Bridge	Some native trees and mixed native and non-native shrubs and ground covers will be removed on the left and right banks with extra vegetation to be removed from the right bank gravel bar for access tracks. Approximately 12 m of river bank to be disturbed on left side of the river from high bank to toe. Approximately 15 m of high bank on right side of the river will be disturbed in addition to the gravel bar that forms the low bank. Direct impacts to aquatic vegetation are unlikely to occur. Disturbance to the benthic substrate will be limited to footprints of the bridge piers, which comprises consolidated and unconsolidated rock, gravel sediment. Piers two and three for Hobarts Bridge have been relocated from within the low flow channel to the outside margins minimising instream activities and impact to conservation significant species (i.e. Bellinger River Snapping Turtle and Giant Barred Frog). Snag removal within the Project footprint is unlikely to be required and therefore will not impact habitat resources for fauna. The impact to river banks and riparian vegetation may remove habitat resources including trees, shrubs, logs, leaf litter, large debris and rocks which may provide foraging, sheltering, roosting and breeding habitat for fauna. Conservation significant species that may be impacted by this include the Giant Barred Frog (riparian habitat specialist), microbats (roost habitat in hollow-bearing trees, under tree bark and in existing bridge), Stephens' Banded Snake (shelter habitat in hollow-bearing trees), Superb Fruit-dove (sheltering and foraging habitat), Grey-headed Flying-fox (foraging resources) and Bellinger River Snapping Turtle (nesting habitat). Howards Bridge is 210 m adjacent to an existing grey-headed flying-fox camp, and while construction of the bridge will not impact roost habitat, it has potential to impact foraging habitat for the species. Timing of construction works has been designed to avoid breeding periods for relevant conservation significant species.

Bridge	Potential habitat impacts
	
Justins Bridge	One native tree on the right bank and mixed native and non-native shrubs and ground covers are to be removed on the left and right banks. Approximately 8 m of river bank to be disturbed on both sides of the river from high bank to toe. Direct impacts to aquatic vegetation are unlikely to occur. No piers will be located within the low flow channel and therefore disturbance to the benthic substrate, consolidated and unconsolidated rock, gravel sediment, will be minimal. The existing bridge piers are planned to be removed to bed level and therefore will result in a small area of habitat disturbance during this process. It is proposed that one or two large snags may be removed to facilitate access and piling works. These snags will be relocated to adjacent habitat such that no loss of resources for fauna occurs. The impact to river banks and riparian vegetation may remove habitat resources including trees, shrubs, logs, leaf litter, rocks and large debris which may provide foraging, sheltering, roosting and breeding habitat for fauna. Conservation significant species that may be impacted by this include the Giant Barred Frog (riparian habitat specialist), microbats (roost habitat in hollow-bearing trees, under tree bark and in existing bridge), Stephens's Banded Snake (shelter habitat in hollow-bearing trees), Superb Fruit-dove (sheltering and foraging habitat), Grey-headed Flying-fox (foraging resources) and Bellinger River Snapping Turtle (nesting habitat). Timing of construction works has been designed to avoid breeding periods for relevant conservation significant species.
	

Bridge	Potential habitat impacts
Duffys Bridge	Mixed native trees (i.e. *Casuarina cunninghamia*) and native and non-native shrubs and ground covers are to be removed on the left and right banks. Approximately 7 m of river bank on the northeastern side of the existing bridge is estimated to be disturbed on both sides of the river, from high bank to the toe. No direct impacts to aquatic vegetation is expected. No piers will be located within the low-flow channel; therefore, disturbance to the benthic substrate, consolidated and unconsolidated rock, and gravel sediment, will be minimal. The existing bridge piers are planned to be removed to bed level, resulting in a small habitat disturbance during this process. It is proposed that one or two large snags may be removed to facilitate access and piling works. These snags will be relocated to adjacent habitat such that no loss of resources for fauna occurs. The impact to river banks and riparian vegetation may remove habitat resources including trees, shrubs, logs, leaf litter, rocks and large debris which may provide foraging, sheltering, roosting and breeding habitat for fauna. Conservation significant species that this may impact include the Giant Barred Frog (riparian habitat specialist), microbats (roost habitat in hollow-bearing trees, under tree bark and in existing bridge), Stephens's Banded Snake (shelter habitat in hollow-bearing trees), Superb Fruit-dove (sheltering and foraging habitat), Grey-headed Flying-fox (foraging resources) and Bellinger River Snapping Turtle (nesting habitat). Timing of construction works has been designed to avoid breeding periods for relevant conservation significant species.
	

Mitigation and management measures proposed to minimise the potential for habitat degradation include:

– Minimising the Project footprint to the smallest area needed for construction work.
– Locating the bridges within road easement and previously disturbed areas immediately adjacent to the existing bridges.
– Minimising instream works through bridge design and construction methodology (i.e. rock bags).
– Scheduling the duration of construction works within the low flow channel to the minimum time necessary and outside the wet season.
– Retaining large woody debris, rocks, root balls from within the Project footprint for reinstatement to the same site it was removed following the completion of construction.
– Demarcate no-go areas of ecological sensitivity both on site and in construction plans, including all vegetation not to be cleared. All vegetation to be retained should be surveyed and clearly demarcated.
– Keeping vehicle and machinery movements confined to designation access tracks and enforcing on-site speed limits.
– Providing environmental training to site personnel through a site induction and toolbox talks on conservation significant species local habitat, potential risks and avoidance, mitigation and management requirements.
– Rehabilitation and revegetating exposed surfaces and redundant road sections on completion of construction activities. Bank morphology will be restored to existing conditions.

7.3 Injury/mortality of fauna

The intensive nature of vegetation clearing has an elevated potential to adversely impact local fauna that shelter in hollows, nests, trees or ground habitat (logs, burrows, soil, leaf litter and beneath rocks). Fauna species most at risk include nocturnal species that are likely to be sheltering during the day when clearing activities are underway (e.g. microbats, flying-foxes), and slow-moving species or sedentary species that are less able to flee the clearing zone (e.g. reptiles and frogs). Increased vehicle movements during the construction phase may also increase the local incidence of fauna injury and mortality through vehicle strike and collision. Additional threats include the entrapment within open excavation areas. Conservation significant species with heightened risk of injury or mortality during construction include threatened microbats, Stephens's Banded Snake, Giant Barred Frog and Bellinger River Snapping Turtle. These species are at greater risk due to localised occurrence, potential breeding areas, nocturnal behaviour and relatively slow dispersal ability.

Aquatic habitats within the Project footprints consists of pool- riffle and pool-run habitats. Key construction activities that have potential to cause injury/mortality include clearing and earthworks within the river banks and the installation of rock bags within the low flow channel, bridge piers and rock anchoring. Conservation significant species Giant Barred Frogs may experience direct injury or mortality if individuals are present within the areas of disturbance at the time of works. Given the adult Giant Barred Frogs have low dispersal ability (potential to move 100 m per night), the species is susceptible to construction phase impacts. The Bellinger River Snapping Turtle may experience direct injury or mortality if individuals are present within the areas of disturbance at the time of works. Spencer et al. (2014) found that when disturbed, 50% of the time turtles remain motionless while 50% of the time they attempted to flee. In addition, the Bellinger River Snapping Turtle is often found partly buried in sand, silt or leaves and are usually found in the deepest part of the waterhole. These factors potentially decrease the detectability of the species within the Project footprints. To mitigation this risk, two pre-clearance surveys will be conducted prior to the commencement of instream construction works. Pre-clearance surveys will be conducted three (3) weeks prior and again one (1) week prior to the start of any construction works within the river channel or banks. No direct injury or mortality of turtle eggs is expected to occur as construction works within the river banks will occur outside of the nesting season.

Mitigation and management measures proposed to minimise the potential for turtle injury/mortality include:

– Avoiding high and medium risk construction activities within the key breeding seasons of aquatic-based conservation significant species including the Bellinger River Snapping Turtle and Giant Barred Frog (refer to Section 6.3).
– Avoiding construction works during times of extreme heat (> 40°C) to avoid disturbance to heat stressed individuals such as the Grey-headed Flying-fox.

- Avoiding demolition of the existing bridges during the breeding season of the Southern Myotis (October to March).
- Conducting pre-clearance surveys by a suitably qualified ecologist experienced to inspect Project footprints for the presence of conservation significant species, including in terrestrial and aquatic habitat. The pre-clearance surveys will include survey techniques suitable for the species and will target areas where individuals, including juveniles, may hide such as they hide under rocks, in banks, in water weed, in crevices, in leaf litter, buried under sand, under Casuarina sp. root balls, in flood debris. Two pre-clearance surveys for the Bellinger River Snapping turtle will be conducted by a suitably qualified ecologist prior to the commencement of instream construction works. Pre-clearance surveys will be conducted three (3) weeks prior and again one (1) week prior to the start of any construction works within the river channel or banks.
- All approvals and permits for Bellinger River Snapping Turtle pre-clearance surveys would be obtained prior to the start of construction and a procedure developed in consultation with BCD for additional avoidance and mitigation measures to be implemented in the event that a Bellinger River Snapping Turtles are found located within or immediately adjacent (i.e. within 100 m) of the Project footprint.
- Minimising instream works through bridge design and construction methodology (i.e. rock bags).
- Scheduling the duration of construction works and works within the low flow channel to the minimum time.
- Enforcing stringent wash down procedures for all machinery and materials used for the Project in accordance with the Department of Planning & Environment Bellinger River Snapping Turtle biosecurity protocol.
- Providing environmental training to site personnel through a site induction and toolbox talks on the Bellinger River Snapping Turtle, its habitat, potential risks and avoidance, mitigation, and management requirements.
- Keeping vehicle and machinery movements confined to designation access tracks and enforcing on-site speed limits.
- Informing BCD of any Bellinger River Snapping Turtles observed during the works and providing appropriately qualified veterinarian/wildlife carer assistant and/or rehabilitation to any turtles injured or suffering evidence of health concerns.

Microbat mitigation measures are detailed in Section 7.8.

7.4 Noise and vibration disturbance

Construction activities within the Project footprints have the potential to result in the temporary disturbance of fauna as a result of noise and vibration disturbance. During the construction period, noise and vibration levels will increase due to the use of construction machinery for vegetation clearing, earthworks, installation of the bridge piles and rock anchors, and bridge/road assembly. Construction activities can adversely impact native wildlife through the disruption of foraging, breeding, and nesting behaviours (Longcore and Rich 2004; Slabbekoorn et al. 2010; Popper and Hawkins 2016). The majority of construction related noise and vibration associated with the bridge replacements is expected to cause minor disturbance only. Fauna behavioural changes that may occur include habitat avoidance and evasive movement. This could result in movement of individuals away from the area.

Installation of the bridge piers and rock anchoring will pose the greatest risk of noise and vibration disturbance to turtles; however, these activities have been designed to occur over a minimal 1-2 week period. Geotechnical investigations were conducted to understand the foundation conditions and then the construction methodology designed to avoid and minimise the potential for noise and vibration disturbance. Specifically, an air rock anchor machine and excavator mounted bored piling machine have been selected as the preferred methodology. The use of an air rock anchor will funnel noise into the underground hole and minimise the sound immitted into the environment. In addition, the bored piling machine will produce sound pressure levels substantially lower than those emitted from pile driving. The bored piling machine has been assessed as this is likely to generate higher noise levels than the rock anchoring.

Noise and vibration impacts from the construction phase may disturb the microbats and Grey-headed Flying-foxes. A Grey-headed Flying-fox camp is located 210 m adjacent to Hobarts Bridge, individuals are likely to be affected by construction at Hobarts Bridge. Flying-foxes are prone to abort foetuses and mass abortions and premature births are known to occur in response to environmental stress. Anthropogenic stresses such as disturbance to camps and habitat clearing is likely to invoke a similar response (DAWE 2021). Microbats may abandon their pups from stress caused by high noise and vibration during intensive repair works (TfNSW 2023).

Anthropogenic noise from traffic has the potential to impact on amphibian breeding behaviours, impeding male call recognition by females and altering spacing between individuals. Anthropogenic noise can decrease the calling rate of some species, and potentially decreasing breeding success (Goosem et al. 2007). Given the noise and vibration output from construction activities are likely to be greater than traffic output, amphibian behaviours within the Project area have the potential to be impacted.

Aquatic fauna such as turtles use sound to navigate, communicate and forage effectively and, as such, many species are sensitive to anthropogenic noise. Artificially generated noise may impact on fauna in the following ways (McCauley et al. 2003):

– Disturbance, leading to behavioural changes or displacement from biologically important habitat areas (such as breeding, feeding, nesting and nursery sites).
– Masking or interference with other biologically important sounds such as communication.
– Physical injury to hearing or other organs.
– Indirectly by inducing behavioural and physiological changes in predator or prey species.

Mitigation and management measures proposed to minimise the potential for noise and vibration disturbance include:

– Using an air rock anchor machine and excavator mounted bored piling machine to minimise the noise and vibration generated within the river channel.
– Minimising the duration of rock anchoring and piling to the shortest period possible.
– Using noise dampening devices on machinery wherever practical and requiring that all equipment is maintained and serviced in accordance with manufacturer's instructions to reduce noise levels.
– Requiring soft starts for a period of five minutes so that individuals have a chance to move away from the area before more intense noise and vibrations start.
– Restricting construction activities to daylight hours to avoid excessive light levels at night.

Due the machinery selected for the rock anchoring and bored piling, combined with the short duration of these works and the requirement for pre-clearance surveys within 100 m upstream and downstream of the bridge locations, the construction works are not expected to cause noise and vibration disturbance at levels that significant impact the Bellinger River Snapping Turtle.

7.4.1 Turtle noise impacts

Research regarding noise impacts on aquatic turtles, especially freshwater turtles, is very limited. This area is an ongoing topic of research and is still evolving. The following sections outlines the current research related to noise impacts on turtles.

Measurements of piling activities were undertaken in the near-field (10 metres) and far-field (791 metres). The following results were obtained:

– SPL rms 166 dB at 10 metres
– SPL rms 154 dB at 791 metres

Based on the above results, calculations were undertaken to determine the noise level at 1 metre for comparison with the South Australian Guideline. Assuming cylindrical spreading (transmission loss = 15 x log (r)), the SPL rms at 1 metre is 181 dB. This lines up with the mid-point of the South Australian Guideline.

The South Australian Department of Planning, Transport and Infrastructure has produced the Underwater Piling Noise Guidelines (2012) which provides sound pressure levels (SPL) vibro-driving piling method (assumed for drilling and bored piling). The levels are provided in Table 7.2 below.

Table 7.2 Piling noise characteristics (Table 1 from the Underwater Piling Noise Guidelines (2012)

Piling method	Character	Noise descriptor	Source levels	Most energy
Vibro-driving	Continuous	SPL	160 – 200 dB re 1 uPa	100 Hz and 2 kHz

The sound pressure level (SPL) is described as:

> *Average noise level over the measurement period expressed in dB re 1 µPa. For impulsive sources, such as impact piling and blasts, the measurement period is the time period that contains 90% of the sound energy (Southall et al. 2007). Continuous sources, such as vibro-piling and shipping, are commonly described in terms of an SPL.*

In addition to the South Australian Guideline, further information has been obtained from a technical memorandum, Manette Bridge Vibratory Pile Driving Noise Measurements, prepared by the Washington State Department of Transport. The Memorandum details the results of underwater noise testing during vibratory pile driving.

7.4.1.1 Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report (ANSI)

There is limited data available regarding potential noise impact on freshwater turtles. In lieu of this, data has been sourced from *Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report* (prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI) which explores the effects of sound exposure on a range of animals, including the sea turtle. This research has been used to determine the effects of continuous noise sources (such as vibratory or bored piling) on the turtle in the near, intermediate and far distances (Table 7.3). Based on this, suitable buffer distances have been provided.

Table 7.3 Response to sounds and relative risk (extract from Table 7.7 of Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report)

Type of animal	Mortality and potential mortal injury	Impairment			Behaviour
		Recoverable injury	Temporary threshold shift (TTS)	Masking	
Sea turtles	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) High (I) Moderate (F) Low

Notes: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F).
Mortality and mortal injury – immediate or delayed death.

Recoverable injury – injuries, including hair cell damage, minor internal or external hematoma, etc. None of these injuries are likely to result in mortality.

TTS – short- or long-term changes in hearing sensitivity that may or may not reduce fitness. TTS, for these Guidelines, is defined as any change in hearing of 6 dB or greater that persists. This level is selected since levels less than 6 dB are generally difficult to differentiate. It is also the view of the Working Group that anything less than 6 dB will not be a significant effect from the standpoint of hearing.

Masking – impairment of hearing sensitivity by greater than 6 dB, including all components of the auditory scene, in the presence of noise.

Behavioural effects – substantial change in behaviour for the animals exposed to a sound. This may include long-term changes in behaviour and distribution, such as moving from preferred sites for feeding and reproduction, or alteration of migration patterns. This behavioural criterion does not include effects on single animals, or where animals become habituated to the stimulus, or small changes in behaviour such as a startle response or small movements.

The relative risk of an effect taking place is indicated as being “high”, “moderate” and “low”. The guideline provides the following related to three relative distances related to these risks:

> *While it would not be appropriate to ascribe particular distances to effects because of the many variables in making such decisions, “near” might be considered to be in the tens of meters from the source, “intermediate” in the hundreds of meters, and “far” in the thousands of meters.*

7.4.1.2 Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis

Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Finneran et al, 2017) was prepared by the US Navy and explored the impacts of explosive testing activities on marine mammals and sea turtles. Based on testing and investigations, the following levels were determined for Temporary Threshold Shift (TTS) and Permanent Threshold Shift (PTS):

- Temporary Threshold Shift (TTS) – 200 dB (weighted)
- Permanent Threshold Shift (PTS) – 220 dB (weighted)

As animals are not equally sensitive to noise at all frequencies, auditory weighting functions were determined and presented in the paper. The paper states "Auditory weighting functions are mathematical functions used to emphasize frequencies where animals are more susceptible to noise exposure and de-emphasize frequencies where animals are less susceptible".

The weighting curve for the sea turtle is provided in Figure 7.1 below.

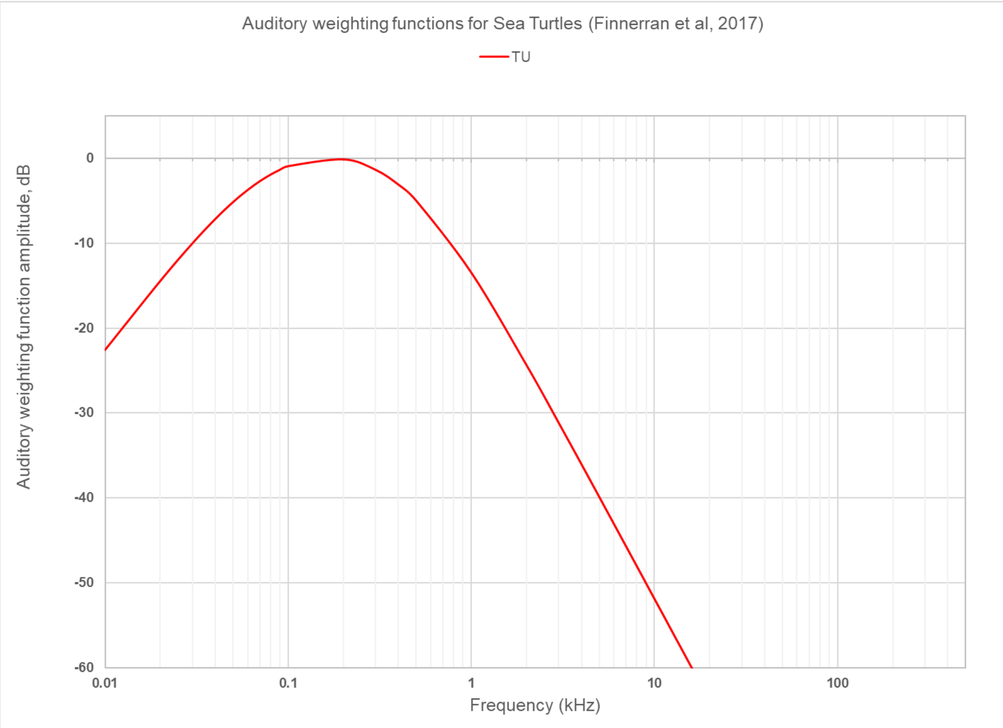


Figure 7.1 Auditory weighting curve for Sea Turtles (Finneran et al, 2017)

7.4.2 Estimated zones of impacts

Based on the measured unweighted noise level of 166 dB, the weighted level at 10 metres would be SPL rms 157 (using the sea turtle weighting) that is also equal to SEL(1sec) 157 dB (weighted) assuming the noise is continuous. Using 10 x log (seconds) to convert to SEL(24hr), the weighted levels at 10 metres would be roughly:

Duration of piling:

- 1 hour: SEL 193
- 2 hours: SEL 196
- 4 hours: SEL 199
- 8 hours: SEL 202
- 16 hours: SEL 205

Propagation of underwater noise is very complex to predict as the local bathymetry, salinity profile, temperature profile, current, seabed characteristics, scattering effects and absorption influence how noise travels.

However, assuming cylindrical propagation loss for shallow water (as opposed to deep ocean water where noise would spread spherically), a 15 x log (distance or R) can provide a rough guide of typical noise levels. This equals a 3 dB reduction for every doubling of distance.

Based on the calculations to determine SEL exposure, the TTS zone is approximately 20 metres. Note there is no PTS zone as noise levels are not calculated to be high enough.

Based on the guidance in the South Australian Guideline, the following buffer distance should be applied in conjunction with the relative risks in Table 7.3:

– Near – less than 100 metres
– Intermediate – 100 metres to 1000 metres
– Far – greater than 1000 metres

Rock anchoring and bored piling will occur over a very short period of up to two weeks and will be conducted outside of the nesting season. Based on the guidelines above, these activities will have no impact on turtles located greater than 1000 metres from the Project footprints. In addition to behaviour disturbance discussed above, any turtles located between 100 to 1000 m may be exposed to an impairing of hearing sensitivity (masking) during the period of the works. Any turtles located immediately adjacent to the construction works (within 20 m) may also experience short- or long-term changes in hearing sensitivity that may or may not reduce fitness (TTS). As such, pre-clearance surveys will be conducted 100 m upstream and downstream of each Project footprint to confirm no Bellinger River Snapping Turtles are present within this area during the rock anchoring and bored pilling works and ensure that they do not enter the 20 m zone. If turtles are identified within this area, then BCD will be contacted to identify the appropriate cause of action.

7.5 Water quality degradation

Construction activities have the potential to indirectly degrade the quality of adjacent habitats and habitat edges through exposure to increased dust, erosion and sedimentation. This can result in altered habitat composition (i.e. reduced flora diversity and simplified ecosystem structure) and quality (i.e. reduced availability of forage resources, increased predation pressure), thereby potentially affecting the composition and abundance of species in the altered habitat. Adverse weather conditions during construction can exacerbate the potential impact of erosion and sedimentation. High rainfall has the potential to remove exposed topsoil, destabilise creek beds and distribute sediment through creek lines. Strong winds have the potential to spread exposed topsoil, decreasing the likelihood of recolonization by vegetation and potentially distributing dust into nearby sensitive environments.

Release of sediments into aquatic habitats can result in altered water chemistry (including increased turbidity, decreased oxygen levels, reduced light penetration), changes in channel morphology (including filling of pools), alteration of substrate composition and smothering of habitat resources (Wood and Armitage 1997). For the proposed activities, these impacts may have a temporary and localised effect by reducing habitat value (e.g. amount of refuges, microhabitats and food availability) within the immediate and/or downstream area and influencing health and physiology. Degradation of potential habitat downstream of the footprint from increased sediments and may reduce the suitability for conservation significant species (i.e. turtle nesting, breeding habitat for Giant Barred Frog).

Bridge construction activities within and above Bellinger River also has the potential to result in the introduction of wastes and hazardous materials, such as fuels and lubricants. Key risk activities include construction of in-situ concrete elements (e.g. spillage of concrete and curing compounds). In severe cases, chemical pollution of the aquatic environment can result in long-term habitat degradation and widespread mortality of species.

Mitigation and management measures proposed to minimise the potential for water quality degradation include:

– Stringent wash down procedures for all machinery and materials used for the Project in accordance with the Project EMP and Department of Planning & Environment Bellinger River Snapping Turtle biosecurity protocol.
– Monitoring of water quality conditions (visual and *in situ* recordings) to identify the potential for water quality degradation and allow for adaptive management. Water quality monitoring will be conducted weekly during works within the low flow channel.
– Scheduling the duration of construction works during the dry season when rainfall and river flow volumes are low.

– Preparing and implementing a Project specific Erosion and Sediment Control Plan (ESCP) in accordance with International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control Guidelines. The ESCP will be prepared by a highly experienced Certified Professional in Erosion and Sediment Control (CPESC). Key measures will include:
  - Installing erosion protection measures in the form of sediment fences where required to minimise the transport of sediment into the river.
  - Minimising erosion potential through scour protection treatments at abutments.
  - Minimising vegetation clearing and the area of bare ground required for construction to only that which is necessary.
  - Appropriately managing and protecting stockpiles. Stockpiles will be a maximum of 1.5 m high and will be set back at least 100 m from the Bellinger River and Kalang River.
– Implementing a site-specific Environmental Management Plan (EMP). Management measures will include:
  - Site management will in accordance with the waste management practices detailed in *Managing Urban Stormwater: Soils and Construction* (4th edition) (Landcom 2004), particularly:
    – Section 6: Sediment and Waste Control.
    – Section 8.2(a): Empty bins for concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter at least weekly and otherwise as necessary. Dispose of any waste in an approved manner.
    – Waste material, other than vegetation and tree mulch, will not to be left on site once the works have been completed.
    – Working areas will be maintained, kept free of rubbish and cleaned up at the end of each working day.
    – A closed system reverse cycle circulation system with sediment trap will be used to collect all water and sediment released during drilling.
    – Drilling support fluid will be biodegradable and a vacuum truck used to dispose of material at the completion of drilling.
    – Installing rock bags, liners and blinding construction to create bunded work platforms to prevent spills.
    – Requiring all auxiliary works activities, including chemical and waste storage, will be located at least 100 m from Bellinger River.

7.6 Restriction of connectivity

Construction works have been designed to avoid physical restriction of aquatic fauna movement. The low flow channel will remain open to flow throughout the duration of the works. Aquatic fauna (i.e. turtles) may be reluctant to move through the footprints due to noise, vibration and/or people/machinery activity levels. Construction works will be restricted to daylight hours to allow periods of non-disturbance at night and works within the river channel will be prioritised and best practice construction methods selected to minimise the duration of disturbance. All instream works are scheduled to occur outside of Bellinger River Snapping Turtle nesting season and Giant Barred Frog peak breeding season and therefore disturbance to breeding cycles are expected to be minimal.

Mitigation and management measures proposed to minimise the potential for restriction of aquatic fauna include:

– Avoiding the use of instream barriers during construction.
– Maintaining natural flow within the low flow channel throughout the duration of construction.
– Minimising instream works through bridge design and construction methodology (i.e. utilising rock bags).
– Scheduling the duration of construction works and works within the low flow channel to the minimum time necessary and outside the Bellinger River Snapping Turtle nesting season and Giant Barred Frog peak breeding season (refer to Section 6.3).
– Restricting construction works to daylight hours only.
– Informing BCD of any Bellinger River Snapping Turtles observed during the works.

7.7 Exacerbation of infectious disease

Bellinger River virus

Due to the impact of the disease, the species is considered highly suspectable to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals. As such, a precautionary approach has been taken for the Project with regards to the design of the bridge structures and the proposed construction methodology, equipment and program.

Best practice techniques have been selected for avoidance, mitigation and management of potential impacts. The methods proposed are known to be effective at protecting aquatic environment and species. Monitoring will be conducted throughout the construction works to assess actual risks against those expected and allow for adaptive management if required. Given the susceptibility of the species to disease and the risk that any impact on the species can have on the viability of the population, this SIS has been prepared to support the active protection of the species throughout construction. Based on the avoidance and mitigation measures proposed, the Project is not expected to exacerbate the effects of the Bellinger River virus on the Bellinger River Snapping Turtle.

The following measures will be instigated to minimise the exacerbation of infectious disease throughout the Project for the Bellinger River Snapping Turtle:

– A biosecurity/hygiene protocol is to be established in consultation with DPI and to the satisfaction of BCS to prevent the spread of the Bellinger River virus. The protocol will include actions that will be undertaken in the event that an encountered turtle is suspected to be infected with the Bellinger River virus.
– The Bellinger River virus biosecurity/hygiene protocol will be implemented across all work sites for the entire construction period.
– Environmental training to be delivered to site personnel will include the Bellinger River virus biosecurity/hygiene protocol.
– Monitoring of water quality conditions (visual and *in situ* recordings) to identify the potential for water quality degradation and allow for adaptive management. Water quality monitoring will be conducted weekly during works within the low flow channel.
– BCD will be informed of any Bellinger River Snapping Turtles observed during the works.

Chytridiomycosis

Chytridiomycosis is stream-borne virus caused by the amphibian chytrid fungal pathogen *Batrachochytrium dendrobatidis* (Bd). Infected frog populations exhibit diverse susceptibility to chytrid, with some species being extremely vulnerable, resulting in mass die-off and extinction (TSSC 2021). The Giant Barred Frog is known to carry chronic infection of chytrid, it has been suggested that the species abundance has dropped largely as a result of the disease. It is uncertain whether the species is continuing to decline from chytrid. Transmission of chytridiomycosis can be exacerbated by the handling of multiple frogs by researchers. Any action that results in the capture and handling of multiple frogs has the potential to spread the disease within the local frog population. Given the Project is likely to directly impact on habitat for the Giant Barred Frog, there is potential for active management or translocation of frogs that would facilitate disease transmission.

The following measures will be instigated to minimise the exacerbation of infectious disease throughout the Project for the Giant Barred Frog:

– Implementing safe hygiene protocols when handling frogs (i.e. disposable gloves, samples bags, sterile equipment).
– Clean and dry all equipment and wet or muddy footwear before and between visiting frog sites. This may include cleaning the tyres of your vehicle before visiting known high-risk sites where threatened frog species may live.
– Avoid translocating Giant Barred Frog individuals further than necessary if individuals are located within the construction Project footprint to minimise the potential spread of chytrid.
– Carry cleaning utensils and a disinfectant for use between sites.
– Record any chytrid-infected frogs and contact Frogwatch Helpline on 0419 249 728.

7.8 Microbat mitigation measures

Mitigation measures specific to roosting microbats for a nearby bridge replacement. These include mitigation measures detailed by Eco Logical (2022). These have been adapted for this Project and include:

- Pre-clearance survey to understand how microbats are using the bridge roost (i.e. at Joyces Bridge) to inform the bat management plan and adaptive management options.
- The use of containment setups to block access in and out of microbat roosting crevices prior to decommissioning of the existing bridges.
- Demolition of the existing bridges will occur outside of the breeding season of the Sothern Myotis, which takes place from October to March (refer to Section 6.3).
- Monitoring of the roost colony within known roosting sites (i.e. known roost at Joyces Bridge) by a suitably qualified ecologist to assess the response of the bats to the disturbance from high-risk construction and provide adaptive management solutions when required.
- Placing noise dampening screens on the upstream side of the existing bridge to reduce noise levels during constructions. The screens will be required to be rolled up and removed at the end of each work day to allow maximum foraging capacity for the bats.
- If bats are observed to leave the roost during the day, work will need to stop and a suitably qualified ecologist will monitor the situation. Work cannot resume until the suitably qualified ecologist approves activities restarting.
- The use of pumps, generators and other noisy equipment should be discussed with the suitably qualified ecologist relating to specific position and/or the use of noise barriers (i.e. ply barriers).
- Works will be programmed to allow bats to habituate to the works i.e. use a progressive introduction of works, starting from further from the bridge and working closer.
- Routine daily pre-works microbat inspections will be required within the work area and surrounding 10 m buffer on the new bridge. An inspection of this nature should also be required during below deck works once the new bridge is at a stage where potential roosting habitat may be present.
- Controls need to be implemented to block potential roosting habitat during construction on the new bridge to prevent conflicts with construction activities. This is important during prolonged periods when construction activities have stopped.
- Under guidance from the suitably qualified ecologist, exclusion of localised areas of the existing timber bridge would be undertaken to move bats away from high-noise Project footprints.
- Construction materials are to be stored in such a way to prevent incidental roosting habitat for microbats (i.e. no gaps between materials).
- Replacement roosting habitat features, such as wooden structures, will be installed under the new bridges to incorporate purpose-built breeding and roosting habitat to provide long-term habitat for threatened microbat species.

7.9 Operational phase impacts and mitigation measures

The operation phase will have relatively minor, localised impacts on terrestrial ecological values. Ongoing traffic noise and vibration impacts associated with operation of the new bridges are expected to be reduced with the replacement of the existing timber structures with new concrete structures. Risk of mortality due to vehicle collision during operations is considered low. These impacts are expected to be negligible and unlikely to have any impact on the long-term viability of local fauna populations.

7.10 Environmental safeguards

Environmental safeguards for the Project are shown in Table 7.4.

Table 7.4 Environmental safeguards

Issue	Safeguard	Timing	Responsibility
Environmental management	A Construction Environmental Management Plan (CEMP) will be prepared, including the specific mitigation/management measures and sub-plans listed below along with work methods, contingencies, roles and responsibilities. The mitigation/management measures included in the CEMP and sub-plans would be implemented during pre-construction and construction stages.	Pre-construction	Construction contractor
Worker inductions	Ensure all workers are provided with an environmental induction prior to starting construction activities on site. This would include information on the ecological values of the Project footprint and protection measures to be implemented to protect biodiversity during construction.	Pre-construction	Construction contractor
Erosion and sediment	Erosion and sediment control measures would be established prior to construction in accordance with the principles and guidelines included in Managing Urban Stormwater: Soils and Construction - Volume 1 (Landcom, 2004) and Volume 2A of Managing Urban Stormwater: Soils and Construction (DECC 2008c). Erosion and sediment control plans would be established prior to the commencement of construction. Controls would be managed and maintained in accordance with the CEMP to ensure their ongoing functionality. Erosion and sediment controls would be regularly inspected, particularly following rainfall events, to ensure their ongoing functionality. All stockpiled material should be stored in bunded areas and kept away from waterways to avoid sediment or contaminants entering waterways.	Pre-construction	Construction contractor
Dust	Specific measures will be incorporated into the CEMP to minimise the generation of dust and associated impacts on natural environments adjacent and downstream of the Project footprint.	Pre-construction/ construction	Construction contractor
Contaminants	Specific measures will be incorporated into the CEMP to minimise the potential for chemical spills and associated impacts on natural environments adjacent to and downstream of the Project footprint. Spill kits would be made available to construction vehicles. A management protocol for accidental spills would be put in place.	Pre-construction/ construction	Construction contractor
Vegetation clearance and threatened species habitat	Disturbance and removal of native vegetation and habitat would be unavoidable during the construction phase. To reduce the potential for adverse impacts on ecologically sensitive areas the following measures are recommended: – Minimise vegetation clearance and disturbance, including impacts to the two hollow-bearing trees at Joyce's Bridge within the Project footprint, as far as possible. Where possible, limit clearing to trimming rather than the removal of whole plants. – Clearing of mature and hollow-bearing trees should be avoided. If possible, the two hollow-bearing trees should be avoided through corridor refinement during detailed design. – Any leaf litter and woody debris removed should be salvaged and replaced following construction.	Pre-construction/ construction	Construction contractor Site ecologist/ environmental officer

Issue	Safeguard	Timing	Responsibility
	– Prior to any clearing works, a suitably qualified ecologist or the Sydney Water Environmental Representative must physically delineate vegetation to be cleared and/or protected on site, and supervise installation of appropriate signage and high-visibility fencing. All vegetation outside this fence line will be clearly delineated as an exclusion zone to avoid unnecessary vegetation and habitat removal. Fencing and signage must be maintained for the duration of the construction period. Fencing should be designed to allow fauna to exit the site during clearing activities. – Sediment fences should be installed to prevent transfer of sediments into adjacent vegetation. – Hygiene protocols should be implemented to prevent the introduction and spread of weed propagules and soil pathogens. This would include exclusion zones around retained areas of native vegetation.		
Protection of trees and shrubs	An arborist should be engaged to supervise trenching in the vicinity of large trees, to advise on the ability to retain trees with protective measures. Protect trees in accordance with the requirements of Australian Standard 4970-2009 for the Protection of Trees on Development Sites. If more than 10% of the Tree Protection Zone is to be affected, a suitably qualified and experienced arborist would be required to advise on the ability for the tree to be retained and survive. Where tree roots >50 mm are impacted within the Tree Protection Zone, an arborist to assess the ability to maintain structural integrity and tree health and advise on appropriate management measures.	Construction	Construction contractor
Fauna management	Pre-clearance surveys will be undertaken by a qualified ecologist and the required methodology will be developed for target species as part of the CEMP. Surveys should include: – An experienced, licenced wildlife carer or ecologist would be present to supervise vegetation clearing and capture and relocate fauna (if required). – All open trenching would be backfilled or covered (e.g. with boards) at the completion of construction each day to minimise the risk of injury or mortality to animals as a result of falling into the excavated trench line. – Open trenches would be checked each morning, before the start of construction, to salvage any fauna that have fallen in, and move them to a safe (and appropriate) nearby location. Protocols would be developed to deal with the removal of injured or dangerous animals (e.g. snakes). – Salvage and relocation of habitat features (e.g. leaf litter, hollow logs and branches).	Pre-construction/ construction	Construction contractor Site ecologist/ environmental officer
Biosecurity and weed management	Manage biosecurity in accordance with: – Biosecurity Act 2015 (see NSW Weedwise). – Contemporary bush regeneration practices, including disposal of sealed, bagged weeds to a licenced waste disposal facility. Weed management may include: – Manual weed removal in preference to herbicides. – Replacing non-target species removed/killed because of weed control activities. – Protecting non-target species from spray drift.	Pre-construction/ construction	Construction contractor

Issue	Safeguard	Timing	Responsibility
	– Using only herbicides registered for use within or near waterways for the specific target weed. – Applying herbicides during drier times when the waterway level is below the high water mark. – not Applying herbicide if it is raining or if rain is expected. – Mixing and loading herbicides, and cleaning equipment away from waterways and drains.		
Protection of native fauna	If native fauna is encountered on site, stop work and allow the fauna to move away un-harassed. A local wildlife rescue service or the ecologist responsible for pre-clearing surveys should be engaged to assist with fauna removal and rescue if fauna fails to move away on its own.	Pre-construction/ construction	Construction contractor
Protection of threatened species/ unexpected finds protocol	Pre-clearance surveys will be conducted by a suitably qualified ecologist experienced to inspect Project footprints for the presence of conservation significant species, including in terrestrial and aquatic habitat. Two pre-clearance surveys for the Bellinger River Snapping turtle will be conducted by a suitably qualified ecologist prior to the commencement of instream construction works. Pre-clearance surveys will be conducted three (3) weeks prior and again one (1) week prior to the start of any construction works within the river channel or banks. All approvals and permits for Bellinger River Snapping Turtle pre-clearance surveys would be obtained prior to the start of construction and a procedure developed in consultation with BCD for additional avoidance and mitigation measures to be implemented in the event that a Bellinger River Snapping Turtles are found located within or immediately adjacent (i.e. within 100 m) of the Project footprint.	Pre-construction / Construction	Construction contractor / Sydney Water Environmental Representative
Damage to vegetation	If any damage occurs to vegetation outside of the Project footprint, notify the Project Manager and Environmental Representative so that appropriate remediation strategies can be developed.	Construction	Construction contractor / Sydney Water Environmental Representative
Pathogen management	Manage plant and animal disease and pathogens such as Phytophthora, Myrtle Rust and Chytrid fungus. Mitigation measures would include: – Exclusion zones around retained areas of native vegetation. – ‘Clean on entry, clean on exit’ policy. – Provision of machine and footwear washdown stations for all equipment and personnel working in areas of native vegetation. Protocols to prevent introduction or spread of chytrid fungus should be implemented following OEH Hygiene protocol for the control of disease in frogs (DECCW, 2008), in particular for any areas where trenching will occur around drainage lines or ephemeral water bodies.	Construction	Construction contractor
Bellinger River virus management	A biosecurity/hygiene protocol is to be established in consultation with DPI and to the satisfaction of BCS to prevent the spread of the Bellinger River virus. The protocol will include actions that will be undertaken in the event that an encountered turtle is suspected to be infected with the Bellinger River virus. The Bellinger River virus biosecurity/hygiene protocol will be implemented across all work sites for the entire construction period. Environmental training to be delivered to site personnel will include the Bellinger River virus biosecurity/hygiene protocol.	Pre-construction / Construction	Construction contractor

8. Other approvals required for the Project

8.1 Environmental Planning and Assessment Act 1979

An Review of Environmental Factors (REF) has been prepared by GHD on behalf of Bellingen Shire Council (Council) for each of the four bridges. The REF for each Project has been undertaken in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Each REF has been undertaken in the context of:

– Clause 171 of the Environmental Planning and Assessment (EP&A) Regulation 2021.

– The factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (DUAP, 1995/1996).

– *Roads and Related Facilities EIS Guideline* (DUAP 1996).

– NSW *Biodiversity Conservation Act 2016* (BC Act).

– NSW *Fisheries Management Act 1994* (FM Act).

– The Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The purpose of each REF is to describe the project, document the likely impacts of the Project on the environment, and to detail mitigation and management measures to be implemented. In doing so, each REF helps to fulfil the requirements of:

– Section 5.5 of the EP&A Act including that Council examine and consider to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of each REF would be considered when assessing:

– Whether the Project is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act.

– The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.

– The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured.

– The potential for the Project to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

8.2 Roads Act 1993

Consent under Section 138 of the *Roads Act 1993* is required for any works or activities in a public reserve, public road or footpath (nature strip). A Section 138 permit is required for the Project however Council are both the proponent and road authority as defined by the *Roads Act 1993*.

8.3 Fisheries Management Act 1995

The *Fisheries Management Act 1995* (FM Act) provides for the protection, conservation, and recovery of threatened species, populations and ecological communities of fish and marine vegetation and fish habitats, as well as promoting the development and sharing of fishery resources in NSW.

The FM Act provides for the protection, conservation, and recovery of threatened species, populations and ecological communities of fish and marine vegetation and fish habitats, as well as promoting the development and sharing of fishery resources in NSW.

Dredging and Reclamation Permit

Dredging is the removal of any material from the waterway and the action of digging within the waterway and its banks. Reclamation is the placement of material into the waterway or onto the waterway bed and banks. For bridges dredging will include excavation for abutments, removal of old bridge components and other associated earthworks. Reclamation will include reinstatement of new abutments, placement of scour protection and the construction of temporary waterway crossings.

Under s200 of the FM Act, a permit is required for dredging work carried out by a local government authority, unless these works are authorised under the *Crown Land Management Act 2016*. The maximum penalty for unauthorised dredging is $220,000 for local government authorities. If works are carried out in contravention of these sections, the Minister for Primary Industries may, under s203, order remedial works to be carried out to rectify any damage caused to fisheries or fish habitat. Permits and approvals may also be necessary from other public authorities (e.g. DPE - Environment Energy and Science (EES), the regional Local Land Services) and advice should be sought from these agencies where applicable.

The proposed works will require a S200 permit under this Act because the works involve reclamation.

9. Conclusion

This SIS has been developed to provide an overview of the ecological values and constraints present within the four bridge Project locations within the Bellinger Shire. The report identifies the presence and likelihood of occurrence of threatened species listed under the BC Act. The outcome of the desktop assessment and field verification identified a total of 10 listed fauna species as likely or known to occur in the Project areas. These species include the Southern Myotis, Large Bent-Wing Bat, Little Bent-Wing Bat, Eastern False Pipistrelle, Eastern Cave Bat, Giant Barred Frog, Grey Headed Flying Fox, Stephens's Banded Snake, Superb Fruit Dove and the Bellinger River Snapping Turtle. Vegetation across each bridge site was classified as remnants of PCT 3020 Northern Hinterland River Oak Sheltered Forest. The PCT is not listed as a Threatened Ecological Community. No threatened flora species were detected by a targeted flora survey.

Due to the impact of the 'Bellinger River virus', the Bellinger River Snapping Turtle is considered highly susceptible to any risks that impact habitat conditions, nesting and recruitment and the health/survival of individuals. As such, a precautionary approach has been taken for the Project with regard to the design of the bridge structures and the proposed construction methodology, equipment, and program. Best practice techniques have been selected for avoidance, mitigation, and management of potential impacts.

The methods proposed are known to be effective at protecting aquatic environment and species. Monitoring will be conducted throughout the construction works to assess actual risks against those expected and allow for adaptive management if required. Given the susceptibility of the species to disease and the risk that any impact on the species can have on the viability of the population, this SIS has been prepared to support the active management of risks throughout Project construction.

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Appendices

Appendix A

Environment Agency Head's Requirements – Species Impact Statement

Department of Planning and Environment

Your Ref: e-mail dated 18 September 2023
Our Ref: DOC23/829361-32

General Manager
Bellingen Shire Council
PO BOX 117
BELLINGEN NSW 2454

Attention: Mr Marc Rouqueirol

Dear Mr Griffioen

ENVIRONMENT AGENCY HEAD'S REQUIREMENTS FOR A SPECIES IMPACT STATEMENT FOR THE BRIDGE REPLACEMENT PROJECTS – HOBARTS BRIDGE, JOYCES BRIDGE AND JUSTINS BRIDGE

Thank you for your e-mail dated 18 September 2023 to the Biodiversity and Conservation Division (BCD) of the Department of Planning and Environment seeking Environment Agency Head's (EAH's) Requirements for a Species Impact Statement (SIS) for the projects to replace Hobarts Bridge, Joyces Bridge and Justins Bridge in accordance with Section 7.21 of the *Biodiversity Conservation Act 2016* (BC Act).

The Department understands the Bellingen Shire Council is assessing the project under Part 5 Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Part 7 of the BC Act.

In response to your request, please find attached the EAH's Requirements for a SIS (**Attachment A)** to address threatened species (known or likely to be present in the area), ecological communities (potentially present in the area), or their habitats present in the area.

The SIS must be submitted to the Department as part of a request for concurrence within 12 months of the date of this letter.

If concurrence is requested outside the 12-month timeframe, then the Department must be consulted to determine whether the EAH Requirements for the SIS need to be modified to reflect, amongst other things, changes to the listings of threatened species, populations and ecological communities, new information on threatened species, populations and ecological communities, or changes to relevant legislation.

Please note that the issuing of EAH's Requirements is a statutory requirement and should not be construed as support or endorsement of the activity.

When lodging a request to the Department seeking concurrence, the Department must be provided with the SIS, any submissions made in response to the SIS, a Submissions Report prepared by the proponent, and any further assessment report for the activity prepared by or on the behalf of the proponent, including a determination and determination conditions.

The further assessment report should, amongst other matters, set out how the activity facilitates ecologically sustainable development.

If you require any further information about these requirements, please contact please contact Mr Gene Mason, Senior Conservation Planning Officer, on 8289 6315 or gene.mason@environment.nsw.gov.au.

Yours sincerely

DIMITRI YOUNG
Senior Team Leader Planning, North East Branch
Biodiversity and Conservation

16/10/2023

ATTACHMENT A

ENVIRONMENT AGENCY HEAD'S REQUIREMENTS - SPECIES IMPACT STATEMENT - BRIDGE REPLACEMENT PROJECTS – HOBARTS BRIDGE, JOYCES BRIDGE AND JUSTINS BRIDGE - DARKWOOD

PURPOSE

The purpose of a Species Impact Statement (SIS) is to:

- allow the proponent to identify threatened species, ecological communities, or their habitats, assess the likely effect of impact from the activity on threatened species, ecological communities, or their habitats, and provide appropriate amelioration for adverse impacts resulting from the activity.
- assist the Environment Agency Head (EAH) in assessing the activity in accordance with Part 7 of the *Biodiversity Conservation Act 2016* (BC Act).

Sections 7.20 and 7.21 of the BC Act and clause 7.6 of the *Biodiversity Conservation Regulation 2017* (BC Regulation) describe the form and content of a SIS. The matters listed in sections 7.20 and 7.21 of the BC Act and clause 7.6 of the BC Regulation have been incorporated into the Environment Agency Head's requirements provided below.

DEFINITIONS

The definitions below are relevant to these requirements:

- **Abundance** means a quantification of the population of the species or community.
- **Action** means the proposed activity.
- **Activity** has the same meaning as in the EP&A Act.
- **Affected species** means subject species likely to be affected by the activity.
- **BC Act** means the Biodiversity Conservation Act 2016
- **BC Regulation** means the Biodiversity Conservation Regulation 2017
- **Environment Agency Head** means the Secretary of the Department of Planning and Environment (or delegate).
- **EP&A Act** means the Environmental Planning and Assessment Act 1979
- **Conservation status** is regarded as the degree of representation of a species or community in formal conservation reserves.
- **Department** means the Department of Planning and Environment (or any name it may be known by in the future)
- **Development** has the same meaning as in the EP&A Act.
- **DP** means Deposited Plan which is the plan number given to a subdivision that is registered by the Land Property Information.
- **LGA** means Local Government Area.
- **Locality** means the area within a 5 km radius of the study area.
- **PCT** means a NSW plant community type derived using the PCT classification system
- **Study area** is the subject land and any additional areas which are likely to be affected by the activity, either directly or indirectly.
- **Subject land** means the area which is proposed for activity.
- **Subject species** means those threatened species and ecological communities which are known or considered likely to occur in the study area.
- **Threatening process** has the same meaning as that contained in the BC Act; the definition is not limited to key threatening processes.

All other definitions are the same as those contained in the BC Act.

MATTERS WHICH HAVE BEEN LIMITED OR VARIED

The Environment Agency Head may vary the matters otherwise required to be included in a species impact statement in a particular case (section 7.21(4) BC Act).

For this activity, none of the matters required to be included in a SIS have been varied.

NEW LISTINGS

If key threatening processes are added to Schedule 4 of the BC Act between the issue of these requirements and the granting of concurrence, these must be addressed in the SIS and considered by the consent or determining authority and concurrence authority (the Environment Agency Head).

If threatened species or ecological communities are added to Schedule 1 of the BC Act between the issue of these requirements and the granting of concurrence, these additional matters will need to be addressed in the SIS and considered by the consent or determining authority and concurrence authority (the Environment Agency Head).

A SIS is not required to address a new listing of a vulnerable species or a vulnerable ecological community after the principal author signs the SIS. This exemption ceases to apply if the activity has not commenced or been approved within 12 months after the SIS has been publicly notified by the consent or determining authority (clause 7.4, BC Regulation). In this case, the newly listed vulnerable species or ecological community will need to be addressed in the SIS.

MATTERS TO BE ADDRESSED

The SIS must meet all the matters specified in sections 7.20 and 7.21 of the BC Act and clause 7.6 of the BC Regulation. The requirements outlined in the BC Act and the BC Regulation have been repeated below (italics) along with the specific EAH's Requirements for the activity.

The SIS must be formatted to follow the sections and subsections provided in the EAH's Requirements.

Failure to comply with the EAH's Requirements is a potential breach of the legislation, and the Department may be unable to grant concurrence to a request by the determining authority to carry out the activity.

1 FORM OF THE SPECIES IMPACT STATEMENT

> *A species impact statement for the purposes of this Part must be in writing signed by the principal author of the statement and by the applicant for development consent or the proponent of the activity proposed to be carried out (as the case requires). BC Act section 7.20 (1)*

The proponent must sign the following declaration:

> "I…[insert name], of ..[address], being the proponent of the activity [insert name of activity, Lot & DP numbers, street, suburb and LGA names] have read and understood this species impact statement. I understand the implications of the recommendations made in the statement and accept that they may be placed as conditions of consent or concurrence for the activity".

The principal author must sign the following declaration:

> "I [insert name] of [address], being the principal author, have prepared the SIS in accordance with the EAH's Requirements issued on [insert date]."

2. CONTEXTUAL INFORMATION

2.1 Description of activity and study area

> *A species impact statement must include a full description of the proposed development or activity and the information as to matters relating to the impact on threatened species or ecological communities as is required by the regulations. (BC Act Section 7.20(2))*

2.1.1 Describe the activity

The SIS must include a comprehensive description of the nature, extent and timing of all components of the activity. A full description of the activity includes a description of all associated actions, including, but not restricted to, installation and maintenance of any proposed structures / dwellings and associated infrastructure, location of any associated facilities (including roads, amenities and other services), location of proposed roadway and associated infrastructure, fire protection zones, access and egress routes, changes in surface water flows, impacts of noise disturbance and pollution, and any increases in people and road traffic. Actions that occur both on and off the subject land resulting from the activity must be assessed, including actions conducted during any construction phase and any proposed action post-construction (e.g. proposed actions within a management plan).

2.1.2 Define the study area

The SIS must define the location, size and dimensions of the study area.

The study area should include the subject land and any adjacent land containing suitable habitat for threatened species that will be directly or indirectly affected by the activity.

Direct impacts are those that directly affect individuals or their habitat, including for example:

- poisoning or removal of the organism itself,
- removal of habitat, and
- clearing of native vegetation / habitat.

Indirect impacts occur when the activity affects threatened species or ecological communities or their habitats in a manner other than direct loss. Examples of indirect impacts include (but are not limited to):

- sediment, pollutant or nutrient runoff into adjacent vegetation
- habitat fragmentation or isolation
- implementation of asset protection zones (though these may also represent direct impact)
- loss of genetic diversity of threatened species, populations or communities
- altered pollination syndromes that may adversely affect seed set
- soil erosion
- altered hydrology regimes (including downstream impacts)
- changes to the saline / freshwater balance in marine environments
- exposure to heat or predators, or loss of shade

- inhibition of nitrogen fixation
- weed invasion and feral animal incursion
- introduction and spread of pathogens,
- noise
- dust
- light pollution
- fire (such as changes to intensity and frequency)
- fertilizer drift
- increased human activity (including litter) within or directly adjacent to sensitive habitat areas.

2.2 Relevant plans and maps

The SIS must include a map of the study area based on digital aerial photography (such as ADS40 imagery) or the best available imagery at an appropriate scale to clearly show:

- The boundary of the study area
- Land tenure and zoning, including protected areas, and any proposed changes
- Relevant Local Government planning instruments, including Local Environmental Plans and Development Control Plans
- IBRA bioregions and IBRA subregions
- Rivers, streams, estuaries classified by stream order and including riparian buffers
- Wetlands including important wetlands and riparian buffers
- Habitat connectivity that may serve as movement corridors
- Karst, caves, crevices, cliffs, rocks and other geological features of significance [delete if not relevant]
- Areas of outstanding biodiversity value
- Vegetation cover identifying the extent of woody and non-woody native vegetation and cleared areas
- Any access limitations

The SIS must include a map of the subject land based on digital aerial photography or the best available imagery at an appropriate scale to clearly show:

- The boundary of the subject land
- Map scale
- Topography
- Land tenure
- Vegetation cover identifying the extent of woody and non-woody native vegetation and cleared areas
- Locally significant areas for threatened species and areas of high human activity
- Any access limitations

Digital files of maps must be supplied with the SIS.

2.3 Vegetation

The SIS must identify and map the distribution of PCTs, or the most likely PCTs, and all Threatened Ecological Communities (TECs) in the study area. The identification must be in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. The identification of TECs must be consistent with the Threatened Species Scientific Committee Final Determination for the TEC.

Information that can support the identification of PCTs and TECs can be found on the:

a) BioNet Vegetation Classification database, which describes how to identify PCTs and TECs as per the NSW PCT classification, and details each PCT and its geographic distribution
b) Threatened biodiversity profile search webpage, which describes TECs.

Any existing information on native vegetation that is relevant to the study area should be reviewed and referenced to justify PCT and TEC identifications. This includes:

a) survey data or individual species records that are held in the Flora Survey (BioNet), or
b) existing maps of native vegetation in the area such as those held by the Department, or a local government authority, or
c) information in ecological reports, soil surveys or previous native vegetation surveys that is relevant to the study area.

3 INITIAL ASSESSMENT

A general description of the threatened species known or likely to be present in the area that is the subject of the action and in any area that is likely to be affected by the action, BC Regulation clause 7.6(2)(a)

3.1 Identifying candidate threatened species

The SIS must identify candidate threatened species that have or may have suitable habitat in the study area.

The following threatened species must be considered as candidate threatened species, as they have either been recorded in the general area, are within the species' known geographic limits or their broad habitat preferences may be present in the study area:

Scientific Name	Common Name	Legal Status
Myuchelys georgesi	Bellinger River Snapping Turtle	Critically Endangered
Mixophyes iteratus	Giant Barred Frog	Endangered
Myotis macropus	Southern Myotis	Vulnerable
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Ptilinopus magnificus	Wompoo Fruit-dove	Vulnerable
Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable
Pandion cristatus	Eastern Osprey	Vulnerable

This list is not exhaustive. One of the roles of the SIS is to determine which species may be utilising a site given the limitations of existing databases.

A list of additional candidate species should be compiled by considering:

a) the distribution of species in the IBRA subregion within which the subject land and study area are mostly located
b) any geographic limitations of a species identified at a) that exclude it from the subject land and/or study area
c) associations between the species identified at a) and the PCTs occurring within the subject land
d) the native vegetation cover required to provide viable habitat for the species
e) the patch size required to provide viable habitat for the species

The identification of candidate species must be informed by databases including the *Threatened Biodiversity Data Collection* (TBDC) and other data available through the *Bionet Atlas* (www.bionet.nsw.gov.au/), *Atlas of Living Australia* (www.ala.org.au/), *Australian Museum* (http://ozcam.org.au/)*, Birdlife Australia* (http://birdsaustralia.ala.org.au/BDRS/home.htm), and the *Royal Botanic Gardens* (http://plantnet.rbgsyd.nsw.gov.au/).

Previous surveys and assessments that are relevant to the locality may be used to assist in identifying candidate species.

3.2 Identify subject threatened species

An assessment of which threatened species known or likely to be present in the area are likely to be affected by the action (BC Regulation clause7.6(2)(b)).

3.2.1 Habitat assessment to confirm suitable habitat

A comprehensive habitat assessment should be conducted across the study area, identifying key habitat features for both flora and fauna. The SIS must evaluate the habitat of the study area for each candidate threatened species. It is important to record all areas of native and introduced vegetation, as even weeds can potentially provide habitat for threatened fauna. As part of the habitat assessment, you should look for:

- hollow-bearing trees, including dead stags
- bush rock and rocky outcrops
- natural burrows
- large trees with basal cavities
- logs
- wetlands, streams, rivers, dams and other water bodies
- nests and roosts
- permanent soaks and seepages
- areas that can act as corridors for plant or animal species.

The SIS must include an analysis of the suitability of the habitat for each candidate species based on the information in the TBDC and including:

- habitat constraints
- microhabitats or other habitat features
- breeding features
- any buffer area around habitat or breeding features
- any considerations around the size or shape of the habitat area

The list of candidate species should be refined based on the outcomes of the habitat assessment to exclude species that are not likely to be present in the study area, to create the list of subject species.

3.2.2 Targeted survey

A targeted species survey for all subject species must be undertaken.

The survey must:

a) only occur during the time specified for that species in the TBDC, unless there is clear justification to vary the timing and the reasoning is documented in the SIS
b) comply with the Department's threatened species survey guides published by the Secretary of the Department or anyone authorised by the Secretary

c) use best-practice methods that can be replicated for repeat surveys, if the Department has not published any relevant guides, after consulting the TBDC and the Department's relevant accountable officer for the entity.

The SIS must describe the survey timing, methods, design and effort used for each species survey. The SIS must record weather conditions (e.g. minimum ambient air temperature, maximum ambient air temperature, amount of precipitation that occurs each 24 hour period, details about wind speed and direction and the amount of cloud cover) and the phase of the moon for each day of survey (including dates).

Surveys must be undertaken by appropriately experienced and qualified persons.

A biodiversity expert recognised under the Biodiversity Offsets Scheme, a recognised expert from institutions such as the Australian Museum (Sydney), the National Herbarium of NSW at the Royal Botanic Gardens (Sydney) or an expert who is otherwise approved by the Department's Environment and Heritage Group (EHG) must be used to determine or confirm the identification of species that are unknown or which have been only provisionally identified.

If a proposed survey methodology is likely to vary significantly from widely accepted methods, the proponent must discuss the proposed methodology with EHG's Biodiversity and Conservation Division.

The outcome of the survey must be a mapped area of habitat in which the species is present or is likely to use for each subject species.

For each species recorded by survey, the mapped areas must include:

- For fauna species, the entire area of the PCTs associated with that species in the TBDC that occur on the study area
- For flora species assessed by count as per the TBDC, a buffer of 30m around individuals or groups of individuals on the study area
- For flora species assessed by area as set out in the TBDC, all recorded individuals and the entire area of suitable habitat for them on the study area, such as the PCT in which they occur, and/or microhabitats in which they occur.

The SIS must include a map of the study area based on digital aerial photography or the best available imagery at an appropriate scale to show key habitat features for each subject species.

3.2.3 Final review of the list of subject threatened species

The results of the survey may be used to further refine the list of subject threatened species to reflect those threatened species that are known or likely to be present in the study area and which may be affected by the activity in the study area.

4 ASSESSMENT OF LIKELY IMPACTS ON THREATENED SPECIES

4.1 Assessment of species likely to be affected

Assessment of impacts must include the assessment of indirect impacts and those of associated activities, including, but not restricted to, installation and maintenance of utilities, access and egress routes, and changes in surface water flows. These actions or impacts may occur on or off the subject land.

Assessment of impacts must also include an assessment of impacts from the provision of bushfire asset protection zones. If, as part of the activity, there will be a requirement to provide fuel free and/or fuel reduced zones in retained bushland, the impacts of this on any threatened species and/or populations must be addressed as part of the impacts of the overall activity. Proponents should also consider recommendations in '*Planning for Bushfire Protection*' (NSW Rural Fire Service 2019) and consider the use of perimeter roads as an option in providing fuel free zones and reducing impacts on retained bushland.

4.2 Discussion of conservation status

For each species likely to be affected — details of its local, regional and State-wide conservation status, the key threatening processes generally affecting it and its habitat requirements (BC Regulation clause 7.6(2)(c))

An assessment of whether those species are adequately represented in conservation reserves (or other similar protected areas) in the region, (BC Regulation clause 7.6(2)(e))

An assessment of whether any of those species is at the limit of its known distribution, (BC Regulation 7.6(2)(f))

Assessment must include reference to the key threatening processes (Schedule 4 to the BC Act). Assessment should also include reference to any approved or draft recovery plans which may be relevant to the activity; including those prepared by other State Governments or the Australian Government.

4.3 Discussion of local and regional abundance and distribution

An estimate of the local and regional abundance of those species (BC Regulation clause 7.6(2)(d))

4.3.1 Discussion of other known local populations

A discussion of other known populations in the locality must be provided, along with an assessment of their regional significance. The long-term security of other habitats must be examined as part of this discussion. The relative significance of the study area for threatened species in the locality must be discussed.

4.3.2 Discussion of habitat utilisation

An estimate of the numbers of individuals utilising the study area and how these individuals use the study area (e.g. residents, transients, adults, juveniles, nesting, foraging). This should include discussion of the significance of these individuals to the viability of the threatened species in the locality.

4.4 Assessment of habitat

A full description of the type, location, size and condition of the habitat of those species and details of the distribution and condition of similar habitats in the region (BC Regulation Clause 7.6(2)(g))

4.4.1 Description of habitat values

Specific habitat features shall be described, such as frequency and location of stags, hollow bearing trees (including size), mature / old growth trees, culverts, rock shelters, rock outcrops, presence of feed tree / shrub / groundcover species areas of native grasses, crevices, caves, drainage lines, soaks etc, and density of understorey vegetation / groundcover.

The condition of the habitat within the study area shall be discussed, including the prevalence of introduced species, species of weeds present and an estimate of the total weed cover as a percentage of each vegetation community, whether trampling or grazing is apparent, effects of erosion, prevalence of rubbish dumping, history of resource extraction or logging and proximity to roads, and assessment of the potential for native seed bank resilience in disturbed areas.

Details of the fire history of the subject site (e.g. frequency, time since last fire, intensity) and the source of fire history (e.g. observation, local records) shall be provided.

4.4.2 Impacts on threatened species and/or populations in the national park estate

This section only needs to be addressed when threatened species and/or populations in the national park estate (e.g. National Parks, Nature Reserves) are likely to be either directly or indirectly impacted upon.

The SIS must assess the potential impacts on any threatened species and/or populations which may likely be directly or indirectly impacted upon that reside with the national park estate, including but not limited to fragmentation or loss of connective linkages, edge effects (e.g. increased boundary to area ratio), increased predation potential, weed invasion, loss or impacts on pollination vectors, changes to hydrology, nutrient increases, pollution, anthropogenic impacts (e.g. increased visitation, refuse) etc.

4.5 Discussion of the likely effect of the activity at local and regional scales

A full assessment of the likely effect of the action on those species, including, if possible, the quantitative effect of local populations in the cumulative effect in the region (BC Regulation Clause 7.6(2)(h))

4.5.1 Significance within a local context

If the activity involves the clearing of vegetation and/or removal / damage to habitat, the SIS must clearly articulate the size of this impact, and where applicable delineate this based on PCT or habitat features. Indirect impacts may lead to direct loss and must be adequately quantified and assessed in the SIS where this is the case. Both impacts within the study area and subject land must be considered and addressed.

The significance of impacts in the study area for conservation of affected threatened species or endangered populations in the *locality* must be discussed. An assessment of the significance of such impacts must compare and take into account the differences in the type, condition, tenure and long-term security, of other areas of known habitats in the *locality* with those in the study area.

4.5.2 Discussion of connectivity

The potential of the activity to increase fragmentation of the habitat or decrease the ability for movement of individuals and/or gene flow between habitats or populations of a threatened species must be appraised. The SIS must include an analysis of the connectivity value of the study area to the subject species.

4.5.3 Consideration of threatening processes

Assessment of effects must not be limited only to threats that are recognised as key threatening processes but must include other threatening processes that are generally accepted by the scientific community as affecting the species and are likely to be caused or exacerbated by the activity. This threat assessment should also include consideration of the threats and information in the Threatened Biodiversity Profiles available at https://www.environment.nsw.gov.au/threatenedSpeciesApp/.

4.6 Description of feasible alternatives

A description of any feasible alternatives to the action that are likely to be of lesser effect and the reasons justifying the carrying out of the action in the manner proposed, having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development (BC Regulation Clause 7.6(2)(i)).

Where an Environmental Impact Statement (EIS) or Review of Environmental Factors (REF) deals with these matters, the SIS may refer to the relevant section of the EIS or REF.

This section must include details of alternative locations considered or alternative footprints within study area and the condition and use of these areas. The SIS must include an explanation of why these are not considered feasible alternatives.

5 ASSESSMENT OF LIKELY IMPACTS ON THREATENED ECOLOGICAL COMMUNITIES

Part 5 of these requirements need only be addressed when threatened ecological communities are likely to be affected.

Assessment of impacts must include the assessment of indirect impacts and those of associated activities, including, but not restricted to, installation and maintenance of utilities, access and egress routes; and changes in surface water flows. These actions or impacts may occur on or off the subject land.

Assessment of impacts must also include an assessment of impacts from the provision of bushfire asset protection zones. If, as part of the development, there will be a requirement to provide fuel free and/or fuel reduced zones in retained bushland, the impacts of this on any endangered or critically endangered ecological communities must be addressed as part of the impacts of the overall activity.

5.1 Assessment of ecological communities (both endangered and critically endangered) likely to be affected

A general description of the ecological community present in the area that is the subject of the action and in any area that is likely to be affected by the action (BC Regulation clause 7.6(3)(a)).

This must include reference to the ecological community as described by the NSW Scientific Committee, including maps of the extent and condition of the community with reference to those parts of the community that may only be represented by soil stored seed with no above ground components of the community present.

Endangered and critically endangered ecological communities that may occur on or near the study area include, but are not limited to:

Threatened Ecological Community	Legal Status
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	Endangered
Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	Endangered

5.2 Discussion of conservation status

For each ecological community present — details of its local, regional and State-wide conservation status, the key threatening processes generally affecting it and its habitat requirements (BC Regulation clause 7.6(3)(b))

An assessment of whether those ecological communities are adequately represented in conservation reserves (or other similarly protected areas) in the region (BC Act Clause 7.6(3)(c)).

An assessment of whether any of those ecological communities is at the limit of its known distribution (BC Act Clause 7.6(3)(d)) .

Assessment should include reference to the threatening processes that are generally accepted by the scientific community as affecting the endangered and/or critically endangered ecological community and are likely to be caused or exacerbated by the activity. The assessment should also include reference to any approved or draft recovery plans which may be relevant to the action.

5.2.1 Significance within a local context

An assessment of the community on the subject land in relation to other sites in the study area and in the locality. The tenure and long-term security of the community in the locality shall be examined as part of this discussion.

The relative significance of the study area for the endangered and/or critically endangered ecological community shall be discussed. The assessment of the community should be considered in terms of the features including, the size of the remnant, the quality of the habitat and the level of disturbance in the study area compared to other sites in the locality.

5.2.2 Discussion of corridor values

The potential of the activity to increase fragmentation of the community and increase edge effects. If corridors that allow connectivity between local occurrences of endangered and/or critically endangered ecological communities are present within the study area, the impact of the proposal on these areas shall also be discussed.

5.2.3 Discussion of regional significance

The significance of the locality for the community from a regional perspective shall be noted and discussed.

5.2.4 Impacts on Ecological Communities in the national park estate

This section only needs to be addressed when endangered and/or critically endangered ecological communities in the national park estate are likely to be either directly or indirectly impacted upon.

The SIS must assess the potential impacts on any endangered and/or critically endangered ecological communities which may likely be directly or indirectly impacted upon that reside with the national park estate.

5.3 Assessment of habitat

A full description of the type, location, size and condition of the habitat of the ecological community and details of the distribution and condition of similar habitats in the region (BC Regulation clause 7.6(3)(e))

A full assessment of the likely effect of the action on the ecological community, including, if possible, the quantitative effect of local populations in the cumulative effect in the region (BC Regulation clause 7.6(3)(f))

5.3.1 Description of disturbance history

If the study area shows signs of disturbance, details should be provided of its disturbance history and an assessment should be made of the ability of the ecological community to recover to a pre-disturbance condition.

5.3.2 Extent of habitat removal

The location, nature and extent of habitat removal or modification which may result from the proposed activity including the cumulative loss of habitat from the study area (including all proposed development applications and those areas in the locality already with development consent or identified for development) and the impacts of this on the viability of the endangered and/or critically endangered ecological community in the locality.

This shall include an assessment of the proportion of the ecological community to be affected by the activity, in relation to the total extent of the ecological community, and the impact of this on the viability of the ecological community in the locality.

5.4 Description of feasible alternatives

A description of any feasible alternatives to the action that are likely to be of lesser effect and the reasons justifying the carrying out of the action in the manner proposed having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development (BC Regulation Clause 7.6(3)(g)).

Where an Environmental Impact Statement (EIS) or Review of Environmental Factors (REF) deals with these matters, the SIS may refer to the relevant section of the EIS or REF.

In the discussion of feasible alternatives to the proposed development with regards to biophysical, economic and social considerations, and the principles of ecologically sustainable development, the SIS must also include details on the alternative locations considered or alternative footprints within study area and the condition and use of these areas. The SIS must include an explanation of why these are not considered feasible alternatives.

6 AMELIORATIVE MEASURES

6.1 Description of ameliorative measures

A full description and justification of the measures proposed to mitigate any adverse effect of the action on the species, including a compilation (in a single section of the statement) of those measures, (BC Regulation Clause 7.6(2)(j))

A full description and justification of the measures proposed to mitigate any adverse effect of the action on the ecological community, including a compilation (in a single section of the statement) of those measures, (BC Regulation Clause 7.6(3)(h))

6.1.1 Biodiversity impact amelioration strategy

The SIS must include a strategy to outline all measures to minimise, mitigate, manage or offset the impacts of the activity on threatened species and ecological communities, or their habitats. This could include but not be limited to revegetation, vegetation management, habitat restoration/rehabilitation, habitat enhancement, monitoring and biodiversity offsets. The strategy should include the timing and frequency of actions and nominate the roles responsible for completing actions.

6.1.2 Long-term management strategies

Consideration shall be given to developing long-term management strategies to protect areas within the study area which are of particular importance for the threatened species or , ecological communities likely to be affected. This may include proposals to restore, improve or provide long term protection for habitat on site where possible. Any such proposal is to be accompanied by a plan of management identifying the specific areas to be restored, improved or protected, the threatened species / ecological community values of those areas, and detailing the management actions to be implemented to maintain and protect those values, including corrective actions to be taken in the event that monitoring indicates that management does not achieve specified objectives.

7 STATEMENT OF LONG-TERM VIABILITY

The SIS must include a concluding statement on whether the activity is likely to reduce the long-term viability for each of the subject threatened species or ecological communities at the local and bioregional scales. Conclusions must be justified and supported by the information and data presented in the SIS. Uncertainties should be acknowledged and discussed.

8 ADDITIONAL INFORMATION

8.1 Qualifications and experience

A species impact statement must include details of the qualifications and experience in threatened species conservation of the person preparing the statement and of any other person who has conducted research or investigations relied on in preparing the statement (BC Act 7.20(3)).

8.2 Other approvals required for the development or activity

A list of any approvals that must be obtained under any other Act or law before the action may be lawfully carried out, including details of the conditions of any existing approvals that are relevant to the species (BC Regulation clause 7.6(2)(k))

A list of any approvals that must be obtained under any other Act or law before the action may be lawfully carried out, including details of the conditions of any existing approvals that are relevant to the ecological community (BC Regulation clause 7.6(3)(i))

In addition to the list of other approvals the SIS must include the name of the determining authority or authorities under Part 5 of the EP&A Act and when these approvals are proposed to be obtained.

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

An activity will require the approval of the Australian Government Minister for the Environment (in addition to any State or Local Government approval or determination) if that activity will have, or is likely to have, a significant impact on a matter of national environmental significance. Threatened species and communities listed in the EPBC Act are considered to be a matter of national environmental significance.

Many of the species and ecological communities listed in the BC Act are also listed in the EPBC Act. Further information regarding the operation of the EPBC Act (including Commonwealth-listed threatened species and communities) may be obtained from the Commonwealth Department of Agriculture, Water and Energy (DAWE) website www.environment.gov.au/ or by contacting the DAWE on (02) 6274 1111.

8.3 Licensing matters relating to the survey

Persons conducting flora and fauna surveys must have appropriate licences or approvals under relevant legislation. The relevant legislation and associated licences and approvals that may be required are contained in Division 3 of Part 2 of the BC Act or in the *Animal Research Act 1985* in relation to animal research authorities:

Typically, you will require a biodiversity conservation licence under Division 3 of Part 2 of the BC Act to undertake activities that would otherwise constitute an offence (such as picking plants, harming animals or damaging a declared area of outstanding biodiversity value).

Information pertaining licences can be obtained from the following websites:

- www.environment.nsw.gov.au/licences-and-permits/wildlife-licences/licences-to-control-or-harm/licences-to-harm-threatened-species
- www.service.nsw.gov.au/transaction/apply-native-flora-and-fauna-research-licence

Please be aware of the requirements relating to animal care and ethics when conducting wildlife surveys. The handling and capture of animals is regulated by the NSW *Animal Research Act 1985* and the *Animal Research Regulation 1995*, which are administered by Department of Primary Industries. The Act requires that persons undertaking animal research must hold an Animal Research Authority. See www.animalethics.org.au/home for further information.

Appendix B

Assumptions and Limitations

This report has been prepared by GHD for Bellingen Shire Council and may only be used and relied on by Bellingen Shire Council for the purpose agreed between GHD and Bellingen Shire Council as set out in Section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Bellingen Shire Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Appendix C

Joyces Bridge Design and Construction Methodology

JOYCES BRIDGE REPLACEMENT

Project Description

Coastal Works are replacing Joyces Bridge over the Bellinger River on Darkwood Road, Darkwood under contract works for Bellingen Shire Council. The existing 48m four span, timber bridge will be removed and replaced adjacent with a new 49.5m four span, all concrete bridge on an improved alignment downstream. The site is located approx. 18km west of Bellingen, is highly flood prone and is in key habitat for the Bellinger River Snapping Turtle.

Existing Timber Bridge

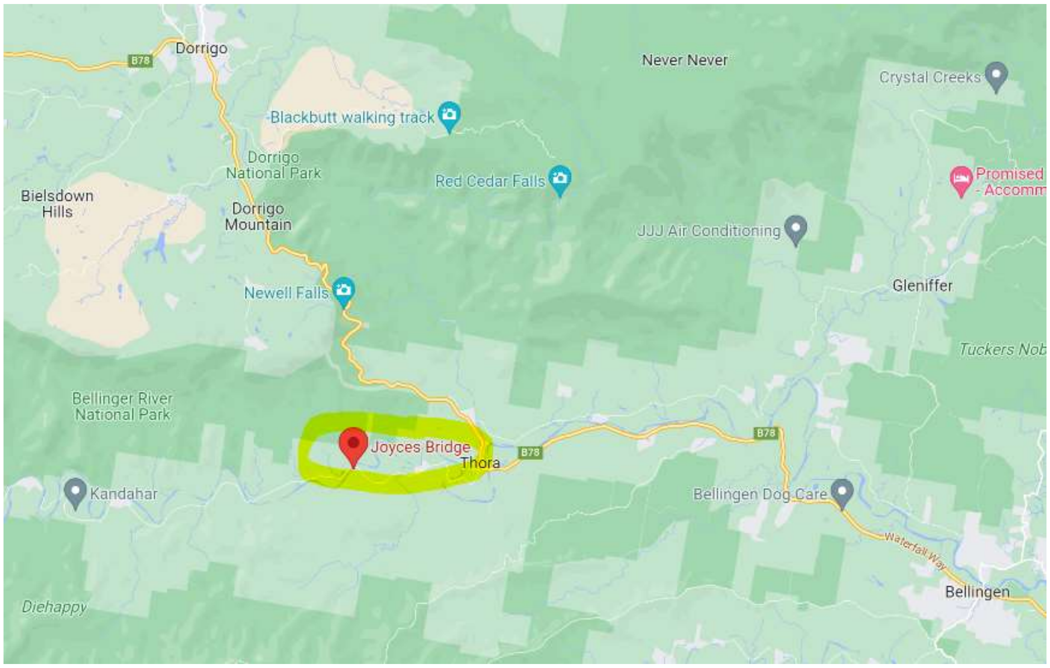
Form of Construction

Foundations – bored, cast in-situ concrete piles (600mm diameter) for all substructures

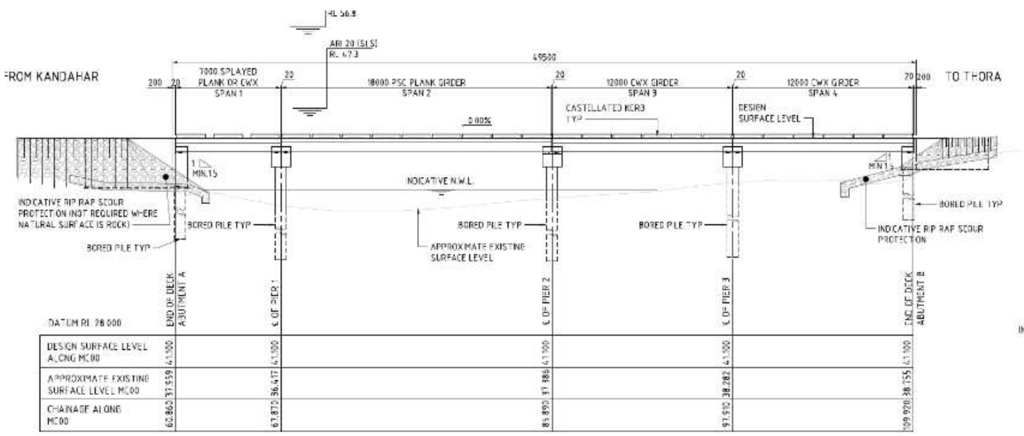
Substructure – cast in-situ reinforced concrete abutments and precast concrete headstocks, rock scour protection on bank and around abutments

Superstructure - precast concrete CoastalWorks 12m bridge beams for 2 spans, one longer span using 18m PSC pre-stressed bridge planks, one shorter 7m PSC plank span at the western end, cast in-situ deck pours for the two planks spans, bolt on concrete kerbs

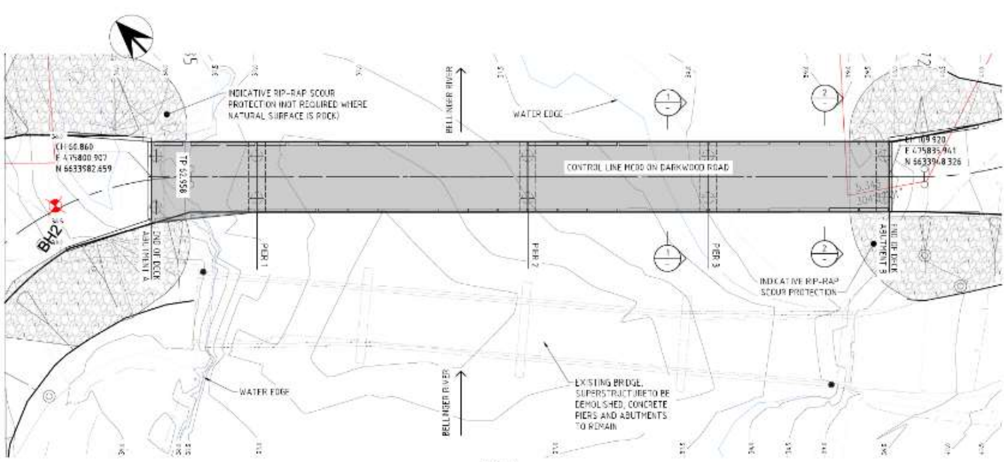
Road approaches – 35m of road works one side and 60m the other side to tie into existing road, two coat bitumen seal, 6m wide plus fill formations, cast in-situ concrete approach slabs, open swale drains



Location Map



ELEVATION
EXISTING BRIDGE NOT SHOWN FOR CLARITY



PLAN

New Bridge Design

Construction Methodology & Sequence

1) <u>Establishment:</u>
    a. Set up compound, laydown and stockpile areas in private property at the next bend east of the bridge off Darkwood Road above the high flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones,
    c. Installation of erosion and sediment controls for piling and river access ramps including booms in the water,
    d. Delivery of all piling and cast in situ work materials/formwork,
    e. Delivery of pre-filled rock bags,
    f. Establish bunded concrete washout and spoil areas at laydown area.

2) <u>Access to riverbed from high banks:</u>
    a. Clear and grub vegetation and topsoil from on land piling positions, stockpile away from river for later rehabilitation works or remove from site,
    b. On Thora (East) side, the access ramp is to be from the road edge immediately downstream of the abutment down to existing stable cobbly riverbed to Pier 3 and to the water's edge towards Pier 2.
    c. On the West side, the access ramp for piling is to be from the road edge down through Abutment A to the water's edge.
    d. Access ramps to be constructed with:
        i. Geofrabric underlay – extra length on the upstream side that can be used to wrap over the ramp and pinned down with rock bags during high flow events to prevent wash out,
        ii. 150mm thick, clean imported ballast (40-60mm) and/or gabion (50-200mm)

3) <u>Prepare piling areas prior to piling contractor mobilisation:</u>
    a. Abutments:
        i. Box down to underside of abutment plus 75mm for blinding layer, remove spoil to stockpile areas,
        ii. Level off adjacent area for positioning of piling rig,
        iii. Bench excavation for stability if needed and install edge delineation.
    b. At Pier 3 (out of waterway) – inside sediment fencing, excavator to dig down 1m to clear larger cobbles and use sieve bucket to sieve fines back into the excavation and cobbles onto adjacent cobble banks. Cobbles of this size (>200mm) particularly near the surface make 600 bored piling extremely difficult.
    c. At Pier 1 and 2:
        i. Access to both of these to be one at a time to limit the amount of afflux of the general water level and blockage of the wateryway,
        ii. Place rock bags with an excavator progressing out from the water's edge above the water level so an excavator can walk over them (on rubber mats to avoid tearing the bags)
        iii. Place a rock bag ring around the pile positions up to 300mm above water level to deflect the water flow/velocity around the area and provide a containment ring.
        iv. Lay geofabric on the inside of the rock bags with enough length to drape down to the bottom
        v. Fill inside the geofabric and bags with clean, imported, small aggregate (10mm-40mm) up to also 300mm above water level.

Aggregate will largely be self levelling and suitable for personnel access (not excavator tracks) and suitable for helping the pile liners to stand up before the high level rock strata

vi. Pull floating hydrocarbon boom tight to the bags

4) Bored piling works:
   a. Plant & equipment – 30t excavator with a 2t vibratory head attachment and pendulum drill head with Kelly bar for the auger.
   b. Abutments – excavator positioned on existing ground behind abutments,
   c. Pier 3 – excavator positioned on existing cobbly riverbed and access track.
   d. Pier 1 & 2 – excavator positioned on rock bags only not the aggregate infill area which will not be stable enough for excavator crawling only small plant, equipment and personnel.
   e. Vibratory head used to install permanent mild steel liners in position first
   f. Pile clean-out material placed either directly in a skip bin or on a geofabrics lined area adjacent the piling area so it can be removed from the riverbed area to the established stockpile area (or off site) daily. 2m screens of geofabric or ply to be erected along the line of rock bags at Pier 1 & 2 to deflect any loose material entering the water as the auger is pulled out.
   g. After piles are cleared, extend pile liners at the 3 pier sets by welding on extra sections up to the underside of headstock levels
   h. Place cages and pour concrete with concrete boom pump on the respective side of the river. Sucker truck to remove water from the wet pile holes during concrete placement.
   i. Concrete overpour out of top of piles (typically 0.2m3 per pile) to be contained within tarps area locally to the pile and then removed once dried the next day. At the abutments, overpour used as a blinding slab.

5) Remove in water piling access – remove piling rock bag areas in reverse order with excavator moving progressively out of the water. Excavator to scoop out imported aggregate from within the geofabric being carful not to tear. Last sections of aggregate removed by bunching, lashing and lifting sections of geofabric directly out of the waterway. Remove rock bags and stockpile until next stage.

6) Cast in-situ concrete sub-structure - abutments:
   a. Reinforcement placed and tied in place by hand on blinding slabs.
   b. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
   c. Elevated walkway up to the top of concrete which will all cantilever off the formwork and not require additional footprint on the banks.
   d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
   e. Strip all formwork after concrete curing period,
   f. Complete mortar pads by hand mixed mortar to finish all substructures.

7) Landing precast headstocks:
   a. Place rock bags progressively out and tight around the in-river piles at Pier 1 and 2 for personnel access only to the top of piles (not for machinery),

b. Reinstate sufficient access track (as above) for crane and semi truck access down next to Pier 3 over the cobbly river bank
c. Lift headstocks to Pier 2 and 3 from eastern crane position, outriggers on rock bags for support.
d. Lift headstock at Pier 1 from the existing road approach at the western end
e. Use 0.5m3 kibble to lift exact amounts of concrete into each of the connecting void pours between the piles and headstocks, concrete trucks to remain on road approaches

8) Place scour rock around abutment fronts – place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks. Excavator to place scour rock from established access ramps and then from behind abutments out of the riverbed area.

9) Land all precast beams and planks and tie cast in-situ deck –
   a. Use same cranage position and access track for larger PSC planks and CoastalWorks as for the Pier 2 and 3 headstocks
   b. Smaller Franna crane to land smaller 7m PSC planks in the western span from on existing road approach
   c. beams sealed soffit formwork to be used between planks and beams to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Temporary access platforms to be installed along the outside edges for the 18m and 7m plank span for access and edge formwork.

10) General fill and drainage zone behind abutments – place and compact area immediately behind abutments up to underside of approach slabs. Maintain access to existing bridge for road traffic. All trucks, rollers and excavators out of the creek and sediment fencing along the whole bank lines to contain from any wet weather during this period.

11) Pour beam and deck pours – CoastalWorks 12m beam spans poured first, 18m and 7m plank span second with the approach slabs. Boom pumps to be again used from the respective sides without putting the line over the waterway. Curing of the deck pour to be done with clean water, soaker hoses and hessian.

12) Install bolt on kerb units onto plank span

13) Fully remove cranage access tracks and rock bags from around headstock piles – excavator to progressively remove rock bags, imported ramp materials and geofrabirc underlay working away from the water on each side back to the high banks. All imported rock to be re-used for road backfill. Rock bags removed from site.

14) Remove temporary works from plank span – use Franna crane and or HIAB truck on the new deck to lift out and load directly to laydown area.

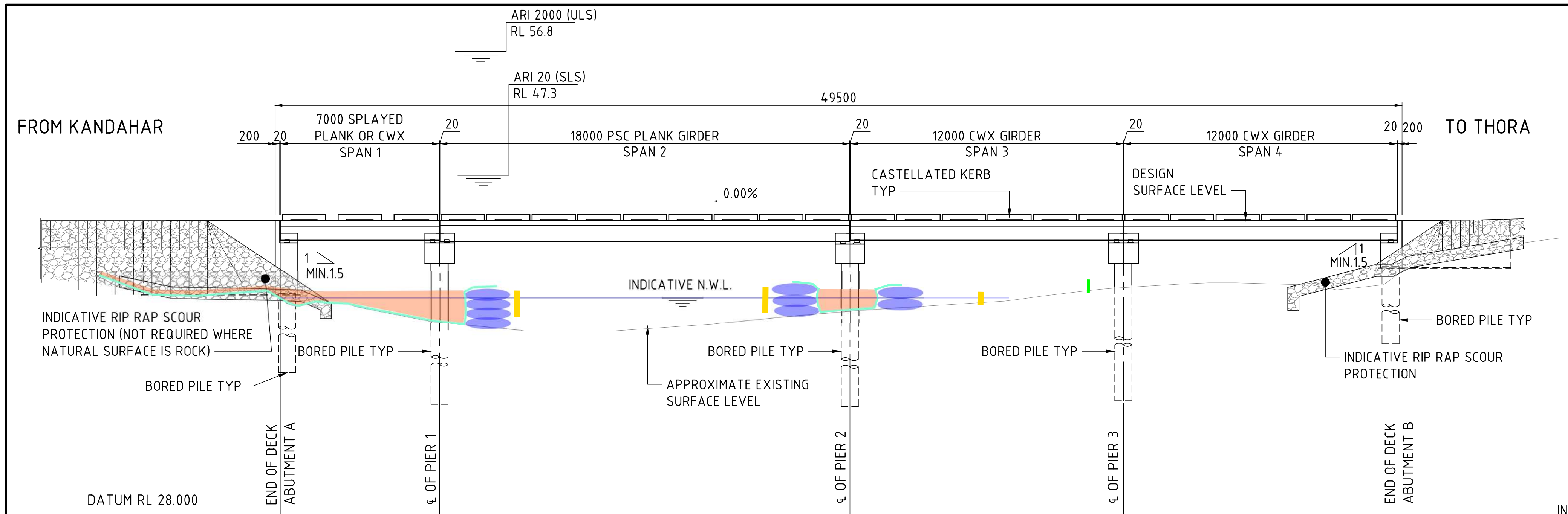
15) Complete approach roadworks – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

16) Demolish original bridge:
   a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers.

b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing ply and timber decking first followed by girders for each span. No access off deck required for this.
c. Once deck fully removed, remove protruding abutments to tie in better with the new scour rock and bank profile. Use rock breaker on excavator to break up and then remove in largest possible pieces by excavator and by hand.
d. For non-accessible headstocks in the water flow area, access via floating platform and remove timber components from above water with chainsaw and oxy cutting bolts down to top of concrete. Concrete headstocks to remain.
e. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

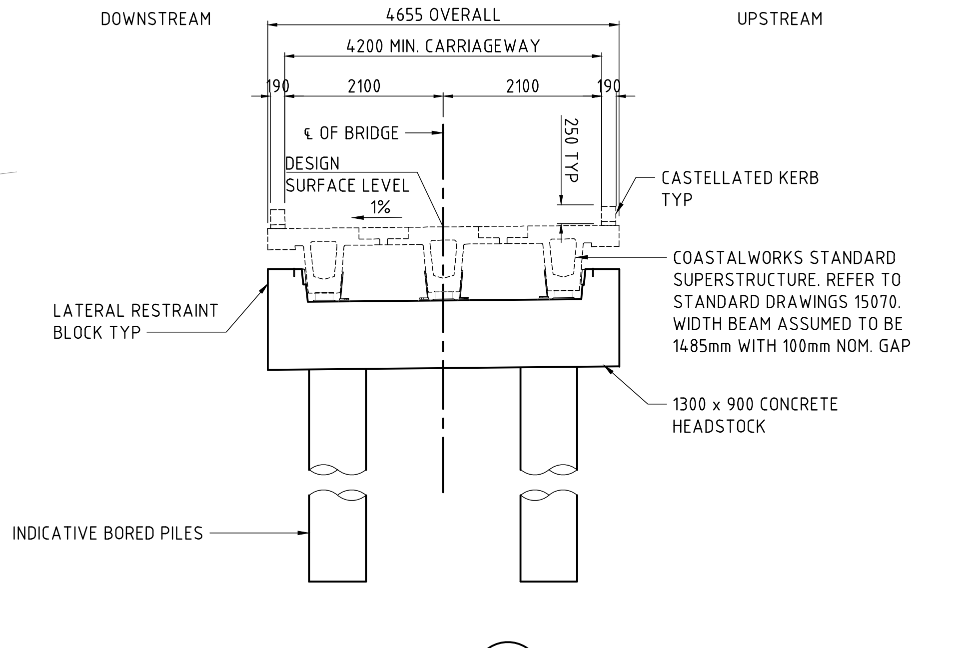
17) <u>Complete rock scour protection</u> – on upstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

18) <u>Demobilise construction activities</u> – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.

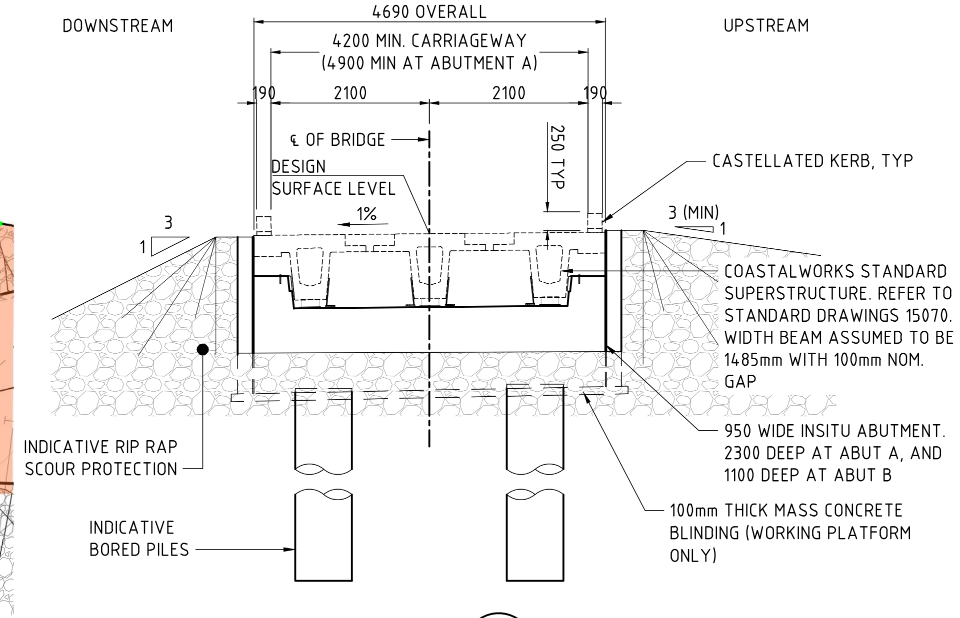


	END OF DECK ABUTMENT A	℄ OF PIER 1	℄ OF PIER 2	℄ OF PIER 3	END OF DECK ABUTMENT B
DESIGN SURFACE LEVEL ALONG MC00	41.100	41.100	41.100	41.100	41.100
APPROXIMATE EXISTING SURFACE LEVEL MC00	37.959	36.417	37.386	38.282	38.755
CHAINAGE ALONG MC00	60.860	67.870	85.890	97.910	109.920

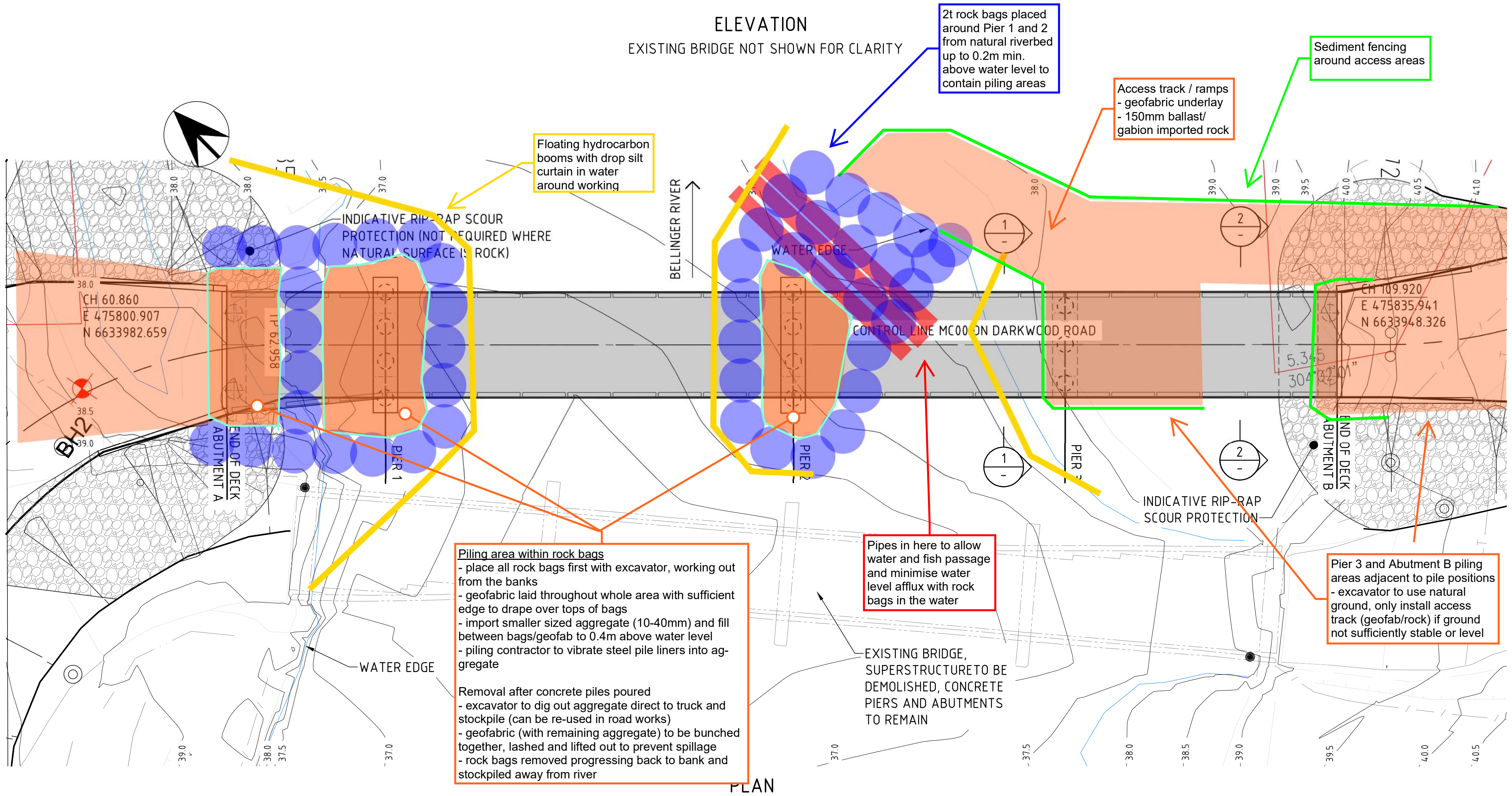
ELEVATION
EXISTING BRIDGE NOT SHOWN FOR CLARITY



SECTION 1



SECTION 2



PLAN

GENERAL NOTE:
ONLY ONE ROCK BAG ACCESS AREA TO BE IN THE WATER AT ANY ONE TIME. FOR EXAMPLE:
- INSTALL ROCK BAG PLATFORM TO PIER 1 AND ABUTMENT A
- COMPLETE PIER 1 & ABUTMENT A PILING WORKS COMPLETELY (CONCRETE POURED)
- REMOVE THIS AREA AND RE-INSTALL FOR PIER 2
- COMPLETE PILING WORKS AT PIER 2
- REMOVE BAGS AND STOCKPILE

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
03	01/06/2023	MINOR AMMENDMENTS	JR	DM	CR
02	17/05/2023	MINOR AMMENDMENTS	JR	DM	CR
01	19/04/2023	CONCEPT DESIGN	JR	DM	CR

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BRIDGE KNOWLEDGE PTY LTD

BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

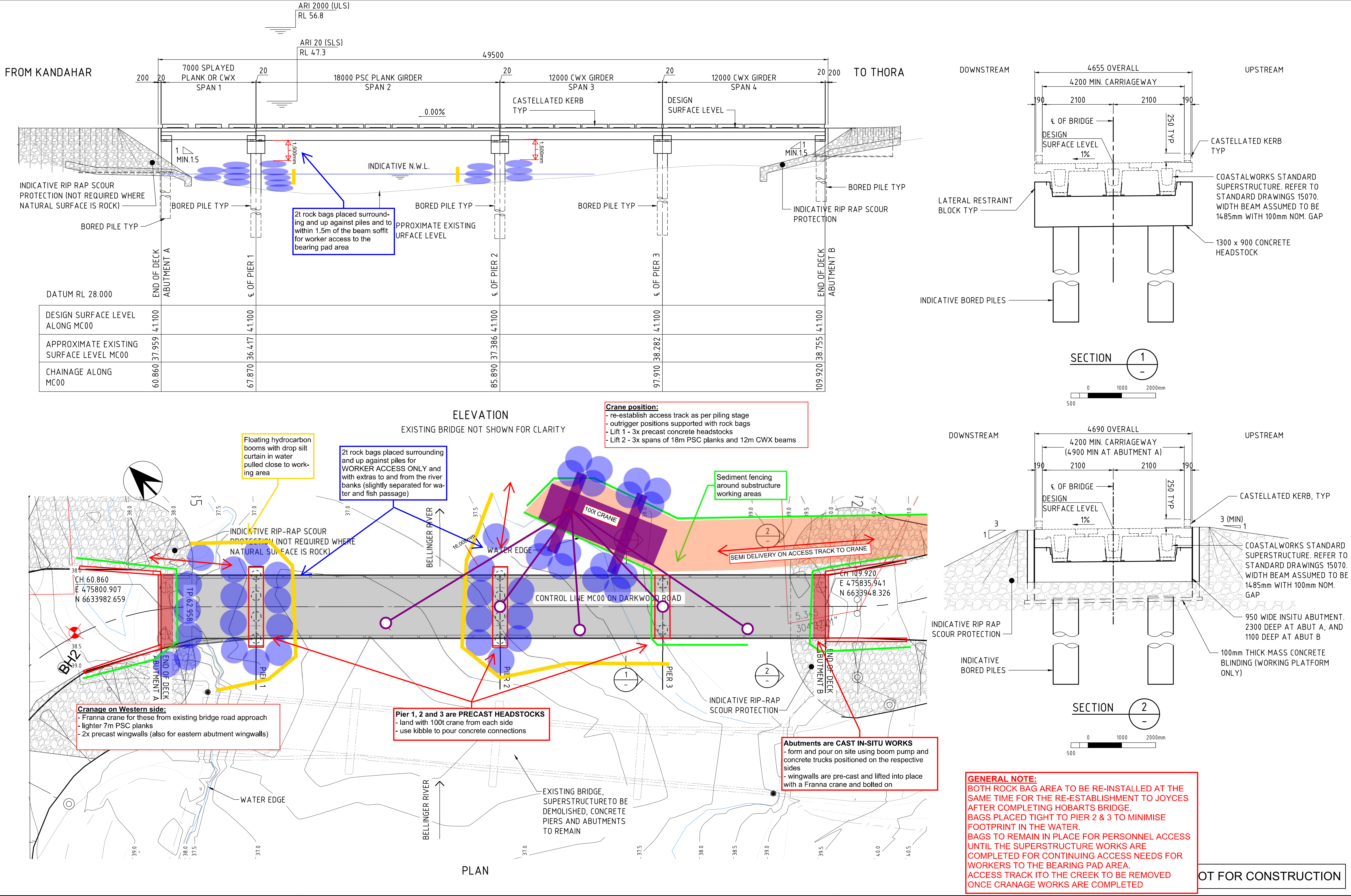
TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	YT
APPROVED	DM

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE

PILING ACCESS PLAN

DRAWING SET No	BKP372-BSC
BRIDGE No	DRG-005
ISSUE STATUS	CONCEPT DESIGN
ISSUE	03
No SHEETS	5
SHEET No	05



GENERAL NOTE:
BOTH ROCK BAG AREA TO BE RE-INSTALLED AT THE SAME TIME FOR THE RE-ESTABLISHMENT TO JOYCES AFTER COMPLETING HOBARTS BRIDGE.
BAGS PLACED TIGHT TO PIER 2 & 3 TO MINIMISE FOOTPRINT IN THE WATER.
BAGS TO REMAIN IN PLACE FOR PERSONNEL ACCESS UNTIL THE SUPERSTRUCTURE WORKS ARE COMPLETED FOR CONTINUING ACCESS NEEDS FOR WORKERS TO THE BEARING PAD AREA.
ACCESS TRACK ITO THE CREEK TO BE REMOVED ONCE CRANAGE WORKS ARE COMPLETED

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
03	01/06/2023	MINOR AMMENDMENTS	JR	DM	CR
02	17/05/2023	MINOR AMMENDMENTS	JR	DM	CR
01	19/04/2023	CONCEPT DESIGN	JR	DM	CR

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BRIDGE KNOWLEDGE PTY LTD

BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	YT
APPROVED	DM

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE

CRANAGE ACCESS PLAN

DRAWING SET No	BKP372-BSC
BRIDGE No	DRG-005
ISSUE STATUS	CONCEPT DESIGN
ISSUE	03
No SHEETS	5
SHEET No	05

DARKWOOD ROAD 3 BRIDGES – EXAMPLE CONSTRUCTION METHODOLOGY PHOTOES

Excavator with 2t vibratory unit used to pitch steel pile liners

Excavator mounted pendulum pile boring rig with extendable Kelly bar and access ramps –

Excavator mounted rock anchor drilling setup (7-12t sized machine) with splatter screens used next to waterway

On-site grout mixing station for rock anchors up on banks away from anchors

Same smaller excavator (7t) rock anchor rig

Containment system used for pouring concrete bored piles to prevent concrete overpour entering the waterway


Kibble being used for on-site pours at headstocks near water to control concrete

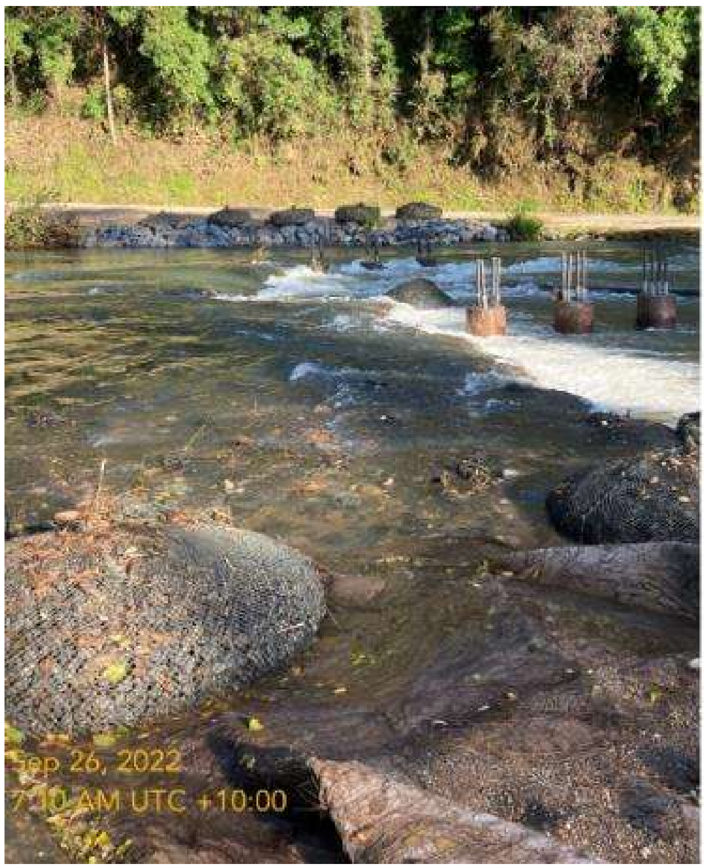
Cast in-situ headstock with elevated temporary works walkway around

Rock bags used as an access track and crane platform for landing precast components

Concrete deck pour with elevated walkway attached to bridge planks

Riverbank access ramp and working area and rock scour protection with excavator

Rock bags used to pin down geofabric with boom adjacent in water

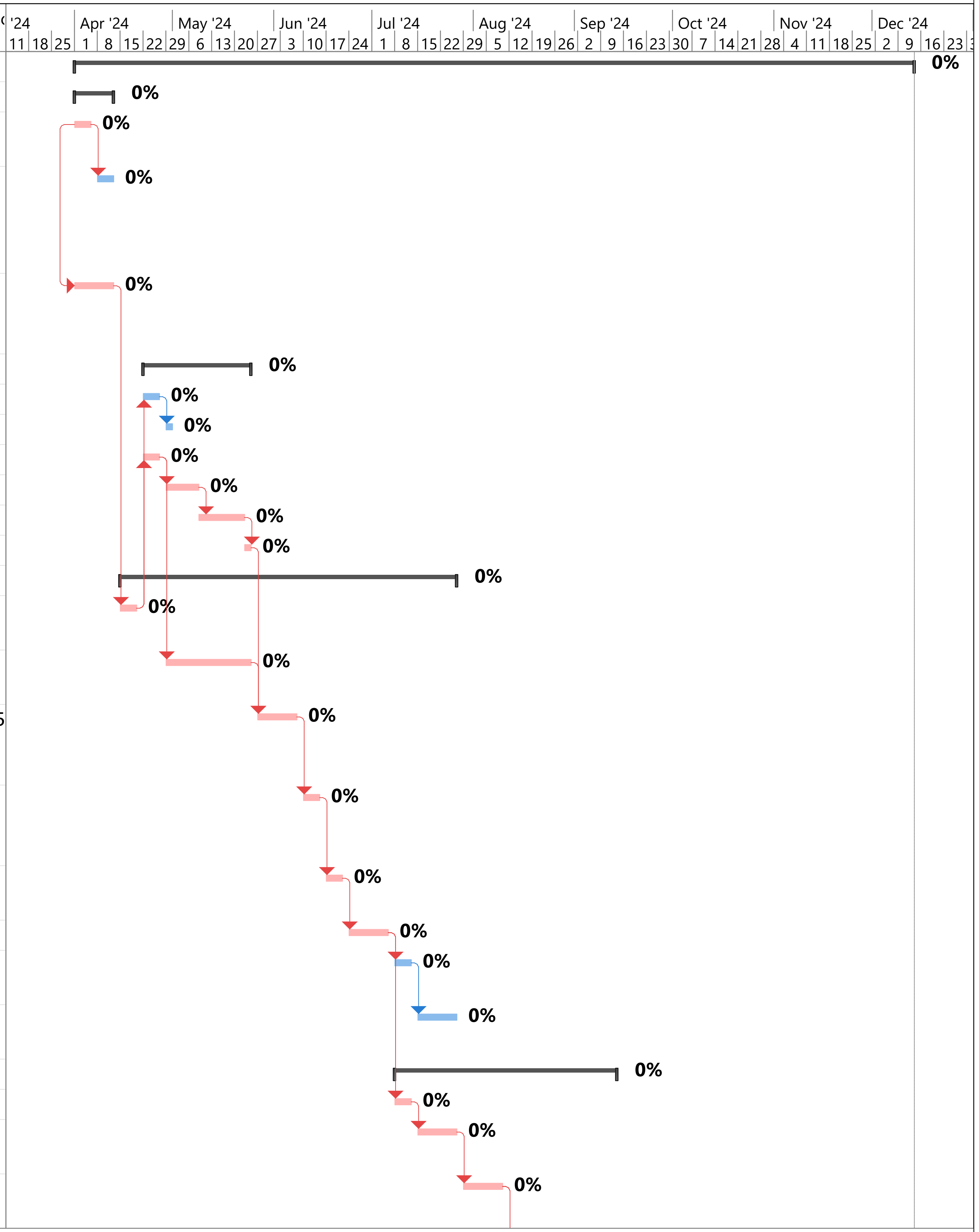


Rock bag access track being overtopped and remaining in place without any material loss during high water flow conditions

Landing precast concrete panels onto steel girder span

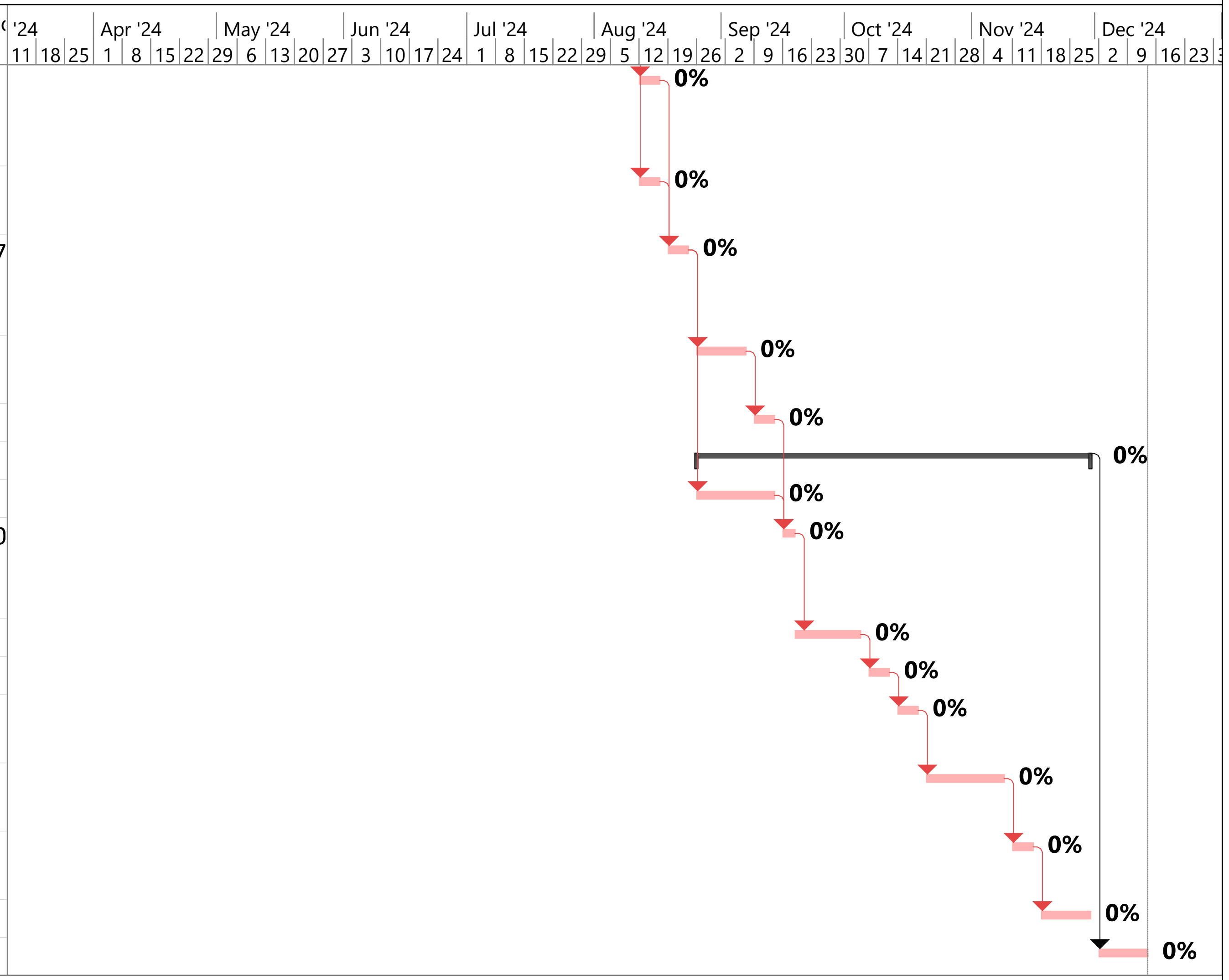
2024 Darkwood Bridges Program 5.7.23 - preferred

ID	Engineer	Task Name	Duration	Start	Finish	Predec
1	**2024**	**Coastal Works - Darkwood Bridges Program 2024**	**185 days**	**Mon 1/04/24**	**Fri 13/12/24**	
2		**Site Establishment all 3 sites**	**10 days**	**Mon 1/04/24**	**Fri 12/04/24**	
3	Crew 1	Main laydown & compound setup at Hobarts + major material deliveries	5 days	Mon 1/04/24	Fri 5/04/24	
4	Crew 1	ALL 3 SITES - vegetation clearing, piling material deliveries, establish excavator access tracks for river banks, ERSD controls at first pile positions and laydown and spoil areas	5 days	Mon 8/04/24	Fri 12/04/24	3
5	Crew 2	ALL 3 SITES - establish rock bag areas - Hobarts headstock, Joyces west abutment, Justins headstock and floating booms installed	10 days	Mon 1/04/24	Fri 12/04/24	3SS
6		**Piling all 3 sites**	**25 days**	**Mon 22/04/24**	**Fri 24/05/24**	
7	Crew 1	HOBARTS - mob, rock anchors (32) drilled, grouted	5 days	Mon 22/04/24	Fri 26/04/24	14
8	Crew 1	JUSTINS - rock anchors (10) and grouted incl. move	2 days	Mon 29/04/24	Tue 30/04/24	7
9	Crew 2	HOBARTS - mob, bored piles (5), pile reo & concrete pours	5 days	Mon 22/04/24	Fri 26/04/24	14
10	Crew 1	JUSTINS - bored piles (9) and poured, incl mob/demob	8 days	Mon 29/04/24	Wed 8/05/24	9
11	Crew 1	JOYCES - bored piles (16) & remove/stockpile rock bags	10 days	Thu 9/05/24	Wed 22/05/24	10
12	Crew 1	Contingency - days between to keep up, wet weather	2 days	Thu 23/05/24	Fri 24/05/24	11
13		**Hobarts Bridge (BSC)**	**75 days**	**Mon 15/04/24**	**Fri 26/07/24**	
14	Crew 2	Prepare all pile locations - box outs, blindings, ERSD controls, rock anchor bunds	5 days	Mon 15/04/24	Fri 19/04/24	5
15	Crew 2	Cast in-situ headstocks and abutments (during remaining piling works)	20 days	Mon 29/04/24	Fri 24/05/24	9
16	Both Crews	Cast in-situ headstocks and abutments completed both crews incl. scour rock in front of abutments and mortar pads	10 days	Mon 27/05/24	Fri 7/06/24	12,15
17	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove access tracks into creek, crane pads and landing prep	5 days	Mon 10/06/24	Fri 14/06/24	16
18	Both Crews	Land beams (2 days) & CoastalWorks beams stitch pours (3 days)	5 days	Mon 17/06/24	Fri 21/06/24	17
19	Both Crews	Plank span deck pour & approach slabs	10 days	Mon 24/06/24	Fri 5/07/24	18
20	Crew 2	Road works on approaches, swap traffic over, install kerbs and brackets	5 days	Mon 8/07/24	Fri 12/07/24	19
21	Crew 2	Demolition, final rock scour, full restoration, pack up & contingency	10 days	Mon 15/07/24	Fri 26/07/24	20
22		**Justins Bridge**	**50 days**	**Mon 8/07/24**	**Fri 13/09/24**	
23	Crew 1	Relocate compound from Hobarts, ERSD controls etc.	5 days	Mon 8/07/24	Fri 12/07/24	19
24	Crew 1	Cast in-situ headstocks and abutments (3) incl. elevated temporary support for headstock at start	10 days	Mon 15/07/24	Fri 26/07/24	23
25	Both Crews	Cast in-situ headstocks and abutments incl. scour rock in front of abutments	10 days	Mon 29/07/24	Fri 9/08/24	24



Critical	Split	Finish-only	Baseline Milestone	Manual Summary	Inactive Task
Critical Split	Task Progress	Duration-only	Milestone	Project Summary	Inactive Milestone
Critical Progress	Manual Task	Baseline	Summary Progress	External Tasks	Inactive Summary
Task	Start-only	Baseline Split	Summary	External Milestone	Deadline

ID	Engineer	Task Name	Duration	Start	Finish	Predec
26	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove rock bags area, crane pads and landing prep	5 days	Mon 12/08/24	Fri 16/08/24	25
27	Both Crews	Steel girders deliverd and put together with franna on west side	5 days	Mon 12/08/24	Fri 16/08/24	25
28	Both Crews	Land beams and deck panels (2 days) & CoastalWorks beams stitch pour & complete steel girder deck bolting and grouting	5 days	Mon 19/08/24	Fri 23/08/24	26,27
29	Crew 1	Road works on approaches, install kerbs and brackets, swap traffic over	10 days	Mon 26/08/24	Fri 6/09/24	28
30	Crew 1	Demolition, final rock scour, full restoration, pack up	5 days	Mon 9/09/24	Fri 13/09/24	29
31		**Joyces Bridge**	**70 days**	**Mon 26/08/24**	**Fri 29/11/24**	
32	Crew 2	Precast 3x Joyces headstocks (CoastalWorks Precast Yard)	15 days	Mon 26/08/24	Fri 13/09/24	28
33	Both Crews	Relocate compound from Justins, re-install rock bag access for personnel access to headstocks only & crane pads	3 days	Mon 16/09/24	Wed 18/09/24	32,30
34	Both Crews	Cast in-situ abutments and bearing pads	12 days	Thu 19/09/24	Fri 4/10/24	33
35	Both Crews	Scour rock protection, approaches general fill	5 days	Mon 7/10/24	Fri 11/10/24	34
36	Both Crews	Land beams (2 days) & Coatalworks beams stitch pours (3 days)	5 days	Mon 14/10/24	Fri 18/10/24	35
37	Both Crews	Plank spans (2) deck pours & approach slabs & install kerb units	15 days	Mon 21/10/24	Fri 8/11/24	36
38	Both Crews	Road works on approaches, swap traffic over, install kerbs	5 days	Mon 11/11/24	Fri 15/11/24	37
39	Both Crews	Demolition, final rock scour, full restoration and pack up	10 days	Mon 18/11/24	Fri 29/11/24	38
40		**Contingency / wet weather**	**10 days**	**Mon 2/12/24**	**Fri 13/12/24**	**31**



Critical	Split	Finish-only	Baseline Milestone	Manual Summary	Inactive Task
Critical Split	Task Progress	Duration-only	Milestone	Project Summary	Inactive Milestone
Critical Progress	Manual Task	Baseline	Summary Progress	External Tasks	Inactive Summary
Task	Start-only	Baseline Split	Summary	External Milestone	Deadline

DARKWOOD 2024 PROGRAM NOTES

Coastal Works intend to undertake the 3 Darkwood Road bridges – Hobarts, Joyces, Justins – as a single program of works commencing in April 2024 to December 2024. Preferred program utilises a typical rock anchor installation small excavator rig with air drilling. Below outlines some of the key dates for the construction sequence:

Site Establishment – April 2024
- Main compound and laydown set up at Hobarts.
- Laydown and piling material deliveries at all 3 bridges.
- Vegetation clearing complete at all 3 bridges
- Establish access points down banks and first piling position at all 3 sites with rock bag setups – 1x headstock at Hobarts, western headstock at Joyces, headstock at Justins.
- Establish all piling positions at Hobarts
- Install erosion and sed controls at all 3 bridges for laydown and piling positions

Piling All 3 bridges – April to June 2024
- Start at Hobarts with the two piling setups concurrently, one 7t excavator rock anchor setup and one 24t excavator for bored piles – aim for completion all in 1 week
- Both setups to move onto Justins Bridge – rock anchor completed in 3 days and setup demobilised from site, bored piles continue – 1.5 weeks
- Bored piling setup moves onto Joyces bridge last, first at previously established western side access which is then removed and established on the east side for completion – 2 weeks
- Coastal Works crews with an excavator to follow the piling crews to manage laydowns, modify the access requirements, remove piling spoil and maintain and adjust environmental controls.
- Coastal Works crew complete the bored pile pours progressively along with the contractor
- Justins site rock bags to remain at headstock to remain, Joyces river access completely removed.

Hobarts Main Bridge Construction – May – August 2024
- Cast in-situ substructure works (6 weeks) to commence in May with one CoastalWorks crew once all piling is completed and piling is continuing at the other sites.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in June.
- Superstructure to be landed, poured, and completed in July with both crews.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in late July and into August.

Justins Main Bridge Construction – July – September 2024
- Relocate main compound setup from Hobarts to Justins in late July once the Hobarts superstructure is completed with second CoastalWorks crew.
- Cast in-situ substructure works (4 weeks) to commence in August with one CoastalWorks crew and completed by both crews once Hobarts is completed.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in late August.
- Superstructure to be landed, poured, and completed in early September.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in September.

Joyces Main Bridge Construction – July – September 2024
- While Justins being finished, 3x precast headstocks made with second crew at Precast Yard.
- Relocate main compound setup from Justins to Joyces in October and reinstate rock bag access to the headstocks for personnel only and crane pads positions for landing precast components.
- Cast in-situ abutments (2 weeks) to be completed in October with both crews.
- Scour rock at abutments placed and abutment backfill completed in late October.
- Superstructure to be landed, poured, and completed by mid-November with both crews.
- Remove rock bags and bank access and complete the roadworks, remaining scour rock protection, demolition, and restoration in late November and December.

Appendix D

Hobarts Bridge Design and Construction Methodology

HOBARTS BRIDGE REPLACEMENT

Project Description

Coastal Works are replacing Hobarts Bridge over the Bellinger River on Darkwood Road, Darkwood under contract works for Bellingen Shire Council. The existing 48m five span, timber bridge will be removed and replaced adjacent with a new 54m four span, all concrete bridge on an improved alignment downstream. The site is located approx. 20km west of Bellingen, is highly flood prone and is in key habitat for the Bellinger River Snapping Turtle.

Existing Timber Bridge

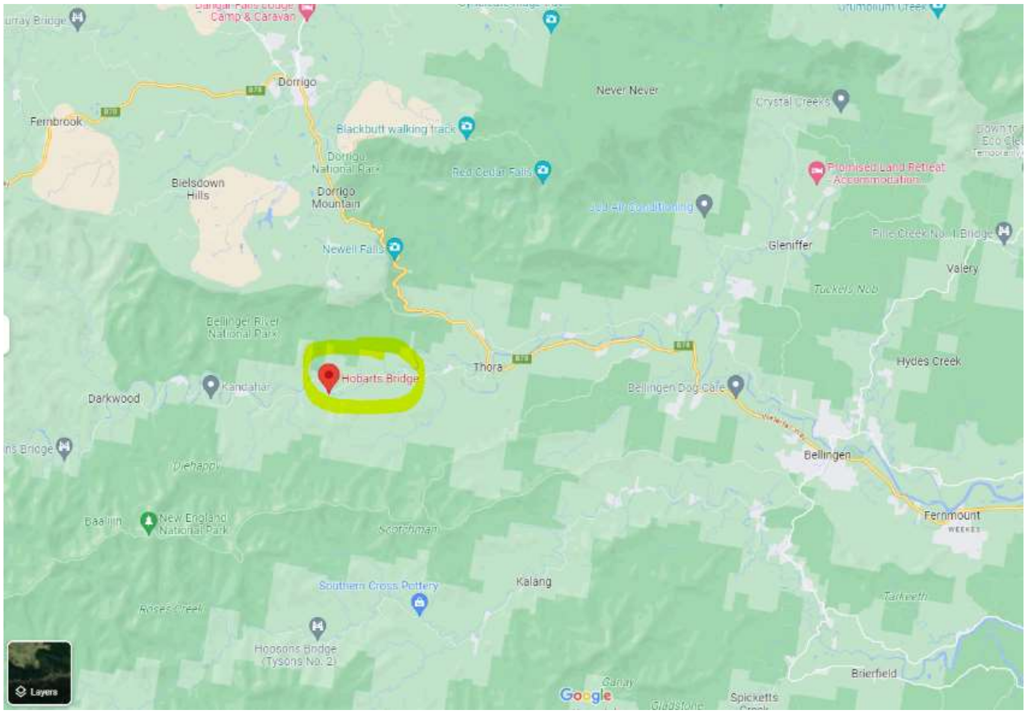
Form of Construction

Foundations – bored, cast in-situ concrete piles (600mm diameter) at one abutment and one headstock, rock anchors at the other abutments and two headstocks into high level rock

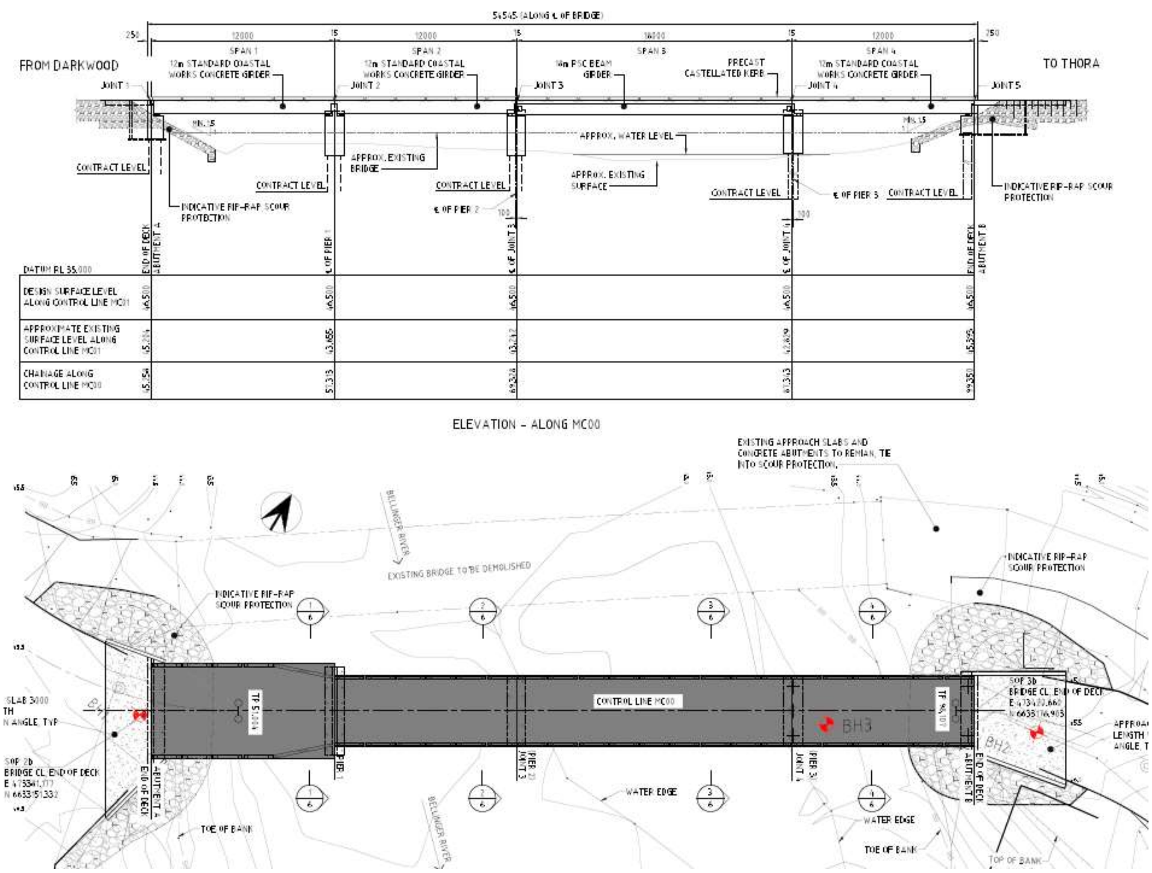
Substructure – cast in-situ reinforced concrete abutments and headstocks throughout, shorter at the two foundations with the bored piles and taller blade walls at the other rock anchor foundations poured directly onto the exposed high level rock shelf, rock scour protection on bank and around abutments

Superstructure - precast concrete CoastalWorks 12m bridge beams for 3 spans and one longer span using 18m PSC pre-stressed bridge planks and a cast in-situ deck pour, cast in-situ concrete approach slabs, bolt on concrete kerbs

Road approaches – 40m of road works one side and 50m the other side to tie into existing road, two coat bitumen seal, 6m wide plus fill formations, open swale drains



Location Map



New Bridge Design

Construction Methodology & Sequence

1) Establishment:
    a. Set up compound, laydown and stockpile areas in the Darkwood Road shoulder on the eastern approach off the road and above the high flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones,
    c. Installation of erosion and sediment controls for piling and river access ramps including booms in the water,
    d. Delivery of all piling and cast in situ work materials/formwork,
    e. Delivery of pre-filled rock bags,
    f. Establish bunded concrete washout and spoil areas at laydown area.

2) Access to riverbed from high banks:
    a. Clear and grub vegetation and topsoil from ramp areas, stockpile away from river for later rehabilitation works or remove from site,
    b. On Thora (East) side, the access ramp is to be immediately downstream of the abutment down to existing stable alluvial gravel shelf. If the alluvial shelf does not churn up with the excavator tracks, then it will be accessed as is and flattened off at completion. If this is not the case, the access ramp construction will extend onto this area also for stability,
    c. On the school side (West), the access ramp is to be between new and existing abutments (shortest bank height) down onto existing exposed rock shelf. Rock shelf is suitable for tracked machine and foot access without a need to import access track materials. A minor amount of loose deposited gravels on top of the rock shelf may be shifted for leveling of plant and equipment.
    d. Access ramps to be constructed with:
        i. Geofrabric underlay – extra length on the upstream side that can be used to wrap over the ramp and pinned down with rock bags during high flow events to prevent wash out,
        ii. 150mm thick, clean imported ballast (40-60mm) and/or gabion (50-200mm)

3) Prepare piling areas prior to piling contractor mobilization:
    a. Abutments (one bored, one rock anchors)
        i. Box down to underside of abutment plus 75mm for blinding layer, remove spoil to stockpile areas,
        ii. Level off adjacent area for positioning of piling rig,
        iii. Bench excavation for stability if needed and install edge delineation.
    b. At Pier 3 (bored piles, east side of water) – blinding slab to be used to aid in keeping piles in correct position and providing a slab for the cast in-situ blade wall style headstock works:
        i. Place approximately 10 rock bags wrapped in geofabric along the edge of the low flow creek line to pin down the edge of the alluvial riverbed material and provide containment for the working area,
        ii. Pull floating hydrocarbon boom tight to the water side of the rock bags and install sediment fencing around the inside of the bag rim,
        iii. Over a 5m x 1.5m area over the footprint of the bored piles, excavator to dig down 1m to remove any larger cobbles,
        iv. Stand up 3 short steel pile liners in the wet excavation,

        v. Pour a 0.5-1.0m deep reinforced concrete blinding slab 5m x 1.5m around the pile liners to approximately 200mm above low flow water level.
    c. At Pier 1 and 2 (rock anchors) – reverse blinding layer to be used around the outside of the blade wall plan area to contain the footprint for piling works and later cast in-situ works from the waterway:
        i. Clear loose debris and river gravel from the blade wall footprint by hand and excavator,
        ii. Pier 2 is in a dry position on the rock shelf – form blinding with timber formwork and pour reinforced blinding ring,
        iii. Pier 3 is 75% dry with one corner in shallow approx. 0.3m deep water. For this corner first place sandbags to above water level, then line with multiple layers of building plastic on the inside and then timber formwork on top of this in the water. Use a sucker truck to remove water from inside this corner as it is displaced by the concrete pour,
        iv. Drier concrete mix to be used to minimise risk of seepage into the adjacent water and lifters cast in so that the blinding can be easily and fully removed after completion of the blade wall.

4) <u>Bored piling works:</u>
    a. Plant & equipment –30t excavator with a 2t vibratory head attachment and pendulum drill head with Kelly bar for the auger.
    b. Abutment B – excavator positioned on existing ground behind abutment,
    c. Pier 3 – excavator positioned on existing river gravel shelf between Abutment B and pier.
    d. Vibratory head used to install permanent mild steel liners in position first from ground level. Abutment B may not require these, Pier 3 to have liners vibrated down inside the established blinding.
    e. Pile clean-out material placed either directly in a skip bin or on a geofabrics lined area adjacent the piling area so it can be removed from the riverbed area to the established stockpile area (or off site) daily. 2m screens of geofabric or ply to be erected along the line of rock bags at Pier 3 to deflect any loose material entering the water as the auger is pulled out.
    f. After piles are cleared, place cages and pour concrete with concrete boom pump up at existing road level behind the abutment. Sucker truck to remove water from the wet pile holes during concrete placement.
    g. Concrete overpour out of top of piles (typically 0.2m3 per pile) to be contained at Pier 3 with tarps. Overpour at Abutment B used as a blinding slab.

5) <u>Rock anchor works:</u>
    a. Plant & equipment – 7t-10t excavator with a specialist air drilling attachment with Down Hole Hammer (DHH) and on-site grout mixing station. DHH option keeps noise and vibration down the hole rather than an above ground hammer which is much noisier above.
    b. Install 2m high spray screens, using geofabric or ply, on 3 sides of the rock anchor areas to deflect any natural rock spray from entering the water.
    c. Excavator drill rig to be positioned on the rock shelf well clear of the water between Pier 1 and 2 and on the existing road level for Abutment A,
    d. Grout mixing station to be on the western existing road near Abutment A out of the riverbed and banks. Bund the area from overspill and grout hoses to

    the rock anchor working area to be plastic wrapped or run in a larger diameter conduit to capture any potential break.
  e. Concrete revers blinding to be 200mm higher than rock level to act as containment for flushing of the rock anchor holes (water and rock sediment) and for containing grout overpour. These can be removed by sucker truck at end of works to tidy area ready for cast in-situ works.

6) Cast in-situ concrete sub-structure:
   a. Reinforcement placed and tied in place by hand inside reverse blindings at piers and on traditional blinding at abutments all above low flow water level.
   b. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
   c. Two blade walls will require elevated walkway up to the top of concrete which will all cantilever off the formwork and not require additional footprint on the riverbed other than a ladder.
   d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour all substructure works. Pump and concrete trucks to be brought to the respective sides of the river for pours so the boom line is not over the waterway at any time. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
   e. Strip all formwork and remove reverse blinding after concrete curing period,
   f. Install cantilevered walkway access platforms off new concrete for access to bearing pad level for piers,
   g. Complete mortar pads by hand mixed mortar to finish all substructures.

7) Fully remove piling access tracks – excavator to progressively remove rock bags, imported ramp materials and geofrabirc underlay working away from the water on each side back to the high banks. All imported rock to be re-used for road backfill.

8) Place scour rock around abutments – place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks. Excavator to place scour rock from established access ramps and then from behind abutments out of the riverbed area.

9) General fill and drainage zone behind abutments – place and compact area immediately behind abutments up to underside of approach slabs. Maintain access to existing bridge for road traffic. All trucks, rollers and excavators out of the creek and sediment fencing along the whole bank lines to contain from any wet weather during this period.

10) Establish crane outrigger positions – use rock bags placed either side either side of the existing timber bridge as outrigger positions, one set on the western end and one on the eastern end using an excavator from the existing bridge deck. Cranes to be positioned on the first 10m of the existing bridge for landing precast components under full road closure.

11) Land all precast beams and planks and tie cast in-situ deck and approach slabs – sealed soffit formwork to be used between planks and beams to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Temporary

access platforms to be installed along the outside edges for the 18m plank span for access and edge formwork.

12) Pour beam and deck pours – CoastalWorks 12m beam spans poured first, 18m plank span second with the approach slabs. Boom pumps to be again used from the respective sides without putting the line over the waterway. Curing of the deck pour to be done with clean water, soaker hoses and hessian.

13) Install bolt on kerb units onto plank span

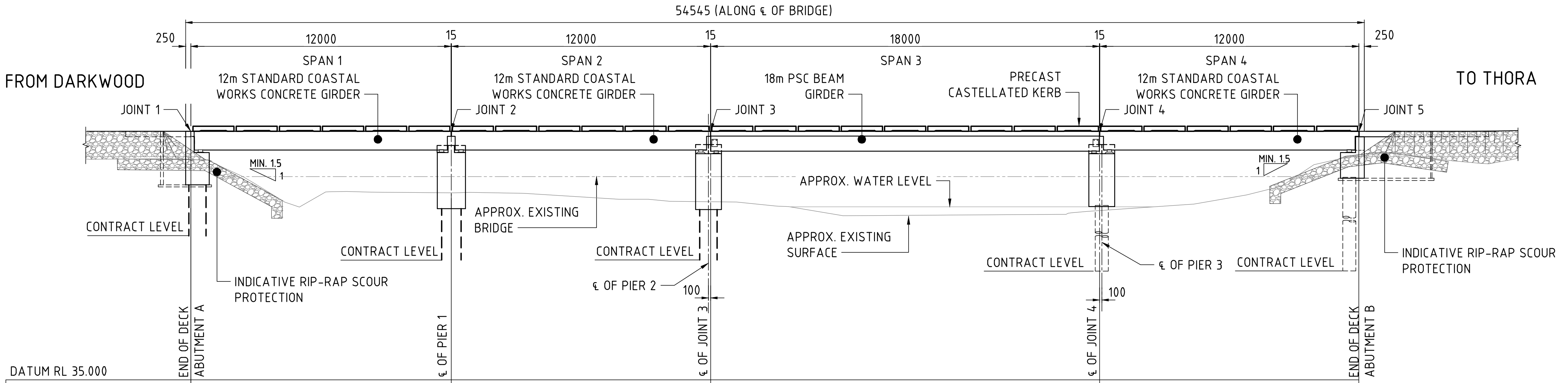
14) Remove temporary works from headstocks and plank span – use Franna crane and or HIAB truck on the new deck to lift out and load directly to laydown area.

15) Complete approach roadworks – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

16) Demolish original bridge:
    a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers.
    b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing ply and timber decking first followed by girders for each span. No access off deck required for this.
    c. Once deck fully removed, remove headstocks on the western side that are accessible outside of the low flow water area only. Use rock breaker on excavator to break up and then remove in largest possible pieces by excavator and by hand.
    d. For non-accessible headstocks in the water flow area, access via floating platform and remove timber components from above water with chainsaw and oxy cutting bolts down to top of concrete. Concrete headstocks to remain.
    e. Existing concrete abutments to remain in place along bank edges to maintain stable banks into the future as scour protection.
    f. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

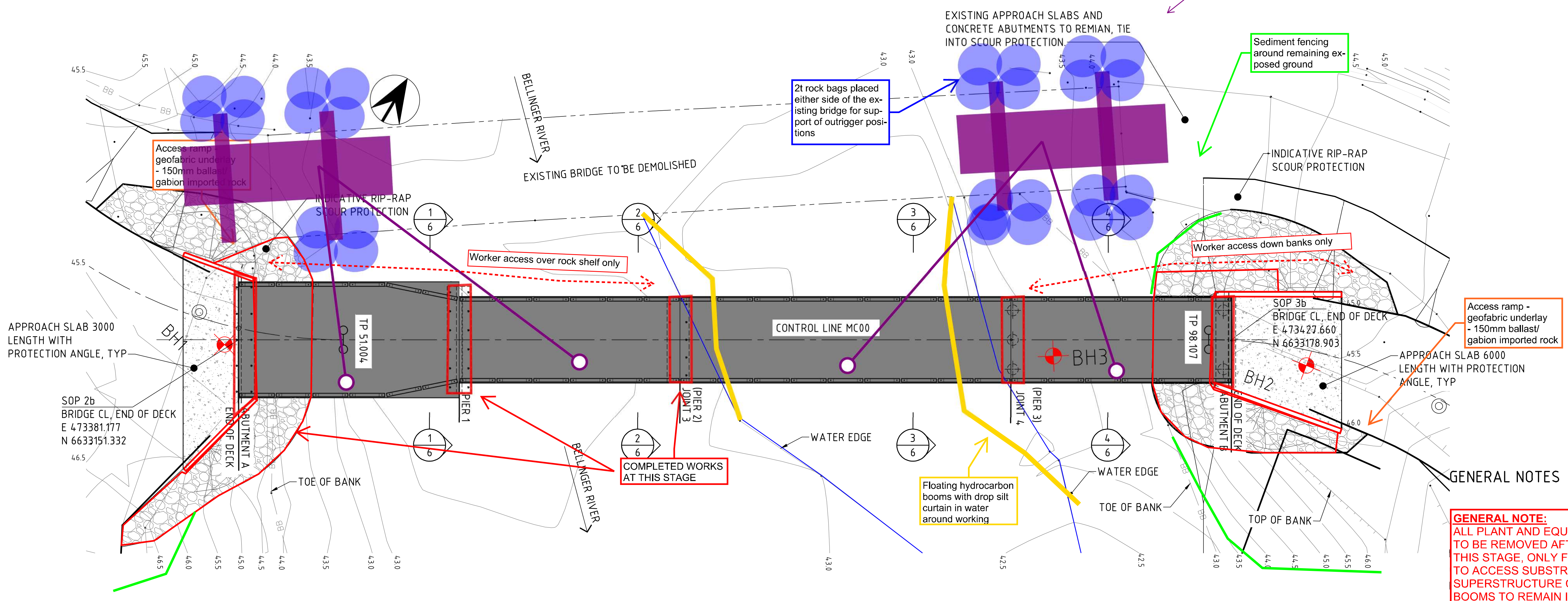
17) Complete rock scour protection – on upstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

18) Demobilise construction activities – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.



	END OF DECK ABUTMENT A	℄ OF PIER 1	℄ OF JOINT 3	℄ OF JOINT 4	END OF DECK ABUTMENT B
DESIGN SURFACE LEVEL ALONG CONTROL LINE MC01	46.500	46.500	46.500	46.500	46.500
APPROXIMATE EXISTING SURFACE LEVEL ALONG CONTROL LINE MC01	45.204	43.655	43.242	42.829	45.393
CHAINAGE ALONG CONTROL LINE MC00	45.258	57.313	69.328	87.343	99.350

ELEVATION - ALONG MC00



PLAN

GENERAL NOTES

GENERAL NOTE:
ALL PLANT AND EQUIPMENT ACCESS TO THE RIVER TO BE REMOVED AFTER CAST IN-SITU WORKS BY THIS STAGE, ONLY FOOT TRAFFIC FOR WORKERS TO ACCESS SUBSTRUCTURE DURING SUPERSTRUCTURE COMPLETION.
BOOMS TO REMAIN IN PLACE UNTIL SUPERSTRUCTURE COMPLETE

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
02	15/06/2023	100% DETAIL DESIGN	JR	DM	CR
01	05/05/2023	80% DETAIL DESIGN	JR	DM	CR

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSE OF THE NOMINATED PROJECT

DESIGNER: bk. bridge knowledge ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE LTY PTD

CONTRACTOR: CW COASTAL WORKS — COASTAL WORKS

CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

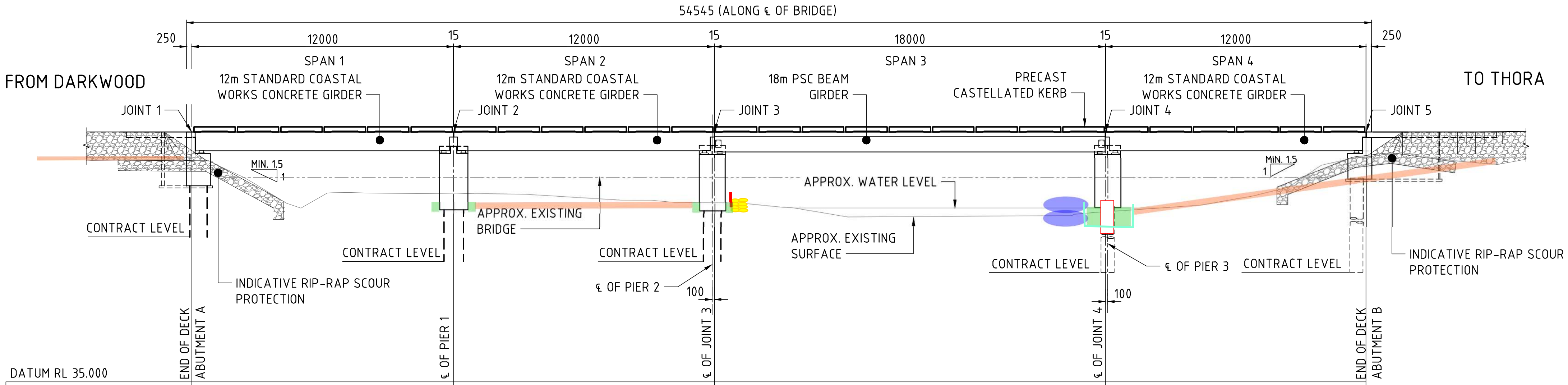
TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

HOBARTS BRIDGE
REPLACEMENT OVER BELLINGER RIVER

CRANAGE ACCESS PLAN

DRAWING SET No: BKP397-BSC
BRIDGE No: DRG-005
ISSUE STATUS: DETAIL DESIGN
ISSUE: 02 | No SHEETS: 34 | SHEET No: 05



DESIGN SURFACE LEVEL ALONG CONTROL LINE MC01	46.500	46.500	46.500	46.500	46.500
APPROXIMATE EXISTING SURFACE LEVEL ALONG CONTROL LINE MC01	45.204	43.655	43.242	42.829	45.393
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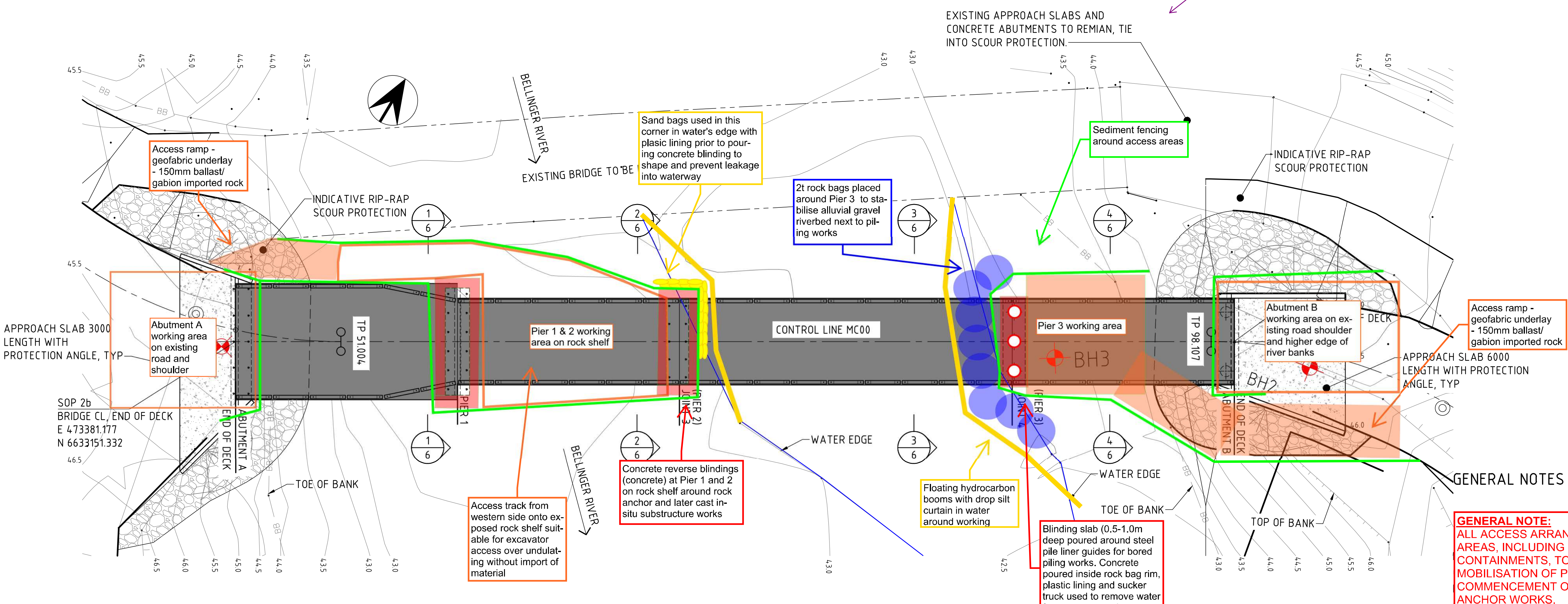
ELEVATION - ALONG MC00



PLAN

GENERAL NOTES

GENERAL NOTE:
ALL ACCESS ARRANGEMENTS FOR ALL PILING AREAS, INCLUDING REVERS BLINDING CONTAINMENTS, TO BE IN PLCE PRIOR TO MOBILISATION OF PILING CONTRACTOR AND COMMENCEMENT OF ANY PILING OR ROCK ANCHOR WORKS.
ALL FULLY REMOVABLE - REVERSE BLINDINGS AT PIER 1 & 2 TO BE COMPLETELY REMOVED AFTE COMPLETION OF THE SUBSTRUCTURE.
BLINDING AT PIER 3 TO BE PERMANENT UNDERNEATH THE COMPLETED SUBSTRUCTURE.

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
02	15/06/2023	100% DETAIL DESIGN	JR	DM	CR
01	05/05/2023	80% DETAIL DESIGN	JR	DM	CR

DESIGNER: bk. bridge knowledge — BRIDGE KNOWLEDGE LTY PTD
CONTRACTOR: COASTAL WORKS — COASTAL WORKS
CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL
HOBARTS BRIDGE
REPLACEMENT OVER BELLINGER RIVER

PILING ACCESS PLAN

DRAWING SET No: BKP397-BSC
BRIDGE No: DRG-005
ISSUE STATUS: DETAIL DESIGN
ISSUE: 02 | No SHEETS: 34 | SHEET No: 05

DARKWOOD ROAD 3 BRIDGES – EXAMPLE CONSTRUCTION METHODOLOGY PHOTOES

Excavator with 2t vibratory unit used to pitch steel pile liners

Excavator mounted pendulum pile boring rig with extendable Kelly bar and access ramps –

Excavator mounted rock anchor drilling setup (7-12t sized machine) with splatter screens used next to waterway

On-site grout mixing station for rock anchors up on banks away from anchors


Same smaller excavator (7t) rock anchor rig

Containment system used for pouring concrete bored piles to prevent concrete overpour entering the waterway


Kibble being used for on-site pours at headstocks near water to control concrete

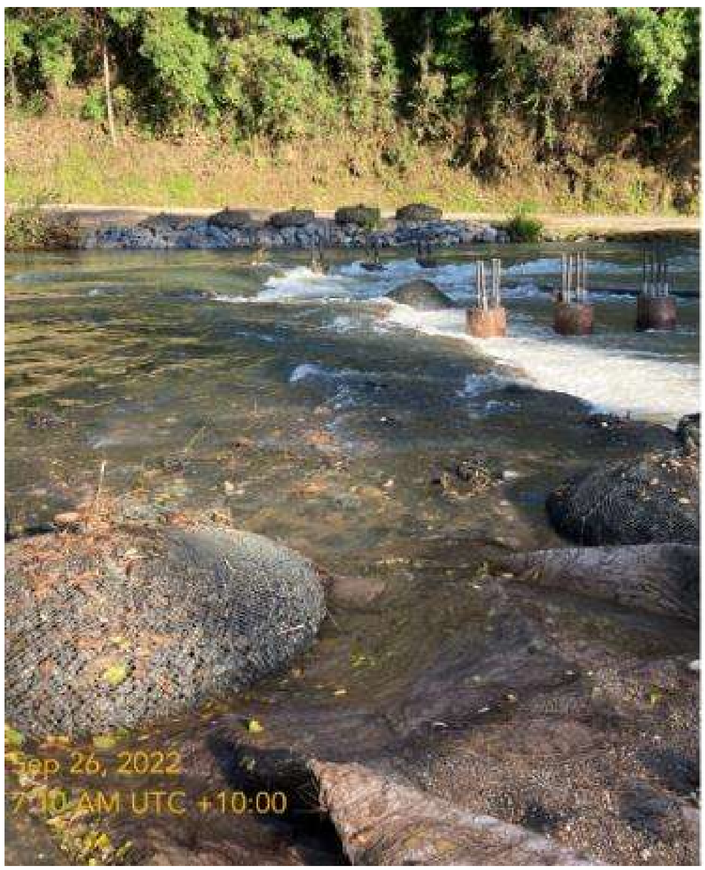
Cast in-situ headstock with elevated temporary works walkway around

Rock bags used as an access track and crane platform for landing precast components

Concrete deck pour with elevated walkway attached to bridge planks

Riverbank access ramp and working area and rock scour protection with excavator

Rock bags used to pin down geofabric with boom adjacent in water

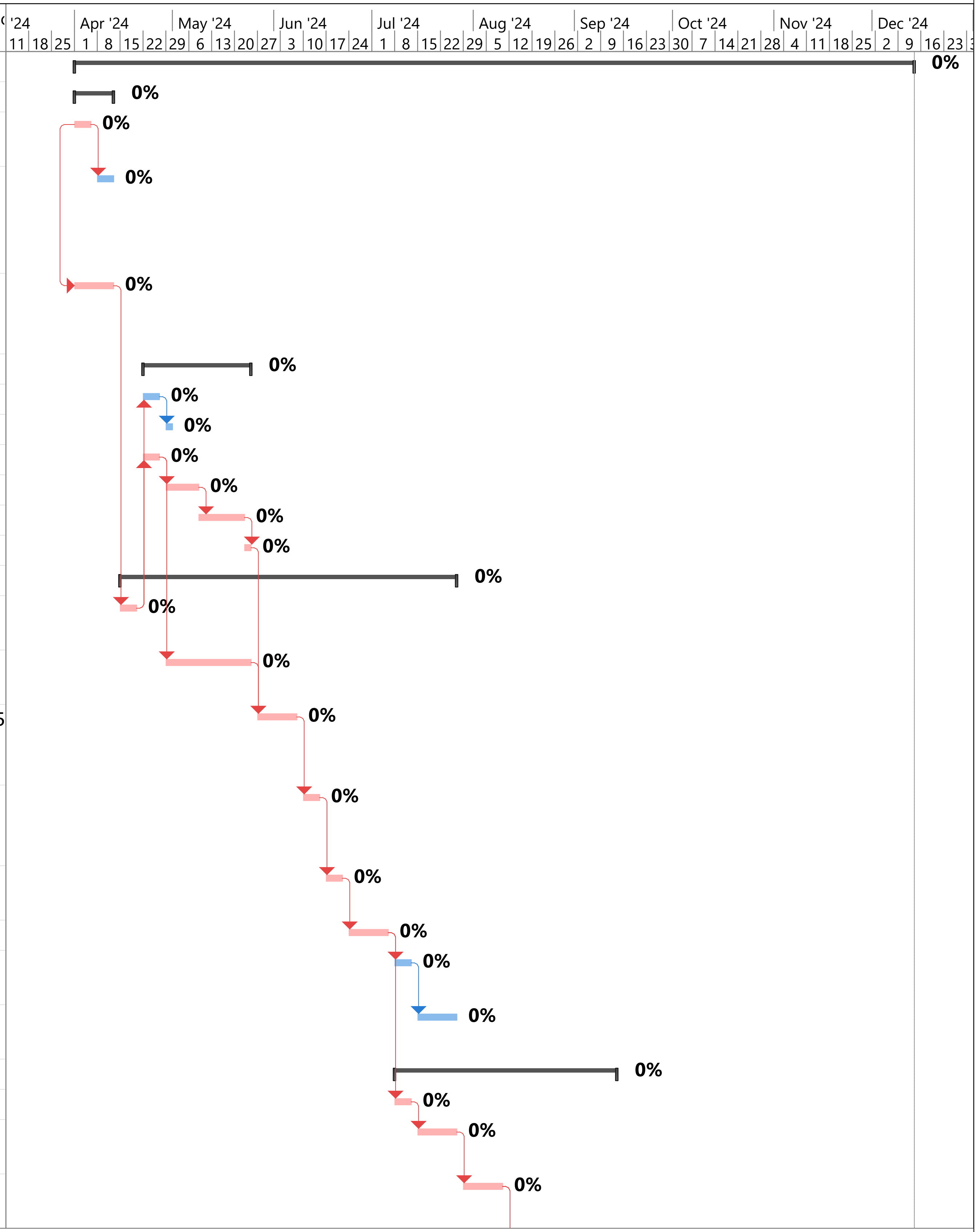


Rock bag access track being overtopped and remaining in place without any material loss during high water flow conditions

Landing precast concrete panels onto steel girder span

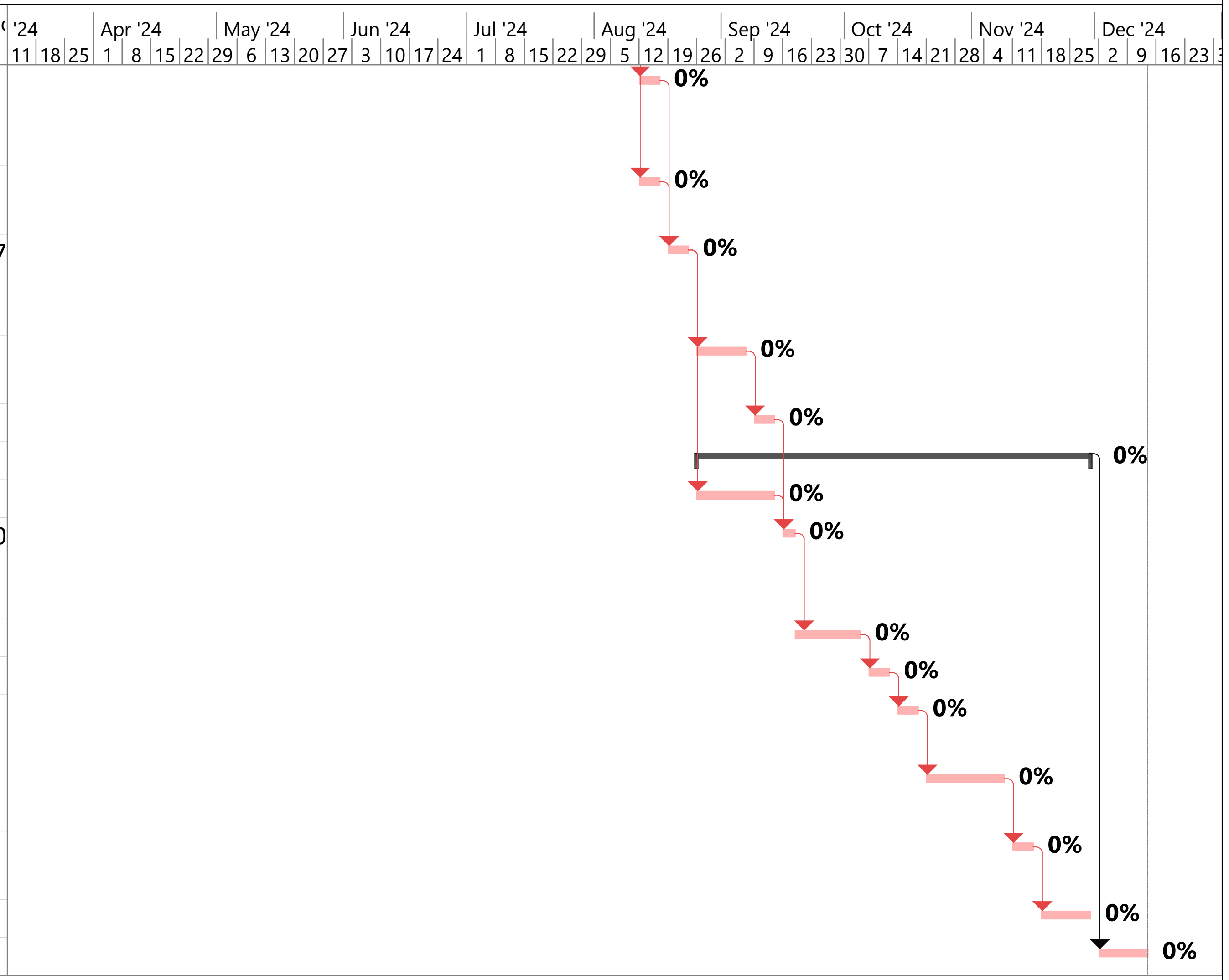
2024 Darkwood Bridges Program 5.7.23 - preferred

ID	Engineer	Task Name	Duration	Start	Finish	Predec
1	**2024**	**Coastal Works - Darkwood Bridges Program 2024**	**185 days**	**Mon 1/04/24**	**Fri 13/12/24**	
2		**Site Establishment all 3 sites**	**10 days**	**Mon 1/04/24**	**Fri 12/04/24**	
3	Crew 1	Main laydown & compound setup at Hobarts + major material deliveries	5 days	Mon 1/04/24	Fri 5/04/24	
4	Crew 1	ALL 3 SITES - vegetation clearing, piling material deliveries, establish excavator access tracks for river banks, ERSD controls at first pile positions and laydown and spoil areas	5 days	Mon 8/04/24	Fri 12/04/24	3
5	Crew 2	ALL 3 SITES - establish rock bag areas - Hobarts headstock, Joyces west abutment, Justins headstock and floating booms installed	10 days	Mon 1/04/24	Fri 12/04/24	3SS
6		**Piling all 3 sites**	**25 days**	**Mon 22/04/24**	**Fri 24/05/24**	
7	Crew 1	HOBARTS - mob, rock anchors (32) drilled, grouted	5 days	Mon 22/04/24	Fri 26/04/24	14
8	Crew 1	JUSTINS - rock anchors (10) and grouted incl. move	2 days	Mon 29/04/24	Tue 30/04/24	7
9	Crew 2	HOBARTS - mob, bored piles (5), pile reo & concrete pours	5 days	Mon 22/04/24	Fri 26/04/24	14
10	Crew 1	JUSTINS - bored piles (9) and poured, incl mob/demob	8 days	Mon 29/04/24	Wed 8/05/24	9
11	Crew 1	JOYCES - bored piles (16) & remove/stockpile rock bags	10 days	Thu 9/05/24	Wed 22/05/24	10
12	Crew 1	Contingency - days between to keep up, wet weather	2 days	Thu 23/05/24	Fri 24/05/24	11
13		**Hobarts Bridge (BSC)**	**75 days**	**Mon 15/04/24**	**Fri 26/07/24**	
14	Crew 2	Prepare all pile locations - box outs, blindings, ERSD controls, rock anchor bunds	5 days	Mon 15/04/24	Fri 19/04/24	5
15	Crew 2	Cast in-situ headstocks and abutments (during remaining piling works)	20 days	Mon 29/04/24	Fri 24/05/24	9
16	Both Crews	Cast in-situ headstocks and abutments completed both crews incl. scour rock in front of abutments and mortar pads	10 days	Mon 27/05/24	Fri 7/06/24	12,15
17	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove access tracks into creek, crane pads and landing prep	5 days	Mon 10/06/24	Fri 14/06/24	16
18	Both Crews	Land beams (2 days) & CoastalWorks beams stitch pours (3 days)	5 days	Mon 17/06/24	Fri 21/06/24	17
19	Both Crews	Plank span deck pour & approach slabs	10 days	Mon 24/06/24	Fri 5/07/24	18
20	Crew 2	Road works on approaches, swap traffic over, install kerbs and brackets	5 days	Mon 8/07/24	Fri 12/07/24	19
21	Crew 2	Demolition, final rock scour, full restoration, pack up & contingency	10 days	Mon 15/07/24	Fri 26/07/24	20
22		**Justins Bridge**	**50 days**	**Mon 8/07/24**	**Fri 13/09/24**	
23	Crew 1	Relocate compound from Hobarts, ERSD controls etc.	5 days	Mon 8/07/24	Fri 12/07/24	19
24	Crew 1	Cast in-situ headstocks and abutments (3) incl. elevated temporary support for headstock at start	10 days	Mon 15/07/24	Fri 26/07/24	23
25	Both Crews	Cast in-situ headstocks and abutments incl. scour rock in front of abutments	10 days	Mon 29/07/24	Fri 9/08/24	24



Critical		Split		Finish-only		Baseline Milestone		Manual Summary		Inactive Task	
Critical Split		Task Progress		Duration-only		Milestone		Project Summary		Inactive Milestone	
Critical Progress		Manual Task		Baseline		Summary Progress		External Tasks		Inactive Summary	
Task		Start-only		Baseline Split		Summary		External Milestone		Deadline	

ID	Engineer	Task Name	Duration	Start	Finish	Predec
26	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove rock bags area, crane pads and landing prep	5 days	Mon 12/08/24	Fri 16/08/24	25
27	Both Crews	Steel girders deliverd and put together with franna on west side	5 days	Mon 12/08/24	Fri 16/08/24	25
28	Both Crews	Land beams and deck panels (2 days) & CoastalWorks beams stitch pour & complete steel girder deck bolting and grouting	5 days	Mon 19/08/24	Fri 23/08/24	26,27
29	Crew 1	Road works on approaches, install kerbs and brackets, swap traffic over	10 days	Mon 26/08/24	Fri 6/09/24	28
30	Crew 1	Demolition, final rock scour, full restoration, pack up	5 days	Mon 9/09/24	Fri 13/09/24	29
31		**Joyces Bridge**	**70 days**	**Mon 26/08/24**	**Fri 29/11/24**	
32	Crew 2	Precast 3x Joyces headstocks (CoastalWorks Precast Yard)	15 days	Mon 26/08/24	Fri 13/09/24	28
33	Both Crews	Relocate compound from Justins, re-install rock bag access for personnel access to headstocks only & crane pads	3 days	Mon 16/09/24	Wed 18/09/24	32,30
34	Both Crews	Cast in-situ abutments and bearing pads	12 days	Thu 19/09/24	Fri 4/10/24	33
35	Both Crews	Scour rock protection, approaches general fill	5 days	Mon 7/10/24	Fri 11/10/24	34
36	Both Crews	Land beams (2 days) & Coatalworks beams stitch pours (3 days)	5 days	Mon 14/10/24	Fri 18/10/24	35
37	Both Crews	Plank spans (2) deck pours & approach slabs & install kerb units	15 days	Mon 21/10/24	Fri 8/11/24	36
38	Both Crews	Road works on approaches, swap traffic over, install kerbs	5 days	Mon 11/11/24	Fri 15/11/24	37
39	Both Crews	Demolition, final rock scour, full restoration and pack up	10 days	Mon 18/11/24	Fri 29/11/24	38
40		**Contingency / wet weather**	**10 days**	**Mon 2/12/24**	**Fri 13/12/24**	**31**



Critical		Split		Finish-only		Baseline Milestone		Manual Summary		Inactive Task	
Critical Split		Task Progress		Duration-only		Milestone		Project Summary		Inactive Milestone	
Critical Progress		Manual Task		Baseline		Summary Progress		External Tasks		Inactive Summary	
Task		Start-only		Baseline Split		Summary		External Milestone		Deadline	

DARKWOOD 2024 PROGRAM NOTES

Coastal Works intend to undertake the 3 Darkwood Road bridges – Hobarts, Joyces, Justins – as a single program of works commencing in April 2024 to December 2024. Preferred program utilises a typical rock anchor installation small excavator rig with air drilling. Below outlines some of the key dates for the construction sequence:

Site Establishment – April 2024
- Main compound and laydown set up at Hobarts.
- Laydown and piling material deliveries at all 3 bridges.
- Vegetation clearing complete at all 3 bridges
- Establish access points down banks and first piling position at all 3 sites with rock bag setups – 1x headstock at Hobarts, western headstock at Joyces, headstock at Justins.
- Establish all piling positions at Hobarts
- Install erosion and sed controls at all 3 bridges for laydown and piling positions

Piling All 3 bridges – April to June 2024
- Start at Hobarts with the two piling setups concurrently, one 7t excavator rock anchor setup and one 24t excavator for bored piles – aim for completion all in 1 week
- Both setups to move onto Justins Bridge – rock anchor completed in 3 days and setup demobilised from site, bored piles continue – 1.5 weeks
- Bored piling setup moves onto Joyces bridge last, first at previously established western side access which is then removed and established on the east side for completion – 2 weeks
- Coastal Works crews with an excavator to follow the piling crews to manage laydowns, modify the access requirements, remove piling spoil and maintain and adjust environmental controls.
- Coastal Works crew complete the bored pile pours progressively along with the contractor
- Justins site rock bags to remain at headstock to remain, Joyces river access completely removed.

Hobarts Main Bridge Construction – May – August 2024
- Cast in-situ substructure works (6 weeks) to commence in May with one CoastalWorks crew once all piling is completed and piling is continuing at the other sites.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in June.
- Superstructure to be landed, poured, and completed in July with both crews.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in late July and into August.

Justins Main Bridge Construction – July – September 2024
- Relocate main compound setup from Hobarts to Justins in late July once the Hobarts superstructure is completed with second CoastalWorks crew.
- Cast in-situ substructure works (4 weeks) to commence in August with one CoastalWorks crew and completed by both crews once Hobarts is completed.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in late August.
- Superstructure to be landed, poured, and completed in early September.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in September.

Joyces Main Bridge Construction – July – September 2024
- While Justins being finished, 3x precast headstocks made with second crew at Precast Yard.
- Relocate main compound setup from Justins to Joyces in October and reinstate rock bag access to the headstocks for personnel only and crane pads positions for landing precast components.
- Cast in-situ abutments (2 weeks) to be completed in October with both crews.
- Scour rock at abutments placed and abutment backfill completed in late October.
- Superstructure to be landed, poured, and completed by mid-November with both crews.
- Remove rock bags and bank access and complete the roadworks, remaining scour rock protection, demolition, and restoration in late November and December.

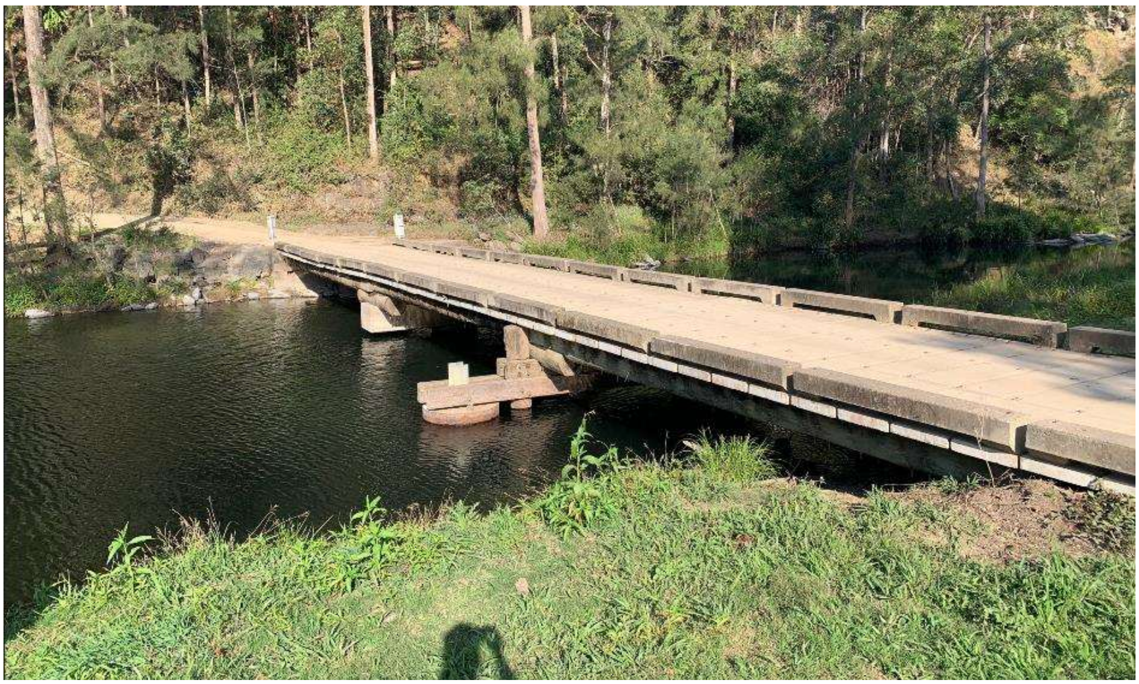
Appendix E

Justins Bridge Design and Construction Methodology

JUSTINS BRIDGE REPLACEMENT

Project Description

Coastal Works are replacing Justins Bridge over the Bellinger River on Darkwood Road, Darkwood under contract works for Bellingen Shire Council. The existing 32m four span, timber bridge will be removed and replaced adjacent with a new 32m two span, concrete and steel bridge on a raised alignment downstream. The site is located approx. 35km west of Bellingen, is highly flood prone and is in key habitat for the Bellinger River Snapping Turtle.



Existing Timber Bridge

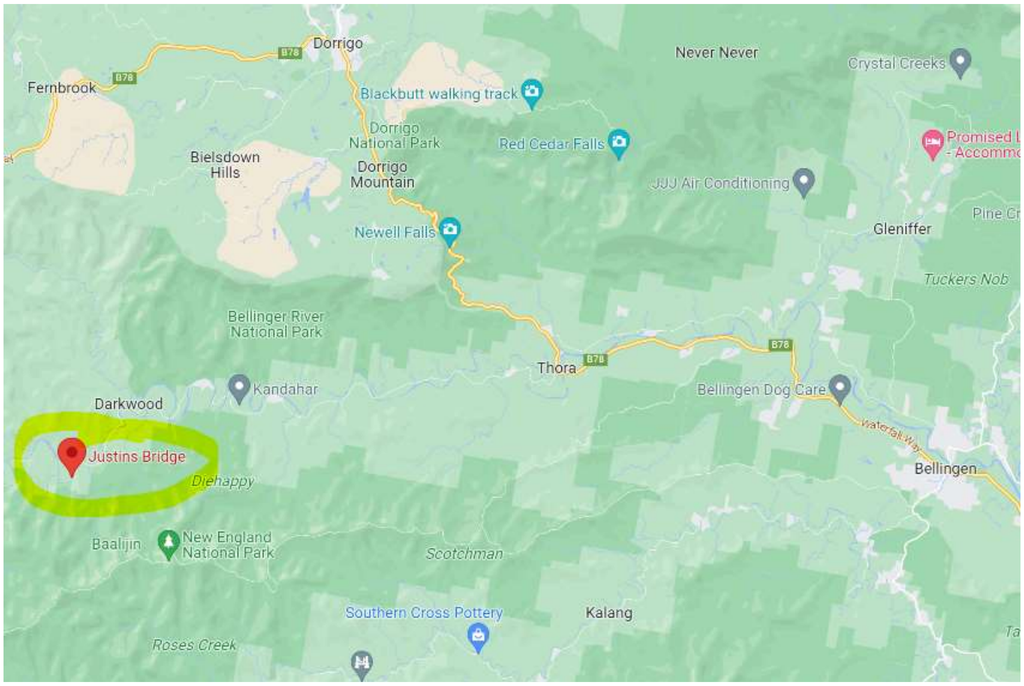
Form of Construction

Foundations – bored, cast in-situ concrete piles (600mm diameter) at one abutment and one headstock, rock anchors at the other abutment into high level rock

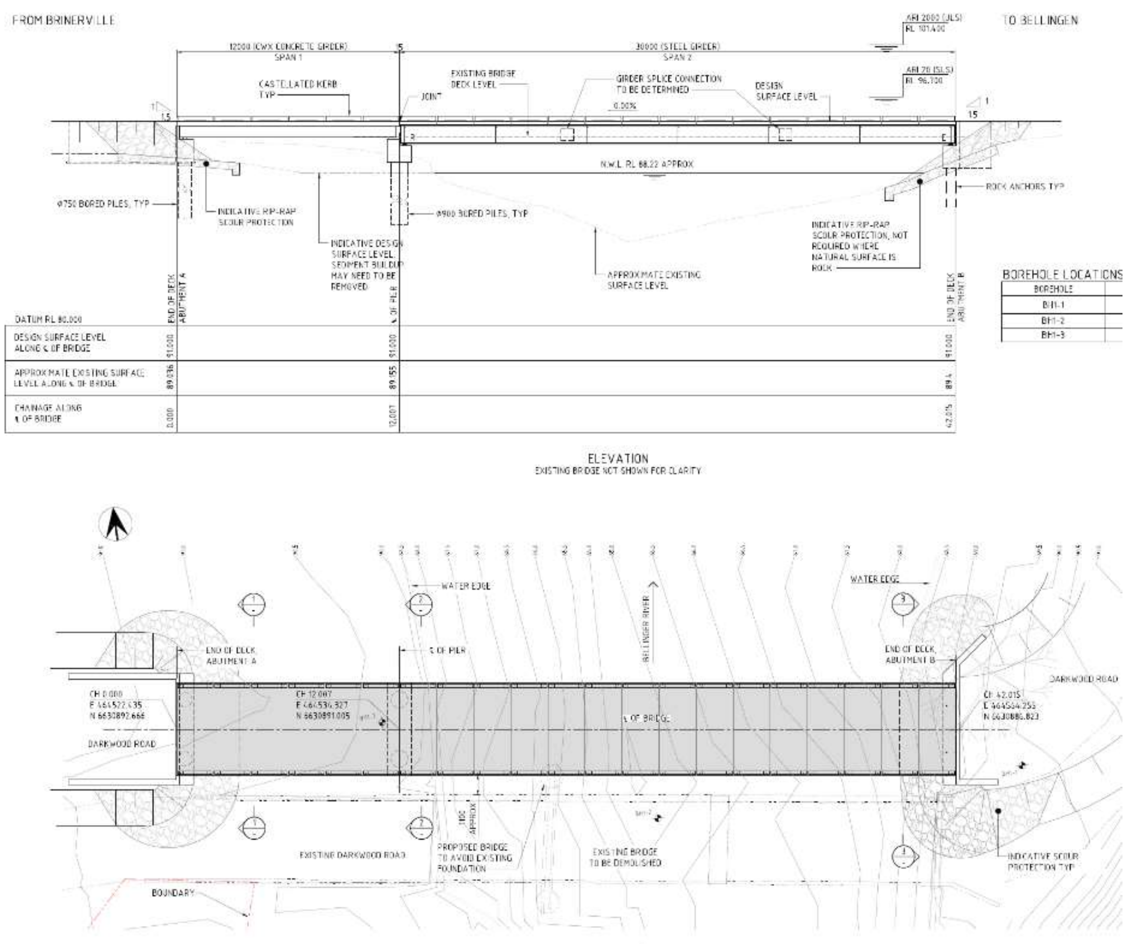
Substructure – cast in-situ reinforced concrete abutments and headstocks poured direct onto existing ground levels on top of piles including direct onto foundation rock at the rock anchor abutment, rock scour protection on banks and around abutments

Superstructure – one span is precast concrete CoastalWorks 12m bridge beams, one span is 30m long over the low flow area over the creek using spliced steel girders with CoastalWorks precast concrete deck panels, bolt on concrete kerbs

Road approaches – 20-30m of road works each side to tie into existing road, two coat bitumen seal, 6m wide plus fill formation formations, open swale drains



Location Map



New Bridge Design

Construction Methodology & Sequence

1) Establishment:
    a. Set up compound, laydown and stockpile areas in the Darkwood Road shoulder and private property paddock on the eastern approach off the road and above the high flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones.
    c. Installation of erosion and sediment controls for piling areas including booms in the water.
    d. Delivery of all piling materials.
    e. Delivery of pre-filled rock bags.
    f. Establish bunded concrete washout and spoil areas at laydown area.

2) Access to and establishment of piling areas:
    a. Clear and grub surface vegetation and topsoil from the three piling locations, stockpile away from river for later rehabilitation works or remove from site.
    b. At Abutment B (east side, rock anchors), excavators can sit in existing road shoulder behind the abutment. Box out with 14t excavator to expose rock.
    c. At Abutment A (west side), no access establishment required, box out with 14t excavator down to pile cutoff level.
    d. At Headstock, no access ramp required, existing riverbanks will be stable enough for tracked machinery access and are to be re-profiled at the end of works. Keep access paths next to abutment and in between headstock and Abutment A. Place rock bags along river side of the piling set to stabilise banks and provide additional containment, pull floating boom tight to water line at rock bags. Minor box out to piles (<0.5m) and provide sediment fencing along inside of rock bags.
    e. Should any areas for excavator positioning become unstable or present unanticipated risk for becoming churned up, establish access platform with geofabric underlay and 150mm clean imported ballast and/or gabion rock with extra length of geofabric on the upstream side that can be used to wrap over and pinned down with rock bags during high flow events to prevent wash out.

3) Rock anchor works:
    a. Plant & equipment – 7t-10t excavator with a specialist air drilling attachment with Down Hole Hammer (DHH) and on-site grout mixing station. DHH option keeps noise and vibration down the hole rather than an above ground hammer which is much noisier above.
    b. Install 2m high spray screens, using geofabric or ply, on 3 sides of the rock anchor area to deflect any natural rock spray from entering the water.
    c. Grout mixing station to be on the eastern existing road immediately next to Abutment B works with minimal grout tube run. Bund the area from overspill and grout hoses to the rock anchor working area to be plastic wrapped.
    d. Box out will be sufficient to contain flushing of the rock anchor holes (water and rock sediment) and for containing grout overpour. These can be removed by sucker truck at end of works to tidy area ready for cast in-situ works.

4) Bored piling works:
    a. Plant & equipment – 30t excavator with a 2t vibratory head attachment and pendulum drill head with Kelly bar for the auger.

b. Vibratory head used to install permanent mild steel liners in position first at all 9 pile positions for western structures.
c. Use pendulum auger to bore out inside each with required rock sockets.
d. Pile clean-out material placed either directly in a skip bin or on a geofabrics lined area adjacent the piling area so it can be removed from the riverbed area to the established stockpile area (or off site) daily.
e. After piles are cleared, place cages and pour concrete with concrete boom pump up at existing road level on the western approach for both headstock and western abutment. Sucker truck to remove water from the wet pile holes during concrete placement.
f. Concrete overpour out of top of piles (typically 0.2m3 per pile) to be contained within the box out areas and become a blinding slab for cast in-situ works.

5) Cast in-situ concrete sub-structure:
   a. Reinforcement placed and tied in place by hand on blinding slabs.
   b. Ply formwork shutters pre-made and placed with excavator using the same access points used during piling. Personnel access to all from ground level.
   c. Elevated walkway required for taller abutments up to the top of concrete which will all cantilever off the formwork and not require additional footprint.
   d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour all substructure works. Pump and concrete trucks to be brought to the respective sides of the river for pours so the boom line is not over the waterway at any time. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
   e. Complete mortar pads by hand mixed mortar to finish all substructures and strip all formwork and elevated access platforms.

6) Fully remove piling temporary working areas and establish western crane position – excavator to progressively remove rock bags, any imported ramp materials (if needed) and geofrabirc underlay working away from the western water's edge. All imported rock to be re-used for road backfill. Reposition rock bags for a crane pad on the downstream side of Abutment A.

7) Cut and re-profile higher bank materials under the shorter western span – excavator to box out materials down to 200mm above the water ripple line from the existing western water line to the western abutment. Place direct into tipper trucks to remove from site.

8) Place scour rock around abutments – place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks, tip adjacent and behind abutments in manageable quantities for placement by 14t excavator.

9) Land all precast concrete beams, steel girders and precast deck panels – semis to deliver beams to western side, all beams and girders lifted in by crane on western side as well as half the steel girder span deck panels. Remaining deck panels placed by Franna crane progressively to Abutment B. Bolting down of panels all to be done from deck level, no scaffold required.

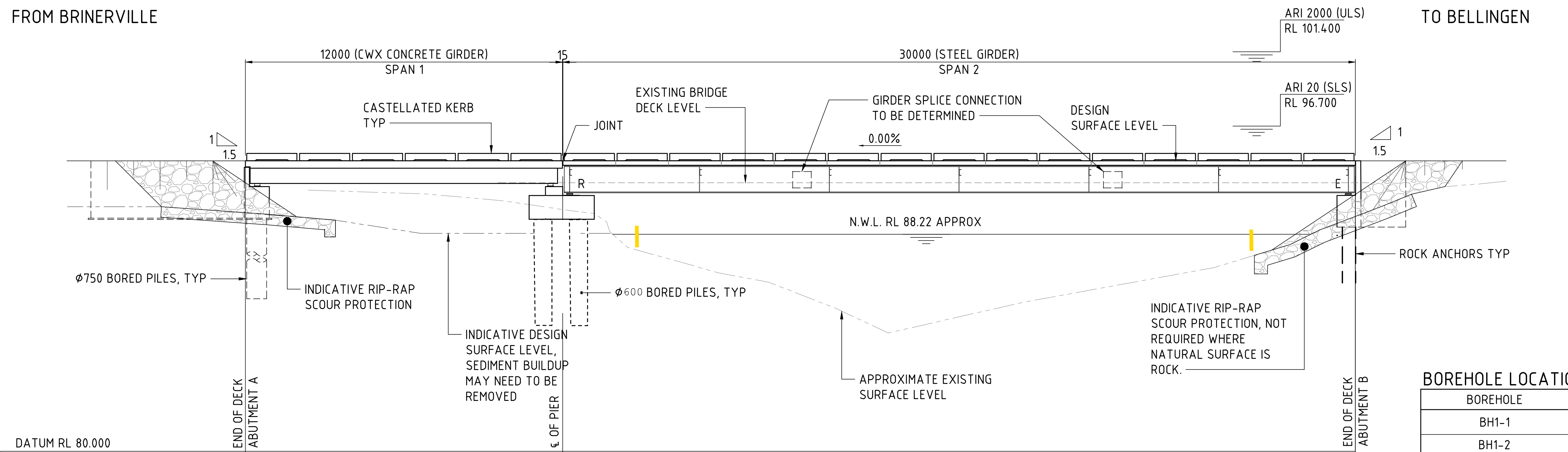
10) <u>Pour 12m beam stitch pour</u> – sealed formwork to be used between CoastalWorks planks to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Boom pump to used from western side again without putting the line over the waterway.

11) <u>Complete approach roadworks</u> – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

12) <u>Demolish original bridge:</u>
    a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers, Franna crane for lifting concrete deck panels.
    b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing concrete deck panels direct onto transport and timber girders for each span. No access off deck or in high banks required.
    c. For in-stream headstocks, install floating scaffold platforms out from each bank. Remove timber components of headstocks using chainsaw and protruding steel components with an oxy torch from platforms, removing all cut off items from the waterway. Concrete headstocks and piles to remain.
    d. Divers to be used with underwater chainsaws to remove timber piles. Floating barrels first attached to the timber before cutting and roped to the banks for full removal.
    e. For abutments and existing western headstock outside the water area, use rock breaker on excavator to break up concrete footings and then remove in largest possible pieces by excavator and by hand down to ground level.
    f. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

13) <u>Complete rock scour protection</u> – on upstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

14) <u>Demobilise construction activities</u> – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.

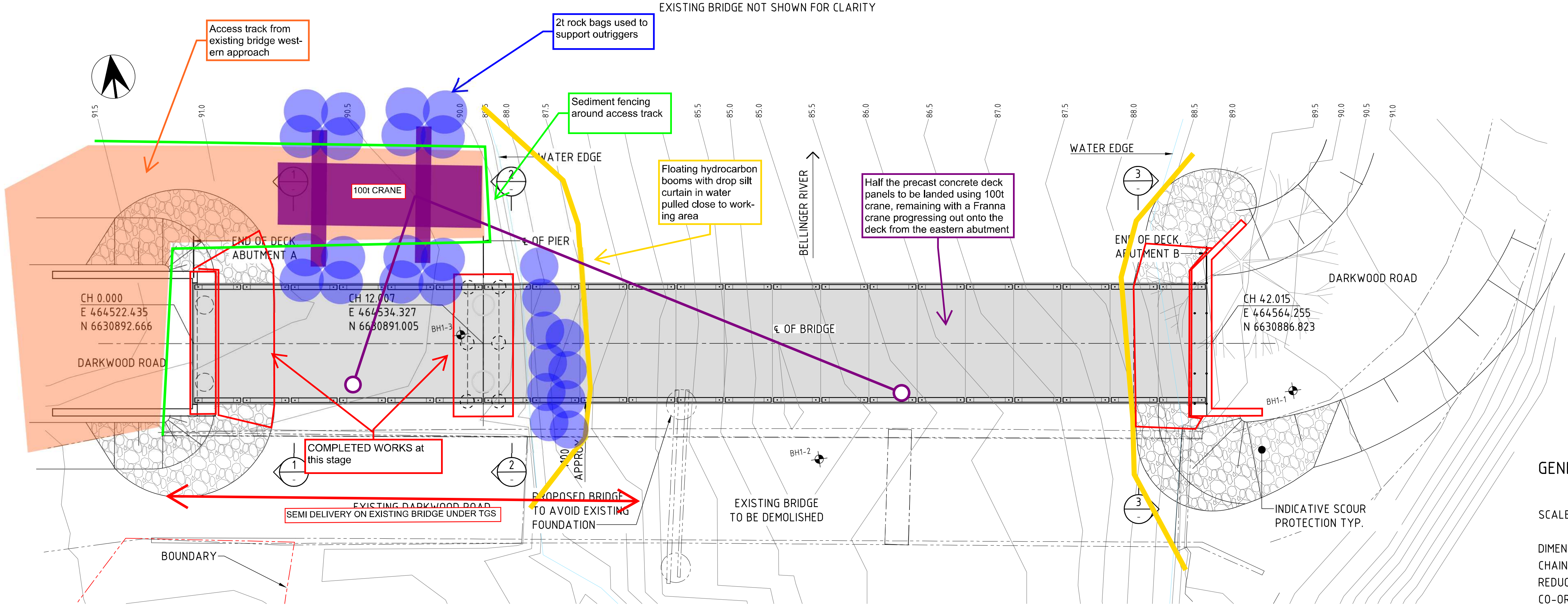


DESIGN SURFACE LEVEL ALONG ℄ OF BRIDGE	91.000	91.000	91.000
APPROXIMATE EXISTING SURFACE LEVEL ALONG ℄ OF BRIDGE	89.036	89.155	89.4
CHAINAGE ALONG ℄ OF BRIDGE	0.000	12.007	42.015

ELEVATION
EXISTING BRIDGE NOT SHOWN FOR CLARITY

BOREHOLE LOCATIONS

BOREHOLE	EASTING	NORTHING	RL
BH1-1	464567	6630884	89.8
BH1-2	464547	6630884	84.8
BH1-3	464533	6630891	89.3



PLAN

GENERAL NOTES

SCALE 0 1 2 3 4 5m OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
⌖ DENOTES BOREHOLE LOCATION (APPROXIMATE).

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
02	29/05/2023	CONCEPT DESIGN	JR	DM	CR
01	25/05/2023	CONCEPT DESIGN	JR	DM	CR

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSE OF THE NOMINATED PROJECT

	PREPARED	CHECKED
DESIGN	D. MERRIKIN	C. RILEY
DRAWING	J. REN	D. MERRIKIN

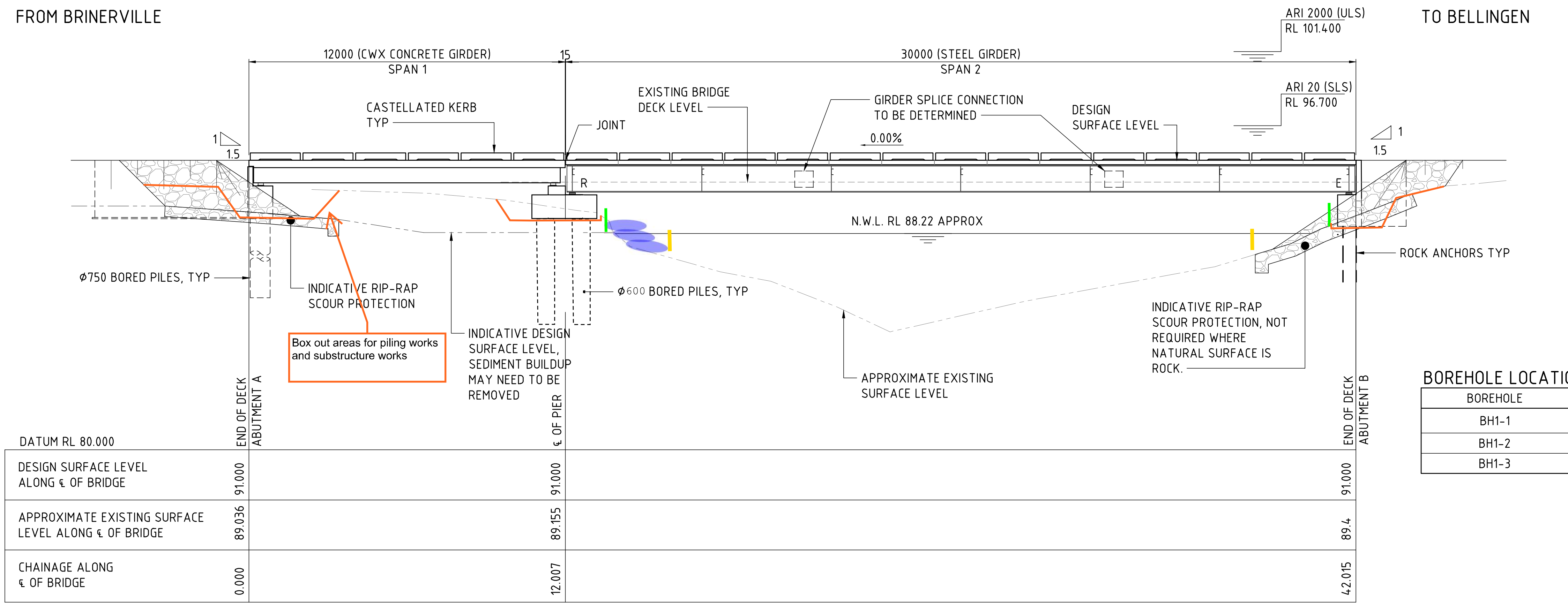
PREPARED BY bk. bridge knowledge. ENGINEERING CONSULTING SERVICES
DANIEL MERRIKIN
STRUCTURAL ENGINEER

BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

DARKWOOD ROAD ADELE HOUSE
CONCEPT REDESIGN
FIXING COUNTRY BRIDGE PROGRAM
JUSTINS BRIDGE
CRANAGE ACCESS PLAN

DRAWING SET No	BKP414-BR104
DRAWING No	BR104-DRG-02
ISSUE STATUS	CONCEPT DESIGN

ISSUE 2 | No SHEETS 3 | SHEET No 02



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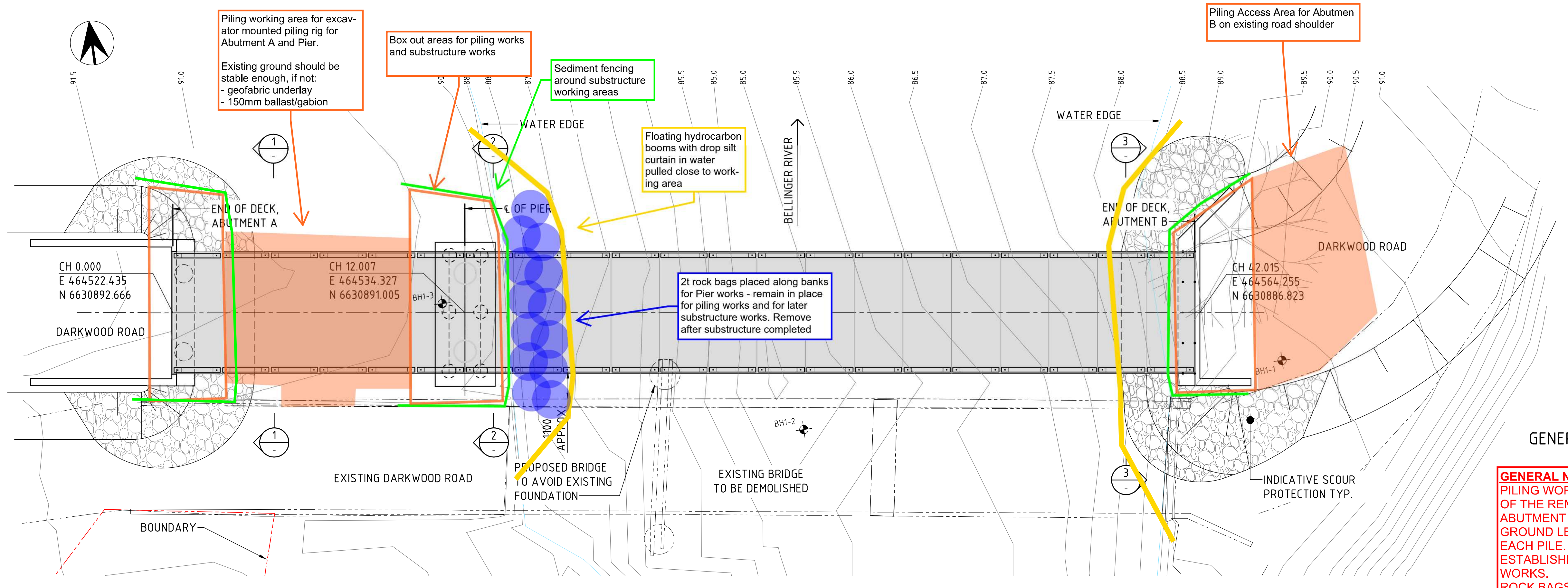

PLAN

GENERAL NOTES

GENERAL NOTE:
PILING WORKS TO OCCUR PRIOR TO PROGRESSION OF THE REMAINING STRUCTURE. BORED PILING AT ABUTMENT A AND PIER TO BE FROM EXISTING GROUND LEVEL A LIMIT TO SMALL BOX OUT LOCAL TO EACH PILE. CAP AND BACKFILL PILES UNTIL RE-ESTABLISHMENT AND PROGRESSION OF CAST IN-SITU WORKS.
ROCK BAGS TO REMAIN IN PLACE ALONG BANK EDGE FOR ONGOING STABILITY IN TIME PERIOD BETWEEN PILING AND CAST IN-SITU WORKS

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
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PREPARED BY
bk. bridge knowledge. ENGINEERING CONSULTING SERVICES
DANIEL MERRIKIN
STRUCTURAL ENGINEER

BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

DARKWOOD ROAD — ADELE HOUSE

CONCEPT REDESIGN
FIXING COUNTRY BRIDGE PROGRAM
JUSTINS BRIDGE

PILING ACCESS PLAN

DRAWING SET No: BKP414-BR104
DRAWING No: BR104-DRG-02
ISSUE STATUS: CONCEPT DESIGN
ISSUE: 2 | No SHEETS: 3 | SHEET No: 02

DARKWOOD ROAD 3 BRIDGES – EXAMPLE CONSTRUCTION METHODOLOGY PHOTOES

Excavator with 2t vibratory unit used to pitch steel pile liners

Excavator mounted pendulum pile boring rig with extendable Kelly bar and access ramps –

Excavator mounted rock anchor drilling setup (7-12t sized machine) with splatter screens used next to waterway

On-site grout mixing station for rock anchors up on banks away from anchors

Same smaller excavator (7t) rock anchor rig

Containment system used for pouring concrete bored piles to prevent concrete overpour entering the waterway


Kibble being used for on-site pours at headstocks near water to control concrete

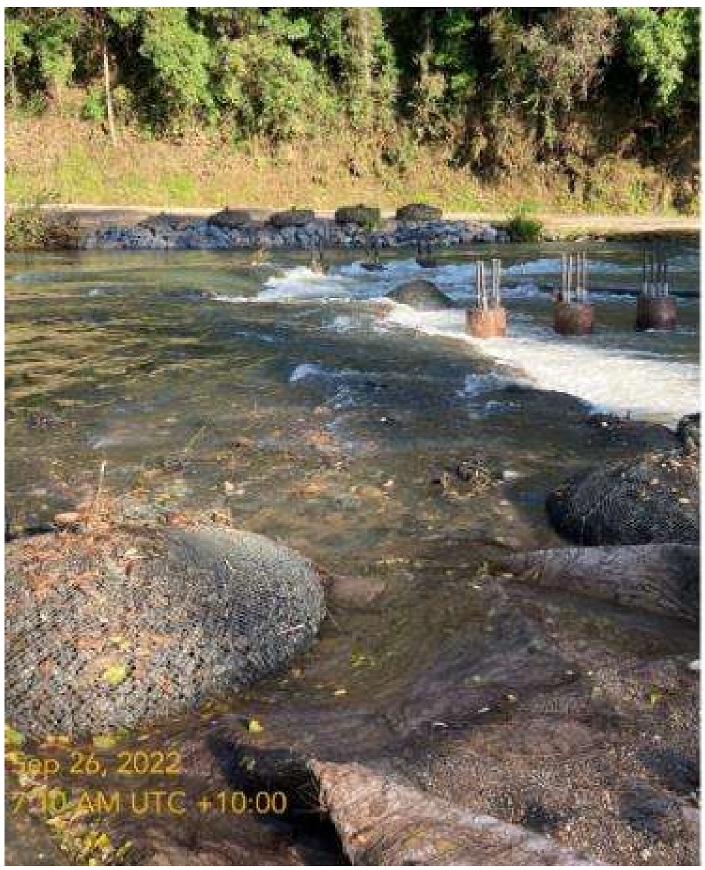
Cast in-situ headstock with elevated temporary works walkway around

Rock bags used as an access track and crane platform for landing precast components

Concrete deck pour with elevated walkway attached to bridge planks

Riverbank access ramp and working area and rock scour protection with excavator

Rock bags used to pin down geofabric with boom adjacent in water

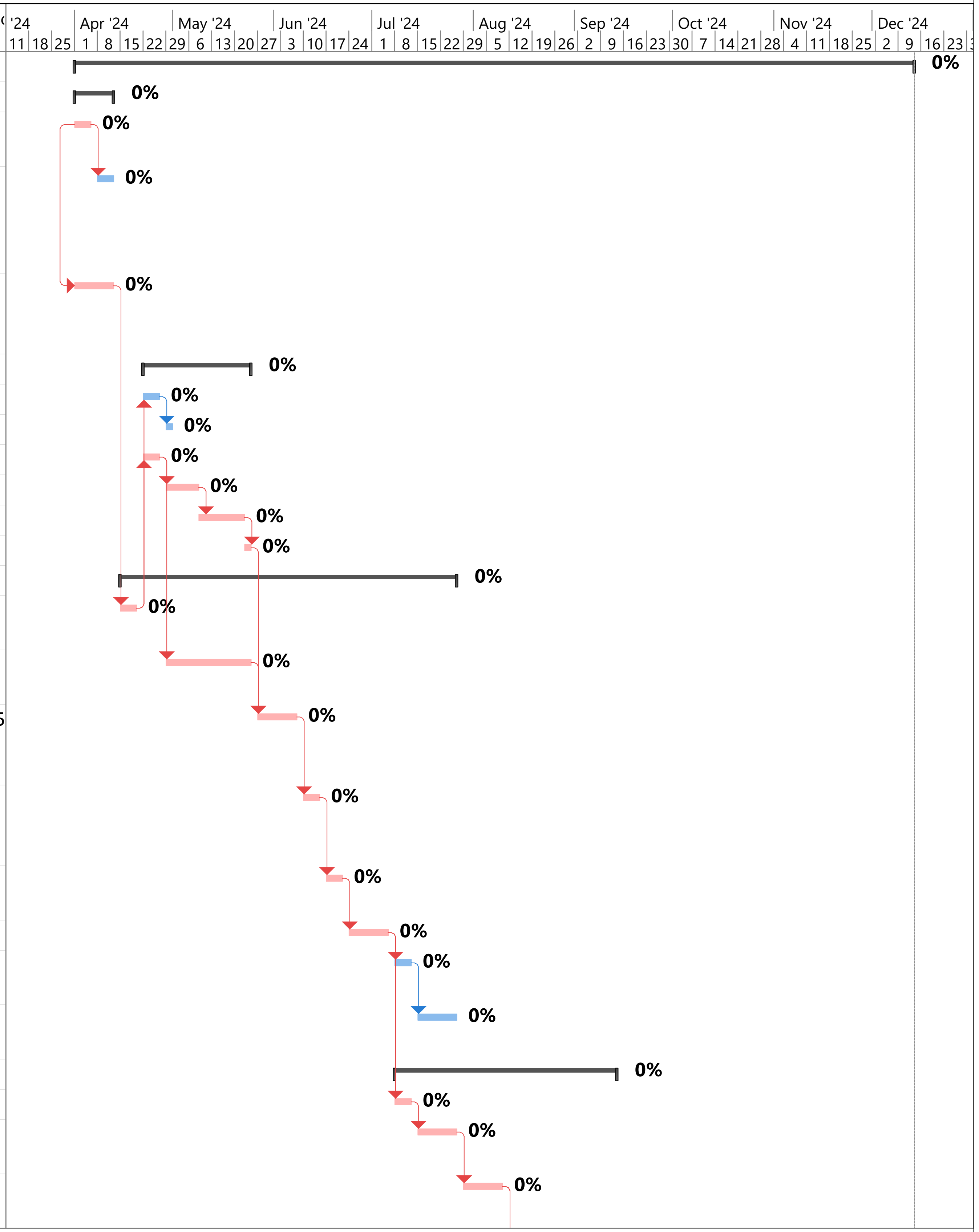


Rock bag access track being overtopped and remaining in place without any material loss during high water flow conditions

Landing precast concrete panels onto steel girder span

2024 Darkwood Bridges Program 5.7.23 - preferred

ID	Engineer	Task Name	Duration	Start	Finish	Predec
1	**2024**	**Coastal Works - Darkwood Bridges Program 2024**	**185 days**	**Mon 1/04/24**	**Fri 13/12/24**	
2		**Site Establishment all 3 sites**	**10 days**	**Mon 1/04/24**	**Fri 12/04/24**	
3	Crew 1	Main laydown & compound setup at Hobarts + major material deliveries	5 days	Mon 1/04/24	Fri 5/04/24	
4	Crew 1	ALL 3 SITES - vegetation clearing, piling material deliveries, establish excavator access tracks for river banks, ERSD controls at first pile positions and laydown and spoil areas	5 days	Mon 8/04/24	Fri 12/04/24	3
5	Crew 2	ALL 3 SITES - establish rock bag areas - Hobarts headstock, Joyces west abutment, Justins headstock and floating booms installed	10 days	Mon 1/04/24	Fri 12/04/24	3SS
6		**Piling all 3 sites**	**25 days**	**Mon 22/04/24**	**Fri 24/05/24**	
7	Crew 1	HOBARTS - mob, rock anchors (32) drilled, grouted	5 days	Mon 22/04/24	Fri 26/04/24	14
8	Crew 1	JUSTINS - rock anchors (10) and grouted incl. move	2 days	Mon 29/04/24	Tue 30/04/24	7
9	Crew 2	HOBARTS - mob, bored piles (5), pile reo & concrete pours	5 days	Mon 22/04/24	Fri 26/04/24	14
10	Crew 1	JUSTINS - bored piles (9) and poured, incl mob/demob	8 days	Mon 29/04/24	Wed 8/05/24	9
11	Crew 1	JOYCES - bored piles (16) & remove/stockpile rock bags	10 days	Thu 9/05/24	Wed 22/05/24	10
12	Crew 1	Contingency - days between to keep up, wet weather	2 days	Thu 23/05/24	Fri 24/05/24	11
13		**Hobarts Bridge (BSC)**	**75 days**	**Mon 15/04/24**	**Fri 26/07/24**	
14	Crew 2	Prepare all pile locations - box outs, blindings, ERSD controls, rock anchor bunds	5 days	Mon 15/04/24	Fri 19/04/24	5
15	Crew 2	Cast in-situ headstocks and abutments (during remaining piling works)	20 days	Mon 29/04/24	Fri 24/05/24	9
16	Both Crews	Cast in-situ headstocks and abutments completed both crews incl. scour rock in front of abutments and mortar pads	10 days	Mon 27/05/24	Fri 7/06/24	12,15
17	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove access tracks into creek, crane pads and landing prep	5 days	Mon 10/06/24	Fri 14/06/24	16
18	Both Crews	Land beams (2 days) & CoastalWorks beams stitch pours (3 days)	5 days	Mon 17/06/24	Fri 21/06/24	17
19	Both Crews	Plank span deck pour & approach slabs	10 days	Mon 24/06/24	Fri 5/07/24	18
20	Crew 2	Road works on approaches, swap traffic over, install kerbs and brackets	5 days	Mon 8/07/24	Fri 12/07/24	19
21	Crew 2	Demolition, final rock scour, full restoration, pack up & contingency	10 days	Mon 15/07/24	Fri 26/07/24	20
22		**Justins Bridge**	**50 days**	**Mon 8/07/24**	**Fri 13/09/24**	
23	Crew 1	Relocate compound from Hobarts, ERSD controls etc.	5 days	Mon 8/07/24	Fri 12/07/24	19
24	Crew 1	Cast in-situ headstocks and abutments (3) incl. elevated temporary support for headstock at start	10 days	Mon 15/07/24	Fri 26/07/24	23
25	Both Crews	Cast in-situ headstocks and abutments incl. scour rock in front of abutments	10 days	Mon 29/07/24	Fri 9/08/24	24



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Task	Start-only	Baseline Split	Summary	External Milestone	Deadline

ID	Engineer	Task Name	Duration	Start	Finish	Predec
26	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove rock bags area, crane pads and landing prep	5 days	Mon 12/08/24	Fri 16/08/24	25
27	Both Crews	Steel girders deliverd and put together with franna on west side	5 days	Mon 12/08/24	Fri 16/08/24	25
28	Both Crews	Land beams and deck panels (2 days) & CoastalWorks beams stitch pour & complete steel girder deck bolting and grouting	5 days	Mon 19/08/24	Fri 23/08/24	26,27
29	Crew 1	Road works on approaches, install kerbs and brackets, swap traffic over	10 days	Mon 26/08/24	Fri 6/09/24	28
30	Crew 1	Demolition, final rock scour, full restoration, pack up	5 days	Mon 9/09/24	Fri 13/09/24	29
31		**Joyces Bridge**	**70 days**	**Mon 26/08/24**	**Fri 29/11/24**	
32	Crew 2	Precast 3x Joyces headstocks (CoastalWorks Precast Yard)	15 days	Mon 26/08/24	Fri 13/09/24	28
33	Both Crews	Relocate compound from Justins, re-install rock bag access for personnel access to headstocks only & crane pads	3 days	Mon 16/09/24	Wed 18/09/24	32,30
34	Both Crews	Cast in-situ abutments and bearing pads	12 days	Thu 19/09/24	Fri 4/10/24	33
35	Both Crews	Scour rock protection, approaches general fill	5 days	Mon 7/10/24	Fri 11/10/24	34
36	Both Crews	Land beams (2 days) & Coatalworks beams stitch pours (3 days)	5 days	Mon 14/10/24	Fri 18/10/24	35
37	Both Crews	Plank spans (2) deck pours & approach slabs & install kerb units	15 days	Mon 21/10/24	Fri 8/11/24	36
38	Both Crews	Road works on approaches, swap traffic over, install kerbs	5 days	Mon 11/11/24	Fri 15/11/24	37
39	Both Crews	Demolition, final rock scour, full restoration and pack up	10 days	Mon 18/11/24	Fri 29/11/24	38
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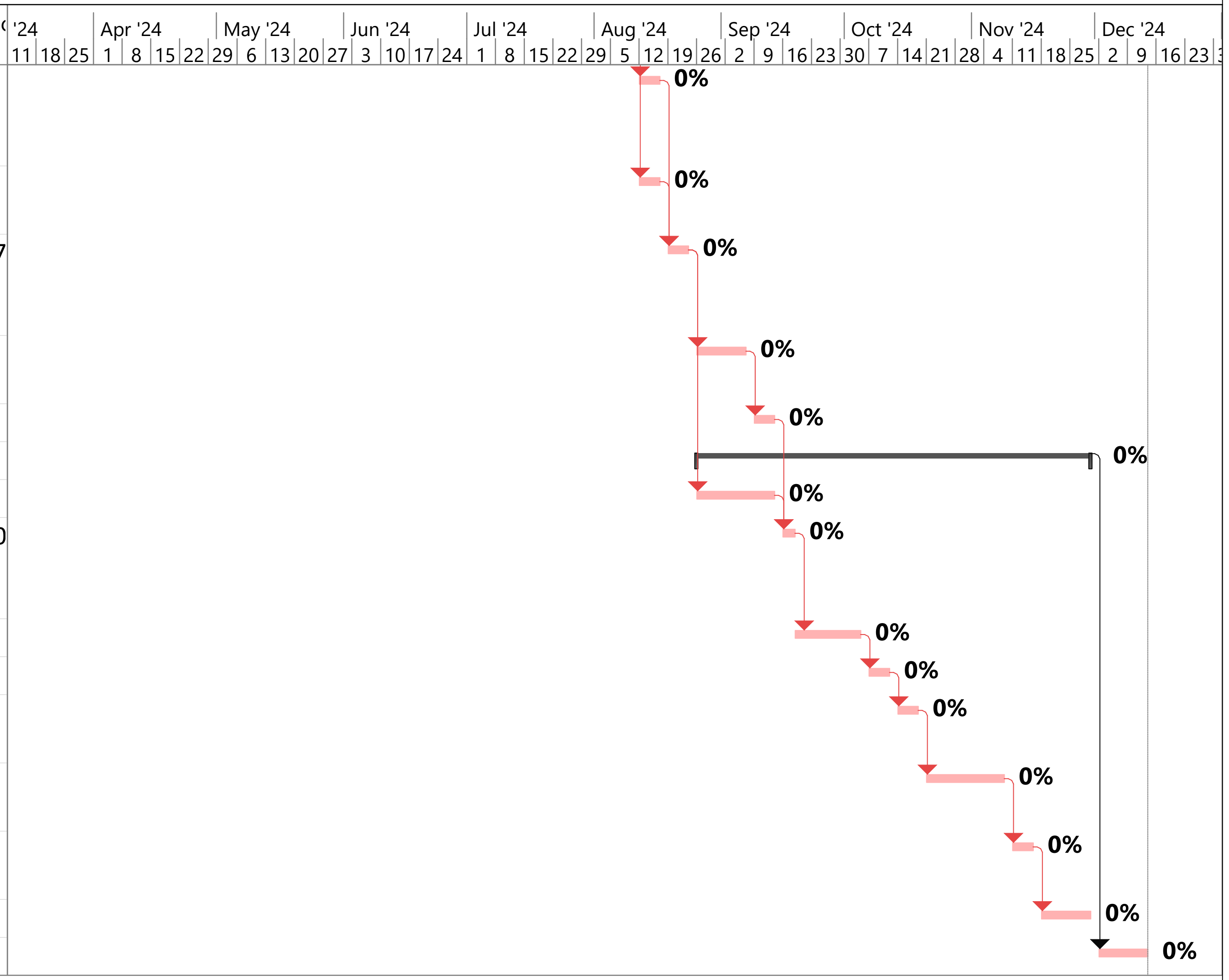

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- Main compound and laydown set up at Hobarts.
- Laydown and piling material deliveries at all 3 bridges.
- Vegetation clearing complete at all 3 bridges
- Establish access points down banks and first piling position at all 3 sites with rock bag setups – 1x headstock at Hobarts, western headstock at Joyces, headstock at Justins.
- Establish all piling positions at Hobarts
- Install erosion and sed controls at all 3 bridges for laydown and piling positions

Piling All 3 bridges – April to June 2024
- Start at Hobarts with the two piling setups concurrently, one 7t excavator rock anchor setup and one 24t excavator for bored piles – aim for completion all in 1 week
- Both setups to move onto Justins Bridge – rock anchor completed in 3 days and setup demobilised from site, bored piles continue – 1.5 weeks
- Bored piling setup moves onto Joyces bridge last, first at previously established western side access which is then removed and established on the east side for completion – 2 weeks
- Coastal Works crews with an excavator to follow the piling crews to manage laydowns, modify the access requirements, remove piling spoil and maintain and adjust environmental controls.
- Coastal Works crew complete the bored pile pours progressively along with the contractor
- Justins site rock bags to remain at headstock to remain, Joyces river access completely removed.

Hobarts Main Bridge Construction – May – August 2024
- Cast in-situ substructure works (6 weeks) to commence in May with one CoastalWorks crew once all piling is completed and piling is continuing at the other sites.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in June.
- Superstructure to be landed, poured, and completed in July with both crews.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in late July and into August.

Justins Main Bridge Construction – July – September 2024
- Relocate main compound setup from Hobarts to Justins in late July once the Hobarts superstructure is completed with second CoastalWorks crew.
- Cast in-situ substructure works (4 weeks) to commence in August with one CoastalWorks crew and completed by both crews once Hobarts is completed.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in late August.
- Superstructure to be landed, poured, and completed in early September.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in September.

Joyces Main Bridge Construction – July – September 2024
- While Justins being finished, 3x precast headstocks made with second crew at Precast Yard.
- Relocate main compound setup from Justins to Joyces in October and reinstate rock bag access to the headstocks for personnel only and crane pads positions for landing precast components.
- Cast in-situ abutments (2 weeks) to be completed in October with both crews.
- Scour rock at abutments placed and abutment backfill completed in late October.
- Superstructure to be landed, poured, and completed by mid-November with both crews.
- Remove rock bags and bank access and complete the roadworks, remaining scour rock protection, demolition, and restoration in late November and December.

Appendix F

Aquatic Ecological Assessment Report

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AQUATIC SCIENCE AND MANAGEMENT

Bellingen Shire Council – Hobarts, Joyces, Justins and Duffys Bridge Replacements

Aquatic Ecological Assessment

Report Prepared for:

GHD

August 2023

Prepared By:

Aquatic Science and Management

Document History

Version	Issued To	Format	Date
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1. Introduction

1.1 Introduction and Background

The Bellinger-Kalang River system is one of the largest drainage systems of the NSW east coast and the major river system in the Bellingen Shire Council (BSC) Local Government Area (LGA).

BSC have secured funding to replace key bridges over the Bellinger and Kalang Rivers that serve remote communities in the Thora and Kalang valleys. Hobarts, Justins, Joyces and Duffy's Bridges are to be replaced. The works are permissible without consent under the State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) and thus require preparation of a Review of Environmental Factors (REF) by way of environmental assessment. GHD are preparing the REF.

The bridges are over the Bellinger and Kalang Rivers, both mapped as Key Fish Habitat under the *Fisheries Management Act 1994*. Bridge construction will require a *Section 200* permit from NSW DPI Fisheries for dredging and reclamation (unless authorised under the *Crown Land Management Act 2016* in which case Crown Lands will require a *Section 199* consultation). In order to provide NSW Fisheries with the required information for either a Section 199 consultation or Section 200 permit, Key Fish Habitat will require further assessment prior to completion of the REF.

The proposed works include:

- Removal and replacement of four bridges, Hobarts, Joyces and Justins Bridges over the Bellinger River and Duffys Bridge over the Kalang River.
- Construction of new bridge abutments
- Construction of new bridge pilings.
- Realignments of the existing approaches.
- Installation of scour rock
- Rehabilitation and revegetation of the riverbank in the area of works.

The proposed works will require a Review of Environmental Factors (REF) under Part 5 of the Environmental Planning and Assessment Act 1979, including relevant state and federal statutory environmental investigations. This aquatic ecological assessment of the proposed works is to contribute to the REF and meet the information requirements for DPI Fisheries assessment. It will consider:

- The likelihood of occurrence within the study area of threatened aquatic species and communities listed under the Federal *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), the NSW *Biodiversity Conservation Act 2016* (BC Act) and the *Fisheries Management Act 1994* (FM Act).
- The potential impacts of the proposed works on threatened aquatic species known or considered likely to inhabit the study area as per the requirements of the EPBC Act, BC Act and the FM Act.

- Information and approvals requirements for the proposed works under the FM Act.
- The overall aquatic ecological impacts of the proposed works.
- Any additional approvals requirements for the proposed works, based upon potential aquatic ecological impacts.

1.2 Description of Proposed Works

The aquatic ecological assessment described in this report applies to the proposed works described in **Table 1.1** (see **Appendix A** for detailed works diagrams and methods). Detailed work methods are provided in the REF.

Table 1.1 Proposed works at each of the four bridge sites

Bridge	*Location (MGA Zone 56)*	*Methods*
Hobarts	E 473400 N 6633165	▪ Setup compound, laydown and stockpile areas outside of the flood zone and off the road on the eastern approach. ▪ Install erosion and sedimentation (ERSED) controls. ▪ Install access ramps on both sides of the river to exposed gravel/rock bars mostly within the proposed bridge and scour rock footprint. ▪ Install 3 concrete blade piers 1300 mm wide x 4655 – 6240 mm long, each anchored into the bed of the Bellinger River by 3 x 600 mm bored piles or N28 anchors. ▪ Construct new concrete abutments on the high banks using prefabricated wing walls and casting the 1200 mm high abutment in place, with 3 x 600 mm embedded piles bored into bedrock. ▪ Repeated placement of 2 tonne rock bags to stabilise crane positions, controls and temporary access ways. ▪ Remove access ramps. ▪ Install scour rock around abutments to the toe of the bank keyed in to high banks upstream and downstream. ▪ Backfill to abutments. ▪ Reshape approaches to downstream of existing bridge. ▪ Place concrete girders for the bridge deck by crane. ▪ Pour concrete decks. ▪ Demolish existing bridge, removing deck, girders, headstocks outside of low flow water area (or those constructed from timber), but leaving existing abutments and concrete piers to minimise disturbance to bed and banks. ▪ Finalise scour rock placement. ▪ Rehabilitate site, including plantings and temporary ERSED controls to remain for 3 months or until stable. ▪ The detailed construction methodology is provided in the REF.

Bridge	*Location (MGA Zone 56)*	*Methods*
Joyces	E 475820 N 6633965	▪ Setup compound, laydown and stockpile areas outside of the flood zone and off the road on the eastern approach. ▪ Install erosion and sedimentation (ERSED) controls, including sediment fencing and floating hydrocarbon booms with drop silt curtains around access pathways. ▪ Install access ramps on both sides of the river to exposed gravel/rock bars mostly within the proposed bridge and scour rock footprint. ▪ Repeated placement of 2 tonne rock bags to stabilise crane positions, controls and temporary access ways. ▪ Install flow/fish passage pipes under eastern access track. ▪ Install 6 x 600 mm bored piles with 3 concrete headstocks into the bed of the Bellinger River. ▪ Remove piling access works. ▪ Construct new concrete abutments on the high banks using prefabricated wing walls and casting the 950 mm wide abutments in place, each with 2 x 600 mm piles bored into bedrock. ▪ Install scour rock around abutments to the toe of the bank keyed in to high banks upstream and downstream. ▪ Install crane access within footprint of previous access works. ▪ Place concrete girders for the bridge deck by crane. ▪ Backfill to abutments. ▪ Pour concrete decks. ▪ Remove crane access works. ▪ Reshape approaches to downstream of existing bridge. ▪ Demolish existing bridge, remove all decking and girders, partially remove abutments to improve tie-in, leaving existing piers, concrete headstocks and majority of abutments to minimise disturbance to bed and banks. ▪ Finalise scour rock placement. ▪ Rehabilitate site, including plantings and temporary ERSED controls to remain for 3 months or until stable. ▪ The detailed construction methodology is provided in the REF.

Bridge	*Location (MGA Zone 56)*	*Methods*
Justins	E 464540 N 6630890	▪ Setup compound, laydown and stockpile areas outside of the flood zone and off the road on the eastern approach. ▪ Install erosion and sedimentation (ERSED) controls, including sediment fencing and floating hydrocarbon booms with drop silt curtains around access pathways. ▪ Install access ramp on western side of the river to exposed gravel/rock bar mostly within the proposed bridge and scour rock footprint. ▪ Access on eastern side from existing road shoulder. ▪ Repeated placement of 2 tonne rock bags to stabilise crane positions, controls and temporary access ways. ▪ Install 2 x 600 mm bored piles into the bed of the Bellinger River with a concrete headstock cast *in-situ*. ▪ Construct new concrete abutments on the high banks using prefabricated wing walls and casting the 1000 mm wide, 900 mm deep abutments in place, with 2 x 600 mm piles bored into bedrock or rock anchors. ▪ Remove piling access works and establish crane position on western bank. ▪ Install scour rock around abutments to the toe of the bank keyed in to high banks upstream and downstream. ▪ Install scour rock around abutments to the toe of the bank keyed in to high banks upstream and downstream. ▪ Place beams, girders and bridge deck by crane and franna crane. ▪ Stich pour. ▪ Reshape approaches to downstream of existing bridge. ▪ Demolish existing bridge, remove all decking and girders, removing timber headstocks and steel components, cutting off timber piles to bed level, leaving concrete piers and headstocks over the water and removing existing abutments. ▪ Finalise scour rock placement. ▪ Rehabilitate site, including plantings and temporary ERSED controls to remain for 3 months or until stable. ▪ The detailed construction methodology is provided in the REF. Reshape approaches to downstream of existing bridge.

Bridge	*Location (MGA Zone 56)*	*Methods*
Duffys	E 486165 N 6629365	▪ Install 6 x 900 mm bored piles into the bed of the Kalang River with two concrete headstocks cast *in-situ*. ▪ Construct new concrete abutments on the high banks using prefabricated wing walls and casting the 1200 mm wide, 1600 - 2000 mm deep abutments in place, with 5 x 750 mm piles bored into bedrock or rock anchors. ▪ Install scour rock around abutments to the toe of the bank keyed in to high banks upstream and downstream. ▪ Place concrete girders for the bridge deck. ▪ Reshape approaches to downstream of existing bridge. ▪ Demolish existing bridge, removing the deck, cutting the existing timber piers to ground level, but leaving the abutments to minimise disturbance to bed and banks. ▪ Detailed construction methodology yet to be prepared but likely to involve similar methods to those described above.

Bridge plans are presented in **Appendix A**.

At the time of writing, detailed construction methodology had been developed for proposed bridge replacements at Hobarts, Joyces and Justins Bridges. It is an assumption of this report that methods for construction of the proposed bridge replacement at Duffys Bridge will be equivalent. The proposed construction methodologies include many strategies to restrict potential harm to the aquatic environment.

The major features of the proposed works with a potential to disturb the aquatic environment are:

- Boring piles and installing rock anchor systems.
- Access and operation of heavy machinery. Heavy machinery will include excavators, trucks, concrete trucks, 100 tonne cranes and franna cranes.
- Excavator and crane access to exposed rock on the bed of the rivers.
- Pollution of water from concrete overpour/spill, disturbance to riverbed materials and drilling works.
- Removal of riparian vegetation.
- Installation of access ramps to the river bed.
- Hydrocarbon spill from machinery.
- Adjustments to existing flow patterns resulting from the placement of new piers.

Most of the work will be undertaken on site using excavators, cranes, trucks and light vehicles. Vehicle access to the sites would be via Darkwood Rd and Kalang Rd.

The combined proposed works at Hobarts, Joyces and Justins bridges are planned to occur between April and December 2024 including site establishment, construction and demolition of the existing bridges. A further 3 months has been allowed for site stabilization following rehabilitation works.

1.3 Location

The proposed works are located on the Bellinger and Kalang Rivers near Bellingen, approximately 420 km north-north-east of Sydney. A map of the study area is presented in **Figure 1.1**. A detailed description of the locations is presented in **Section 2**.

1.4 Proponent

With the exception of the haulage routes and sites for stockpile, laydown and compounds, the proposed works are largely located on Crown Land. Bellingen Shire Council (BSC) are the proponent.

1.5 Alternatives Considered

A variety of alternatives to the proposed works were considered. They include:

- Do nothing. This option has been discarded due to the risk to safety and access of leaving the existing bridges in place.
- Other bridge designs, construction methods and materials have been considered during concept development. The current proposal represents the best mixture of feasibility, cost and minimised environmental impact.

1.6 Strategic Need for the Proposal

The proposed activity is a key element to maintaining safe access to remote communities in the Bellingen Shire LGA.

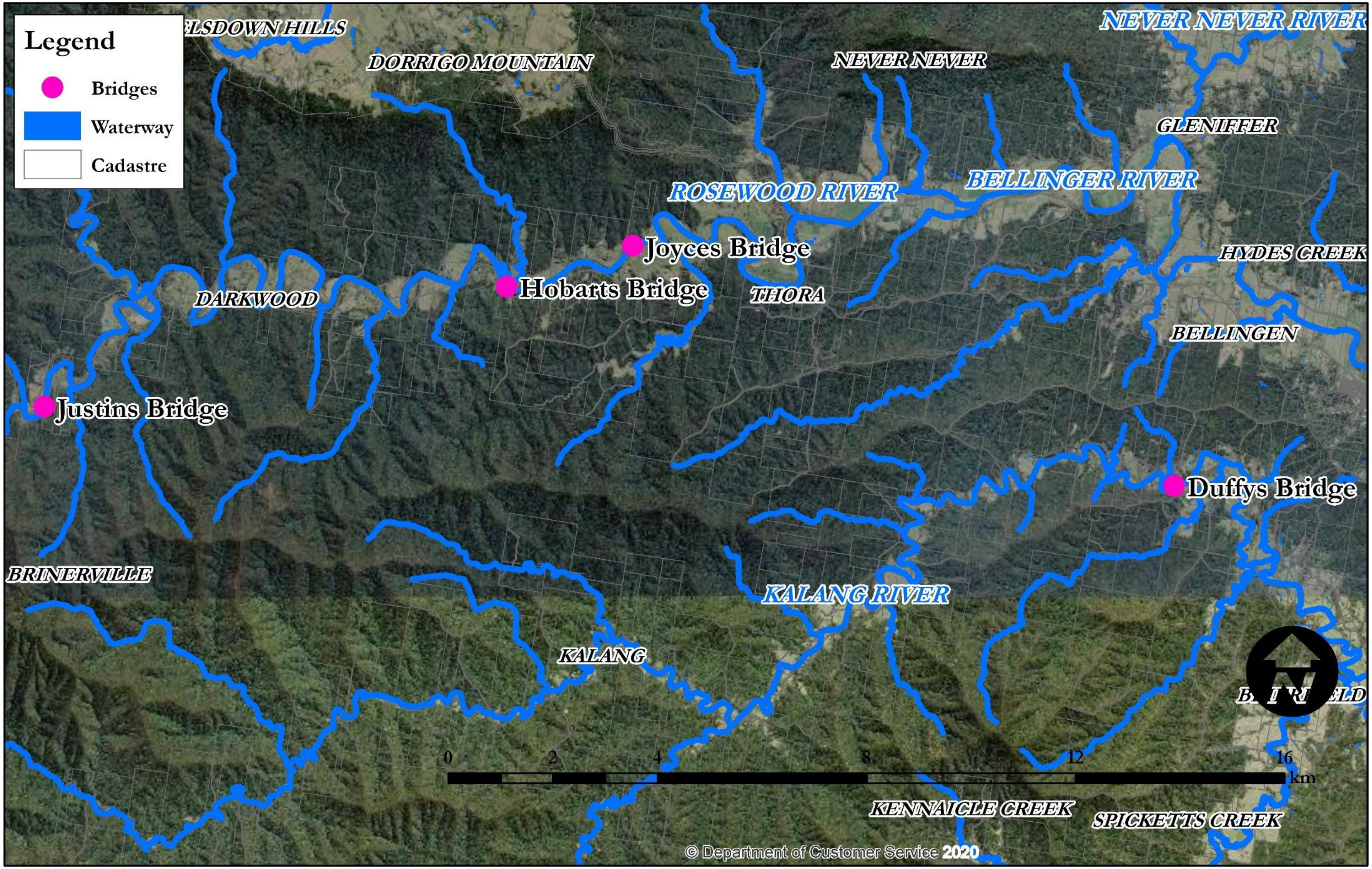

Figure 1.1 Key features of the study area and bridge locations

2. Site Description and Environmental Assessment

2.1 Site Location and Study Area

The locations for the proposed bridges are across the Bellinger and Kalang Rivers near Bellingen NSW. The location is approximately 420 km north-north-east of Sydney. The proposed works are mostly in and on the bed and banks of the Bellinger and Kalang Rivers. Haulage routes are on the existing road networks. Stockpiles and site compounds would be located outside of the flood zone.

The study area for this assessment includes the bridge sites, upstream and downstream aquatic habitat within 100m of the bridges. Stockpile sites and compound locations, which are located outside of the aquatic habitat and away from the banks of the rivers, are not considered.

2.2 Climate and Rainfall

The study area experiences a subtropical climate typical of the Mid-North and North coast of NSW. Rainfall tends to be greatest during the late summer and early autumn months. The closest Bureau of Meteorology (BOM) station with long-term data is in Dorrigo. Basic climate information for the Dorrigo BOM station is displayed in **Figure 2.2**.

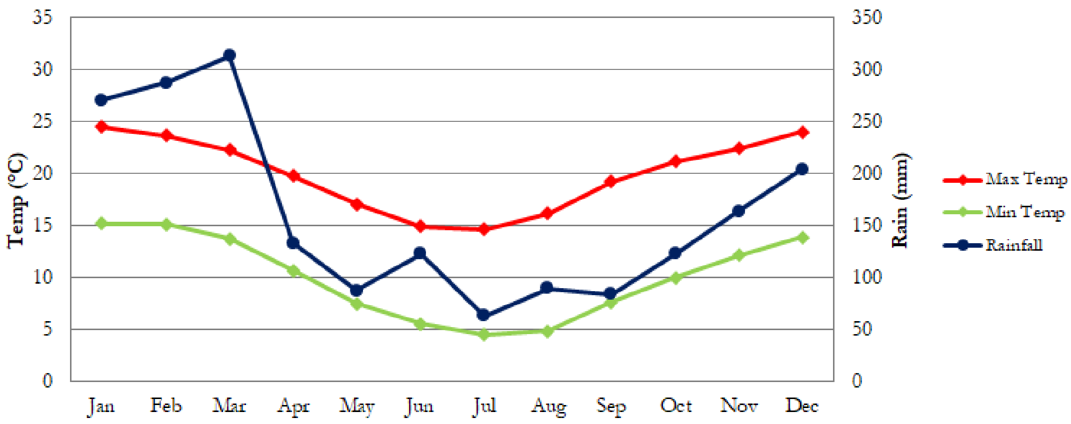

Figure 2.2 Average climate information for Dorrigo (1997 – 2023, BOM 2023).

2.3 Landuses and Zoning

The surrounding landuses are primarily agricultural.

The zoning instrument in the study area is the *Bellingen Local Environment Plan 2010* (BLEP). The zonings that apply to the study area are; E4 – Environmental Living and E3 – Environmental Management. The majority of the land affected by the proposed works, including the earthworks, is zoned E4 – Environmental Living.

2.4 Site Inspections

Site inspections to inform this report were undertaken on the 30th June and 4th July 2023. The site inspections comprised of a foot-based meander around the bed and banks of the Bellinger and Kalang Rivers within 100 m upstream and downstream of the bridge sites to identify aquatic habitat features and assess bank condition.

During the site inspections all aquatic and riparian flora encountered were identified with the assistance of photography and field guides.

Photographs of all important habitat types were collected. The locations of photo sites and all photographs are presented in **Appendix H**. Aquatic habitat types were described and notes about their distribution collected in order to facilitate predictive occurrence of threatened species, populations and communities identified during online searches.

2.5 Aquatic Habitat

In terms of aquatic habitat, the study area includes the Bellinger and Kalang Rivers and a small number of mapped tributaries.

The Bellinger - Kalang River system is a major east coast drainage with a shared opening to the Pacific Ocean at Urunga. It has a catchment area of approximately 1110 km^2 and the Bellinger is approximately 69 km long while the Kalang is approximately 77 km long. In the study area the Bellinger and Kalang Rivers are either confined bedrock rivers with a discontinuous floodplain or meandering gravel bed freshwater systems through the lower reaches of the coastal ranges. The reaches within the study area are all pool and riffle sequences. The Bellinger and Kalang Rivers in the study area are Key Fish Habitat. Maps of key fish habitat around the individual bridges are presented in **Figures 2.3 to 2.6**. For the purpose of environmental assessment under the *Fisheries Management Act 1994*, all sites are Class 1 - Major Key Fish Habitat, containing Type 1 - highly sensitive Key Fish Habitat. Specific habitat features in the study area are gravel bars, beds of aquatic plants, unvegetated unconsolidated sediments, bedrock outcrops, snag features, deep pools and riffles.

There are several mapped tributaries within or near the study areas around each bridge (**Figures 2.3 to 2.6**). Of these, only Blakes Gully, located approximately 150 m downstream of the Duffys Bridge site, is mapped as Key Fish Habitat. The others are all ephemeral first or second order streams. For the purposes of environmental assessment, Blakes Gully is Class 3 - Minimal Key Fish Habitat with Type 2 – moderately sensitive key fish habitat. The proposed works are unlikely to have any impact on mapped tributaries.

Figure 2.3 Key fish habitat around Duffys Bridge

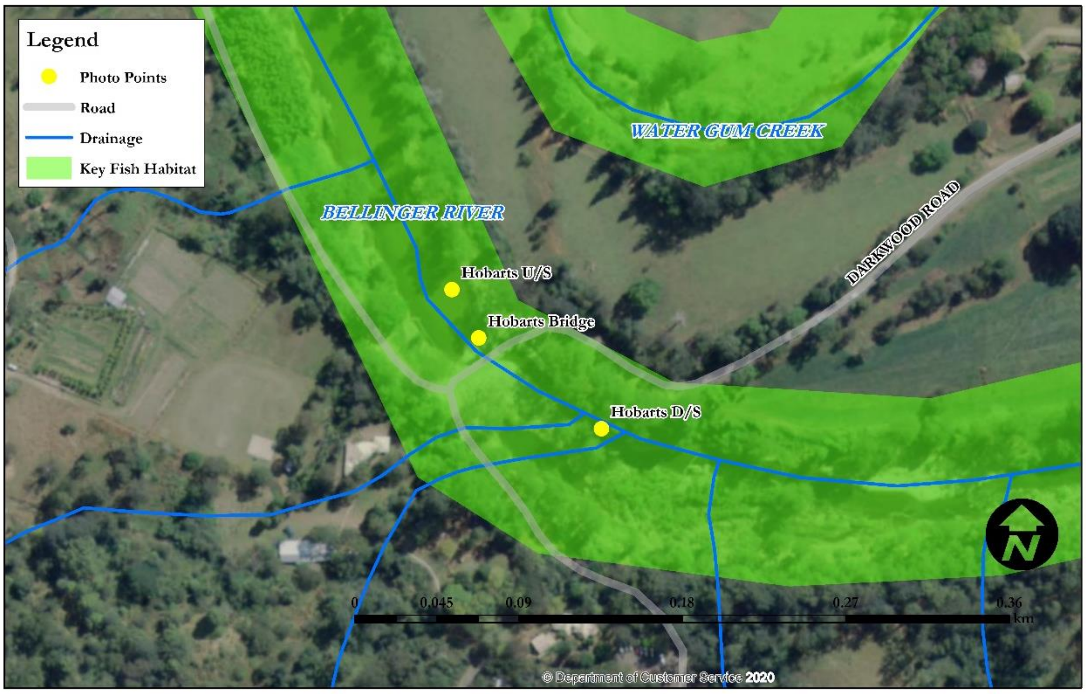

Figure 2.4 Key fish habitat around Hobarts Bridge

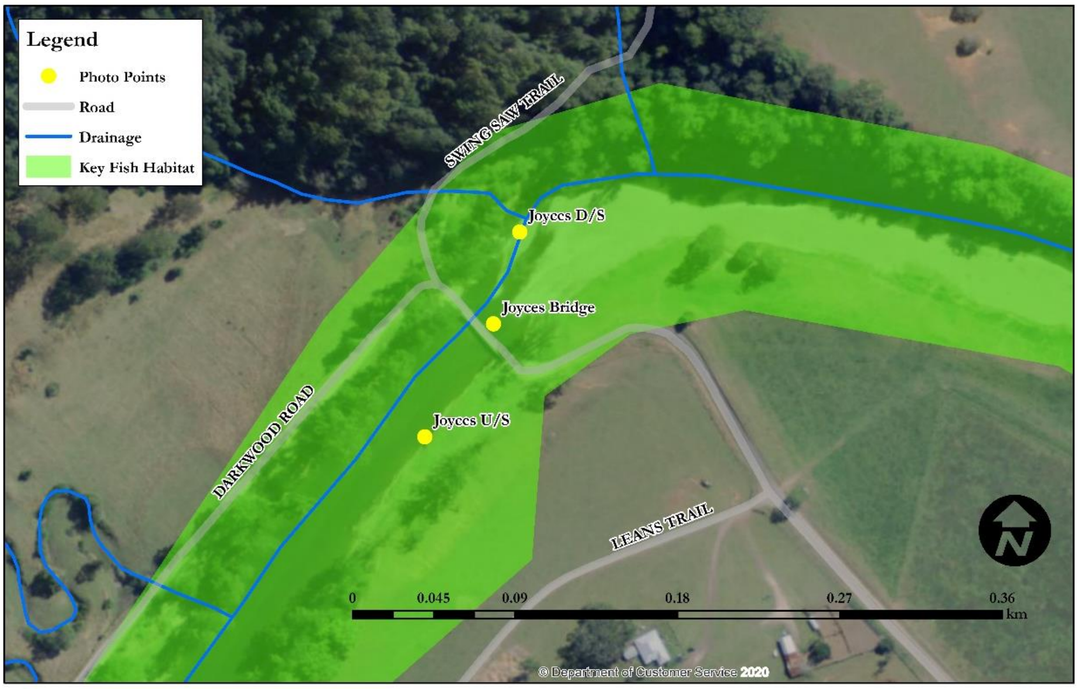

Figure 2.5 Key fish habitat around Joyces Bridge

Figure 2.6 Key fish habitat around Justins Bridge

A description of habitat features around each existing and new bridge site is presented in **Table 2.1** along with a description of the major features within 100 m upstream and downstream. The photos in **Appendix H** form part of the aquatic habitat description

Table 2.1 Aquatic habitat features around each of the bridges

Bridge	***Upstream Habitat***	***Bridge Habitat***	***Downstream Habitat***
Duffys	The benthic material was mostly rock with some coarse and fine gravel. Upstream of the photo point there is a long pool to approximately 1 m deep that enters a short riffle prior to the existing bridge. There is a large gravel bar on the river left which is densely vegetated with a mixture of native and non-native species. Structural elements include large snags and a mixed bed of aquatic plants.	The benthic material was mostly rock with some coarse and fine gravel and a low proportional cover of alluvial fines. The bridge crosses the low-flow river channel and a flood chute and gravel bar. The flood chute is densely vegetated with majority weeds on the upstream side. There is a riffle feature heading downstream of the bridge and a small shallow pool underneath it. Structural features include the bridge pylons, many large snags, a small, sparse bed of *Vallisneria nana* that is upstream of the existing bridge and scattered small beds of *Isolepis fluitans* under the left (western) bank under the proposed bridge.	The benthic material was mostly rock with some coarse and fine gravel. There is a large gravel bar on the river right, a riffle feature leading from the bridge and a long pool downstream to 1.5 m deep. Structural features include lots of large woody debris downstream of the bridge including a log jam in the downstream pool, a small amount of trailing vegetation on the left bank and scattered small beds of *Isolepis fluitans* in the riffle feature.
Hobarts	The benthic material was mostly coarse and fine gravel with a low proportional cover of rock and sand. Upstream of the bridge is a long shallow pool that enters a riffle immediately upstream of the existing bridge. Structural features are limited but include a small number of snags, scattered trailing vegetation, a small bed of *V. nana* and a small bed of emergent vegetation, both on the toe of the right bank.	The benthic material was mostly bedrock with a low cover of rock. There is short pool to approximately 2 m deep directly under the existing bridge with riffle features immediately upstream and downstream. Much of the existing bridge crosses a large gravel bar and bedrock outcrops. The new bridge is located over the entry to a riffle feature and gravel bar. Structural features around the bridges include bridge piers, bedrock caves and a few scattered large snags. No aquatic plants around the old or new bridges.	The benthic material was mostly rock with a low cover of bedrock. There is a long steep riffle downstream of the bridge that enters a bedrock constrained pool to approximately 2 m deep. There is also a backwater, separated from the main channel by a large, well vegetated gravel bar, at the confluence of two ephemeral streams that enter on the river right. Structural features in the riffle and pool include bedrock overhangs. The backwater has a high proportional cover of mixed aquatic plant beds.
Joyces	Upstream of the bridge is a very long pool feature to approximately 1 m deep. The benthic material is an even mixture of rock and large gravel. Structural features include a small number of snags, scattered large beds of mixed submerged aquatic plants and some small stands of emergent aquatic plants (*Schoenoplectus mucronatus*).	The benthic material was mostly rock, with a small area of bedrock and gravel. A long pool extends from upstream all the way under the existing and new bridge sites, where it has a maximum depth of approximately 2 m. There is some scour rock around the existing bridge abutments. Structural habitat features included a small number of large snags, the	The benthic material was mostly bedrock with a low cover of rock. There is a long steep riffle downstream of the bridge with a large gravel bar on the river right. Structural features include a small bed of submerged aquatic plants and some scattered large snags, all on the river left.

		existing concrete bridge piers, debris fields, bedrock caves and large, scattered beds of mixed aquatic plants. Aquatic plants are mostly concentrated upstream of the existing bridge, though there are some scattered clumps of *Vallisneria nana* downstream of the existing bridge with a total area of approximately 2 m².	
Justins	Upstream of the existing bridge the river is comprised of a long pool, greater than 100 m long and to a maximum depth of approximately 2 m during low flow conditions. The benthic material is primarily rock and bedrock with a small proportion of gravel and alluvial sand. Structural habitat is limited to a gravel bar, bedrock features, occasional clumps of *P. parviflora*, and trailing riparian vegetation.	The pool located upstream continues under the existing bridge with a maximum depth of approximately 3 m. Benthic material on the river right is dominated by bedrock and rock features but on the river left is dominated by a cover of alluvial sand and gravel. Structural habitat include bedrock features, existing bridge piers, a deep pool and a small number of large snags and other small debris.	The Bellinger River is comprised of a series of long shallow pools with a short intervening riffle feature downstream of the existing Justins Bridge. The benthic material is mostly rock with small proportional coverages or gravel and alluvial sand. Structural habitat includes a gravel bar/island, the riffle feature and large, scattered beds of mixed aquatic plants mostly comprising *V. nana* and *Potamogeton perfoliatus*.

Potential Impacts of the Proposed Activity

There will be some direct impacts, and potential indirect impacts upon aquatic habitat in the Bellinger and Kalang Rivers associated with the proposed works. These are presented for each location in **Table 2.2**:

There will be no direct impacts on any of the mapped tributaries within the study area associated with the proposed works.

Table 2.2 Potential impact to aquatic habitat at each of the bridge sites

Bridge	*Benthic Habitat*	*Structural Habitat*	*Vegetative Habitat*
Duffys	Piles will be installed in rock with some coarse and fine gravel. Temporary access will be required over an exposed gravel bar. Impacts to an unknown area of unvegetated, unconsolidated rock, gravel and sediment.	At least 16 existing timber bridge piers will be removed to bed level. One or two large snags may require removal to facilitate access and piling works.	Direct impacts to aquatic vegetation will be limited to the potential removal of four individual clumps of *Potamophila parviflora* (total area < 1 m^2) growing out of disused timber pylons and a scattered bed of *Isolepis fluitans* smaller than 0.5 m^2 that is under proposed scour rock. There are potential impacts to vegetative habitats downstream associated with sediment pollution or other water pollution.
Hobarts	Piles will be installed in rock and bedrock with some coarse and fine gravel. Scour rock will be placed over exposed rock and bedrock. Temporary access will be required over a gravel bar and exposed bedrock. Rock bags will be placed over some submerged and some exposed rock. Combined total impacts to approximately 215 m^2 of consolidated and unconsolidated rock, gravel and sediment.	Existing bridge piers will be mostly retained. Snag removal is unlikely to be required.	Direct impacts to aquatic vegetation are unlikely. There are potential impacts to vegetative habitats downstream associated with sediment pollution or other water pollution.
Joyces	Piles will be installed in rock and bedrock. Scour rock to be placed over exposed rock and bedrock and a small area of submerged rock. Temporary excavator access will be required over an exposed gravel bar and submerged rock and unconsolidated sediment. Rock bags will be placed temporarily over submerged rock and bedrock. Combined total impacts to approximately 320 m^2 of consolidated and unconsolidated rock, gravel and sediment.	Existing bridge piers will be mostly retained. Snag removal is unlikely to be required.	Direct impacts to aquatic vegetation will be limited to disturbance of several small clumps of *Vallisneria nana* downstream of the existing bridge with a total area of approximately 1-2 m^2. Shading is unlikely to impact any further vegetation. There are potential impacts to vegetative habitats downstream associated with sediment pollution or other water pollution.

Bridge	*Benthic Habitat*	*Structural Habitat*	*Vegetative Habitat*
Justins	Piles will be installed in areas of exposed rock, and sand with some coarse and fine gravel. Scour rock will be installed over a small area of submerged bedrock and some exposed rock and gravel. Rock bags will be placed temporarily over submerged and exposed rock, sand and gravel. Temporary crane access to exposed rock and gravel required. Combined total impacts to approximately 75 m^2 of consolidated and unconsolidated bedrock, rock, gravel and sediment.	Timber bridge piers will be removed to bed level. One or two large snags may require removal to facilitate access and piling works.	Direct impacts to aquatic vegetation are unlikely. There are potential impacts to vegetative habitats downstream associated with sediment pollution or other water pollution.

2.6 Water Quality

Site Assessment

Water quality is a key aspect of overall aquatic environmental health. Poor water quality can negatively impact aquatic fauna, flora and habitats. Water quality in the Bellinger and Kalang Rivers is relatively well described. In addition, physicochemical water quality measurements were collected during the site inspections.

Water quality studies of the Bellinger and Kalang Rivers undertaken in 2009-2010 and 2015-16 included studies of water quality. Samples were collected monthly for 12-month periods and the sample sites included sites BR1 between Justins and Hobarts Bridges, BR2 approximately 4 km downstream of Joyces Bridge and KR2 approximately 2 km downstream of Duffys Bridge (Ryder *et al* 2011, Mika *et al* 2016). Of these sites, only BR2 was sampled in 2015-16. In general,

- The sites are freshwater with near neutral average pH.
- Turbidity was below state guideline concentrations during all surveys and total suspended solids concentrations were consistently low.
- Dissolved oxygen concentrations were consistently healthy.
- Chlorophyll-a concentrations (a surrogate for algal biomass) were below state guideline concentrations during all surveys in 2019-10 and most surveys in 2015-16.
- Available nitrogen concentrations were consistently high relative to guideline concentrations but available phosphorus concentrations were generally lower than guideline concentrations, particularly in the Kalang.
- BR1 had extremely high values for total nitrogen and total phosphorus at times.

Water quality results collected during the site inspections for this assessment are presented in **Table 2.3**. They demonstrate excellent water quality for a wide variety of native freshwater flora and fauna.

Table 2.3 Water quality results collected during the site inspections

Site	*Date*	*Time*	*Temp (°C)*	*pH*	*EC (mS/cm)*	*Turbidity (NTU)*	*DO (mg/L)*	*DO (% sat)*
Duffys D/S	30/06	12:50:08	11.17	7.17	0.087	6.4	8.56	80.5
Duffys U/S	30/06	13:09:59	11.13	7.26	0.091	5.2	8.6	80.9
Justins D/S	4/07	12:09:48	11.49	7.11	0.07	5	10.03	95.1
Justins U/S	4/07	12:28:51	11.72	7.23	0.07	5.6	7.75	73.9
Hobarts D/S	4/07	13:50:14	12.57	7.04	0.067	5.6	8.62	83.7
Hobarts U/S	4/07	13:29:59	12.66	7.08	0.063	5.7	7.93	77.2
Joyces D/S	4/07	14:27:17	12.42	7.12	0.067	6.4	9.75	94.4
Joyces U/S	4/07	14:42:58	12.7	7.16	0.068	7.1	7.98	77.8

Potential Impacts of the Proposed Activity

There are some general potential short-term negative impacts of the proposed activity on water quality in the study area.

There is potential for short-term impacts on water quality in the study area associated with drilling, bank excavations, concrete pours, scour rock placement, disturbance to ground covers and spills from machinery. Historical water quality monitoring from around the study area indicates that the Bellinger and Kalang Rivers could be highly sensitive to pollution.

Drilling and bank excavations present a risk of short-term sediment pollution and increased turbidity downstream.

Operation of the machinery around the site carries a risk of hydrocarbon pollution from spills of fuel, oil or hydraulic fluids. Impacts of this nature could extend far downstream in the rivers and have significant consequences.

The construction methodology developed for Hobtarts, Justins and Joyces Bridges includes many strategies to mitigate risks to water quality:

- Repeated use of pre-filled rock bags
- Installation of sediment fencing around all disturbed soils and riverbanks.
- Stockpiles and laydown areas to be located outside of high flood zones.
- Minimal access to exposed riverbed only, mostly within the footprint of the proposed works.
- Material specifications that exclude fines.
- Floating hydrocarbon booms with drop silt curtains around all piling works and temporary access tracks.
- No concrete pours boom lines positioned over water.
- Use of sucker trucks to remove site water.
- Use of spray screens around rock anchor drilling locations.
- Refuelling locations to be at least 50 m from waterways and in bunded areas.
- Concrete truck washout to be remote from sites or in bunded areas outside of high flood zones.
- Daily removal of excavated materials, rock hole flushout materials to stockpiles.

In addition to the above, it is recommended that

- All materials specifications are to exclude fines.
- Spill kits must be kept on site at all times.

2.7 Fauna

There were no aquatic fauna observed during the site inspection.

The fauna of the Bellinger and Kalang Rivers in the study area are very well described elsewhere. Gilligan (2010) surveyed freshwater fish communities throughout the Bellinger-Kalang River basin, including sites in the lowlands (as per Justins, Hobarts and Joyces Bridges) and coastal plains area (as per Duffys Bridge). The study assigned values for 'expectedness' and 'nativeness' of species captured at each site. They found freshwater fish communities overall to be in moderate condition during the time of sampling. Overall fish community condition was good in the coastal zone and moderate in the lowlands. The nativeness of the freshwater fish communities was good, with only one species of alien fish found at only one site (a heavily degraded site in the coastal plains). The expectedness was poor across the study area, with six expected species not observed. The species observed are presented in **Table 2.4**.

Table 2.4 Freshwater fish in the Bellinger Kalang River system (Gilligan 2010)

Common Name	***Species Name***	***Notes***
Australian Bass	*Macquaria novemaculeata*	Freshwater fish that breeds in estuaries. Recruitment impacted by restrictions in riparian habitat and beds of aquatic vegetation. Likely to pass upstream and downstream of the study area.
Australian Smelt	*Retropinna semoni*	A schooling fish found among structural habitats in fresh and brackish waters. Likely to pass upstream and downstream of the study area.
Bellinger Climbing Galaxias	*Galaxias sp.*	A freshwater fish likely to be found upstream of the study area
Bullrout	*Notesthes robusta*	Normally a freshwater species but enter estuaries during rain events. Likely to pass upstream and downstream of the study area.
Cox's Gudgeon	*Gobiomorphus coxii*	Freshwater fish that favours structured habitats. Juveniles commonly encountered in estuaries. Likely to pass upstream and downstream of the study area.
Ornate Rainbowfish	*Rhadinocentrus ornatus*	A freshwater species. Likely to pass upstream and downstream of the study area.
Dwarf Flat-headed Gudgeon	*Phylipnodon acrostomus*	Mostly found in lower freshwater and upper estuarine reaches. Unlikely to be found in the study area.
Empire Gudgeon	*Hypseleotris compressa*	Freshwater fish that favours structured habitats. Juveniles commonly encountered in estuaries. Likely to pass upstream and downstream of the study area.
Firetail Gudgeon	*Hypseleotris galii*	A common freshwater species.

Common Name	***Species Name***	***Notes***
Flat-headed Gudgeon	*Phylipnodon grandiceps*	Mostly found in lower freshwater and upper estuarine reaches. Likely to pass upstream and downstream of the study area.
Bellinger Freshwater Catfish	*Tandanus sp.*	A freshwater species.
Freshwater Herring	*Potamolosa richmondia*	A freshwater fish that appears to spawn in estuarine reaches. Likely to pass upstream and downstream of the study area.
Freshwater Mullet	*Myxus petardi*	Schooling freshwater fish that spawns in estuaries or marine environments. Likely to pass upstream and downstream of the study area.
Sea Mullet	*Mugil cephalus*	Schooling estuarine and freshwater fish that undertakes a migration in marine environments to spawn. Likely to pass upstream and downstream of the study area.
Long-finned Eel	*Anguilla reinhardtii*	Freshwater fish that undertakes a migration in marine environments to spawn. Likely to pass upstream and downstream of the study area.
Short-finned Eel	*Anguilla australis*	Freshwater fish that undertakes a migration in marine environments to spawn. Likely to pass upstream and downstream of the study area.
Southern Blue-eye	*Pseudomugil signifer*	Ranges from estuarine to freshwater habitats. Likely to pass upstream and downstream of the study area.
Striped Gudgeon	*Gobiomorphus australis*	Freshwater fish that favours structured habitats. Juveniles commonly encountered in estuaries. Likely to pass upstream and downstream of the study area.
Yellowfin Bream	*Acanthopagrus australis*	Occurs mainly in estuaries and marine habitats but sometimes found in freshwater environments. Unlikely to use the study area.
Gambusia	*Gambusia holbrooki*	Introduced freshwater fish also found in upper estuarine reaches

NSW DPI fisheries fish community condition maps indicate that the waters of the Bellinger and Kalang Rivers in the study area are in 'Good' condition (**Figure 2.8,** Riches *et al.* 2016).

Threatened species populations and communities of aquatic fauna listed under the FM Act, BC Act and the EPBC Act were subjected to a potential occurrence assessment of threatened fauna species listed under the EPBC Act or BC Act is provided in **Appendix B**. Species subject to the assessment were determined using DPIE Bionet database search of the study area, mapped freshwater fish distributions presented on the DPI Fisheries Spatial Data viewer and an EPBC Act Protected Matters Search of the study area (refer to **Appendix E**). The potential occurrence assessment did not include frogs or the Bellinger River Snapping Turtle (*Myuchelys georgesii*) as it is understood these are already considered as part of the REF. Only one species of animal was assessed, the

Southern Purple-spotted Gudgeon (*Mogurnda adspersa*) (**Figure 2.9**). It was thought to possibly occur in the study area. A seven-part test (as per the FM Act) to assess the likelihood of a significant impact upon threatened species was applied. The results of the seven-part test is presented in **Appendix D**. The test concluded that there is not likely to be any significant impact arising from the proposed activity on Southern Purple-spotted Gudgeon.

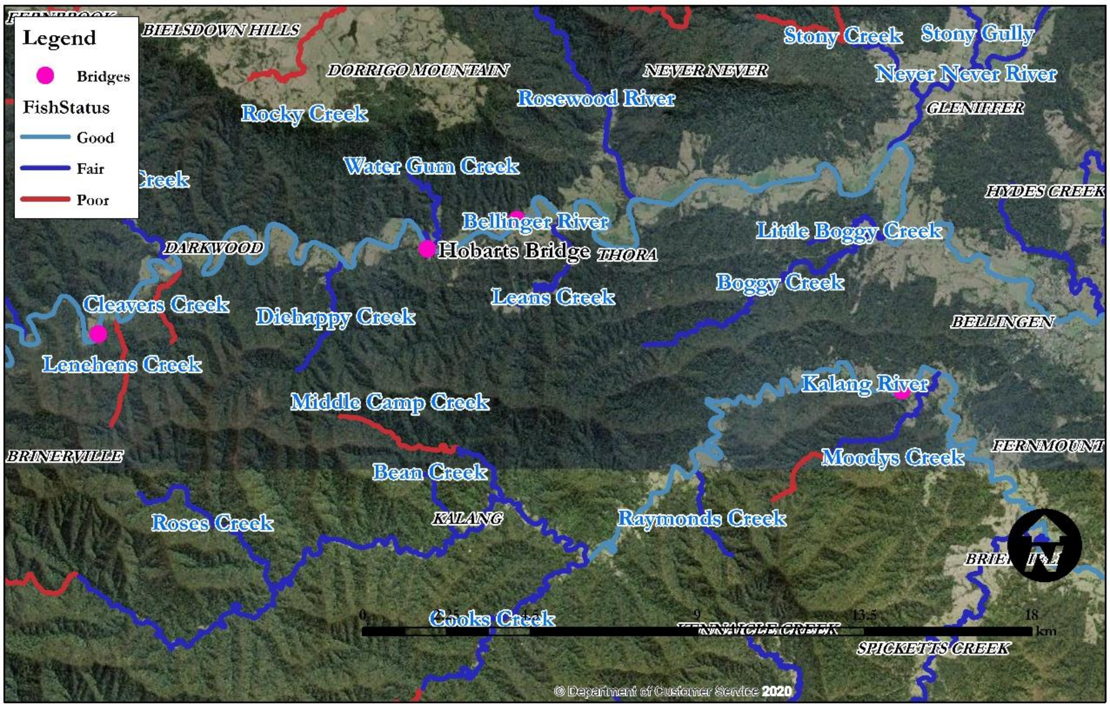

Figure 2.7 Freshwater fish community status in the study area

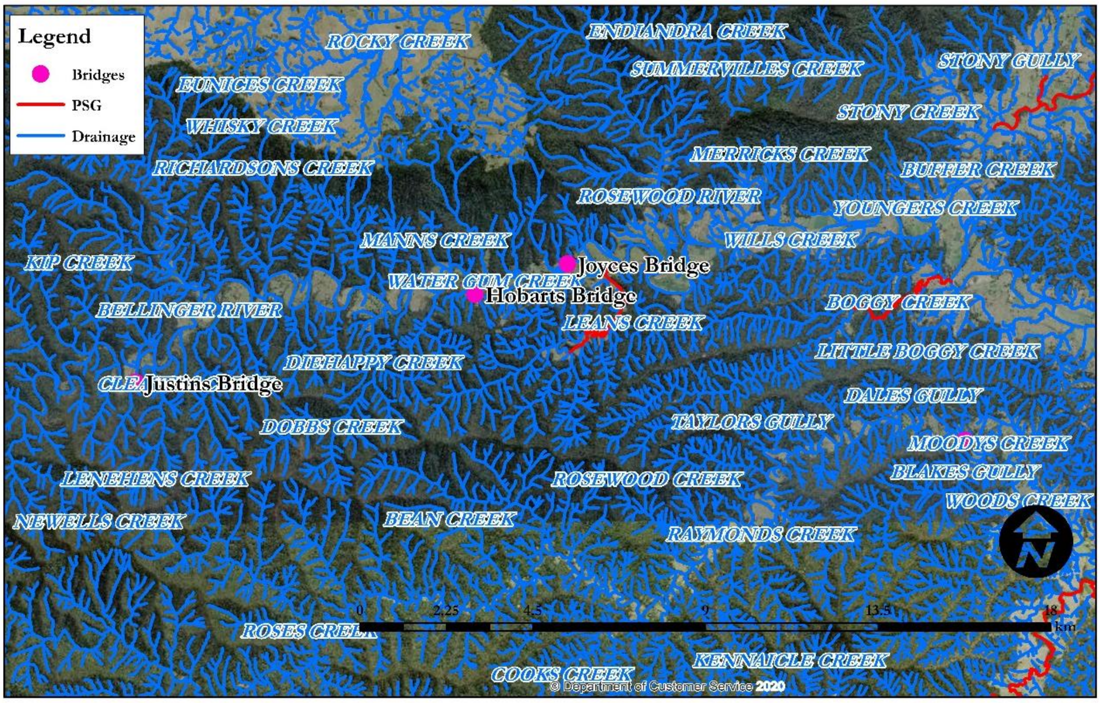

Figure 2.8 Southern Purple-spotted Gudgeon habitat in the study area

Other threatened species listed under the FM Act, including the Black Cod (*Epinephelus daemelii*), White Shark (*Carcharodon carcharias*), Great Hammerhead Shark (*Sphyrna mokarran*) and Scalloped Hammerhead Shark (*Sphyrna lewini*), have distributions that overlap the entrance to the Bellinger-Kalang River system but do not enter freshwater areas conforming to the description of the study area. The short-term or long-term influence of the proposed works is unlikely to extend into the habitat of any of these species.

Potential Impacts of the Proposed Activity

The proposed earthworks would result in direct impacts to benthic invertebrate fauna and, potentially, some short-term disturbances to more mobile aquatic fauna. The potential impacts of the proposed works upon aquatic fauna are difficult to predict but potentially include:

- Direct impacts to aquatic flora (an important habitat feature for aquatic fauna) through drilling, scour rock placement and shading. A total combined area of approximately 3.5 m^2 of aquatic flora is likely to be impacted (See **Section 2.8**).
- The proposed works would have direct impacts upon the less mobile benthic invertebrate fauna on benthic habitats underneath the areas of scour rock placement, rock bag placement and drilling.
- The proposed works would potentially have a short-term impact upon water quality (see **Section 2.6**) that might, in turn negatively impact aquatic fauna.

2.8 Aquatic Flora

Beds of aquatic flora were observed at each of the bridge sites within the study area. The species observed are presented in **Table 2.5**.

Table 2.5 Aquatic flora identified during the site inspections

Common Name	*Species Name*	*Duffys*	*Hobarts*	*Joyces*	*Justins*
Floating Clubrush	*Isolepis fluitans*	Y		Y	Y
Hydrilla	*Hydrilla verticilliata*		Y	Y	
A Millfoil	*Myriophyllum sp.*	Y			
Water Couch	*Paspalum distichum*				
Smartweed	*Persicaria decipiens*	Y			Y
A Smartweed	*Persicaria attenuata*		Y		
Spotted Knotweed	*Persicaria strigosa*	Y	Y		Y
Small Knotweed	*Polygonum plebium*				
Curled Pondweed	*Potamogeton crispus*		Y	Y	
Clasped Pondweed	*Potamogeton perfoliatus*				Y
Pondweed	*Potamogeton octandrus*		Y		
River Sweetgrass	*Potamophila parviflora*		Y	Y	Y

Marsh Clubrush	*Schoenoplectus mucronatus*		Y	Y	Y
River Clubrush	*Schoenoplectus validus*		Y		Y
Cumbungi	*Typha sp.*		Y		
Ribbonweed	*Valisneria nana*	Y	Y	Y	Y

There were no individual threatened species of flora observed during the site inspection.

A potential occurrence assessment of threatened aquatic flora species listed under the EPBC Act or BC Act is provided in **Appendix B**. Species subject to the assessment were determined using OEH Atlas of NSW Wildlife database search of the study area (refer to **Appendix E**). Some threatened aquatic flora species identified by the EPBC Act Protected Matters Search Tool identified as "*species or their habitats*" potentially occurring within the study area (refer to **Appendix D**) were also subject to the potential occurrence assessment. Terrestrial plants included in the results of online searches were not considered. A total of 2 species of aquatic plant were included in the potential occurrence assessment. Of these, both were found to possibly occur in the study area. A five-part test to assess the likelihood of a significant impact upon each of the threatened species was applied to both species. The results of the five-part tests are presented in **Appendix C**. The conclusions were that there is not likely to be any significant impact arising from the proposed activity on any of the threatened species potentially occurring in the study area.

The Bionet search identified one Threatened Ecological Community (TEC) associated with the aquatic environment within the search area – Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. A potential occurrence assessment found it is unlikely to occur in the study area.

Potential Impacts of the Proposed Activity

The proposed works would result in direct and indirect impacts to aquatic flora that include:

- Direct impacts to aquatic flora through drilling, scour rock placement and shading. A total area of approximately 3.5 m^2 is likely to be impacted.
- The proposed works would potentially have a short-term impact upon water quality (see **Section 2.6**) that might, in turn, negatively impact aquatic flora downstream.

2.9 Banks and Riparian Vegetation

The condition of the banks and riparian vegetation at the time of the site inspection was highly variable within and between sites. A brief description of the banks and riparian zones around the proposed and existing bridge sites is presented in **Table 2.6**.

Table 2.6 Riparian and bank condition at each of the bridge sites

Bridge	***Riparian Vegetation***	***River Bank***
Duffys	▪ Left bank has moderate vegetation continuity, good vegetation structure and mostly non-native vegetation. Width of riparian vegetation 3 – 10 m. ▪ Right bank has high vegetation continuity in the area of the proposed bridge, mostly native species and has a medium vegetation structure. Width of riparian vegetation is > 20 m, including the vegetated gravel bar.	▪ Left bank steep to 2.5 m high, comprised of alluvial materials and no signs of active erosion. ▪ Right bank is gradual to 2 m high, comprised of gravels and has no signs of active erosion.
Hobarts	▪ Left bank has poor vegetation continuity in the area of the proposed bridge, a mixture of native and non-native species and has a medium vegetation structure. Width of riparian vegetation is 2 - 4 m. ▪ Right bank has poor vegetation continuity, poor vegetation structure and is a mixture of native and non-native vegetation. Width of riparian vegetation 2 m.	▪ Left bank moderately steep to 4 m high, comprised of gravel and alluvial materials and with no signs of active erosion. ▪ Right bank is gradual to 3 m high, comprised of rock, gravels and bedrock and has no signs of active erosion.
Joyces	▪ Left bank has poor vegetation continuity in the area of the proposed bridge, has a poor vegetation structure and is comprised of mixed native and non-native species. Width of riparian vegetation is < 2 m. ▪ Right bank has negligible vegetation continuity, poor vegetation structure and is comprised of mostly native vegetation. Width of riparian vegetation < 2 m.	▪ Left bank is gradually sloped to 3 m high, comprised of bedrock and some alluvial materials and with no signs of active erosion. ▪ Right bank is gradual to 2.5 m high, comprised of rock, gravels and alluvial materials. Some signs of historical erosion.
Justins	▪ Left bank has negligible vegetation continuity in the area of the proposed bridge, has a very poor vegetation structure and is comprised of mostly non-native species. Width of riparian vegetation is < 2 m. ▪ Right bank has poor vegetation continuity, poor vegetation structure and is comprised of mostly native vegetation. Width of riparian vegetation < 2 m.	▪ Left bank is steeply sloped to 2.5 m high, comprised of gravel and alluvial materials and with no signs of active erosion. ▪ Right bank is gradual to 3 m high, comprised of rock and bedrock with no signs of active erosion.

Potential Impacts of the Proposed Activity

At all sites riparian vegetation will be cleared and roots will be grubbed to allow construction of abutments and placement of scour rock. Specific bank lengths and

Table 2.7 Riparian and bank condition at each of the bridge sites

Bridge	***Riparian Vegetation***	***River Bank***
Duffys	Some native trees and mixed native and non-native shrubs and ground covers to be removed on the left and right banks for 12 m of riverbank	15 m of riverbank to be disturbed on left side of the river from high bank to toe. 19 m of high bank on right side of

	and gravel bar on either bank. Vegetation on the right bank gravel bar will need to be cleared for access track.	the river in addition to disturbances to the gravel bar that forms the low bank.
Hobarts	Some native trees and mixed native and non-native shrubs and ground covers to be removed on the left and right banks for 12 m of riverbank on the left bank and 15 m on the right bank and gravel bar. Vegetation on the right bank gravel bar will need to be cleared for access tracks.	12 m of riverbank to be disturbed on left side of the river from high bank to toe. 15 m of high bank on right side of the river in addition to disturbances to the gravel bar that forms the low bank.
Joyces	Mixed native and non-native ground covers to be removed on the left and right banks for approximately 16 m of riverbank and gravel bar on either bank. Some vegetation on the right bank gravel bar will need to be cleared for an access track.	16 m of riverbank to be disturbed on the left side of the river from high bank to toe. 16 m of high bank on right side of the river in addition to disturbances to the gravel bar that forms the low bank.
Justins	One native tree on right bank and mixed native and non-native shrubs and ground covers to be removed on the left and right banks for approximately 8 m of riverbank on either side.	Approximately 8 m of riverbank to be disturbed on both sides of the river from high bank to toe.

3. Summary of Impacts and Suggested Controls

A variety of positive and negative impacts have been identified. They are summarised in **Table 3.1** along with the recommendations of this report.

Table 3.1 Summary of impacts and recommendations

Type of Impact	*Impacts*	*Recommendations*
Aquatic Habitat	Temporary and permanent impacts to a combined total of at least 610 m^2 of consolidated and unconsolidated unvegetated benthic materials from drilling, piling, abutments, access tracks and rock bag placements.	No further controls suggested to those included in construction plans. Apply for a Section 200 permit from NSW DPI Fisheries for reclamation.
	Direct impacts to 3.5 m2 of aquatic vegetation.	No further controls suggested. Impacts have been minimised by placement of piers.
	Removal of several individual snags to facilitate piling.	Reposition any snags that are removed to a suitable location within the permanent aquatic environment.
	Removal of existing bridge piers	No further controls suggested. Impacts have been minimised by leaving piers in place where feasible.
Water Quality	There is potential for short-term minor impacts on water quality in the study area associated with associated with drilling, bank excavations, concrete pours, scour rock placement and disturbance to ground covers. These relate specifically to increased suspended sediment concentrations and associated increases to nutrient concentrations and turbidity.	- Strategies already described in the construction methodology will be adequate to mitigate most risks to water quality. - Prepare an ERSED plan for the earthworks and revegetation phase. - All materials specifications to exclude fines.

Type of Impact	*Impacts*	*Recommendations*
Water Quality	Operation of the machinery around the site carries a risk of hydrocarbon pollution from spills of fuel, oil or hydraulic fluids. Impacts of this nature could extend downstream in the Bellinger and Kalang Rivers and have significant consequences.	- Strategies already described in the construction methodology will be adequate to mitigate most risks to water quality. - Maintain suitable spill kits on site during works. - Refuel machinery remote from waterways. - All stored fuel (and other chemicals) to be kept in a bunded area remote from waterways. - Daily heavy plant checks on all hydraulic hoses, fuel lines and bearings.
Aquatic Fauna	The proposed works would have direct impacts upon the benthic invertebrate fauna on submerged river beds impacted by some drilling and rock bag placements.	No suitable controls.
	The proposed works would potentially have a short-term impact upon water quality that might, in turn, negatively impact aquatic fauna.	- Strategies already described in the construction methodology will be adequate to mitigate most risks to water quality. - Prepare an ERSED plan for the earthworks and revegetation phase. - All materials specifications to exclude fines. - Maintain suitable spill kits on site during works. - Refuel machinery remote from waterways. - All stored fuel (and other chemicals) to be kept in a bunded area remote from waterways. - Daily heavy plant checks on all hydraulic hoses, fuel lines and bearings.

Type of Impact	*Impacts*	*Recommendations*
Aquatic Flora	Direct impacts to aquatic flora through drilling, scour rock placement and shading. A total area of approximately 3.5 m^2 is likely to be impacted.	No further controls, impact already minimised in design phase.
River Banks and Riparian Vegetation	Removal of riparian vegetation	- Riparian vegetation removal has been minimised in the design phase. - Revegetation to refer to Raine and Gardiner (1997) for species selection and placement.
	Disturbances to river banks associated with access, abutment construction and scour rock placement.	- No further controls. - Area of disturbance minimised to construction footprint in design phase and rehabilitation of disturbed banks considered.

4. Legal and Planning Framework

4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is used to plan and assess development proposals in NSW. Certain development does not need consent under *Part 4* of the EP&A Act, including developments where the proponent is a public authority, such as *State Environmental Planning Policy (Infrastructure) 2007*.

Such developments may still require assessment under *Part 5* of the EP&A Act if they are likely to have a significant impact on the environment.

4.2 State Environmental Planning Policy (Infrastructure) 2007

The *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) aims to facilitate the effective delivery of infrastructure across the state. *Section 108* of the ISEPP defines soil conservation works as development necessary 'to avoid, manage or mitigate the effects of erosion'.

Under *Section 109* of the ISEPP development for the purpose of soil conservation works may be carried out by or on behalf of a public authority without consent on any land. This includes environmental management works.

4.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) lists among its objectives:

- To conserve fish stocks and key fish habitats; and
- To conserve threatened species and ecological communities of fish and marine vegetation.

The FM Act includes all major rivers within the definition of Key Fish Habitats. The Hastings River meets the description of and is mapped as Key Fish Habitat.

Under the FM Act (Part 7, Division 3), NSW Fisheries are responsible for assessing proposals for dredging and reclamation in NSW waterways. *Section 200* of the FM Act authorises local government authorities to carry out dredging and reclamation works in Key Fish Habitat with the authorisation of the Minister (Currently the Minister for Primary Industries). The proposed activity will require a *Section 200* permit from DPI Fisheries because it involves reclamation.

Finally, the FM Act provides for the protection of threatened species of fish, ecological communities and critical habitat listed as vulnerable, endangered or critically endangered. Under the FM Act it is an offence to harm any listed species, population or community. For any proposed activity it is the responsibility of the proponent to meet the information requirements that will allow the minister to determine whether a significant impact will arise from the activity.

Underpinning the responsibilities and powers granted to NSW Fisheries are the *Policy and guidelines for fish habitat conservation and management* (NSW Fisheries 2013). Specifically:

- Section 3.3 outlines the general information requirements of NSW Fisheries for the assessment of proposed activities on fish and fish habitats.
- Section 6.3 outlines the specific information requirements of NSW Fisheries for the assessment of proposed reclamation activities on fish and fish habitats.

4.4 Water Management Act 2000

Under the *Water Management Act 2000* controlled activity approvals are required for certain types of developments that are carried out near waterways, including the removal of material or vegetation from land and the deposition of material on land. However, *Clause 40* of the *Water Management Regulation 2018* contains details of exemptions for public authorities to the requirement to hold a controlled activity approval. Consequently, BSC do not require a controlled activity approval under the *Water Management Act 2000* for the proposed activity.

4.5 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) and the *Biodiversity Conservation Regulation 2017* set out the legal framework for the protection of flora, fauna and ecological communities in NSW. Relevant sections of the BC Act are those that allow for

- Licensing of acts that may damage protected species and ecological communities (Part 2, Division 3).
- Listing of threatened flora, fauna and ecological communities (Part 4).
- Listing of key threatening processes.
- Biodiversity assessment and approvals under the planning act (Part 7), including 5-part tests of significance. An assessment of significance of the potential impacts of the proposal on threatened species, populations, ecological communities and their habitats is required under *Section 7.3* of the BC Act.

Schedules of threatened species, populations and ecological communities were checked in the preparation of this ecological assessment. They include listings for two plant species that are thought to possibly occur within the study area. No threatened species, populations or ecological communities are likely to be significantly negatively impacted by the proposal (refer to **Appendix C**).

Among the key threatening processes listed under the BC Act is 'Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands (as described in the final determination of the Scientific Committee to list the threatening process)'. The proposed activity is unlikely to result in the alteration of the current flow regime of the Bellinger or Kalang Rivers in the short or long term. The proposed works are not, and will not contribute to, the operation of any key threatening processes.

4.6 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the key federal legislation for the assessment of environmental impacts of a proposed activity. Under the EPBC Act a referral is required to the Australian Government for proposed "actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land". These are considered in **Appendix E** of this REF.

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is not likely to be a significant impact of the proposed works upon any matter of national environmental significance. Accordingly, the proposed works do not need to be referred to the Federal Department of the Environment and Energy under the EPBC Act.

4.7 Bellingen Local Environmental Plan 2010

Bellingen Shire Council is the local government authority for the study area. The proposed works occur on land zoned E4 – Environmental Living under the *Bellingen Local Environmental Plan 2010* (BLEP). Under the BLEP, construction of roads is permissible with consent in areas zoned E4. However, development consent is not required because the proposed activity would be assessed under provisions of the ISEPP.

4.8 Approvals Required

No development approval is required.

A *Section 200* permit or *Section 199* consultation from DPI Fisheries would be required under the FM Act for reclamation.

No controlled activity approval would be required.

No consultation arising from impacts to threated aquatic flora, aquatic fauna or aquatic communities would be required with the NSW Minister for the Environment for the proposed works.

No Biodiversity Conservation Licence would be required for impacts upon aquatic threatened species or aquatic species associated with TECs.

No referral with the Federal Government Department of the Environment for potential impacts to aquatic matters would be required.

5. Conclusions

The likely short-term and long-term environmental effects upon the aquatic environment resulting from the proposed activities are potentially significant. However, the construction methodologies developed for the proposed activities to date contain a several strategies to mitigate environmental risk. In this report there are a small number of suggested further strategies.

Correct implementation of environmental controls should adequately mitigate the short-term risks to the aquatic environment associated with the proposed works.

There are a small number of relatively minor unavoidable long-term impacts to the aquatic environment that will arise from the proposed works. For the most part, these are impacts to unvegetated, unconsolidated rock and bedrock associated with piling. At two of the sites the proposed works would result in impacts to small areas of aquatic plants. In total, the aerial extent of this is to a maximum of approximately 3 m^2.

No significant negative impact on any threatened species, population or ecological community would be likely to arise from the proposed activities.

A *Section 200* licence from NSW DPI Fisheries would be required prior to commencement of the proposed activities.

6. Project Team

The Following individuals contributed to the preparation of this report

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7. References

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8. Appendices

Appendix A
Proposed Works

Appendix B

Threatened Species Potential Occurrence Assessment

Table B.1 Threatened aquatic species potential occurrence assessment

Scientific Name	*Common Name*	*Status*		*Habitat Requirement*	*Suitability of Site Habitat*	*Potential Occurrence*
		BC Act	*EPBC Act*			
Mogurnda adspersa	Purple-spotted Gudgeon	E	V	Usually found in slow moving or still waters of rivers creeks and billabongs, often amongst weeds rocks and snags.	Suitable	**Possible**
Persicaria elatior	Tall Knotweed	V	V	Normally grows in damp places, especially beside streams and lakes.	Suitable	**Possible**
Zannichellia palustris	Horned Pondweed	E		Grows in fresh or slightly saline stationary or slowly flowing water	Suitable	**Possible**
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC		Occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea along the NSW coast.	Unsuitable	Unlikely

Appendix C

BC Act 5 Part Tests

Table C.1 Five Part Tests for Tall Knotweed and Horned Pondweed

Factor	**Tall Knotweed** **(*Persicaria elatior*)**	**Horned Pondweed** **(*Zannichellia palustris*)**
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. [BC Act section 7(1)(a)]	Tall Knotweed flowers in the summer and autumn. The proposed activity would not have any impact upon the life cycle of Tall Knotweed. No disturbance to Tall Knotweed is likely to occur as a result of the proposed activity.	Horned Pondweed flowers during the warmer months and dies back completely in the summer months. The proposed activity would not have any impact upon the life cycle of Horned Pondweed. No disturbance to Horned Pondweed is likely to occur as a result of the proposed activity
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction [BC Act section 7(1)(b)]	N/A	N/A

Factor	Tall Knotweed (*Persicaria elatior*)	Horned Pondweed (*Zannichellia palustris*)
(c) in relation to the habitat of a threatened species or ecological community: i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality [BC Act section 7(1)(c)]	The proposed bridge works will not result in any change to available Tall Knotweed habitat in the study area. No isolation or fragmentation of Tall Knotweed habitat would result from the proposed works.	The proposed bridge works will not result in any change to available Horned Pondweed habitat in the study area. No isolation or fragmentation of Horned Pondweed habitat would result from the proposed works.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly) [BC Act section 7(1)(d)]	There are no declared areas of outstanding biodiversity value within the study area.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process [BC Act section 7(1)(e)]	The proposed works are not, not part of and not likely to increase the impact of any of the 39 key threatening processes listed under the BC Act, although there is 1 relevant Key Threatening Processes listed; Alteration to the natural flow regimes of rivers and streams. While there may be minor changes to the direction of flow around new bridge piers but there would be no significant changes to flow volumes, flow velocities or river levels associated with the proposed works and the proposed works are not considered part of this key threatening process or likely to increase the impact of this key threatening process.	
Conclusion	No significant negative impact on Tall Knotweed.	No significant impact on Horned Pondweed

Appendix D
FM Act Seven Part Test

Assessment of significance ('7-part test') under Part 7 of the NSW Fisheries Management Act 1994 for the Purple Spotted Gudgeon

Background

A review of relevant databases and documents indicate that potential habitat may exist for the Purple Spotted Gudgeon (*Mogurnda adspersa*) in the study area.

Assessment of Significance criterion (Seven Part Test)	Southern Purple-spotted Gudgeon (*Mogurnda adspersa*)
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	No. The proposed works are not likely to interfere with the breeding, growth or movement of Southern Purple-spotted Gudgeon. The proposed works will be timed and undertaken in a way that would have a very minor, if any, impact upon the aquatic environment. The proposed works will not result in any significant change to fish passage during or after works.
b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	N/A
c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	N/A

Assessment of Significance criterion (Seven Part Test)	Southern Purple-spotted Gudgeon (*Mogurnda adspersa*)
d) In relation to the habitat of a threatened species, population or ecological community: i. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	Southern Purple-spotted Gudgeon utilise freshwater habitats that are found near the study area (Pusey *et al.* 2004). However, the proposed works are unlikely to have a significant impact on habitat upstream or downstream of the bridge sites. i) The aquatic habitats that will be removed or modified are mostly riffle habitats or deep pools in a high flow environment. There is also a potential impact to approximately 3 m^2 of aquatic plant beds, w very small proportion of the overall vegetative aquatic habitat in the greater study area. However, following the proposed works, which will be undertaken in a dry period, the habitat will remain functionally the same ii) The proposed works will not result in the fragmentation or isolation of habitat for Southern Purple-spotted Gudgeon. The proposed works will result in no change to fish passage between areas of potential habitat for Southern Purple-spotted Gudgeon. iii) The habitat that will be modified by the proposed works is not of specific importance to the Southern Purple-spotted Gudgeon. There are no recorded observations of Southern Purple-spotted Gudgeon in the Bellinger River and the bridge sites have not been mapped as potential habitat for Southern Purple-spotted Gudgeon.
e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	There is no critical habitat listed for Southern Purple-spotted Gudgeon.
f) Whether the action proposed is consistent with the objectives or actions of a Recovery Plan or Threat Abatement Plan	The proposed works are not consistent with any of the 29 recovery plan objectives (under 8 categories) recommended for the Southern Purple-spotted Gudgeon (Port Stephens Fisheries Institute 2012).
g) Whether the action proposed constitutes or is part of a Key Threatening Process (KTP) or is likely to result in the operation of, or increase the impact of, a KTP	There are currently 8 key threatening processes listed under the *Fisheries Management Act 1994*. These include Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams. The proposed activity involves the installation of an instream structure. However, the proposed activity will not impact fish and is unlikely to impact the volume or velocity of flows in the Bellinger and Kalang Rivers.

Conclusion

The proposal would not have a significant impact upon Southern Purple-spotted Gudgeons. This conclusion is based upon:

- No works occurring in mapped Southern Purple-spotted Gudgeon habitat.
- The relatively restricted area of disturbance associated with the proposed activity.
- No change to fish passage during or following the proposed works.

Appendix E

Protected Matter Search Tool Results

Appendix F

Bionet Search Tool Results

Appendix G

Consideration of EPBC Protected Matters

Matters of National Environmental Significance

Background

Under the *Environment Protection and Biodiversity Conservation Act 1999* the following matters of national environmental significance and impacts on Commonwealth Land are to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of Agriculture, Water and the Environment.

Matter Assessed	***Notes***
a) Any impact on a World Heritage Property?	None.
b) Any impact on a place of National Heritage?	None
c) Any impact on a Wetland of International Importance?	None
d) Any impact on a listed aquatic threatened species or aquatic ecological communities?	No negative impact.
e) Any impact on an aquatic migratory species protected under international agreements?	None of the species identified in the search would be negatively impacted by the proposed activity.
f) Any impact on Commonwealth Marine Areas?	None
g) Any impact on the Great Barrier Reef Marine Park?	None.
h) Any nuclear actions?	None.
i) Any impact on a water resource (in relation to coal seam gas development and large coal mining development)?	None.

Conclusion

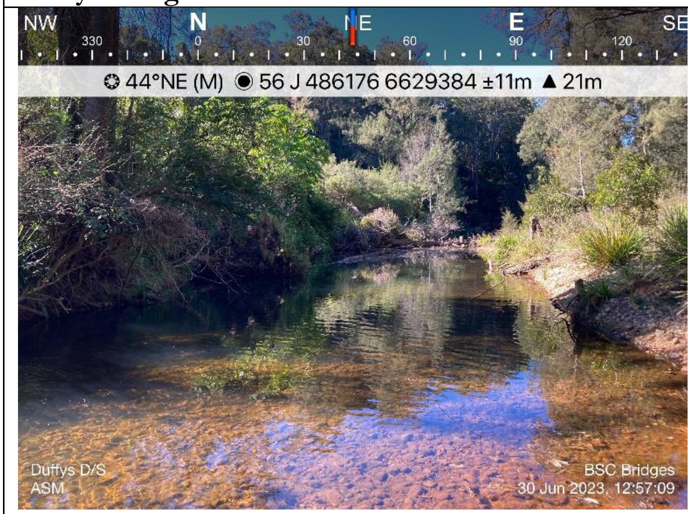
No referral required.

Appendix H

Plates

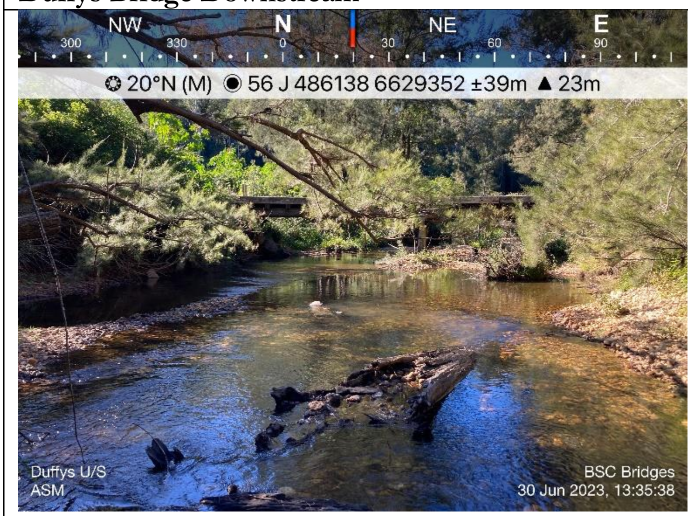
Duffys Bridge Downstream

Duffys Bridge Downstream



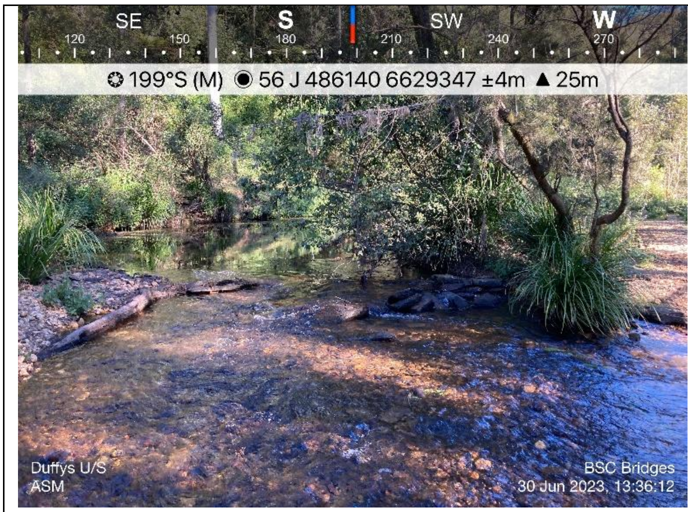
Duffys Bridge Downstream

Duffys Bridge Downstream



Duffys Bridge Upstream

Duffys Bridge Upstream

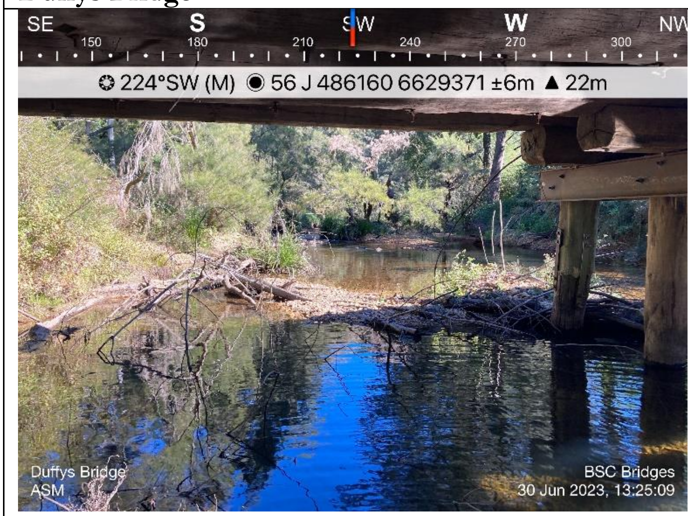


Duffys Bridge Upstream

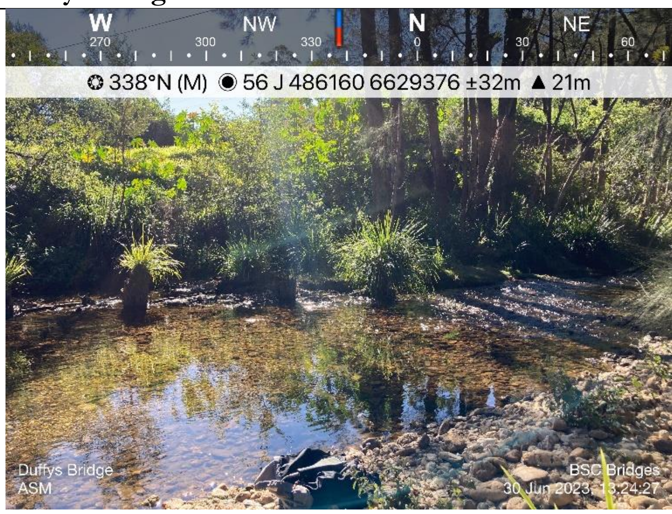
Duffys Bridge Upstream

Duffys Bridge

Duffys Bridge



Duffys Bridge



Duffys Bridge

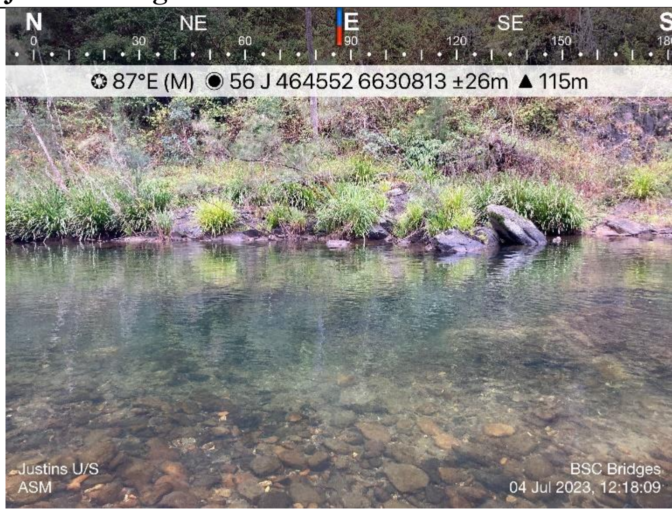
Justins Bridge Downstream

Justins Bridge Downstream

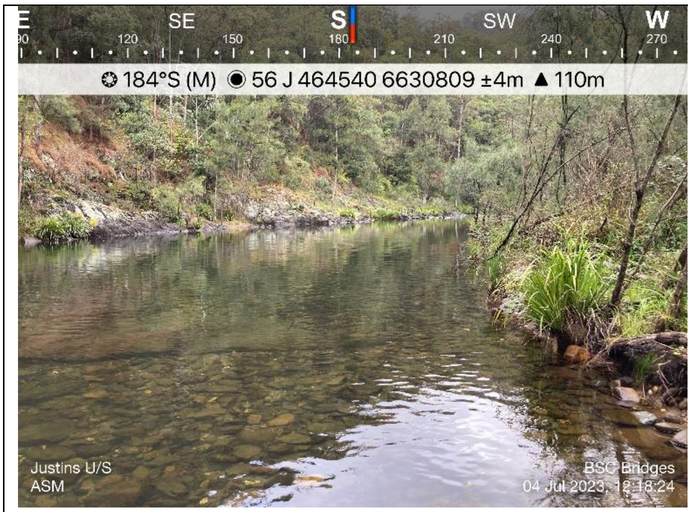
Justins Bridge Downstream

Justins Bridge Downstream

Justins Bridge Upstream

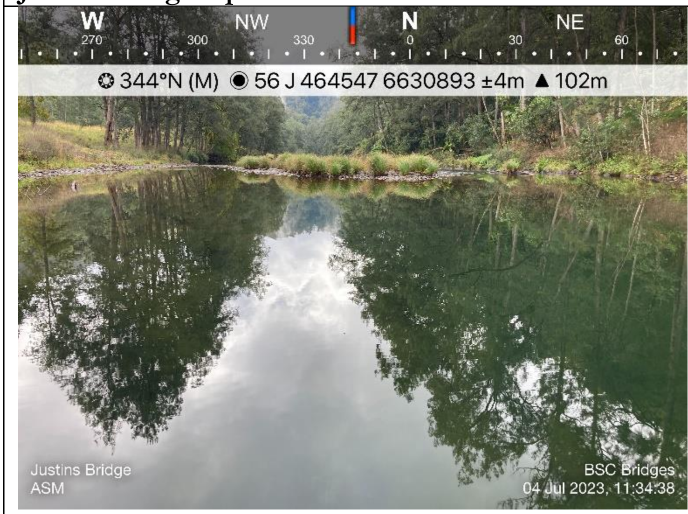


Justins Bridge Upstream



Justins Bridge Upstream

Justins Bridge Upstream



Justins Bridge

Justins Bridge

Justins Bridge

Justins Bridge

Hobarts Bridge Downstream

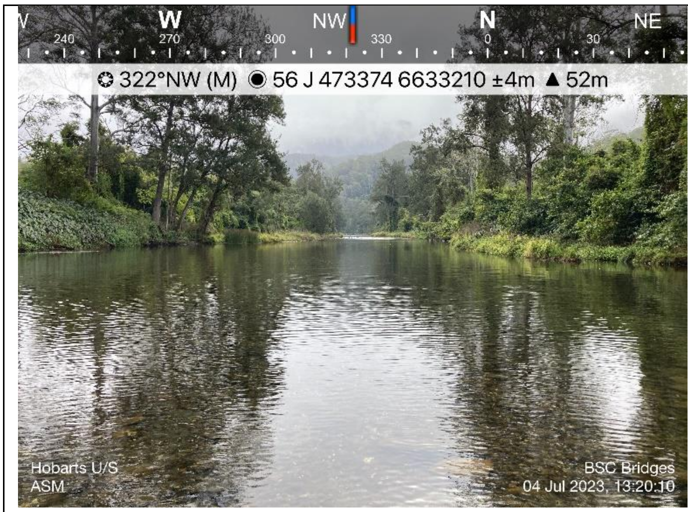
Hobarts Bridge Downstream

Hobarts Bridge Downstream

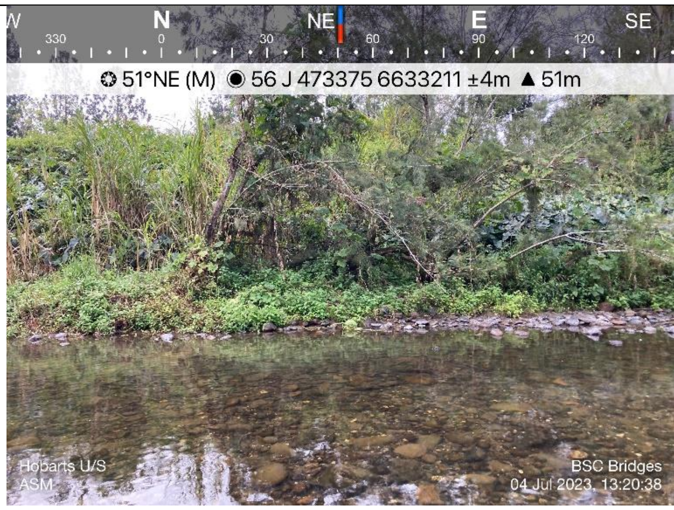
Hobarts Bridge Downstream

Hobarts Bridge Upstream

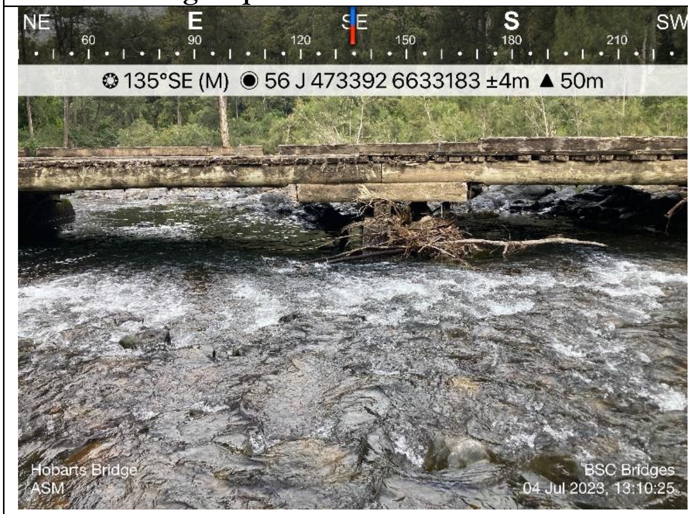
Hobarts Bridge Upstream



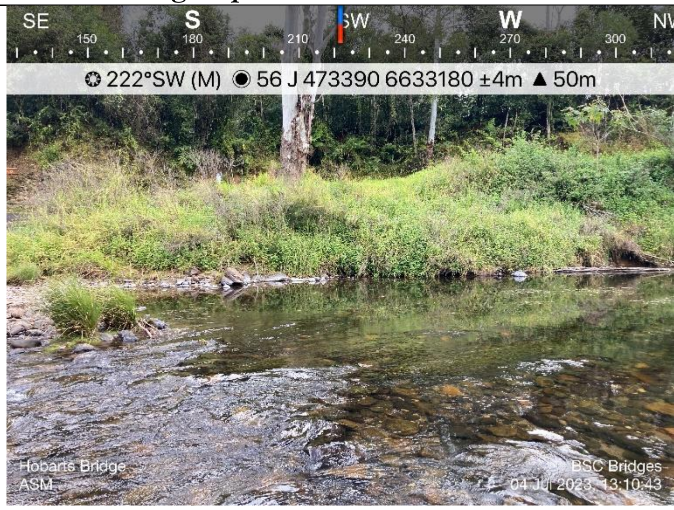
Hobarts Bridge Upstream



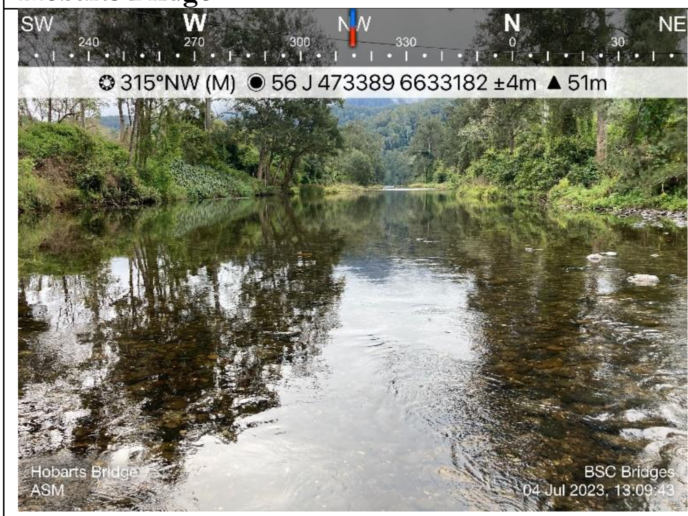
Hobarts Bridge Upstream



Hobarts Bridge



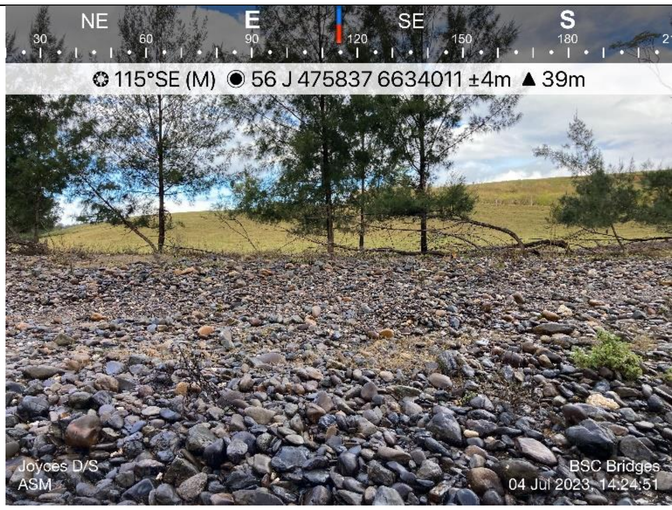
Hobarts Bridge



Hobarts Bridge

Hobarts Bridge

Joyces Bridge Downstream



Joyces Bridge Downstream

Joyces Bridge Downstream

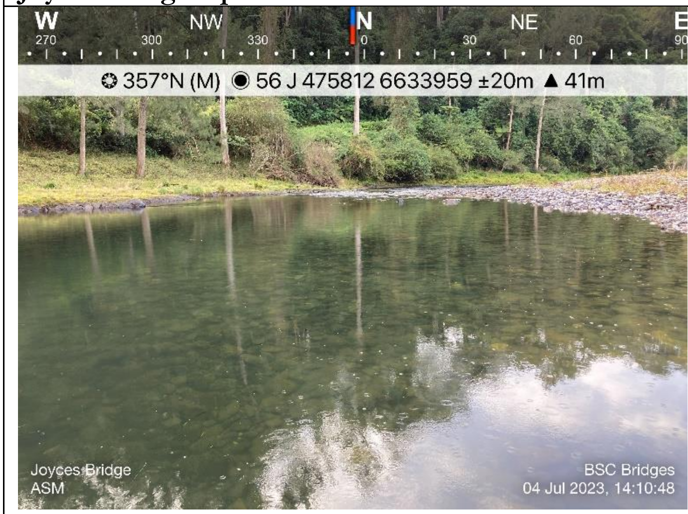
Joyces Bridge Downstream

Joyces Bridge Upstream

Joyces Bridge Upstream

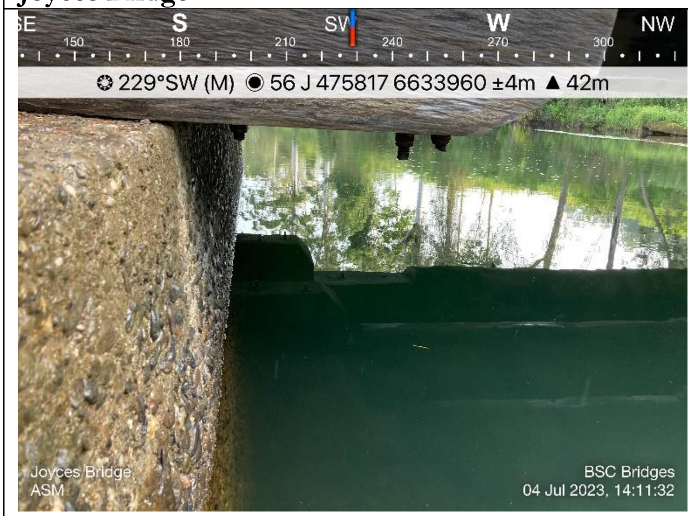
Joyces Bridge Upstream

Joyces Bridge Upstream

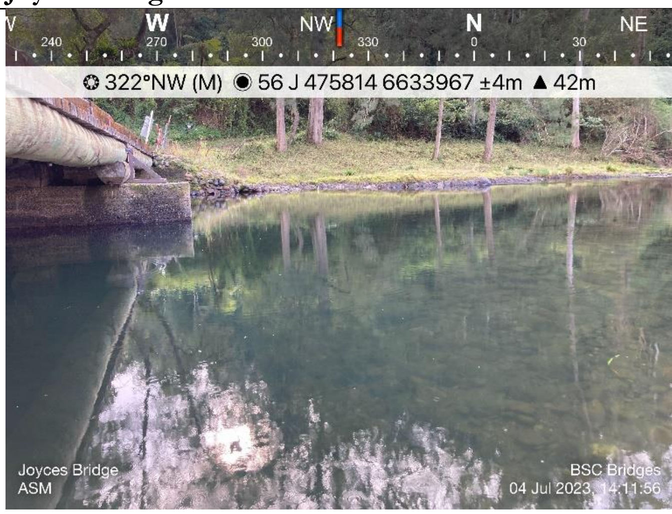


Joyces Bridge

Joyces Bridge



Joyces Bridge



Joyces Bridge

Appendix G

Microbat Analysis Report

Technical Memorandum

December 15, 2023

To	Mal Weerakoon	**Tel**	[Enter text]
Copy to	[Enter text]	**Email**	[Enter text]
From	[Enter text]	**Ref. No.**	12611463
Subject	Bat call analysis – Bellinger River – Four Bridge Sites		

Dear Mal,

The following technical memo presents the methods and results for analysis of bat calls for the Bellingen Bridge upgrade project (project number - 12611463).

Anabat detector recorders were placed for four nights near or under the following four existing bridges all located within the Bellingen Local Government Area (LGA):

- Duffy's Bridge located on Kalang Road, Kalang NSW, crossing the Kalang River
- Joyces Bridge located on Darkwood Road, crossing the Bellinger River
- Hobarts Bridge located on Darkwood Road, crossing the Bellinger River
- Justins Bridge located on Darkwood Road, crossing the Bellinger River

Table 1 Anabat detector placement and photos

Location	Dates and details of placement	Photos of bridge and underside of bridge targeting potential roost habitat
Duffys Bridge	27-28th November 2023: Southern end underside of bridge 29-30th November 2023: Northern end underside of bridge	 *Plate 1 Underside of Duffys Bridge*

<table>
<tr><th>Location</th><th>Dates and details of placement</th><th>Photos of bridge and underside of bridge targeting potential roost habitat</th></tr>
<tr><td></td><td></td><td>
Plate 2 Potential microbat roosting habitat under Duffys Bridge</td></tr>
<tr><td>Joyces Bridge</td><td>27-28th November 2023: On casuarina on north side of Bellinger River ~50m downstream from bridge (as access to underside of bridge was difficult)
29-30th November 2023: Northern end underside of bridge</td><td>
Plate 3 Underside of Joyces Bridge

Plate 4 Potential microbat roosting habitat under Joyces Bridge</td></tr>
</table>

Location	Dates and details of placement	Photos of bridge and underside of bridge targeting potential roost habitat
Hobarts Bridge	27th November 2023: Western end underside of bridge 28th November 2023: South side of Bellinger River ~75m from bridge (moved from underside of bridge due to forecast rain) 29-30th November 2023: Eastern end underside of bridge	 ***Plate 5 Underside of Hobarts Bridge***  ***Plate 6 Potential microbat roosting habitat under Hobarts Bridge***
Justins Bridge	27-28th November 2023: Eastern end underside of bridge 29-30th November 2023: Western end underside of bridge	 ***Plate 7 Underside of Justins Bridge***

1. Analysis method

Bat calls were recorded during field surveys using Anabat Express Zero Crossing detectors (Titley Scientific).

The zero crossing analysis file (zca file) recorded using the detector was converted to zc sequence files using Anabat Insight (version 2.0.6-3) for analysis and in order to add metadata (e.g. species label etc). During the conversion process a filter was applied to identify bat sequences and remove noise files. Noise files were moved to a separate folder for later checking.

The *Bat calls of NSW: Region based guide to the echolocation calls of microchiropteran bats* (Pennay et al. 2004) was used to assist call analysis. Call identification was also assisted by consulting distribution information for potential species (Pennay et al 2011; Churchill 2008; Van Dyck et al. 2013) and records from BioNet (December 2023) and BatMap (December 2023). No reference calls were collected during the survey.

A call (pass) was defined as a sequence of three or more consecutive pulses of similar frequency and shape. Calls with less than three defined consecutive pulses of similar frequency and shape were not unambiguously identified to a species but were used as part of the activity count for the survey area. Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (see Mills *et al.* 1996 & Duffy *et al.* 2000 for similar process) as summarised in Table 1. Due to the absence of reference calls from the study area, high level of variability within a bat call and overlap in call characteristics between some species, a conservative approach was taken when analysing calls. Species nomenclature follows Armstrong et al 2022.

Table 2 Confidence ratings applied to calls

Identification	Description
D - Definite	Species identification not in doubt.
PR - Probable	Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call type or call lacks sufficient detail.
SG - Species Group	Call made by one of two or more species. Call characteristics overlap making it too difficult to distinguish between species for e.g. *Chalinolobus gouldii /Ozimops sp.*

2. Analysis results

A large number of zc sequence files were recorded from 2 of the 4 locations (n = 13,000 +). Very few files and no bat calls were recorded for the Duffys Bridge or Hobarts Bridge sites. A review of the log files revealed that both detectors suffered from technical issues (e.g. faulty power supply or possible faulty microphone). Both Justins Bridge and Joyces Bridge sites each recorded 4 consecutive nights of data.

The analysis of data focused on the emergence period – the period from sunset onwards for 2 hours to understand the timing and activity of bat species that may be roosting within the bridge structure. Data for the remainder of the night was scanned using species specific filters and random manually checking of data.

Emergence summary

Table 3 provides a summary of emergence period calls recorded at each bridge site for each date. In summary:

Justins Bridge

– The detector was placed on the underside of the bridge for two nights each at two locations (opposite ends)

– A small number of calls (< 15) each night were recorded for the evening emergence period for 2 of the 4 survey nights (27-28/11/23) including calls from the species group *Myotis macropus/Nyctophilus sp.*and two probable *Falsitrellus tasmaniensis* calls. No calls were recorded for this same period for the 29-30/11/23.

– A small number of calls (< 10) each night were also recorded for the early morning re-entry period near sunrise for 3 of the 4 survey nights (28, 29, 30/11/23).

– This data suggests some bat species may be roosting within the bridge, most likely at a location, nearby the site of the detector for the detector dates 27-28/11/23 or between the two detector sites.

Joyces Bridge

– The detector was placed near the bridge on a tree for two consecutive nights then on the underside of the bridge for two consecutive nights

- A small number of calls (< 3) each night were recorded for the evening emergence period for 2 non-consecutive nights of the 4 survey nights (27 and 30/11/23) including calls from the species group *Myotis macropus/Nyctophilus* sp.and *M.o.oceanensis/Vespadelus* sp.
- No calls were recorded or the early morning re-entry period near sunrise for any survey night
- The few calls recorded indicate emergence from a nearby roost however the source of the calls cannot be confidently placed within bridge structure.

Table 3 Summary of first calls recorded for each site for each date

Date	Sunset / Civil twilight (CT)	First calls	Species / Group	Notes
Joyces Bridge				
27/11/23	19:33 / 19:59	19:47 20:04 20:13 20:16	Bat call undescribed *S. rueppellii/S. orion/F. tasmaniensis* *M.o.oceanensis/Vespadelus sp* *M.macropus/Nyctophilus sp.*	1 call prior to CT and few (< 5) calls within 15 mins of CT No post CT near sunrise calls (05:12 am – 05:39 am) were recorded
28/11/23	19:33 / 20:00	20:21	*M.macropus/Nyctophilus sp.* .	No calls before or within 15 mins of CT No post CT near sunrise calls were recorded
29/11/23	19:34 / 20:01	20:19	*M.macropus/Nyctophilus sp.* .	No calls before or within 15 mins of CT No post CT near sunrise calls were recorded
30/11/23	19:35 / 20:02	20:13 20:16	*C. gouldii/S. rueppellii/S. orion* Bat call undescribed	2 calls within 15 min of CT No post CT near sunrise calls were recorded
Justins Bridge				
27/11/23	19:33 / 19:59	19:54 19:55 19:58 20:01 20:03 20:05 20:06 20:07 20:12 20:13 20:14	*C. gouldii* and bat call undescribed *C. gouldii* and bat call undescribed *C. gouldii* and bat call undescribed *M. macropus/ Nyctophilus sp.* *Falsistrellus tasmaniensis (PR)* and bat call undescribed bat call undescribed *C. gouldii/ Ozimops sp* *M. macropus/ Nyctophilus sp.* *M. macropus/ Nyctophilus sp.* *C. gouldii/ Ozimops sp* *V. darlingtoni/V. reguls*	Several calls prior to CT and many calls within 15 mins of CT including SG M. macropus/Nyctophilus sp. and PR F. tasmaniensis No post CT near sunrise calls (05:12 am – 05:39 am) were recorded

Date	Sunset / Civil twilight (CT)	First calls	Species / Group	Notes
28/11/23	19:33 / 20:00	19:57 19:59 20:00 20:03 20:04 20:10 20:11 20:14 20:15	*M. macropus/ Nyctophilus sp.* *M. o. oceansis/ Vespadelus sp.* *C. gouldii/ Ozimops sp* *S. orion/F. tasmaniensis* bat call undescribed *M. macropus/ Nyctophilus sp.* bat call undescribed *C. gouldii/ Ozimops sp* *M. macropus/ Nyctophilus sp.*	Several calls prior to CT and many calls within 15 mins of CT including SG *M. macropus/Nyctophilus* sp. Few post CT near sunrise calls were recorded and identified as undescribed bat calls
29/11/23	19:34 / 20:01	20:48	*C. gouldii* and bat call undescribed	No calls before or within 15 mins of CT Few post CT near sunrise calls were recorded for *M. macropus/ Nyctophilus sp.* and *C. gouldii/ Ozimops sp.*
30/11/23	19:35 / 20:02	20:59	*M. macropus/ Nyctophilus sp.*	No calls before or within 15 mins of CT Few post CT near sunrise calls were recorded for *M. macropus/ Nyctophilus sp.* and *Micronomus norfolkensis*

Table notes – sunset/civil twilight source - https://www.timeanddate.com/ (location Thora NSW)

Species summary

Of the 13,903 files recorded approximately 82% contained bat files of some description. Remaining files contained anthropogenic and/or insect noise. Table 3 presents a summary of the species recorded for each site for the survey period as a result of the bat call analysis. Seven species were positively (Definite) identified of the 21 or so species that are known to occur from the locality of the study area. As many as five other species may also have been recorded, but poor data quality and/or interspecific call similarities precluded reliable identification of additional species. Furthermore not all files were labelled as a species or species group, therefore additional species may also be occur within the data. Three of the seven species positively identified are listed under the *Biodiversity Conservation Act 2016* listed:

– *Myotis macropus* – vulnerable BCA Act
  - Recorded from approximately 50 (definite and probable combined) files consisting of 15 or more consecutive pulses. Most call sequences recorded average initial slope of greater than 400 octaves per second (OPS) and average pulse interval of less than 75 milliseconds (ms). Some sequences also contained pulse shapes displaying central kink in slope.
  - In addition 268 files were attributed to the species group Nyctophilus sp./Myotis Macropus. The call characteristics of both species are very similar and can be easily confused particularly when call quality is less than optimal. Given the location of the bat detectors (e.g. next to or over water) and few definitive Nyctophilus calls (n = 7) recorded during the survey, it is most likely that a portion of calls attributed to the species group Nyctophilus sp./Myotis Macropus are Myotis macropus.

– *Micronomus norfolkensis* – vulnerable BCA Act

- Recorded from approximately 145 (definite and probable combined) files consisting of calls with 5 or more consecutive pulses and a characteristic frequency of 31 – 35 kHz. Most call sequences consisted of alternating pulses with most pulses presenting a short initial and down-sweeping tail.

– *Miniopterus australis* – vulnerable BCA Act

  - Recorded from approximately 28 (definite) files consisting of calls with 3 or more consecutive pulses and a characteristic frequency of 57 – 63 kHz. Most call sequences consisted of curved alternating pulses with down-sweeping tail. This species has a higher characteristic frequency than any other species within this region.

Example spectrogram calls for the three threatened bat species definitely identified from call analysis are provided in Attachment 1.

Table 4 Summary of bat call analysis results for each site and night

Species or Species Group	Joyces Bridge_ Wagga Wagga/ SN409366 2023-11-27	Joyces Bridge_ Wagga Wagga/ SN409366 2023-11-28	Joyces Bridge_ Wagga Wagga/ SN409366 2023-11-29	Joyces Bridge_ Wagga Wagga/ SN409366 2023-11-30	Justins Bridge_Dracula/SN434272 2023-11-27	Justins Bridge_Dracula/SN434272 2023-11-28	Justins Bridge_Dracula/SN434272 2023-11-29	Justins Bridge_Dracula/SN434272 2023-11-30
Austronomus australis	D	D	D	D				
Chalinolobus gouldii			PR		D	D	D	D
Chalinolobus morio				D				
Falsistrellus tasmaniensis	D				PR			
Micronomus norfolkensis	PR	D	D	D		D	PR	PR
Miniopterus australis	D	D	D					
Myotis macropus PR	D	D	D		D			
Nyctophilus spp	D	D		D				
Ozimops ridei		PR		PR				
C. gouldii/S. rueppellii/S. orion		SG		SG	SG	SG		
C.gouldii/O. ridei/ M. norfolkensis		SG	SG	SG	SG	SG	SG	SG
M.macropus/ Nyctophilus sp.	SG	SG	SG	SG	SG	SG	SG	SG
M.o.oceanensis/Vespadelus sp	SG	SG	SG	SG	SG	SG	SG	
S. orion/F. tasmaniensis	SG	SG	SG			SG		
S. rueppellii/S. orion/F. tasmaniensis	SG		SG	SG	SG			

Species or Species Group	Joyces Bridge_ Wagga Wagga/ SN4093 66 2023-11-27	Joyces Bridge_ Wagga Wagga/ SN4093 66 2023-11-28	Joyces Bridge_ Wagga Wagga/ SN4093 66 2023-11-29	Joyces Bridge_ Wagga Wagga/ SN4093 66 2023-11-30	Justins Bridge_Dracula/SN434272 2023-11-27	Justins Bridge_Dracula/SN434272 2023-11-28	Justins Bridge_Dracula/SN434272 2023-11-29	Justins Bridge_Dracula/SN434272 2023-11-30
V. pumilus/M. australis	SG				SG	SG		
V.darlingtoni/ V.regulus			SG		SG			
Vespadelus sp./C. morio.				SG				
Other bat calls	Y	Y	Y	Y	Y	Y	Y	Y
Number of files	245	324	3047	2665	2908	2900	500	1352
Number of species per night	5	5	4	4	2	2	1	1
Survey effort (hrs:mins)	11	11	11	11	11	11	11	11

Table Notes:
Total number of species recorded for each night/site is based on definite (D) identification only. Total number of D species for each night includes one *Nyctophilus* species where recorded. See Table 1 for confidence rating e.g. D or Pr
Other bat calls – incomplete single pulses, single scattered pulses, call sequences consisting of incomplete, fragmented pulses lacking key diagnostic features
ce, e, v - species listed under the *NSW Biodiversity Conservation Act 2016*.
CE, E, VU – species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Survey effort: estimate of time between sunset and sunrise for a successful night of Anabat detection.

Regards

Craig Grabham
Senior Ecologist

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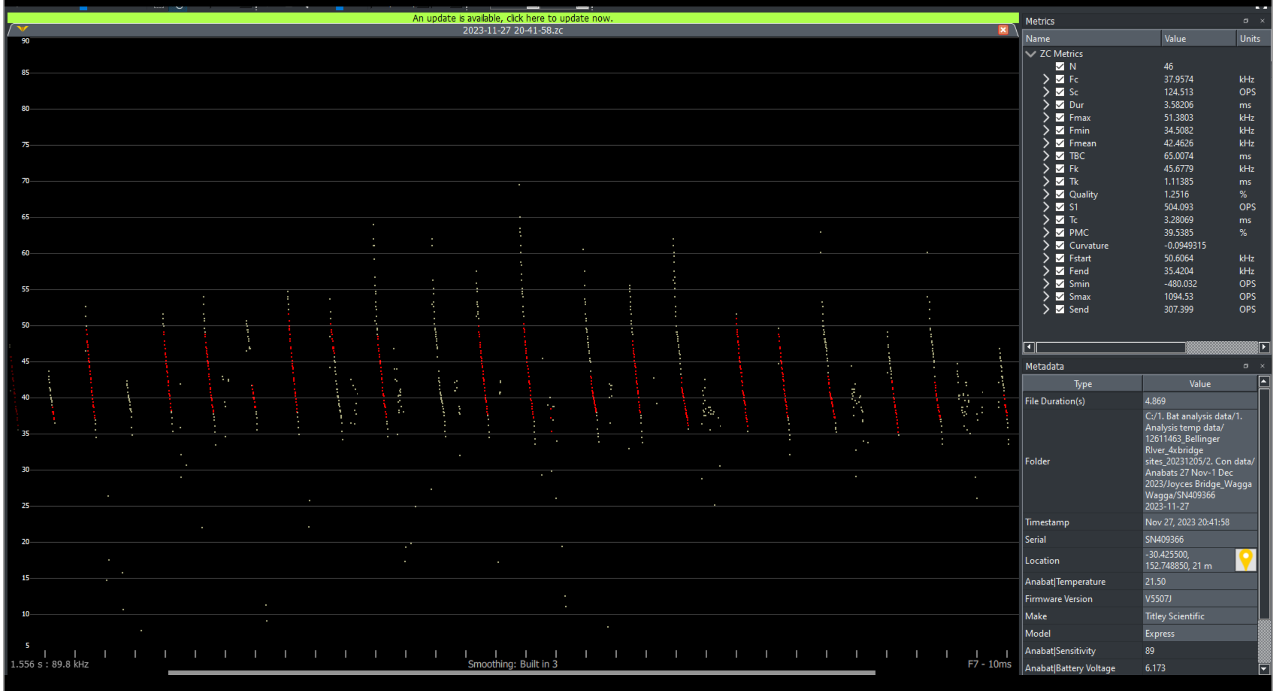
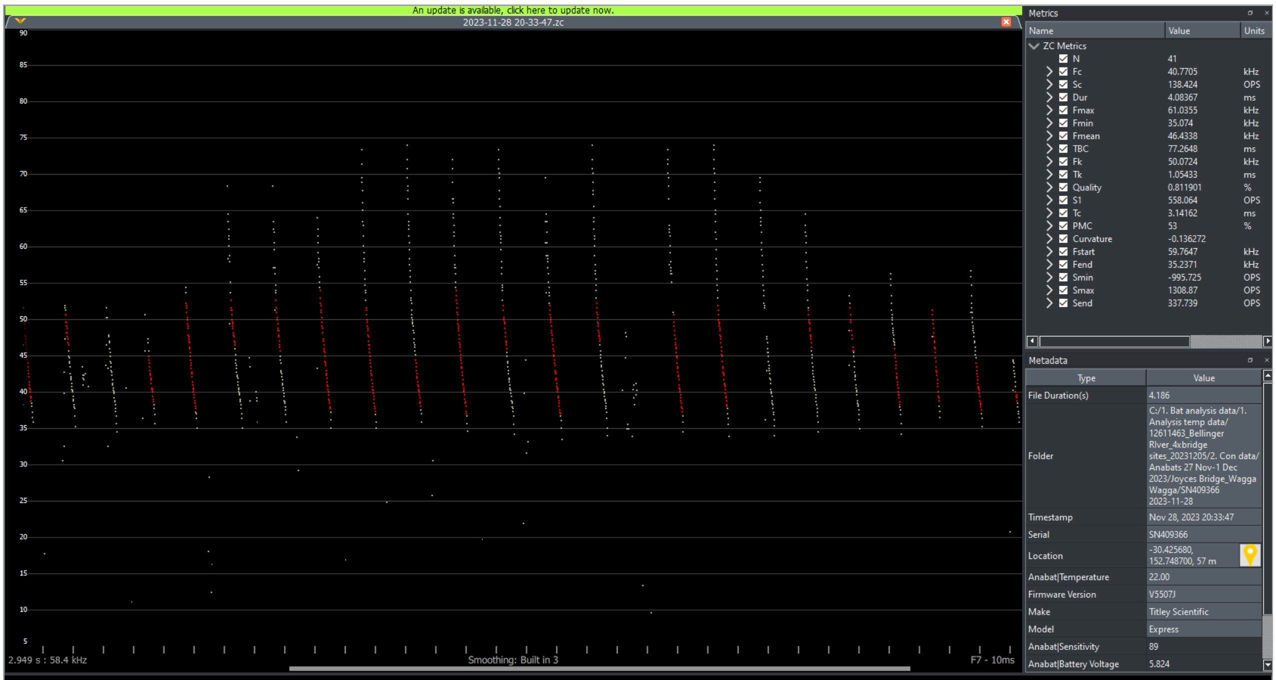
Attachment 1 – Example spectrogram calls from site for Definite threatened species. Calls presented in F7, compressed mode

Myotis macropus

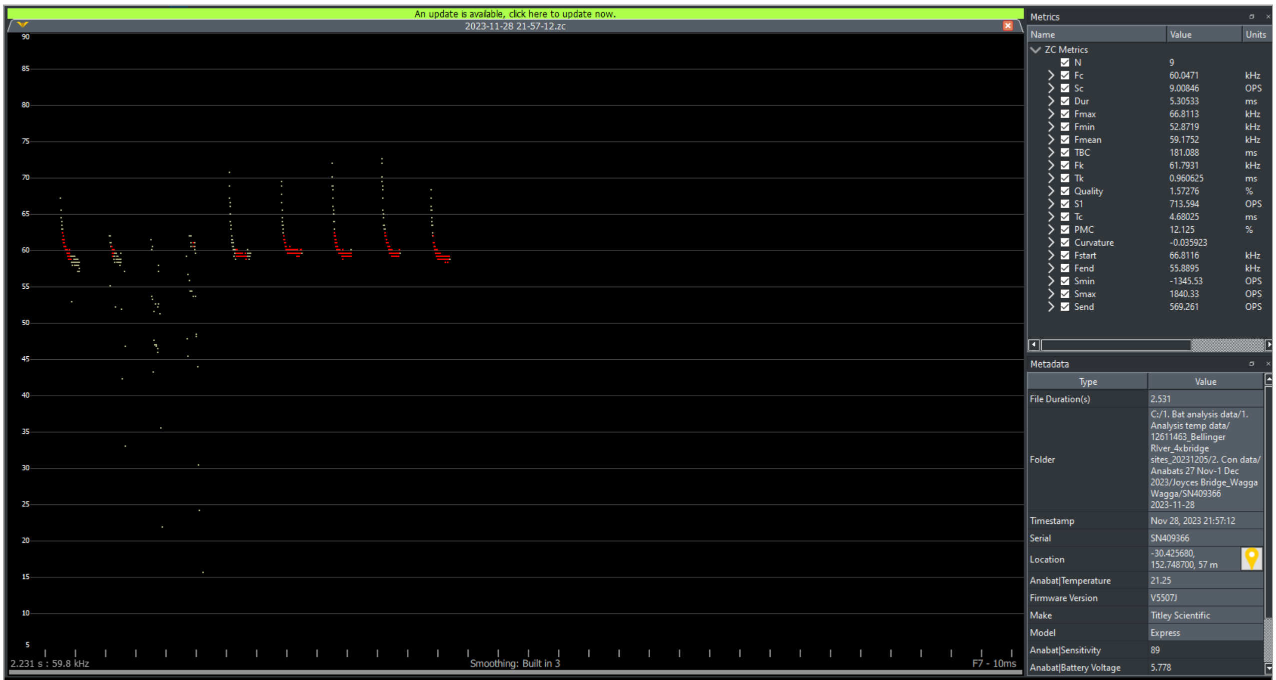


Myotis macropus

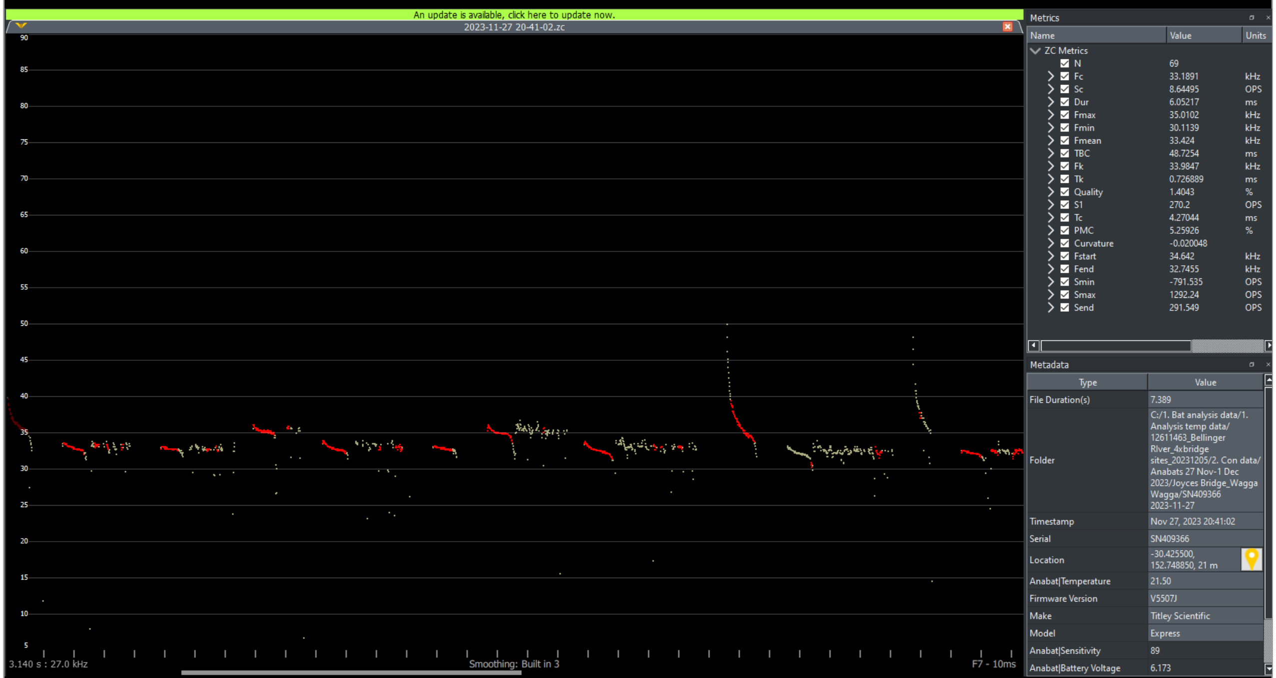


Miniopterus australis

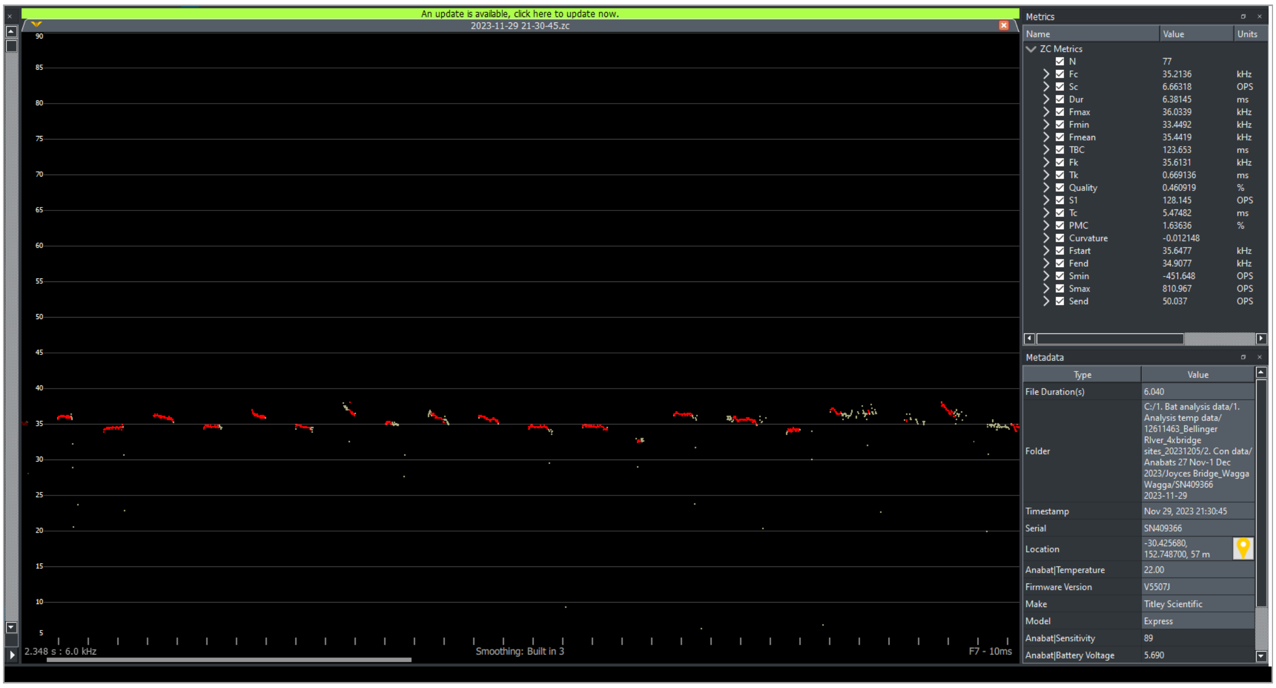
Miniopterus australis



Micronomus norfolkensis



Micronomus norfolkensis


An update is available, click here to update now.
2023-11-29 21-30-45.zc
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85
80
75
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5
2.348 s : 6.0 kHz
Smoothing: Built in 3
F7 - 10ms
Metrics
Name
Value
Units
ZC Metrics
N 77
Fc 35.2136 kHz
Sc 6.66318 OPS
Dur 6.38145 ms
Fmax 36.0339 kHz
Fmin 33.4492 kHz
Fmean 35.4419 kHz
TBC 123.653 ms
Fk 35.6131 kHz
Tk 0.669136 ms
Quality 0.460919 %
S1 128.145 OPS
Tc 5.47482 ms
PMC 1.63636 %
Curvature -0.012148
Fstart 35.6477 kHz
Fend 34.9077 kHz
Smin -451.648 OPS
Smax 810.967 OPS
Send 50.037 OPS
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Value
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Serial SN409366
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Anabat|Temperature 22.00
Firmware Version V5507J
Make Titley Scientific
Model Express
Anabat|Sensitivity 89
Anabat|Battery Voltage 5.690

Appendix H

Fauna Species List

Observation type: O: Observed, A: Aural observation :W: Heard

NSW Status: P: Protected, E= Endangered, V=Vulnerable, CE=Critically Endangered

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Joyces Bridge								
Litoria phyllochroa	Leaf-green Tree Frog	P		A	3	Joyces Bridge	NOC 1	27/11/2023
Litoria latopalmata	Broad-palmed Frog	P		O	1	Joyces Bridge	NOC 1	27/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	10	Joyces Bridge	NOC 2	28/11/2023
Litoria fallax	Eastern Dwarf Tree Frog	P		A	10	Joyces Bridge	NOC 2	28/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		A	5	Joyces Bridge	NOC 2	28/11/2023
Litoria latopalmata	Broad-palmed Frog	P		O	1	Joyces Bridge	NOC 2	28/11/2023
(Microchiroptera suborder) (Microchiroptera suborder)	Unidentified microbat			O	1	Joyces Bridge	NOC 2	28/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	19	Joyces Bridge	NOC 3	29/11/2023
Litoria latopalmata	Broad-palmed Frog	P		O	3	Joyces Bridge	NOC 3	29/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	3	Joyces Bridge	NOC 3	29/11/2023
Mus musculus	House Mouse			O	1	Joyces Bridge	NOC 3	29/11/2023
Intellagama lesueurii	Eastern Water Dragon	P		O	2	Joyces Bridge	NOC 3	29/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Aegotheles cristatus	Australian Owlet-nightjar	P		A	1	Joyces Bridge	NOC 3	29/11/2023
Vanellus miles	Masked Lapwing	P		A	2	Joyces Bridge	NOC 3	29/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	19	Joyces Bridge	NOC 3	29/11/2023
Litoria latopalmata	Broad-palmed Frog	P		O	3	Joyces Bridge	NOC 3	29/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	3	Joyces Bridge	NOC 3	29/11/2023
Mus musculus	House Mouse			O	1	Joyces Bridge	NOC 3	29/11/2023
Intellagama lesueurii	Eastern Water Dragon	P		O	2	Joyces Bridge	NOC 3	29/11/2023
Aegotheles cristatus	Australian Owlet-nightjar	P		A	1	Joyces Bridge	NOC 3	29/11/2023
Vanellus miles	Masked Lapwing	P		A	2	Joyces Bridge	NOC 3	29/11/2023
Intellagama lesueurii	Eastern Water Dragon	P		O	5	Joyces Bridge	NOC 4	30/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	4	Joyces Bridge	NOC 4	30/11/2023
^^*Mixophyes iteratus*	Giant Barred Frog	V	E	O	1	Joyces Bridge	NOC 4	30/11/2023
Tropidechis carinatus	Rough-scaled Snake	P		O	4	Joyces Bridge	NOC 4	30/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Anguilla australis	Shortfin Eel			O	1	Joyces Bridge	NOC 4	30/11/2023
Litoria dentata	Bleating Tree Frog	P		O	1	Joyces Bridge	NOC 4	30/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		O	1	Joyces Bridge	NOC 4	30/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	1	Joyces Bridge	NOC 4	30/11/2023
Limnodynastes peronii	Brown-striped Frog	P		O	1	Joyces Bridge	NOC 4	30/11/2023
Cracticus tibicen	Australian Magpie	P		A	1	Joyces Bridge	BIRD2	28/11/2023
Vanellus miles	Masked Lapwing	P		A	2	Joyces Bridge	BIRD2	28/11/2023
Corvus coronoides	Australian Raven	P		OA	3	Joyces Bridge	BIRD2	28/11/2023
Psophodes olivaceus	Eastern Whipbird	P		A	2	Joyces Bridge	BIRD2	28/11/2023
Eudynamys orientalis	Eastern Koel	P		A	1	Joyces Bridge	BIRD2	28/11/2023
Rhipidura albiscapa	Grey Fantail	P		OA	20	Joyces Bridge	BIRD2	28/11/2023
Oriolus sagittatus	Olive-backed Oriole	P		A	4	Joyces Bridge	BIRD2	28/11/2023
Meliphaga lewinii	Lewin's Honeyeater	P		OA	6	Joyces Bridge	BIRD2	28/11/2023
Eopsaltria australis	Eastern Yellow Robin	P		A	1	Joyces Bridge	BIRD2	28/11/2023
Ailuroedus crassirostris	Green Catbird	P		O	3	Joyces Bridge	BIRD2	28/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Gallinula tenebrosa	Dusky Moorhen	P		O	8	Joyces Bridge	BIRD2	28/11/2023
Alisterus scapularis	Australian King-parrot	P		O	1	Joyces Bridge	BIRD2	28/11/2023
Phalacrocorax sulcirostris	Little Black Cormorant	P		O	1	Joyces Bridge	BIRD2	28/11/2023
Anhinga novaehollandiae	Australasian Darter	P		O	1	Joyces Bridge	BIRD2	28/11/2023
Macropygia amboinensis	Brown Cuckoo-dove	P		O	3	Joyces Bridge	BIRD2	28/11/2023
Ardea ibis	Cattle Egret	P		O	1	Joyces Bridge	BIRD2	28/11/2023
Monarcha melanopsis	Black-faced Monarch	P		O	1	Joyces Bridge	BIRD2	28/11/2023
Acanthiza pusilla	Brown Thornbill	P		O	2	Joyces Bridge	BIRD2	28/11/2023
Nesoptilotis leucotis	White-eared Honeyeater	P		O	1	Joyces Bridge	BIRD2	28/11/2023
Pachycephala pectoralis	Golden Whistler	P		O	2	Joyces Bridge	BIRD2	28/11/2023
Neochmia temporalis	Red-browed Finch	P		OA	5	Joyces Bridge	BIRD2	28/11/2023
Litoria dentata	Bleating Tree Frog	P		A	2	Joyces Bridge	BIRD2	28/11/2023
Hobarts Bridge								
^^*Mixophyes iteratus*	Giant Barred Frog	V	E	O	1	Hobarts Bridge	NOC 1	27/11/2023
Adelotus brevis	Tusked Frog	P		A	3	Hobarts Bridge	NOC 1	27/11/2023
Litoria fallax	Eastern Dwarf Tree Frog	P		A	30	Hobarts Bridge	NOC 1	27/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	10	Hobarts Bridge	NOC 1	27/11/2023
Litoria latopalmata	Broad-palmed Frog	P		O	1	Hobarts Bridge	NOC 1	27/11/2023
Litoria fallax	Eastern Dwarf Tree Frog	P		O	1	Hobarts Bridge	NOC 2	28/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	1	Hobarts Bridge	NOC 2	28/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	10	Hobarts Bridge	NOC 2	28/11/2023
Adelotus brevis	Tusked Frog	P		A	1	Hobarts Bridge	NOC 2	28/11/2023
Limnodynastes peronii	Brown-striped Frog	P		O	3	Hobarts Bridge	NOC 2	28/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	11	Hobarts Bridge	NOC 3	29/11/2023
Litoria latopalmata	Broad-palmed Frog	P		O	2	Hobarts Bridge	NOC 3	29/11/2023
Litoria fallax	Eastern Dwarf Tree Frog	P		O	5	Hobarts Bridge	NOC 3	29/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	5	Hobarts Bridge	NOC 3	29/11/2023
Adelotus brevis	Tusked Frog	P		A	1	Hobarts Bridge	NOC 3	29/11/2023
Austronomus australis	White-striped Freetail-bat	P		A	3	Hobarts Bridge	NOC 3	29/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Anguilla australis	Shortfin Eel			O	4	Hobarts Bridge	NOC 3	29/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	8	Hobarts Bridge	NOC 4	30/11/2023
Anguilla australis	Shortfin Eel			O	2	Hobarts Bridge	NOC 4	30/11/2023
Intellagama lesueurii	Eastern Water Dragon	P		O	2	Hobarts Bridge	NOC 4	30/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	2	Hobarts Bridge	NOC 4	30/11/2023
Perameles nasuta	Long-nosed Bandicoot	P		A	1	Hobarts Bridge	NOC 4	30/11/2023
Limnodynastes peronii	Brown-striped Frog	P		A	1	Hobarts Bridge	NOC 4	30/11/2023
Litoria fallax	Eastern Dwarf Tree Frog	P		A	4	Hobarts Bridge	NOC 4	30/11/2023
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	OA	500	Hobarts Bridge	BIRD4	29/11/2023
Pteropus alecto	Black Flying-fox	P		OA	200	Hobarts Bridge	BIRD4	29/11/2023
Malurus cyaneus	Superb Fairy-wren	P		OA	2	Hobarts Bridge	BIRD4	29/11/2023
Ailuroedus crassirostris	Green Catbird	P		O	1	Hobarts Bridge	BIRD4	29/11/2023
Alisterus scapularis	Australian King-parrot	P		OA	1	Hobarts Bridge	BIRD4	29/11/2023
Macropygia amboinensis	Brown Cuckoo-dove	P		O	1	Hobarts Bridge	BIRD4	29/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Acanthiza pusilla	Brown Thornbill	P		O	1	Hobarts Bridge	BIRD4	29/11/2023
Colluricincla harmonica	Grey Shrike-thrush	P		O	1	Hobarts Bridge	BIRD4	29/11/2023
Meliphaga lewinii	Lewin's Honeyeater	P		OA	2	Hobarts Bridge	BIRD4	29/11/2023
Pachycephala rufiventris	Rufous Whistler	P		O	1	Hobarts Bridge	BIRD4	29/11/2023
Cracticus tibicen	Australian Magpie	P		O	1	Hobarts Bridge	BIRD4	29/11/2023
Psophodes olivaceus	Eastern Whipbird	P		A	2	Hobarts Bridge	BIRD4	29/11/2023
Pseudophryne bibronii	Bibron's Toadlet	P		A	1	Hobarts Bridge	BIRD4	29/11/2023
Melithreptus brevirostris	Brown-headed Honeyeater	P		A	1	Hobarts Bridge	BIRD4	29/11/2023
Trichoglossus haematodus	Rainbow Lorikeet	P		A	3	Hobarts Bridge	BIRD4	29/11/2023
Rhipidura leucophrys	Willie Wagtail	P		A	1	Hobarts Bridge	BIRD4	29/11/2023
Corvus coronoides	Australian Raven	P		OA	4	Hobarts Bridge	BIRD4	29/11/2023
Lopholaimus antarcticus	Topknot Pigeon	P		A	1	Hobarts Bridge	BIRD4	29/11/2023
Pachycephala pectoralis	Golden Whistler	P		A	2	Hobarts Bridge	BIRD4	29/11/2023
Oriolus sagittatus	Olive-backed Oriole	P		A	1	Hobarts Bridge	BIRD4	29/11/2023
Ptilinopus superbus	Superb Fruit-dove	V,P		A	1	Hobarts Bridge	BIRD4	29/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Eopsaltria australis	Eastern Yellow Robin	P		A	1	Hobarts Bridge	BIRD4	29/11/2023
Dacelo novaeguineae	Laughing Kookaburra	P		A	1	Hobarts Bridge	BIRD4	29/11/2023
Eudynamys orientalis	Eastern Koel	P		A	1	Hobarts Bridge	BIRD4	29/11/2023
Adelotus brevis	Tusked Frog	P		A	1	Hobarts Bridge	BIRD4	29/11/2023
Justins Bridge								
^^*Mixophyes iteratus*	Giant Barred Frog	V, P	E	OA	2	Justins Bridge	NOC 1	27/11/2023
Litoria latopalmata	Broad-palmed Frog	P		O	1	Justins Bridge	NOC 1	27/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	10	Justins Bridge	NOC 1	27/11/2023
^^*Mixophyes iteratus*	Giant Barred Frog	E,P	E	O	2	Justins Bridge	NOC 2	28/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		OA	1	Justins Bridge	NOC 2	28/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	1	Justins Bridge	NOC 2	28/11/2023
Hoplocephalus Stephens'sii	Stephens's' Banded Snake	V,P		O	1	Opportunistic.~1.8km NE of Justins Bridge on Darkwood Road	NOC 2	28/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	1	Justins Bridge	NOC 3	29/11/2023
^^*Mixophyes iteratus*	Giant Barred Frog	V,P	E	O	3	Justins Bridge	NOC 3	29/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Litoria latopalmata	Broad-palmed Frog	P		O	1	Justins Bridge	NOC 3	29/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	1	Justins Bridge	NOC 3	29/11/2023
Austronomus australis	White-striped Freetail-bat	P		A	2	Justins Bridge	NOC 3	29/11/2023
	Undifentified Turtle			O	1	Justins Bridge	NOC 4	30/11/2023
Anguilla australis	Shortfin Eel			O	2	Justins Bridge	NOC 4	30/11/2023
Intellagama lesueurii	Eastern Water Dragon	P		O	1	Justins Bridge	NOC 4	30/11/2023
^^Mixophyes iteratus	Giant Barred Frog	V1,P,2	E	O	2	Justins Bridge	NOC 4	30/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	3	Justins Bridge	NOC 4	30/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		A	1	Justins Bridge	NOC 4	30/11/2023
Podargus strigoides	Tawny Frogmouth	P		A	1	Justins Bridge	NOC 4	30/11/2023
(Microchiroptera suborder) (Microchiroptera suborder)	Unidentified microbat			O	1	Justins Bridge	NOC 4	30/11/2023
Phalacrocorax varius	Pied Cormorant	P		O	1	Justins Bridge	BIRD3	29/11/2023
Eolophus roseicapillus	Galah	P		OA	3	Justins Bridge	BIRD3	29/11/2023
Fulica atra	Eurasian Coot	P		O	1	Justins Bridge	BIRD3	29/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Malurus cyaneus	Superb Fairy-wren	P		OA	3	Justins Bridge	BIRD3	29/11/2023
Rhipidura albiscapa	Grey Fantail	P		OA	1	Justins Bridge	BIRD3	29/11/2023
Gallinula tenebrosa	Dusky Moorhen	P		O	1	Justins Bridge	BIRD3	29/11/2023
Dacelo novaeguineae	Laughing Kookaburra	P		A	3	Justins Bridge	BIRD3	29/11/2023
Egretta novaehollandiae	White-faced Heron	P		O	1	Justins Bridge	BIRD3	29/11/2023
Chenonetta jubata	Australian Wood Duck	P		A	2	Justins Bridge	BIRD3	29/11/2023
Macropygia amboinensis	Brown Cuckoo-dove	P		A	2	Justins Bridge	BIRD3	29/11/2023
Oriolus sagittatus	Olive-backed Oriole	P		A	1	Justins Bridge	BIRD3	29/11/2023
Eopsaltria australis	Eastern Yellow Robin	P		A	1	Justins Bridge	BIRD3	29/11/2023
Meliphaga lewinii	Lewin's Honeyeater	P		A	1	Justins Bridge	BIRD3	29/11/2023
Cacatua galerita	Sulphur-crested Cockatoo	P		OA	3	Justins Bridge	BIRD3	29/11/2023
Pachycephala pectoralis	Golden Whistler	P		A	2	Justins Bridge	BIRD3	29/11/2023
Strepera graculina	Pied Currawong	P		A	1	Justins Bridge	BIRD3	29/11/2023
Cracticus tibicen	Australian Magpie	P		A	2	Justins Bridge	BIRD3	29/11/2023
Psophodes olivaceus	Eastern Whipbird	P		A	1	Justins Bridge	BIRD3	29/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Leucosarcia melanoleuca	Wonga Pigeon	P		A	2	Justins Bridge	BIRD3	29/11/2023
Eopsaltria australis	Eastern Yellow Robin	P		A	1	Justins Bridge	BIRD3	29/11/2023
Meliphaga lewinii	Lewin's Honeyeater	P		A	1	Justins Bridge	BIRD3	29/11/2023
Cacatua galerita	Sulphur-crested Cockatoo	P		OA	3	Justins Bridge	BIRD3	29/11/2023
Pachycephala pectoralis	Golden Whistler	P		A	2	Justins Bridge	BIRD3	29/11/2023
Strepera graculina	Pied Currawong	P		A	1	Justins Bridge	BIRD3	29/11/2023
Cracticus tibicen	Australian Magpie	P		A	2	Justins Bridge	BIRD3	29/11/2023
Psophodes olivaceus	Eastern Whipbird	P		A	1	Justins Bridge	BIRD3	29/11/2023
Leucosarcia melanoleuca	Wonga Pigeon	P		A	2	Justins Bridge	BIRD3	29/11/2023
Duffys Bridge								
^^*Mixophyes iteratus*	Giant Barred Frog	V,P	E	OA	3	Duffys Bridge	NOC 1	27/11/2023
Rattus fuscipes	Bush Rat	P		O	1	Duffys Bridge	NOC 1	27/11/2023
Litoria dentata	Bleating Tree Frog	P		A	2	Duffys Bridge	NOC 1	27/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		A	5	Duffys Bridge	NOC 1	27/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	10	Duffys Bridge	NOC 1	27/11/2023
(Microchiroptera suborder)	Unidentified microbat			O	1	Duffys Bridge	NOC 1	27/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
(Microchiroptera suborder)								
^^*Mixophyes iteratus*	Giant Barred Frog	E,P	E	O	1	Duffys Bridge	NOC 2	28/11/2023
Limnodynastes peronii	Brown-striped Frog	P		A	2	Duffys Bridge	NOC 2	28/11/2023
Litoria fallax	Eastern Dwarf Tree Frog	P		A	1	Duffys Bridge	NOC 2	28/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		O	2	Duffys Bridge	NOC 2	28/11/2023
Limnodynastes dumerilii	Eastern Banjo Frog			A	1	Duffys Bridge	NOC 2	28/11/2023
Perameles nasuta	Long-nosed Bandicoot	P		O	1	Duffys Bridge	NOC 2	28/11/2023
^^*Mixophyes iteratus*	Giant Barred Frog	E,P	E	O	3	Duffys Bridge	NOC 3	29/11/2023
Podargus strigoides	Tawny Frogmouth	P		O	1	Duffys Bridge	NOC 3	29/11/2023
Anguilla australis	Shortfin Eel	0		O	3	Duffys Bridge	NOC 3	29/11/2023
Vanellus miles	Masked Lapwing	P		A	1	Duffys Bridge	NOC 3	29/11/2023
Adelotus brevis	Tusked Frog	P		A	3	Duffys Bridge	NOC 3	29/11/2023
Uperoleia laevigata	Smooth Toadlet	P		A	1	Duffys Bridge	NOC 3	29/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	3	Duffys Bridge	NOC 3	29/11/2023
Austronomus australis	White-striped Freetail-bat	P		A	1	Duffys Bridge	NOC 3	29/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Pavo cristatus	Indian Peafowl			A	4	Duffys Bridge	NOC 3	29/11/2023
Ranoidea wilcoxii	Eastern Stony Creek Frog	P		A	4	Duffys Bridge	NOC 4	30/11/2023
(Microchiroptera suborder) (Microchiroptera suborder)	Unidentified microbat			O	2	Duffys Bridge	NOC 4	30/11/2023
^^Mixophyes iteratus	Giant Barred Frog	V,P	E	O	1	Duffys Bridge	NOC 4	30/11/2023
Adelotus brevis	Tusked Frog	P		OA	3	Duffys Bridge	NOC 4	30/11/2023
Litoria peronii	Peron's Tree Frog	P		A	1	Duffys Bridge	NOC 4	30/11/2023
Pavo cristatus	Indian Peafowl			A	1	Duffys Bridge	NOC 4	30/11/2023
Litoria phyllochroa	Leaf-green Tree Frog	P		A	1	Duffys Bridge	NOC 4	30/11/2023
Macropod sp.	Unidentified macropod	P		A	1	Duffys Bridge	NOC 4	30/11/2023
Rhipidura leucophrys	Willie Wagtail	P		A	3	Duffys Bridge	NOC 4	30/11/2023
Pachycephala pectoralis	Golden Whistler	P		A	5	Duffys Bridge	BIRD1	27/11/2023
Meliphaga lewinii	Lewin's Honeyeater	P		OA	5	Duffys Bridge	BIRD1	27/11/2023
Corvus coronoides	Australian Raven	P		A	2	Duffys Bridge	BIRD1	27/11/2023
Melithreptus brevirostris	Brown-headed Honeyeater	P		A	5	Duffys Bridge	BIRD1	27/11/2023
Dacelo novaeguineae	Laughing Kookaburra	P		A	1	Duffys Bridge	BIRD1	27/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Cormobates leucophaea	White-throated Treecreeper	P		A	2	Duffys Bridge	BIRD1	27/11/2023
Ailuroedus crassirostris	Green Catbird	P		A	4	Duffys Bridge	BIRD1	27/11/2023
Rhipidura leucophrys	Willie Wagtail	P		A	5	Duffys Bridge	BIRD1	27/11/2023
Pavo cristatus	Indian Peafowl			A	1	Duffys Bridge	BIRD1	27/11/2023
Psophodes olivaceus	Eastern Whipbird	P		A	3	Duffys Bridge	BIRD1	27/11/2023
Eudynamys orientalis	Eastern Koel	P		A	4	Duffys Bridge	BIRD1	27/11/2023
Meliphaga lewinii	Lewin's Honeyeater	P		OA	12	Duffys Bridge	BIRD5	30/11/2023
Colluricincla harmonica	Grey Shrike-thrush	P		O	1	Duffys Bridge	BIRD5	30/11/2023
Eopsaltria australis	Eastern Yellow Robin	P		OA	3	Duffys Bridge	BIRD5	30/11/2023
Melithreptus lunatus	White-naped Honeyeater	P		O	1	Duffys Bridge	BIRD5	30/11/2023
Neochmia temporalis	Red-browed Finch	P		OA	5	Duffys Bridge	BIRD5	30/11/2023
Melithreptus brevirostris	Brown-headed Honeyeater	P		O	1	Duffys Bridge	BIRD5	30/11/2023
Corvus coronoides	Australian Raven	P		OA	1	Duffys Bridge	BIRD5	30/11/2023
Pavo cristatus	Indian Peafowl			A	2	Duffys Bridge	BIRD5	30/11/2023

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Ailuroedus crassirostris	Green Catbird	P		OA	4	Duffys Bridge	BIRD5	30/11/2023
Eolophus roseicapillus	Galah	P		O	4	Duffys Bridge	BIRD5	30/11/2023
Sphecotheres vieilloti	Australasian Figbird	P		O	1	Duffys Bridge	BIRD5	30/11/2023
Alisterus scapularis	Australian King-parrot	P		O	1	Duffys Bridge	BIRD5	30/11/2023
Cracticus tibicen	Australian Magpie	P		O	2	Duffys Bridge	BIRD5	30/11/2023
Rhipidura leucophrys	Willie Wagtail	P		A	1	Duffys Bridge	BIRD5	30/11/2023
Oriolus sagittatus	Olive-backed Oriole	P		A	1	Duffys Bridge	BIRD5	30/11/2023
Malurus cyaneus	Superb Fairy-wren	P		A	4	Duffys Bridge	BIRD5	30/11/2023
Cormobates leucophaea	White-throated Treecreeper	P		A	1	Duffys Bridge	BIRD5	30/11/2023
Macropygia amboinensis	Brown Cuckoo-dove	P		A	1	Duffys Bridge	BIRD5	30/11/2023
Philemon corniculatus	Noisy Friarbird	P		A	1	Duffys Bridge	BIRD5	30/11/2023
Dacelo novaeguineae	Laughing Kookaburra	P		A	3	Duffys Bridge	BIRD5	30/11/2023
Vanellus miles	Masked Lapwing	P		A	1	Duffys Bridge	BIRD5	30/11/2023
Grallina cyanoleuca	Magpie-lark	P		A	1	Duffys Bridge	BIRD5	30/11/2023
Opportunistic sightings								
Wallabia bicolor	Swamp Wallaby	P		O	3			

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Thylogale sp.	Unidentified Pademelon	P		O	1			
Hoplocephalus Stephens'sii	Stephens's' Banded Snake	V,P		O	1			
Centropus phasianinus	Pheasant Coucal	P		O	2			
Acanthiza chrysorrhoa	Yellow-rumped thornbill	P		O	3			
Alectura lathami	Australian Brush-turkey	P		O	4			
Intellagama lesueurii	Eastern Water Dragon	P		O	15			
Coturnix ypsilophora	Brown Quail	P		O	2			
Cacatua galerita	Sulphur-crested Cockatoo	P		O	2			
Tropidechis carinatus	Rough-scaled Snake	P		O	1			
Threskiornis spinicollis	Straw-necked Ibis	P		O	8			
Platycercus elegans	Crimson Rosella	P		O	2			
Cracticus nigrogularis	Pied Butcherbird	P		O	6			
Perameles nasuta	Long-nosed Bandicoot	P		O	1			
Tachybaptus novaehollandiae	Australasian Grebe	P		O	2			

Scientific Name	Common Name	NSW Status	EPBC Status	Observation Type	Number	Location	Survey ID	Date
Manorina melanocephala	Noisy Miner	P		O	10			
Trachystoma petardi	Pinkeye Mullet, Fresh Water Mullet			O	18			
Mus musculus	House Mouse			O	20+			
Hydromys chrysogaster	Water-rat	P		O	2+			
Varanus varius	Lace monitor	P		O	1			
Isoodon macrourus	Northern Brown Bandicoot	P		O	2			
Intellagama lesueurii	Eastern Water Dragon	P		O	15			

Appendix I

Flora Species List

Key:

Status: n=native, e=exotic

Biosecurity obligation: a = asset protection

Scientific name	Common name	Status
Hobarts Bridge		
Casuarina cunninghamiana	River oak	n
Ageratina riparia	Mistflower	e
Persicaria strigosum	Spotted knotweed	n
Setaria sphacelata	Pigeon grass	e
Persicaria decipiens	Slender knotweed	n
Ageratum houstonianum	Blue billygoat weed	e
Cuphea carthagenensis	Colombian waxweed	e
Carex appressa	Grassy sedge	n
Lomandra hystrix	Stream mat-rush	n
Cyperus spp	Sedges	n
Joyces Bridge		
Casuarina cunninghamiana	River oak	n
Lomandra hystrix	Stream mat-rush	n
Ageratum houstonianum	Blue billygoat weed	e
Cynodon dactylon	Common couch	n
Trifolium repens	White clover	e
Setaria sphacelata	Pigeon grass	e
Juncus spp	Rush	n
Carex appressa	Grassy sedge	n
Sporobolus fertilis	Giant parramatta grass	e, a
Cyperus spp	Sedge	n
Ageratina riparia	Mistflower	e
Tradescantia fluminensis	Trad	e
Duffys Bridge		
Casuarina cunninghamiana	River oak	n

Scientific name	Common name	Status
Cinnamomum camphora	Camphor laurel	e, a
Ligustrum sinense	Small-leaved privet	e, a
Ricinus communis	Castor oil plant	e
Ficus coronata	Sandpaper fig	n
Leptospermum brachyandrum	Tea tree	n
Lomandra hystrix	Stream mat-rush	n
Ageratum houstonianum	Blue billygoat weed	e
Calochlaena dubia	Rainbow fern	n
Setaria palmifolia	Palm grass	e
Setaria sphacelata	Pigeon grass	e
Thunbergia alata	Black-eyed susan	e
Paspalum mandiocanum	Broadleaved paspalum	e
Justins Bridge		
Casuarina cunninghamiana	River oak	n
Ageratina riparia	Mistflower	e
Persicaria strigosum	Spotted knotweed	n
Setaria sphacelata	Pigeon grass	e
Cyperus spp	Sedge	n
Ageratum houstonianum	Blue billygoat weed	e
Cuphea carthagenensis	Colombian waxweed	e
Carex appressa	Grassy sedge	n
Lomandra hystrix	Stream mat-rush	n

Appendix J

Likelihood of Occurrence Table

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Flora								
Native Guava *Rhodomyrtus psidioides d*	CE	CE	PMST, BioNet	Occurs from Broken Bay, approximately 90 km north of Sydney, to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation and also occur up to approximately 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Pioneer species found in littoral, warm temperate and subtropical rainforest, and wet sclerophyll forest often near creeks and drainage lines. Extremely susceptible to infection by Myrtle Rust.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey.	**May occur** This species was not recorded during targeted surveys by subconsultant however, . historical records occur within 5 km of the Project and the species may occur.
Scrub Turpentine *Rhodamnia rubescens*	CE	CE	PMST, BioNet	Occurs in coastal districts north from Batemans Bay in New South Wales to areas inland of Bundaberg in Queensland. Populations typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000 -1,600 mm. Found in littoral, warm temperate and subtropical rainforest, and wet sclerophyll forest usually on volcanic and sedimentary soils. Highly to extremely susceptible to infection by Myrtle Rust.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Slender Marsdenia *Marsdenia longiloba*	E	V	PMST, BioNet	Scattered sites on the north coast of NSW north from Barrington Tops to QLD. Grows in subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and in areas with rocky outcrops. Associated species include *Eucalyptus crebra, E. microcorys, E. acmenoides, E. saligna, E. propinqua, Corymbia intermedia and Lophostemon confertus.*	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified within the Project footprint during the field survey	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.
Milky Silkpod *Parsonsia dorrigoensis*	E	V	PMST, BioNet	Scattered populations on the north coast between Kendall and Woolgoolga. Grows on brown clay soils in subtropical and warm temperate rainforest, on rainforest margins and in moist eucalypt forest up to 800m asl. Has a preference for more open areas and forest edges.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Scented Acronychia *Acronychia littoralis*	E	E	PMST	Scented Acronychia is found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW, within 2 km of the coast on sandy soil. Scented Acronychia occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.
White-Flowered Wax Plant *Cynanchum elegans*	E	E	PMST, BioNet	This species is a climbing plant with a variable form. This species is found from Gloucester district to the Wollongong area and inland to Mt Dangar. It is often found in ecotones between dry subtropical rainforest and sclerophyll forest/woodland communities from Brunswick Heads to the Illawarra region (DEWHA, 2008)	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.
Vincetoxicum woollsii (listed as *Tylophora woollsii EPBC*)	E	E	PMST, BioNet	This species is a slender, woody climber growing up to 3 m long. It is found in the New South Wales north coast and New England Tablelands, north to southern Queensland. It grows in moist eucalypt forest, moist sites in dry eucalypt forests and rainforest margins (OEH, 2020).	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Nightcap Plectranthus, Silver Plectranthus *Coleus nitidus* (listed as *Plectranthus nitidus EPBC*)	E	E	PMST	This species is a multi-stemmed herb forming small clumps 30 – 0150 cm tall. It forms small clumps in gullies and on boulders in rainforest or open forest on the margins of rainforest (DEWHA, 2008). Its distribution is restricted to southeast Queensland northeast New South Wales, occurring from Nightcap Range north to the McPherson Range.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.
Clear Milkvine *Leichhardtia longiloba* (listed as *Marsdenia longiloba EPBC*)	V	E	PMST, BioNet	Scattered sites on the north coast of NSW north from Barrington Tops to QLD. Grows in subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and in areas with rocky outcrops. Associated species include *Eucalyptus crebra, E. microcorys, E. acmenoides, E. saligna, E. propinqua, Corymbia intermedia* and *Lophostemon confertus.*	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**Unlikely to occur** The species has not been recorded within 5 km of the Project and suitable habitat was not identified during the field survey.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Red Boppel Nut *Hicksbeachia pinnatifolia*	V	V	PMST, BioNet	Occurs in the coastal areas of north-east NSW from the Nambucca Valley north to south-east Queensland. Occurs in subtropical rainforest, moist eucalypt forest and Brush Box forest. The species usually habitats flat to gently inclined valley flats to steeply inclined slopes and hillcrests. Soils are generally slightly acidic loams derived from basalt (Weston, 1995).	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.
Hairy Jointgrass *Arthraxon hispidus*	V	V	PMST, BioNet	Scattered locations through SE QLD and northern coast and tablelands of NSW to Kempsey and inland to Glen Innes. Found in or on the edges of rainforest and wet eucalypt forest, often near creeks or swamps. Also recorded in woodland, or around freshwater springs on coastal foreshore dunes, gullies, and creek banks and on creek beds in open forests.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	**Hobarts Bridge**	**Justins Bridge**	**Duffys Bridge**
Tall Velvet Sea-berry *Haloragis exalata subsp. velutina*	V	V	PMST	Occurs on the north coast of NSW, and is abundant in inaccessible areas of the Macleay River. Grows in damp places near watercourses, in woodland on steep rocky slopes of gorges.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Ravine Orchid *Sarcochilus fitzgeraldii*	V	V	PMST	Occurs north-east NSW, north of the Macleay River, to Maleny in south-east Queensland. Grows mainly on rocks, amongst organic matter, in cool, moist, shady ravines, gorges and on cliff faces in dense subtropical rainforest at altitudes between 500 and 700 m. Occasional clumps are found on the bases of fibrous-barked trees.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** Suitable habitat for the species occurs within the Project footprint, however there are historical records within 5 km of the Project and the species may occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Rainforest cassia *Senna acclinis*	-	E	BioNet	Coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland. Grows in or on the edges of subtropical and dry rainforest.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Newry Golden Wattle *Acacia chrysotricha*	-	E	BioNet	Restricted to an area south of Bellingen on the NSW north coast. An understorey species on rainforest edges and in wet or dry eucalypt forest in steep narrow gullies on quartzite soils.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Neoastelia spectabilis	-	V	BioNet	This soft-stemmed lily-like plant is only found in New South Wales, specifically in the New England National Park which occurs on the eastern edge of the New England Tablelands. It is associated in Antarctic Beech rainforest, often growing in rocky crevices near waterfalls and seepage lines on rocky slopes. It occurs in altitudes between 900 - 1150 m.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Red-flowered King of the Fairies *Oberonia titania*	-	V	BioNet	Occurs on the NSW north coast, north from Kendall. Found in littoral and subtropical rainforest and paperbark swamps, but can also occur in eucalypt-forested gorges and in mangroves.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Rusty Plum, Plum Boxwood *Niemeyera whitei*	-	V	BioNet	Occurs in the coast and adjacent ranges of northern NSW from the Macleay River into southern Queensland. Distributional stronghold on the mid north coast around Coffs Harbour. Found in gullies, warm temperate or littoral rainforests and the adjacent understorey of moist eucalypt forest. Occurs on poorer soils in areas below 600 metres above sea level.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** This species was not recorded during targeted surveys by subconsultant however, historical records occur within 5 km of the Project and the species may occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Silver Sword Lily *Neoastelia spectabilis*	V	V	PMST, BioNet	This soft-stemmed lily-like plant is only found in New South Wales, specifically in the New England National Park which occurs on the eastern edge of the New England Tablelands. It is associated in Antarctic Beech rainforest, often growing in rocky crevices near waterfalls and seepage lines on rocky slopes. It occurs in altitudes between 900 - 1150 m.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Bertya sp. Clouds Creek (M.Fatemi 4)	-	E	PMST, BioNet	A 3 m tall hairy stemmed shrub that only occurs in NSW west of the Great Dividing Range. The species occurs in low shrubland or heath, surrounded by eucalypts. It mainly grows on rocky, steep slopes within shallow soil. Flowers after August and are still in seed-set between January to February.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Leafless Tongue-orchid *Cryptostylis hunteriana*	V		PMST, BioNet	Occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences not well defined. Grows mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with Large Tongue Orchid and the Bonnet Orchid. Soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. Flowers November-February.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak *Macadamia integrifolia*	V	V	PMST, BioNet	Found in remnant rainforest in northern NSW and south-east Queensland, preferring partially open areas such as rainforest edges. While specimens have been collected from the North Coast of NSW, this species is not known to occur naturally in NSW.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Knotweed, Tall Knotweed *Persicaria elatior*	V	V	PMST, BioNet	Recorded in south-eastern NSW from Ulladulla to the Victorian border. Known from Raymond Terrace and the Grafton area in northern NSW. Normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Lesser Swamp-orchid *Phaius australis*	E	E	PMST, BioNet	Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Grows in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Smooth-bark Rose Apple, Red Lilly Pilly *Syzygium hodgkinsoniae*	V	V	PMST, BioNet	Syzygium hodgkinsoniae has a distribution from Richmon River (NSW) to Maleny and Kin Kin (QLD), with disjunct populations in Kuranda and Gordonvale (QLD). S. hodgkinsoniae occurs in riverine subtropical or gallery rainforests on deep rich alluvial and basalt soils at altitudes up to 300 m (Barry & Thomas, 1994; Floyd, 1989; Hyland, 1983; NSW DECCW, 2005; Sheringham & Westaway, 1995; Stanley & Ross, 1986).	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Austral Toadflax, Toadflax *Thesium australe*	V	V	PMST, BioNet	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Occurs in grassland or grassy woodland, and is often found in association with Kangaroo Grass.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Asperula asthenes Trailing Woodruff	V	V	PMST, BioNet	Occurs in scattered locations from Bulahdelah to Kempsey. Some records from Port Stephens/Wallis Lakes area. Occurs in damp sites, often along river banks.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Callistemon pungens	V	V	PMST, BioNet	In NSW, occurs on the northern tablelands from Inverell to the eastern escarpment in New England NP. Habitats range from riparian areas dominated by Casuarina cunninghamiana subsp. cunninghamiana to woodland and rocky shrubland and if often observed growing along rocky watercourses with sandy granite or basalt creek beds. Flowers over spring and summer.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Cryptostylis hunteriana Leafless Tongue-orchid	V	V	PMST, BioNet	Occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences not well defined. Grows mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with Large Tongue Orchid and the Bonnet Orchid. Soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. Flowers November-February.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Euphrasia arguta	CE	CE	PMST, BioNet	Recently rediscovered near Nundle on the north-western slopes and tablelands, once known from scattered locations between Sydney, Bathurst and Walcha. Known populations occur in eucalypt forest with a mixed grass/shrub understorey, while previous records are described as occurring in open forest, grassy country and river meadows. Dense stands observed in cleared firebreak areas, suggesting it may respond well to disturbance.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Gingidia rupicola Mountain Angelica, Broad-leafed Carrot	E	E	PMST, BioNet	Endemic to NSW and known from only two locations within New England National Park. Occurs in Snow Gum (Eucalyptus pauciflora) Woodland and at the edge of Antarctic Beech (Nothofagus moorei) forest. Grows in humic soil in pockets in ledges or cracks in basalt or trachyte rocks, mostly on cliff faces at altitudes of 1400–1750 m above sea level.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Birds								
Anthochaera phrygia Regent Honeyeater	CE	CE	PMST, BioNet	Mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. Very patchy distribution in NSW, mainly confined to the two main breeding areas and surrounding fragmented woodlands. Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests.	**Unlikely to occur** No suitable habitat for the species occurs within the Project footprint, and the species was not identified during the field survey. No historical records occur within 5 km.	**Unlikely to occur** No suitable habitat for the species occurs within the Project footprint, and the species was not identified during the field survey. No historical records occur within 5 km.	**Unlikely to occur** No suitable habitat for the species occurs within the Project footprint, and the species was not identified during the field survey. No historical records occur within 5 km.	**Unlikely to occur** No suitable habitat for the species occurs within the Project footprint, and the species was not identified during the field survey. No historical records occur within 5 km.

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	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Lathamus discolor Swift parrot	CE	E	PMST	The swift parrot breeds in Tasmania during the summer, before migrating north to mainland Australia for the winter (DCCEEW, 2023). The species inhabits dry sclerophyll forests and woodlands, particularly areas supporting winter-flowering species (DCCEEW, 2023). Mostly recorded in box-ironbark woodlands (Menkhorst et al., 2019). Routinely returns to winter foraging habitat.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** Suitable habitat for the species occurs within broader locality of the Project footprint. The species was not identified during the field survey. Historical records occur within 5 km of the Project and the species may occur.
Atrichornis rufescens Rufous Scrub-bird	E	V	PMST, BioNet	Found above 600 m sea level in north-eastern NSW, including subtropical, warm temperate and cool temperate rainforests, and nearby moist and wet eucalypt forests. Requires dense ground cover, a moist microclimate at ground level and abundant leaf litter, which is usually restricted to ecotones, forested watercourses and wetlands, and areas regenerating from fires, storms or along roadsides.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Rostratula australis Australian Painted Snipe	E	E	PMST	The Australian painted snipe has a broad distribution across, though is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland, NSW, and Victoria (DCCEEW, 2023). The species generally inhabits shallow, terrestrial freshwater wetlands, including temporary and permanent lakes, swamps, claypans and waterlogged grasslands (DCCEEW, 2023, Menkhorst et al., 2019). Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum (DCCEEW, 2023) A rare species seldom seen.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Botaurus poiciloptilus Australasian Bittern	E	E	PMST	Occurs within eastern and south-eastern Australia. Considered uncommon throughout much of its range (Pizzey and Knight, 1999). Occurs in and about water in reedbeds, sedges and rushes (Menkhorst et al., 2019). Occasionally seen in tussock paddocks, saltmarshes, and brackish wetlands.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Erythrotriorchis radiatus Red Goshawk	V	CE	PMST, BioNet	The red goshawk is widely distributed throughout northern and eastern Australia, particularly in a wide coastal strip along eastern Queensland, through to Cape York and the Northern Territory / Kimberly. The species occurs in a range of habitats, often at ecotones, including coastal and sub-coastal tall open forests, tropical savannahs crossed by wooded or forested watercourses, woodlands, edges of rainforests and gallery forests along watercourses, and wetlands that include Melaleuca and Casuarina species (Menkhorst et al., 2019). The species typically nests in tall trees within 1 km of permanent water and favours habitats that support a high abundance of bird species (Pizzey and Knight, 1999).	**May occur** Suitable habitat for the species occurs within the broader Project Area of the Project footprint, however there are no historical records within 5 km of the Project. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within the broader Project Area of the Project footprint, however there are no historical records within 5 km of the Project. The species is highly mobile and may occur temporarily	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Climacteris picumnus victoriae Brown treecreeper (eastern subspecies)	V	V	PMST, BioNet	Brown treecreepers (south-eastern) are endemic to south-eastern Australia from the Grampians in western Victoria, through central New South Wales to the Bunya Mountains in Queensland (DCCEEW, 2023). The subspecies mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. They also occur in mallee, forests, and woodlands subject to periodic inundation (DCCEEW, 2023).	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Hirundapus caudacutus White-throated needletail	V, Mig	-	PMST	Almost exclusively aerial, it does prefer wooded, inland areas and heathland. In coastal areas they have been seen flying over mudflats and beaches. Widespread throughout eastern and south-eastern Australia. It has been recorded long all coastal regions of QLD and NSW (Menkhorst et al., 2019). Breeds in eastern Siberia, north-eastern China and Japan between August to October and arrives in Australia during September and October. Upon arrival they move south along both sides of the Great Dividing Range in QLD and NSW. They head north again, passing through QLD in February and March (DCCEEW, 2023).	**May occur** The species has been historically recorded within 5 km of the Project. The species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions. Unlikely to be a permanent occupant.	**May occur** The species has been historically recorded within 5 km of the Project. The species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions. Unlikely to be a permanent occupant.	**May occur** The species has been historically recorded within 5 km of the Project. The species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions. Unlikely to be a permanent occupant.	**May occur** The species has been historically recorded within 5 km of the Project. The species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions. Unlikely to be a permanent occupant.
Calyptorhynchus lathami lathami Glossy black-cockatoo	V	V	PMST, BioNet	Uncommon although widespread throughout suitable forest and woodland habitats. Occurs from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species).	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.

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Glossopsitta pusilla Little lorikeet	V	-	PMST	Distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year. Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	**May occur** The species has not been historically recorded within 5 km of the Project however the species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions.	**May occur** The species has not been historically recorded within 5 km of the Project however the species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions.	**May occur** The species has not been historically recorded within 5 km of the Project however the species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions.	**May occur** The species has not been historically recorded within 5 km of the Project however the species is largely nomadic. Species may occur temporarily in response to seasonal and climatic conditions.

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Haliaeetus leucogaster White-bellied sea-eagle	Marine	V	PMST, BioNet	Widespread along the NSW coast, and along all major inland rivers and waterways. Habitats characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries, and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs, and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat.	**May occur** The species has not been historically recorded within 5 km of the Project, however, the species is largely nomadic and highly mobile. Species may occur temporarily in response to seasonal and climatic conditions.	**May occur** The species has not been historically recorded within 5 km of the Project, however, the species is largely nomadic and highly mobile. Species may occur temporarily in response to seasonal and climatic conditions.	**May occur** The species has not been historically recorded within 5 km of the Project, however, the species is largely nomadic and highly mobile. Species may occur temporarily in response to seasonal and climatic conditions.	**May occur** The species has not been historically recorded within 5 km of the Project, however, the species is largely nomadic and highly mobile. Species may occur temporarily in response to seasonal and climatic conditions.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Pandion cristatus Eastern osprey	Mig	V	PMST, BioNet	The eastern osprey is distributed around the Australian coastline, excluding only Victoria and Tasmania (EOH, 2023). Preferred habitats for the species include coastlines, estuaries, bays and inlets, river systems and lake complexes, and the species are known to venture inland, particularly in northern Queensland (Pizzey and Knight, 1999; OEH, 2023). The species favours large, emergent trees, cliff faces and high vantage points as nesting habitat, usually in exposed locations and within 1 km of water (Thomson et al., 2019).	**May occur** The species has not been historically recorded within 5 km of the Project, however, the species is largely nomadic and highly mobile. Species may occur temporarily in response to seasonal and climatic conditions.	**May occur** The species has not been historically recorded within 5 km of the Project, however, the species is largely nomadic and highly mobile c. Species may occur temporarily in response to seasonal and climatic conditions.	**May occur** The species has not been historically recorded within 5 km of the Project, however, the species is largely nomadic and highly mobile. Species may occur temporarily in response to seasonal and climatic conditions.	**May occur** The species has not been historically recorded within 5 km of the Project, however, the species is largely nomadic and highly mobile. Species may occur temporarily in response to seasonal and climatic conditions.
Ptilinopus magnificus Wompoo fruit-Dove	-	V	BioNet	Occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula. Rare south of Coffs Harbour, it used to occur in the Illawarra, though there are no recent records. Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. Feeds on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit.	**May occur** Suitable habitat for the species occurs within broader Project Area, however the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within broader Project Area, however the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within broader Project Area, however the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within broader Project Area, however the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act						
					Joyces Bridge	**Hobarts Bridge**	**Justins Bridge**	**Duffys Bridge**
Ptilinopus regina Rose-crowned Fruit-Dove	-	V	BioNet	Occurs from Newcastle north to Cape York, with vagrants occasionally as far south as Victoria. Occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. Thought to be locally nomadic in response to fruit availability.	**May occur** Suitable habitat for the species occurs within broader Project Area of the Project footprint, however the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within broader Project Area of the Project footprint, however the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within broader Project Area of the Project footprint, however the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within broader Project Area of the Project footprint, however the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.
Ptilinopus superbus Superb Fruit-Dove	-	V	BioNet, confirmed present during survey	Occurs principally from north-eastern in Queensland to north-eastern NSW. Much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic. At least some of the population, particularly young birds, moves south through Sydney, especially in autumn.	**May occur** Suitable habitat for the species occurs within broader Project Area, however the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.	**Confirmed present** This species was heard calling in the vicinity of Hobarts Bridge. Suitable habitat occurs within the Project Area.	**May occur** Suitable habitat for the species occurs within broader Project Area, however the species was not identified during the field survey. No historical records occur within 5 km of the Project however, the species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within broader Project Area, however, the species was not identified during the field survey. Historical records occur within 5 km of the Project. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Ephippiorhynchus asiaticus Black-necked Stork	-	E	BioNet	Widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland away from breeding areas). Species becomes increasingly uncommon south of the Clarence Valley, and rarely occurs south of Sydney. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the species. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	**May occur** Suitable habitat for the species occurs within the Project footprint, however there are no historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within the Project footprint, however there are no historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within the Project footprint, however there are no historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable habitat for the species occurs within the Project footprint, however there are no historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Ninox strenua Powerful Owl	-	V	BioNet	The powerful owl is endemic to eastern and south-eastern Australia, occurring east of the Great Dividing Range from southern Queensland to the Victorian highlands (Menkhorst et al., 2019). The species inhabits forested coastal ranges, open eucalypt forests and woodlands, often along sheltered gullies and watercourses with dense mid and understoreys. As an obligate hollow-nester, the species requires vegetation communities containing trees over 150 years old and an abundance of large hollows (Bain et al. 2014; Cooke, 2002). The species generally favours dense gullies for roosting and nesting sites (Cooke et al. 2002, Clemens et al., 2020).	**May occur** Suitable foraging habitat for this species was recorded during the field survey, however there are no records within 5 km. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded during the field survey, however there are no records within 5 km. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded during the field survey, however there are no records within 5 km. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded during the field survey, however there are no records within 5 km. The species is highly mobile and may occur temporarily.

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					Joyces Bridge	**Hobarts Bridge**	**Justins Bridge**	**Duffys Bridge**
Tyto novaehollandiae Masked Owl	-	V	BioNet	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. Lives in dry eucalypt forests and woodlands from sea level to 1100 m and often hunts along the edges of forests, including roadsides. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	**May occur** Suitable roosting habitat for this species was recorded during the field survey, however there are few records within 5 km. The species is highly mobile and may occur temporarily.	**May occur** Suitable roosting habitat for this species was recorded during the field survey, however there are few records within 5 km. The species is highly mobile and may occur temporarily.	**May occur** Suitable roosting habitat for this species was recorded during the field survey, however there are few records within 5 km. The species is highly mobile and may occur temporarily.	**May occur** Suitable roosting habitat for this species was recorded during the field survey, however there are few records within 5 km. The species is highly mobile and may occur temporarily.
Tyto tenebricosa Sooty Owl	-	V	BioNet	Occupies the eastern most one-eighth of NSW, occurring on the coast, coastal escarpment, and eastern tablelands. Found in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roost by day in the hollow of a tall forest tree or in heavy vegetation and nest in very large tree hollows.	**May occur** Suitable roosting habitat for this species was recorded during the field survey. There are records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable roosting habitat for this species was recorded during the field survey. There are records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable roosting habitat for this species was recorded during the field survey. There are records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable roosting habitat for this species was recorded during the field survey. There are records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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Daphoenositta chrysoptera Varied Sittella	-	V	BioNet	Sedentary species, inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Found in eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.	**Unlikely to occur** No suitable habitat for this species was recorded during the field survey. There are no historical records within 5 km of the Project footprint, as such the species is unlikely to occur.
Hieraaetus morphnoides Little Eagle	-	V	BioNet	Found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. Occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Also found in Sheoak or Acacia woodlands and riparian woodlands of inland NSW. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Lophoictinia isura Square-tailed kite	-	V	BioNet	Ranges along coastal and subcoastal areas from south-western to northern Australia. Scattered records throughout NSW indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. Summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests and shows a particular preference for timbered watercourses. Observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland in arid north-western NSW.	**May occur** Suitable foraging habitat for this species was recorded during the field survey, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded during the field survey. There are few records 5 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded during the field survey, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded during the field survey. There are records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Tyto longimembris Eastern Grass Owl	-	V	BioNet	More likely to be resident in the north-east of NSW. Numbers can fluctuate greatly, increasing especially during rodent plagues. Found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. Always breeds on the ground. Nests are found in trodden grass, and often accessed by tunnels through vegetation.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** Suitable habitat is absent from the Project footprint. Whie there is one record of the species approximately 5 km northeast of the Project , without suitable habitat, the species is unlikely to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Calidris ferruginea Curlew Sandpiper	CE	E	PMST, BioNet	Distributed around most of the Australian coastline. Occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. Migrates to Australia for the non-breeding period, arriving between August and November, and departing between March and mid-April. Generally occupies littoral and estuarine habitats, and is mainly found in intertidal mudflats of sheltered coasts in NSW. Also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. Forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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	EPBC Act	BC Act						
					Joyces Bridge	**Hobarts Bridge**	**Justins Bridge**	**Duffys Bridge**
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover	V	V	PMST, BioNet	Breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. The species is almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

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Grantiella picta Painted Honeyeater	V	V	PMST	Nomadic species occurring at low densities throughout its range. Most commonly found on the inland slopes of the Great Dividing Range in NSW, where almost all breeding occurs. More likely to be found in the north of its distribution in winter. Inhabits Boree/ Weeping Myall (Acacia pendula), Brigalow (A. harpophylla) and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Hirundapus caudacutus White-throated Needletail	V	V	PMST	Migrates to eastern Australia from October to April. Almost exclusively aerial and most often seen before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. Occurs over most types of habitat, but mostly recorded above wooded areas, including open forest and rainforest. May also fly between trees or in clearings, below the canopy. Recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern)	E	E	PMST	Found throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies picata. Prefers lightly wooded country, usually open eucalypt woodland, Acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Neophema chrysostoma Blue-winged Parrot	V	V	PMST	During the non-breeding period, from autumn to early spring, birds are recorded in western NSW, with some reaching south-eastern NSW, particularly on the southern migration. Inhabits a range of habitats from coastal, sub-coastal and inland areas, through to semi-arid zones. Tends to favour grasslands and grassy woodlands, often found near wetlands both near the coast and in semi-arid zones. Sometimes seen in altered environments such as airfields, golf-courses and paddocks. Pairs or small parties forage mainly near or on the ground for seeds of a wide range of native and introduced grasses, herbs and shrubs.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew	CE	E	PMST	Occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. Generally occupies coastal lakes, inlets, bays and estuarine habitats, and is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts in NSW. Rarely seen inland.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act						
					Joyces Bridge	**Hobarts Bridge**	**Justins Bridge**	**Duffys Bridge**
Stagonopleura guttata Diamond Firetail	V	V	PMST	Widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. Scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities, and often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Turnix melanogaster Black-breasted Button-quail	V	CE	PMST	Endemic to south-eastern Queensland and far north-eastern NSW, at scattered sites from the Byfield region south to the Border Ranges and mainly on and east of the Great Divide but extending inland to the inner western slopes, up to 300 km from the coast. The species is rare in NSW, it hasn't been detected in NSW since 2000 and ecological requirements are largely unknown. Preferred habitat includes drier low closed forests, including dry rainforests, vine forest and vine thickets, often in association with Hoop Pine, and Bottletree scrubs. The understorey may be dense or sparse, but a deep, moist leaf-litter layer, in which the birds forage, is an important component of habitat. Birds have been recorded using Lantana thickets at edges of rainforest or Lantana understorey of forest or rainforest, but it is not known if Lantana associations are suitable for sustaining breeding.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

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	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Mammals								
Phascolarctos cinereus Koala	E	E	PMST, BioNet	Found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests of NSW, with some smaller populations on the plains west of the Great Dividing Range. Inhabits eucalypt woodlands and forests, and feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but will select preferred browse species in any one area.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur while moving to areas of suitable habitat.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur while moving to areas of suitable habitat.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur while moving to areas of suitable habitat.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur while moving to areas of suitable habitat.

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	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Petauroides volans Greater glider (southern and central)	E	E	PMST	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria. This species is largely restricted to tall, mature, eucalypt forests and woodlands (DCCEEW, 2023; Eyre et al., 2022). Species requires abundance of hollow-bearing trees which provide den sites and is generally restricted to extensive forest networks larger than 160 km2 (DCCEEW, 2023).	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur.	**May occur** The Project footprint doesn't support suitable foraging habitat for the species and the species was not confirmed present within the Project footprint; however the species has been historically recorded within 5 km. As such, the species may occur.	**Unlikely to occur** The species has not been historically recorded within 5 km and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Potorous tridactylus Long-nosed potoroo	V	V	PMST, BioNet	Generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns, or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint, however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area of the Project footprint. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Notamacropus parma Parma wallaby	V	V	PMST, BioNet	Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area. There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area There are historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat for this species was recorded in the broader Project Area however there are no records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.
Pteropus poliocephalus Grey-headed flying-fox	V	V	PMST, BioNet, confirmed present during surveys	Generally found within 200 km of the eastern coast of Australia, from Rockhampton to Adelaide. May be found in unusual locations in times of natural resource shortage. Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	**May occur** Suitable foraging habitat occurs within broader Project Area. The species has been historically recorded within 5 km. Known to travel large distances to forage and may occur temporarily.	**Confirmed present** Grey-headed flying-fox camp was recorded within 120m of Project footprint. Black Flying-foxes also occur in this camp. This is a maternity camp for both species; dependant young observed, comprising at least 1000 individuals and restricted to a bamboo plantation.	**May occur** Suitable foraging habitat occurs within broader Project Area The species has been historically recorded within 5 km. Known to travel large distances to forage and may occur temporarily.	**May occur** Suitable foraging habitat occurs within broader Project Area. The species has been historically recorded within 5 km. Known to travel large distances to forage and may occur temporarily.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Dasyurus maculatus maculatus Spot-tailed quoll (SE mainland population)	E	V	PMST	The spotted-tailed quoll is found along both sides of the Great Dividing Range from the Victorian to the Queensland borders (DCCEEW, 2023). Prefers mature wet forest habitat, though known to inhabit a range of forest environments, from rainforest to open woodland (EOH, 2023). They require forests with suitable den sites such as rock crevices, caves, hollow logs, burrows, and tree hollows.	**May occur** This species was not observed during field surveys or remote camera survey efforts. There are no historical records within 5 km of the Project footprint however there is suitable denning habitat within the broader Project Area. The species has a large home range and may occur temporarily.	**May occur** This species was not observed during field surveys or remote camera survey efforts. There are no historical records within 5 km of the Project footprint however there is suitable denning habitat within the broader Project Area. The species has a large home range and may occur temporarily	**May occur** This species was not observed during field surveys or remote camera survey efforts. There are no historical records within 5 km of the Project footprint however there is suitable denning habitat within the broader Project Area. The species has a large home range and may occur temporarily	**May occur** This species was not observed during field surveys or remote camera survey efforts. There are no historical records within 5 km of the Project footprint however there is suitable denning habitat within the broader Project Area. The species has a large home range and may occur temporarily.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Petaurus australis australis Yellow-bellied glider (south-eastern)	V	V	PMST	The yellow-bellied glider has a widespread but patchy distribution from south-eastern Queensland to the SA-Victoria border (DCCEEW, 2023). The species occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests (Rees et al. 2007). Yellow-bellied gliders favour large patches of mature old growth forest that provide suitable trees for foraging and shelter, with a preference for forests with a high proportion of winter-flowering and smooth-barked eucalypt. Hollow-bearing trees are a critical habitat feature for the yellow-bellied glider due to their usage as dens.	**May occur** Suitable habitat for the species occurs within the broader locality of the Project footprint, however the species was not identified during the field survey. There are no historical records occur within 5 km of the Project.	**May occur** Suitable habitat for the species occurs within the broader locality of the Project footprint, however the species was not identified during the field survey. There are no historical records occur within 5 km of the Project.	**May occur** Suitable habitat for the species occurs within the broader locality of the Project footprint, however the species was not identified during the field survey. There are no historical records occur within 5 km of the Project.	**May occur** Suitable habitat for the species occurs within the broader locality of the Project footprint, however the species was not identified during the field survey. There are no historical records occur within 5 km of the Project.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Chalinolobus dwyeri Large-eared pied bat	V	V	PMST	The large-eared pied bat occurs in eastern Australia, from Rockhampton to Canberra (DCCEEW, 2023). The species roosts in sandstone cliffs, rock outcrops and woodland valleys and requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging. In south-east Queensland, the species is known from rainforest and moist eucalypt forest habitats at high elevation (DCCEEW, 2023).	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km. The species may occur temporarily.	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km. The species may occur temporarily.	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km. The species may occur temporarily.	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km. The species may occur temporarily.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Syconycteris australis Common Blossom Bat	-	V	BioNet	Found in coastal areas of eastern Australia from Hawks Nest in NSW to Cape York peninsula in Queensland. In areas, the distribution extends inland to coastal foothills. Often roosts in littoral rainforest and feed on nectar and pollen from flowers in adjacent heathland and paperbark swamps. Also recorded in a range of other vegetation communities, such as subtropical rainforest, wet sclerophyll forest and other coastal forests. Generally roost individually in dense foliage and vine thickets of the sub-canopy, staying in the same general area for a season.	**May occur** Suitable foraging habitat was recorded during the field survey and there is one historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.	**May occur** Suitable foraging habitat was recorded during the field survey however there are no historical records within 5 km of the Project Area. The species is highly mobile and may occur temporarily.
Phascogala tapoatafa Brush-tailed Phascogale	-	V	BioNet	Mainly found east of the Great Dividing Range in NSW, with occasional records west to the divide. Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Forages preferentially in rough barked trees of 25 cm DBH or greater.	**Unlikely to occur** No suitable habitat was identified during the field survey. There are no historical records within 5 km and the species is unlikely to occur.	**Unlikely to occur** No suitable habitat was identified during the field survey. There are no historical records within 5 km and the species is unlikely to occur.	**Unlikely to occur** No suitable habitat was identified during the field survey. There are no historical records within 5 km and the species is unlikely to occur.	**Unlikely to occur** No suitable habitat was identified during the field survey. There are no historical records within 5 km and the species is unlikely to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	**Hobarts Bridge**	**Justins Bridge**	**Duffys Bridge**
Miniopterus australis Little Bent-Winged Bat	-	V	BioNet, confirmed present during surveys	Occurs along the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. Prefers moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests, and banksia scrub. Generally found in well-timbered areas. Roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day. Forages for small insects beneath the canopy of densely vegetated habitats.	**Confirmed present** Data analysed from the Anabat echolocators from this site indicate these species may be roosting near the Project footprint. The source of the calls cannot be confidentially placed within bridge structure. However they are confirmed as foraging around the bridge and can be assumed that they utilise the bridge.	**Likely to occur** Suitable roosting habitat was recorded during the field survey, there are no historical records within 5 km of the Project Area and the species wasn't recorded during the field survey. The species is highly mobile and may occur temporarily.	**Likely to occur** Suitable roosting habitat was recorded during the field survey, there are no historical records within 5 km of the Project Footprint and the species wasn't recorded during the field survey. The species is highly mobile and is likely to occur.	**Likely to occur** Suitable roosting habitat was recorded during the field survey; however the species wasn't recorded during the field survey. The species has been recorded within 5 km of the Project Footprint. The species is highly mobile and is likely to occur.
Falsistrellus tasmaniensis Eastern False Pipistrelle	-	V	Confirmed present during surveys	Found on the south-east coast and ranges of Australia, from southern Queensland to Victoria. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows but also found under loose bark on trees or in buildings.	**Confirmed present** Data analysed from the Anabat echolocators from this site indicate these species may be roosting near the Project footprint. The source of the calls cannot be confidentially placed within bridge structure.	**Likely to occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has been recorded within 5 km of the Project footprint and is likely to occur	**Likely to occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has been recorded within 5 km of the Project footprint and is likely to occur.	**Likely to occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has been recorded within 5 km of the Project footprint and is likely to occur

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Micronomus norfolkensis Eastern Coastal Free-Tailed Bat	-	V	Confirmed present during surveys	Found along the east coast from south Queensland to southern NSW. Occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in man-made structures.	**Confirmed present** Data analysed from the Anabat echolocators from this site indicate these species may be roosting near the Project footprint. The source of the calls cannot be confidentially placed within bridge structure.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has been recorded within 5 km of the Project footprint and is likely to occur.	**Confirmed present** Data analysed from the Anabat echolocators from this site indicate these species may be roosting near the Project footprint. The source of the calls cannot be confidentially placed within bridge structure.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has been recorded within 5 km of the Project footprint and is likely to occur
Miniopterus orianae oceanensis Large bent-winged bat	-	V	BioNet, confirmed present during surveys	Occurs along the east and north-west coasts of Australia. Uses caves as the primary roosting habitat, but also uses derelict mines, storm-water tunnels, buildings, and other man-made structures. Hunts in forested areas, catching moths and other flying insects above the tree tops.	**Confirmed present** Data analysed from the Anabat echolocators from this site indicate these species may be roosting near the Project footprint. The source of the calls cannot be confidentially placed within bridge structure.	**Likely to occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has been recorded within 5 km of the Project footprint. The species is highly mobile is likely to occur.	**Likely to occur** Suitable roosting habitat was recorded during the field survey, however the species wasn't recorded. The species has not been recorded within 5 km of the Project footprint. The species is highly mobile are likely to occur.	**Likely to occur** Suitable roosting habitat was recorded during the field survey, however the species wasn't recorded. The species has been recorded within 5 km of the Project footprint. The species is highly mobile and is likely to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	**Hobarts Bridge**	**Justins Bridge**	**Duffys Bridge**
Myotis macropus Southern Myotis	-	V	BioNet, confirmed present during surveys	Mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in close proximity to water.	**Confirmed present** The Project footprint supports suitable roosting and foraging habitat. Data analysed from the Anabat echolocators from this site indicate these species may be roosting nearby. The source of the calls cannot be confidentially placed within bridge structure.	**Likely to occur** The Project footprint supports suitable roosting and foraging habitat, however, were not confirmed present during field surveys due to technical issues with the echolocation recorder. There are historical records within 5 km. The species is likely to occur.	**Confirmed present** The Project footprint supports suitable roosting and foraging habitat. Data analysed from the Anabat echolocators from this site indicate that some bat species may be roosting within the bridge.	**Likely to occur** The Project footprint supports suitable roosting and foraging habitat, however, were not confirmed present during field surveys due to technical issues with the echolocation recorder. There are historical records within 5 km. The species is likely to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Phoniscus papuensis Golden-Tipped Bat	-	V	BioNet	Distributed along the east coast of Australia in scattered locations from Cape York Peninsula in Queensland to south of Eden in southern NSW. Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. Roosts mainly in rainforest gullies on small first- and second-order streams in usually abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests modified with an access hole on the underside. Bats may also roost under thick moss on tree trunks, in tree hollows, dense foliage and epiphytes.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has not been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has not been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Saccolaimus flaviventris Yellow-Bellied Sheathtail-Bat	-	V	BioNet	Wide-ranging species found across northern and eastern Australia. Rare visitor of south-western NSW in late summer and autumn. Scattered records of this species across the New England Tablelands and North West Slopes. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. It forages in most habitats across its very wide range, with and without trees.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has not been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has not been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has not been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.	**May occur** Suitable roosting habitat was recorded during the field survey, however, the species wasn't recorded. The species has been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.
Nyctophilus bifax Eastern Long-Eared Bat	-	V	BioNet	Appears to be confined to the coastal plain and nearby coastal ranges, extending south to the Clarence River area, with a few records further south around Coffs Harbour. Typically inhabits lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest. Coastal rainforest and patches of coastal scrub are particularly favoured.	**Unlikely to occur** The species is not known to occur south of Maclean area, approximately 100 km north of the Project areas. The species is unlikely to occur due to its restricted distribution.	**Unlikely to occur** The species is not known to occur south of Maclean area, approximately 100 km north of the Project areas. The species is unlikely to occur due to its restricted distribution.	**Unlikely to occur** The species is not known to occur south of Maclean area, approximately 100 km north of the Project areas. The species is unlikely to occur due to its restricted distribution.	**Unlikely to occur** The species is not known to occur south of Maclean area, approximately 100 km north of the Project areas. The species is unlikely to occur due to its restricted distribution.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Vespadelus troughtoni Eastern Cave Bat	-	V	BioNet	Found on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. Cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; recorded roosting in disused mine workings. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Forage over a small area, but are capable of flying 500 m over clear paddocks.	**May occur** Data analysed from the Anabat echolocators did not confidential record this species. It is likely to have been from a different species group. The Project footprint supports foraging habitat. There are no known records within 5 km, however this species may occur.	**May occur** Suitable foraging habitat was identified during the field survey, however, the species wasn't recorded. The species has not been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.	**May occur** Suitable foraging habitat was identified during the field survey, however, the species wasn't recorded. The species has not been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.	**May occur** The Project footprint supports suitable foraging habitat, however, were not confirmed present during field surveys, potentially due to technical issues with the echolocation recorder. The Project footprint supports foraging habitat. There are no known records within 5 km, however this species may occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Pseudomys gracilicaudatus Eastern Chestnut Mouse	-	V	BioNet	Mainly occurs north from the Hawkesbury River area as scattered records along to coast and eastern fall of the Great Dividing Range extending north into Queensland. Isolated records in the Jervis bay area. Found in heathland in low numbers and most common in dense, wet heath and swamps. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. The species is highly mobile may occur temporarily.
Pseudomys novaehollandiae New Holland mouse	-	V	BioNet	Largely restricted to the coast of central and northern NSW, with one inland occurrence near Parkes. Known from Royal National Park (NP), the Kangaroo Valley, Kuringai Chase NP, and Port Stephens's to Evans Head near the Queensland border. Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. Soil type may be an important indicator of suitability of habitat, with deeper top soils and softer substrates being preferred for digging burrows.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**Unlikely to occur** The species has not been historically recorded within 5 km of the Project footprint and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Petrogale penicillata Brush-tailed Rock-wallaby	V	V	PMST	Occurs from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. It typically shelters or basks during the day in rock crevices, caves and overhangs and are most active at night when foraging. Browse on vegetation in and adjacent to rocky areas.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**Unlikely to occur** The species has not been historically recorded within 5 km of the Project footprint and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.
Pseudomys oralis Hastings River Mouse, Koontoo	E	E	PMST	Occurs from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. It typically shelters or basks during the day in rock crevices, caves and overhangs and are most active at night when foraging. Browse on vegetation in and adjacent to rocky areas.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**Unlikely to occur** The species has not been historically recorded within 5 km of the Project footprint and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat is absent from the Project footprint. As such, the species is unlikely to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Reptiles								
Myuchelys georgesi Bellinger River Snapping Turtle	CE	CE	PMST, BioNet	This freshwater turtle is endemic to the Bellinger Catchment on the north coast of New South Wales. It is typically prefers moderate to deep pools with a rocky substrate.	**Likely to occur** Suitable habitat is present within the Project footprint. The species is likely to occur.	**Likely to occur** Suitable habitat is present within the Project footprint. The species is likely to occur.	**Likely to occur** Suitable habitat is present within the Project footprint. The species is likely to occur.	**Likely to occur** Suitable habitat is present within the Project footprint. The species is likely to occur.
Hoplocephalus Stephens'sii Stephens's' Banded Snake	-	V	BioNet, confirmed present during surveys	Ranges along the coast from Southern Queensland to Gosford in NSW. Inhabits rainforest and eucalypt forests and rocky areas up to 950 m in altitude. Shelters between loose bark and tree trunks, amongst vines, or in hollow trunks limbs, rock crevices or under slabs during the day.	**Likely to occur** Suitable habitat is present within the Project footprint. There are known historical records within 5 km. As such, the species is likely to occur.	**Likely to occur** This species was recorded approximately 1.8 km north east of the Project footprint. This species prefers wet sclerophyll forest and rainforest. There are known historical records within 5 km NE of the bridge.	**Likely to occur** Suitable habitat is present within the Project footprint. There are known historical records within 5 km. As such, the species is likely to occur.	**Likely to occur** Suitable habitat is present within the Project footprint. There are known historical records within 5 km. As such, the species is likely to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	**Hobarts Bridge**	**Justins Bridge**	**Duffys Bridge**
Coeranoscincus reticulatus Three-toed Snake-tooth Skink	V	V	PMST	Occurs on the coast and ranges from the Macleay valley in NSW to south-eastern Queensland. Very uncommon south of Grafton. Inhabits rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. Lives in loose soil, leaf litter and rotting logs, and feeds on earthworms and beetle grubs. Recorded in garden beds and urban yards under leaf litter on alluvial soils.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.	**May occur** Suitable habitat was not identified during the field survey, however, the species has been recorded within 5 km of the Project footprint. As such, the species has the potential to occur temporarily.
Frogs								
Mixophyes balbus Stuttering Frog	V	E	PMST, BioNet	This large frog is found along the east coast of Australia from Southern Queensland to north-east Victoria. Their preferred habitat is rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has not been recorded within 5 km of the Project footprint however has the potential to occur.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has been recorded within 5 km of the Project footprint and has the potential to occur.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has not been recorded within 5 km of the Project footprint however has the potential to occur.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has been recorded within 5 km of the Project footprint and has the potential to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Mixophyes iteratus Giant Barred frog	V	E	PMST, BioNet, confirmed present during survey	Distributed along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains. Stronghold in northern NSW, particularly the Coffs Harbour-Dorrigo area. Typically found along freshwater streams with permanent or semi-permanent water, generally at lower elevation. Favours moist riparian habitats such as rainforest or wet sclerophyll forest for the deep leaf litter which provides shelter and foraging. Sometimes occur in other riparian habitats with drier forest or degraded riparian remnants, and occasionally around dams.	**Confirmed present** One adult was confirmed present on one night of surveys. This individual was recorded atop of *Lantana camera* and broad-leaved privet leaf litter. This site is likely to also provide breeding habitat for the species.	**Confirmed present** A metamorph was recorded on one night of the survey, on the edge of the water. This site provides occupied breeding habitat for the species. While no adults were detected (likely due high noise levels from rapids and inaccessibility issues to areas around the existing bridge) the location is also likely to provide foraging and refuge habitat for the species.	**Confirmed present** Adults were recorded on all four nights of surveys on both banks of the river. Each individual was recorded atop leaf litter of *Casuarina cunninghamiana* needles. This site is likely to provide breeding habitat for the species.	**Confirmed present** Adults were recorded on all four nights of surveys on both banks of the river. The indviduals were recorded atop leaf litter of *Casuarina cunninghamiana* needles or in a paddock on the edge of the bridge. This site is likely to provide breeding habitat for the species.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Philoria sphagnicolus Sphagnum Frog	V	V	PMST, BioNet	Occurs as a series of fragmented populations along the eastern escarpment of the Great Dividing Range in north-east NSW from Chaelundi State Forest south to Killabakh Nature Reserve near Comboyne. Habitat characterised by high moisture levels. Typically found in high rainfall areas at high elevation in Sphagnum Moss beds or seepages on steep slopes. Habitat often occurs in rainforest (including Antarctic Beech forest) and wet sclerophyll forest. Also occur at lower elevation (to about 250 m) in wet coastal foothills.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat was absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat was absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat was absent from the Project footprint. As such, the species is unlikely to occur.	**Unlikely to occur** The species has not been historically recorded within the Study area and suitable habitat was absent from the Project footprint. As such, the species is unlikely to occur.
Litoria brevipalmata Green-Thighed Frog	-	V	BioNet	Isolated localities along the coast and ranges from just north of Wollongong to south-east Queensland. Occurs in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. Prefers wetter forests in the south of its range, but extends into drier forests in northern NSW.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has been recorded within 5 km of the Project footprint so have the potential to occur.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has not been recorded within 5 km of the Project footprint however has the potential to occur.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has not been recorded within 5 km of the Project footprint however has the potential to occur.	**May occur** The Project footprint supports suitable habitat for this species however they were not recorded during the field survey. The species has not been recorded within 5 km of the Project footprint however has the potential to occur.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act						
					Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Litoria subglandulosa Glandular Frog	V	V	PMST	Known only from stream habitats on the eastern escarpment of the Great Dividing Range from the “The Flags” near Walcha in the south to Girraween National Park in the north, a distance of about 250 km. Glandular Frogs may be found along streams in rainforest, moist and dry eucalypt forest or in subalpine swamps.	**May occur** The broader Project Area may support suitable breeding habitat. The species has been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily. .	**May occur** The broader Project Area may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily	**May occur** The broader Project Area may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area may support suitable breeding habitat. The species has been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily
Insects and Crustacean								
Phyllodes imperialis southern subspecies Southern Pink Underwing Moth	E	E	PMST, BioNet	Distributed from Nambour in south-eastern Queensland to Bellingen in northern NSW. Known to occur in a small number of localities from the QLD border to Wardell, with a disjunct population in the Bellingen area. Found in subtropical rainforest below about 600 m elevation. Potential breeding habitat for the species is restricted to areas where the caterpillar's food plant, a native rainforest vine, *Carronia multisepalea*, occurs in subtropical rainforest.	**May occur** The broader Project Area may support suitable breeding habitat. The species has been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area may support suitable breeding habitat. The species has been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.

Species/ Community	Conservation status		Source	Distribution and habitat requirements	Likelihood of occurrence			
	EPBC Act	BC Act			Joyces Bridge	Hobarts Bridge	Justins Bridge	Duffys Bridge
Phyllodes imperialis smithersi Pink Underwing Moth	-	E	BioNet	This moth is typically found below 600 m altitude in subtropical rainforest on fertile alluvium and rich volcanic soils. It occurs in association with the vine *Carronia multisepalea*, a vine which is needed for this species to breed.	**May occur** The broader Project Area of the Project footprint may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily	**May occur** The broader Project Area of the Project footprint may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily.	**May occur** The broader Project Area of the Project footprint may support suitable breeding habitat. The species has not been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily	**May occur** The broader Project Area of the Project footprint may support suitable breeding habitat. The species has been recorded within 5 km of the Project footprint. This species is highly mobile so may occur temporarily

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The Power of Commitment

Appendix D

Joyces Bridge Construction Methodology

JOYCES BRIDGE REPLACEMENT

Project Description

Coastal Works are replacing Joyces Bridge over the Bellinger River on Darkwood Road, Darkwood under contract works for Bellingen Shire Council. The existing 48m four span, timber bridge will be removed and replaced adjacent with a new 49.5m four span, all concrete bridge on an improved alignment downstream. The site is located approx. 18km west of Bellingen, is highly flood prone and is in key habitat for the Bellinger River Snapping Turtle.

Existing Timber Bridge

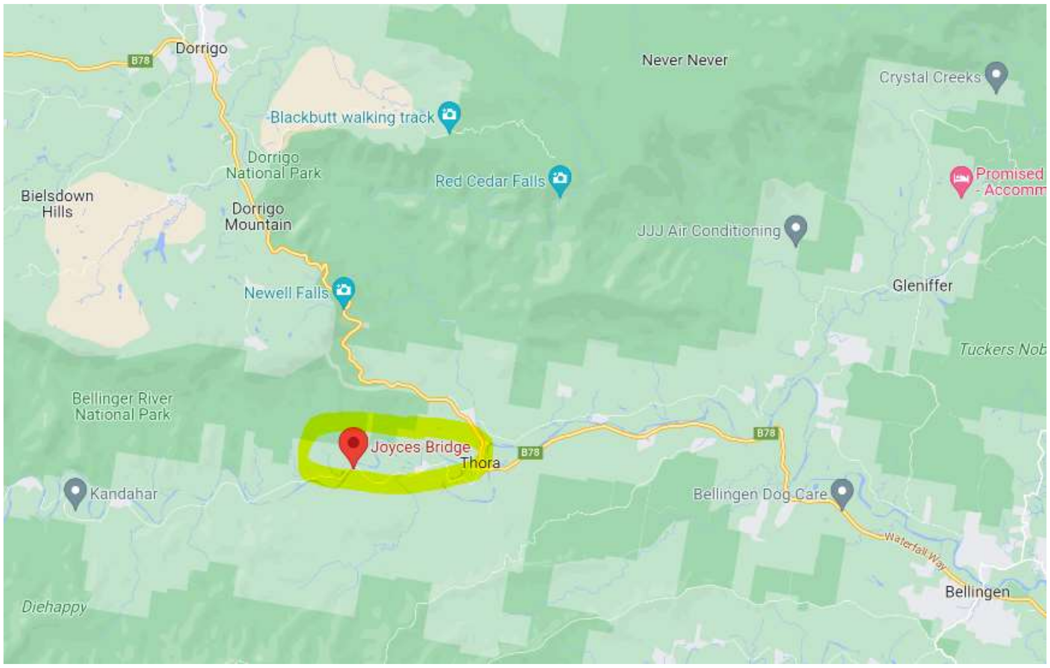
Form of Construction

Foundations – bored, cast in-situ concrete piles (600mm diameter) for all substructures

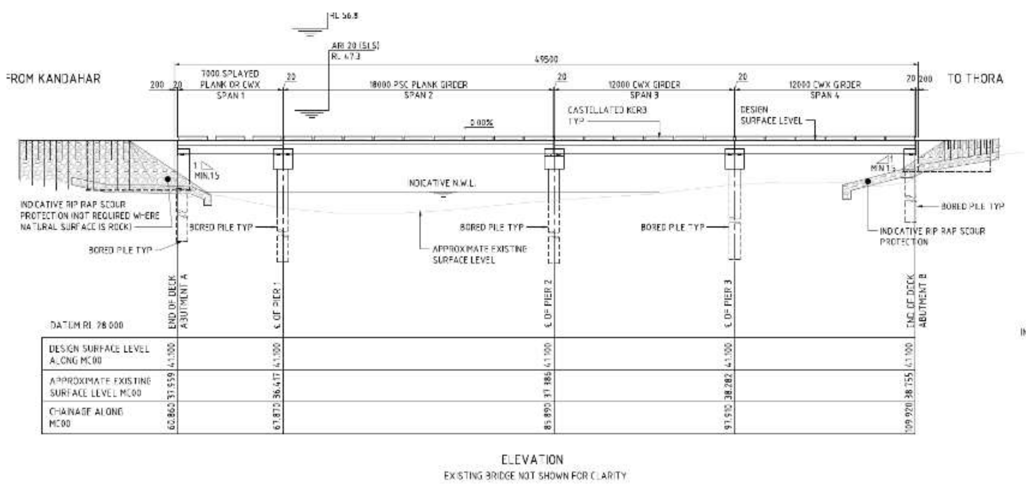
Substructure – cast in-situ reinforced concrete abutments and precast concrete headstocks, rock scour protection on bank and around abutments

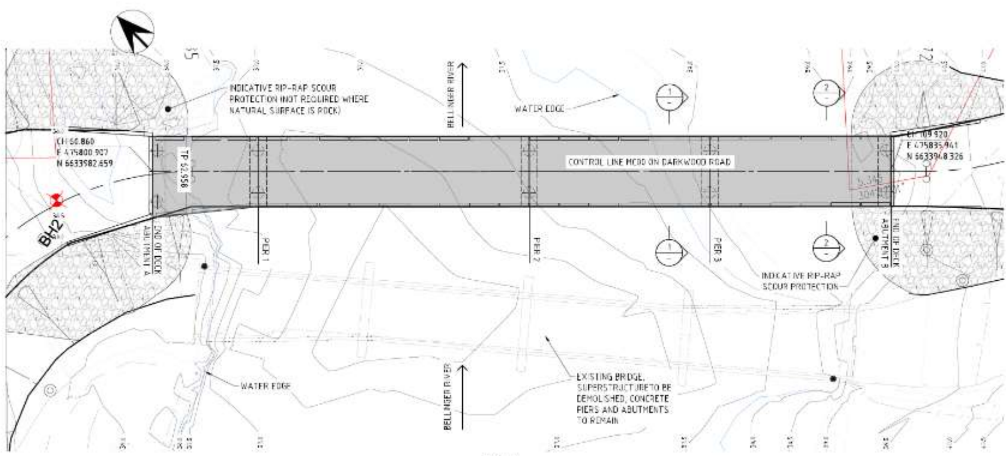
Superstructure - precast concrete CoastalWorks 12m bridge beams for 2 spans, one longer span using 18m PSC pre-stressed bridge planks, one shorter 7m PSC plank span at the western end, cast in-situ deck pours for the two planks spans, bolt on concrete kerbs

Road approaches – 35m of road works one side and 60m the other side to tie into existing road, two coat bitumen seal, 6m wide plus fill formations, cast in-situ concrete approach slabs, open swale drains



Location Map





New Bridge Design

Construction Methodology & Sequence

1) <u>Establishment:</u>
    a. Set up compound, laydown and stockpile areas in private property at the next bend east of the bridge off Darkwood Road above the high flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones,
    c. Installation of erosion and sediment controls for piling and river access ramps including booms in the water,
    d. Delivery of all piling and cast in situ work materials/formwork,
    e. Delivery of pre-filled rock bags,
    f. Establish bunded concrete washout and spoil areas at laydown area.

2) <u>Access to riverbed from high banks:</u>
    a. Clear and grub vegetation and topsoil from on land piling positions, stockpile away from river for later rehabilitation works or remove from site,
    b. On Thora (East) side, the access ramp is to be from the road edge immediately downstream of the abutment down to existing stable cobbly riverbed to Pier 3 and to the water's edge towards Pier 2.
    c. On the West side, the access ramp for piling is to be from the road edge down through Abutment A to the water's edge.
    d. Access ramps to be constructed with:
        i. Geofrabric underlay – extra length on the upstream side that can be used to wrap over the ramp and pinned down with rock bags during high flow events to prevent wash out,
        ii. 150mm thick, clean imported ballast (40-60mm) and/or gabion (50-200mm)

3) <u>Prepare piling areas prior to piling contractor mobilisation:</u>
    a. Abutments:
        i. Box down to underside of abutment plus 75mm for blinding layer, remove spoil to stockpile areas,
        ii. Level off adjacent area for positioning of piling rig,
        iii. Bench excavation for stability if needed and install edge delineation.
    b. At Pier 3 (out of waterway) – inside sediment fencing, excavator to dig down 1m to clear larger cobbles and use sieve bucket to sieve fines back into the excavation and cobbles onto adjacent cobble banks. Cobbles of this size (>200mm) particularly near the surface make 600 bored piling extremely difficult.
    c. At Pier 1 and 2:
        i. Access to both of these to be one at a time to limit the amount of afflux of the general water level and blockage of the wateryway,
        ii. Place rock bags with an excavator progressing out from the water's edge above the water level so an excavator can walk over them (on rubber mats to avoid tearing the bags)
        iii. Place a rock bag ring around the pile positions up to 300mm above water level to deflect the water flow/velocity around the area and provide a containment ring.
        iv. Lay geofabric on the inside of the rock bags with enough length to drape down to the bottom
        v. Fill inside the geofabric and bags with clean, imported, small aggregate (10mm-40mm) up to also 300mm above water level.

Aggregate will largely be self levelling and suitable for personnel access (not excavator tracks) and suitable for helping the pile liners to stand up before the high level rock strata

vi. Pull floating hydrocarbon boom tight to the bags

4) Bored piling works:
    a. Plant & equipment – 30t excavator with a 2t vibratory head attachment and pendulum drill head with Kelly bar for the auger.
    b. Abutments – excavator positioned on existing ground behind abutments,
    c. Pier 3 – excavator positioned on existing cobbly riverbed and access track.
    d. Pier 1 & 2 – excavator positioned on rock bags only not the aggregate infill area which will not be stable enough for excavator crawling only small plant, equipment and personnel.
    e. Vibratory head used to install permanent mild steel liners in position first
    f. Pile clean-out material placed either directly in a skip bin or on a geofabrics lined area adjacent the piling area so it can be removed from the riverbed area to the established stockpile area (or off site) daily. 2m screens of geofabric or ply to be erected along the line of rock bags at Pier 1 & 2 to deflect any loose material entering the water as the auger is pulled out.
    g. After piles are cleared, extend pile liners at the 3 pier sets by welding on extra sections up to the underside of headstock levels
    h. Place cages and pour concrete with concrete boom pump on the respective side of the river. Sucker truck to remove water from the wet pile holes during concrete placement.
    i. Concrete overpour out of top of piles (typically 0.2m3 per pile) to be contained within tarps area locally to the pile and then removed once dried the next day. At the abutments, overpour used as a blinding slab.

5) Remove in water piling access – remove piling rock bag areas in reverse order with excavator moving progressively out of the water. Excavator to scoop out imported aggregate from within the geofabric being carful not to tear. Last sections of aggregate removed by bunching, lashing and lifting sections of geofabric directly out of the waterway. Remove rock bags and stockpile until next stage.

6) Cast in-situ concrete sub-structure - abutments:
    a. Reinforcement placed and tied in place by hand on blinding slabs.
    b. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
    c. Elevated walkway up to the top of concrete which will all cantilever off the formwork and not require additional footprint on the banks.
    d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
    e. Strip all formwork after concrete curing period,
    f. Complete mortar pads by hand mixed mortar to finish all substructures.

7) Landing precast headstocks:
    a. Place rock bags progressively out and tight around the in-river piles at Pier 1 and 2 for personnel access only to the top of piles (not for machinery),

b. Reinstate sufficient access track (as above) for crane and semi truck access down next to Pier 3 over the cobbly river bank
c. Lift headstocks to Pier 2 and 3 from eastern crane position, outriggers on rock bags for support.
d. Lift headstock at Pier 1 from the existing road approach at the western end
e. Use 0.5m3 kibble to lift exact amounts of concrete into each of the connecting void pours between the piles and headstocks, concrete trucks to remain on road approaches

8) Place scour rock around abutment fronts – place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks. Excavator to place scour rock from established access ramps and then from behind abutments out of the riverbed area.

9) Land all precast beams and planks and tie cast in-situ deck –
   a. Use same cranage position and access track for larger PSC planks and CoastalWorks as for the Pier 2 and 3 headstocks
   b. Smaller Franna crane to land smaller 7m PSC planks in the western span from on existing road approach
   c. beams sealed soffit formwork to be used between planks and beams to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Temporary access platforms to be installed along the outside edges for the 18m and 7m plank span for access and edge formwork.

10) General fill and drainage zone behind abutments – place and compact area immediately behind abutments up to underside of approach slabs. Maintain access to existing bridge for road traffic. All trucks, rollers and excavators out of the creek and sediment fencing along the whole bank lines to contain from any wet weather during this period.

11) Pour beam and deck pours – CoastalWorks 12m beam spans poured first, 18m and 7m plank span second with the approach slabs. Boom pumps to be again used from the respective sides without putting the line over the waterway. Curing of the deck pour to be done with clean water, soaker hoses and hessian.

12) Install bolt on kerb units onto plank span

13) Fully remove cranage access tracks and rock bags from around headstock piles – excavator to progressively remove rock bags, imported ramp materials and geofrabirc underlay working away from the water on each side back to the high banks. All imported rock to be re-used for road backfill. Rock bags removed from site.

14) Remove temporary works from plank span – use Franna crane and or HIAB truck on the new deck to lift out and load directly to laydown area.

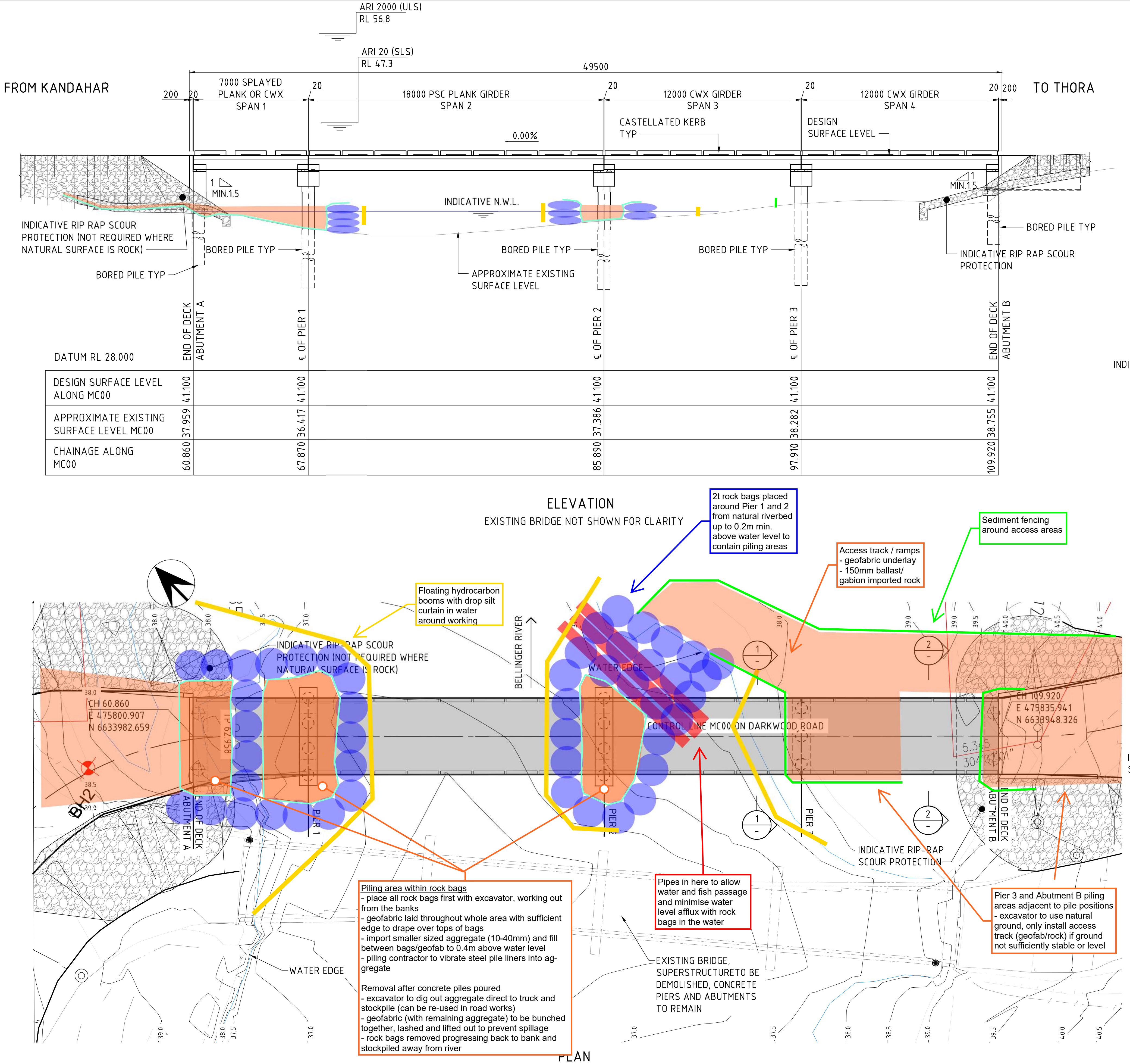
15) Complete approach roadworks – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

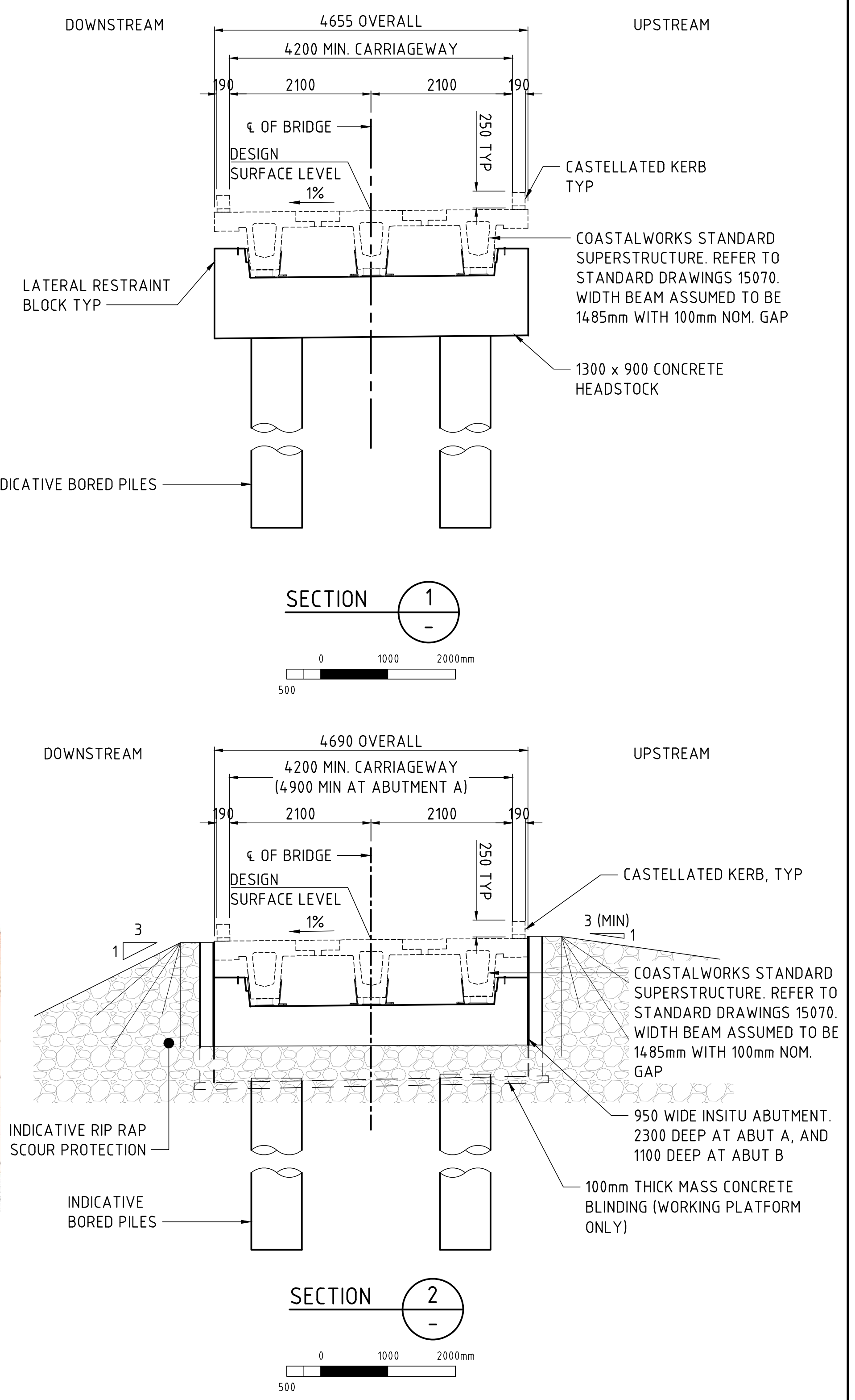
16) Demolish original bridge:
   a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers.

b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing ply and timber decking first followed by girders for each span. No access off deck required for this.
c. Once deck fully removed, remove protruding abutments to tie in better with the new scour rock and bank profile. Use rock breaker on excavator to break up and then remove in largest possible pieces by excavator and by hand.
d. For non-accessible headstocks in the water flow area, access via floating platform and remove timber components from above water with chainsaw and oxy cutting bolts down to top of concrete. Concrete headstocks to remain.
e. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

17) <u>Complete rock scour protection</u> – on upstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

18) <u>Demobilise construction activities</u> – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.





GENERAL NOTE:
ONLY ONE ROCK BAG ACCESS AREA TO BE IN THE WATER AT ANY ONE TIME. FOR EXAMPLE:
- INSTALL ROCK BAG PLATFORM TO PIER 1 AND ABUTMENT A
- COMPLETE PIER 1 & ABUTMENT A PILING WORKS COMPLETELY (CONCRETE POURED)
- REMOVE THIS AREA AND RE-INSTALL FOR PIER 2
- COMPLETE PILING WORKS AT PIER 2
- REMOVE BAGS AND STOCKPILE

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
03	01/06/2023	MINOR AMMENDMENTS	JR	DM	CR
02	17/05/2023	MINOR AMMENDMENTS	JR	DM	CR
01	19/04/2023	CONCEPT DESIGN	JR	DM	CR

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BELLINGEN SHIRE COUNCIL

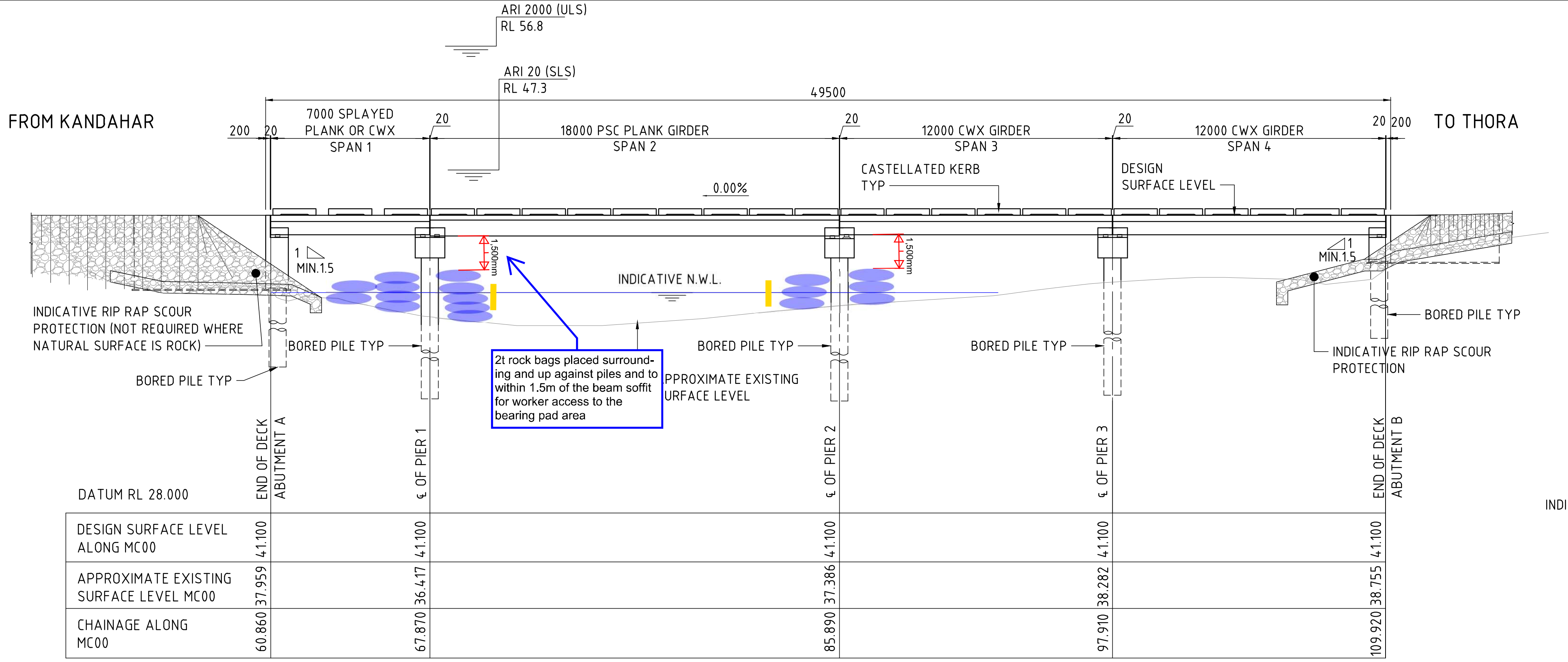
TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	YT
APPROVED	DM

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE

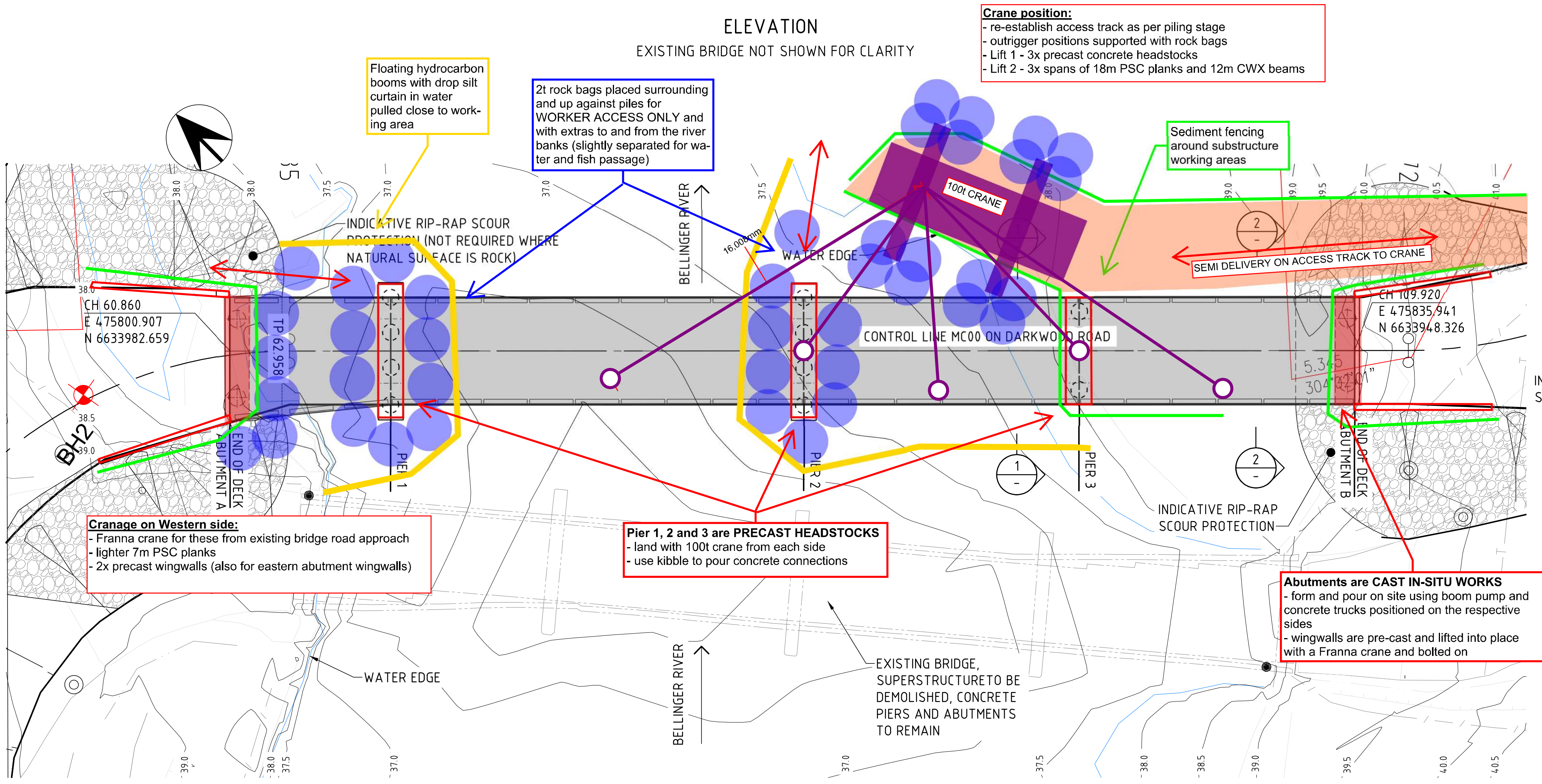
PILING ACCESS PLAN

DRAWING SET No	BKP372-BSC
BRIDGE No	DRG-005
ISSUE STATUS	CONCEPT DESIGN
ISSUE	03
No SHEETS	5
SHEET No	05

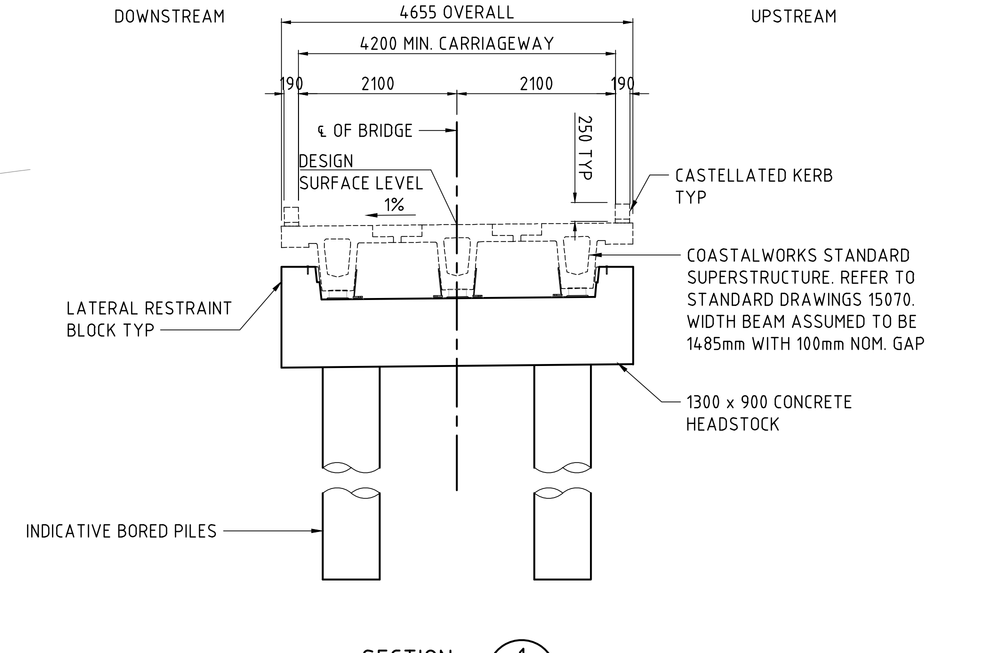


DESIGN SURFACE LEVEL ALONG MC00	41.100	41.100	41.100	41.100	41.100
APPROXIMATE EXISTING SURFACE LEVEL MC00	37.959	36.417	37.386	38.282	38.755
CHAINAGE ALONG MC00	60.860	67.870	85.890	97.910	109.920

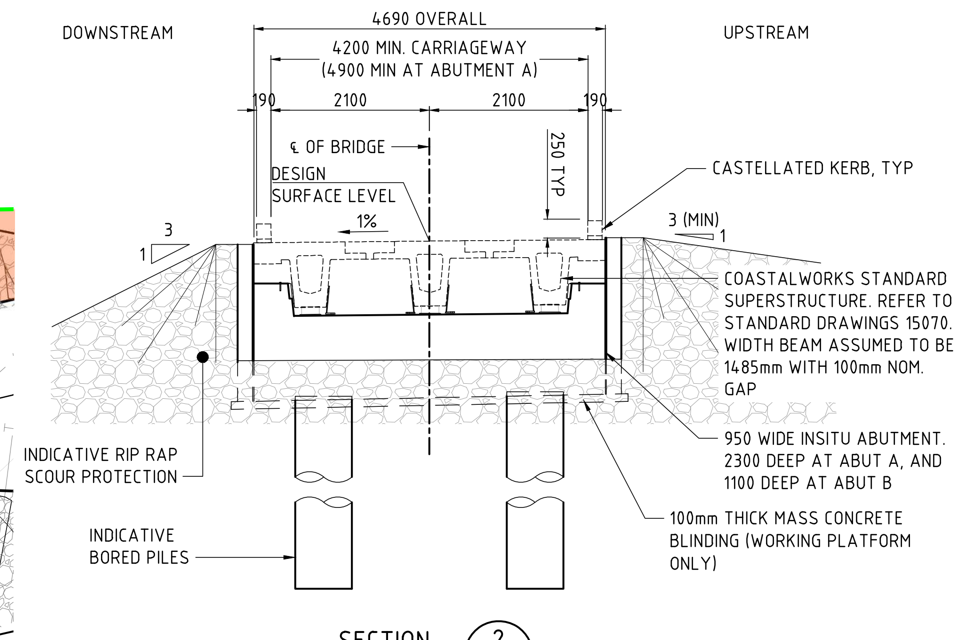
ELEVATION
EXISTING BRIDGE NOT SHOWN FOR CLARITY



PLAN



SECTION 1



SECTION 2

GENERAL NOTE:
BOTH ROCK BAG AREA TO BE RE-INSTALLED AT THE SAME TIME FOR THE RE-ESTABLISHMENT TO JOYCES AFTER COMPLETING HOBARTS BRIDGE.
BAGS PLACED TIGHT TO PIER 2 & 3 TO MINIMISE FOOTPRINT IN THE WATER.
BAGS TO REMAIN IN PLACE FOR PERSONNEL ACCESS UNTIL THE SUPERSTRUCTURE WORKS ARE COMPLETED FOR CONTINUING ACCESS NEEDS FOR WORKERS TO THE BEARING PAD AREA.
ACCESS TRACK ITO THE CREEK TO BE REMOVED ONCE CRANAGE WORKS ARE COMPLETED

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
03	01/06/2023	MINOR AMMENDMENTS	JR	DM	CR
02	17/05/2023	MINOR AMMENDMENTS	JR	DM	CR
01	19/04/2023	CONCEPT DESIGN	JR	DM	CR

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSE OF THE NOMINATED PROJECT

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TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	YT
APPROVED	DM

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL
TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE
CRANAGE ACCESS PLAN

DRAWING SET No: BKP372-BSC
BRIDGE No: DRG-005
ISSUE STATUS: CONCEPT DESIGN
ISSUE: 03 | No SHEETS: 5 | SHEET No: 05

DARKWOOD ROAD 3 BRIDGES – EXAMPLE CONSTRUCTION METHODOLOGY PHOTOES

Excavator with 2t vibratory unit used to pitch steel pile liners

Excavator mounted pendulum pile boring rig with extendable Kelly bar and access ramps –

Excavator mounted rock anchor drilling setup (7-12t sized machine) with splatter screens used next to waterway

On-site grout mixing station for rock anchors up on banks away from anchors


Same smaller excavator (7t) rock anchor rig

Containment system used for pouring concrete bored piles to prevent concrete overpour entering the waterway


Kibble being used for on-site pours at headstocks near water to control concrete

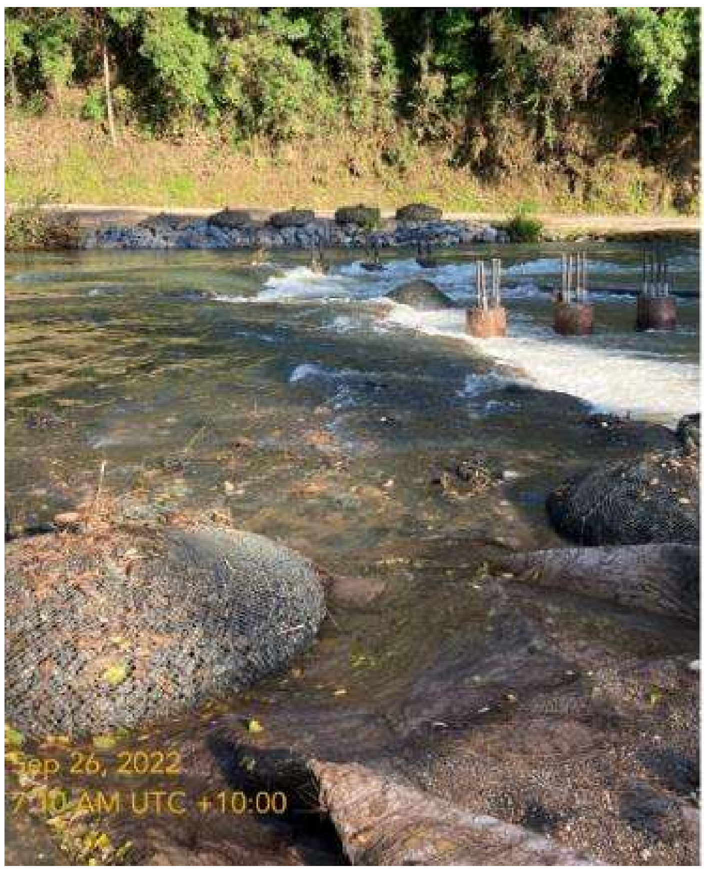
Cast in-situ headstock with elevated temporary works walkway around

Rock bags used as an access track and crane platform for landing precast components

Concrete deck pour with elevated walkway attached to bridge planks

Riverbank access ramp and working area and rock scour protection with excavator


Rock bags used to pin down geofabric with boom adjacent in water

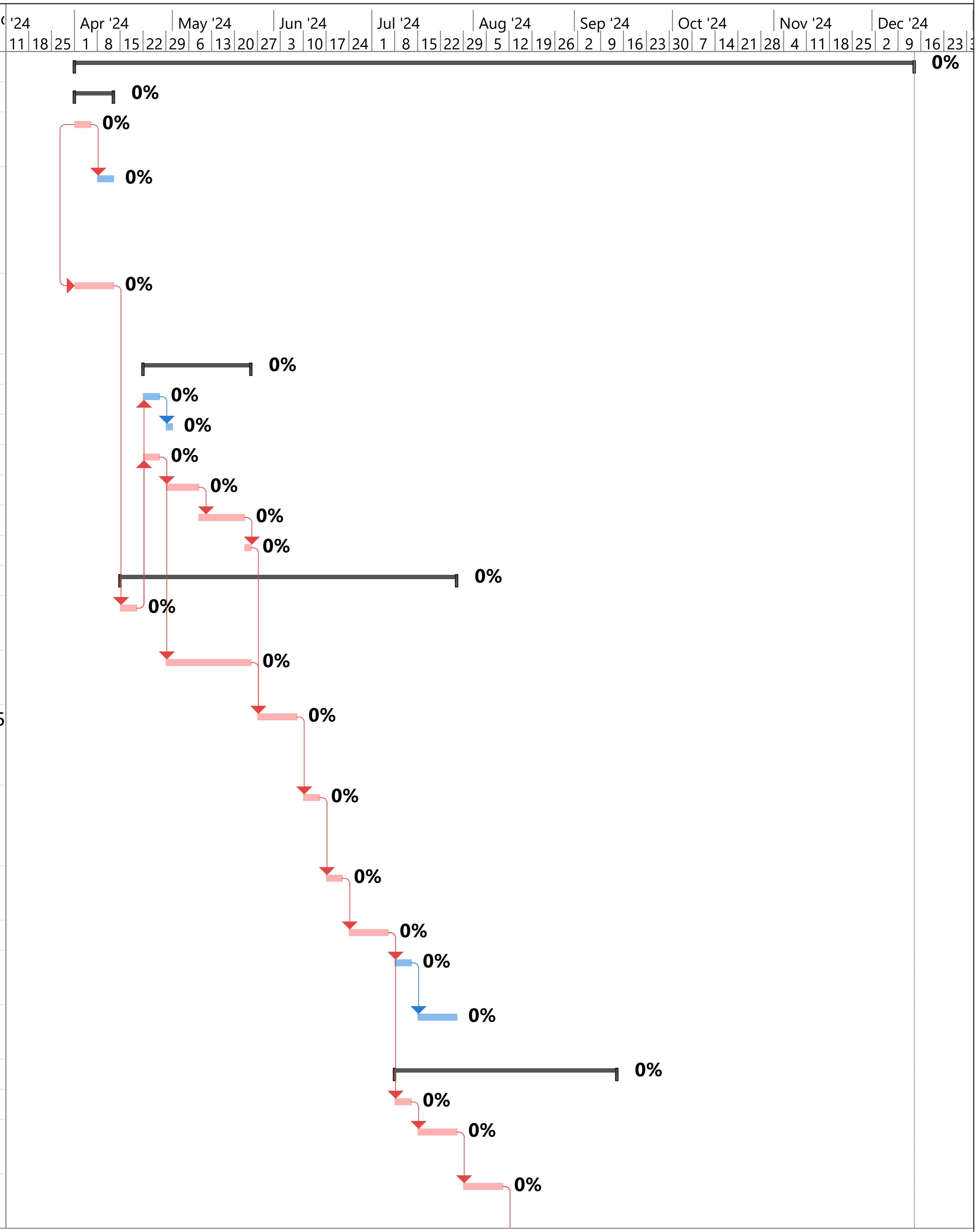


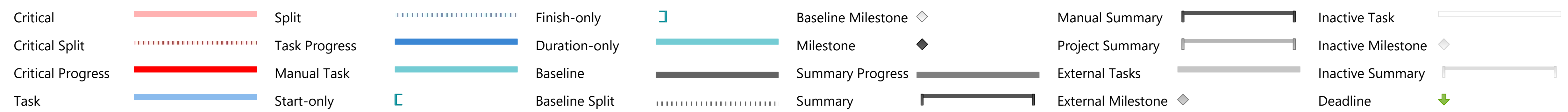
Rock bag access track being overtopped and remaining in place without any material loss during high water flow conditions


Landing precast concrete panels onto steel girder span

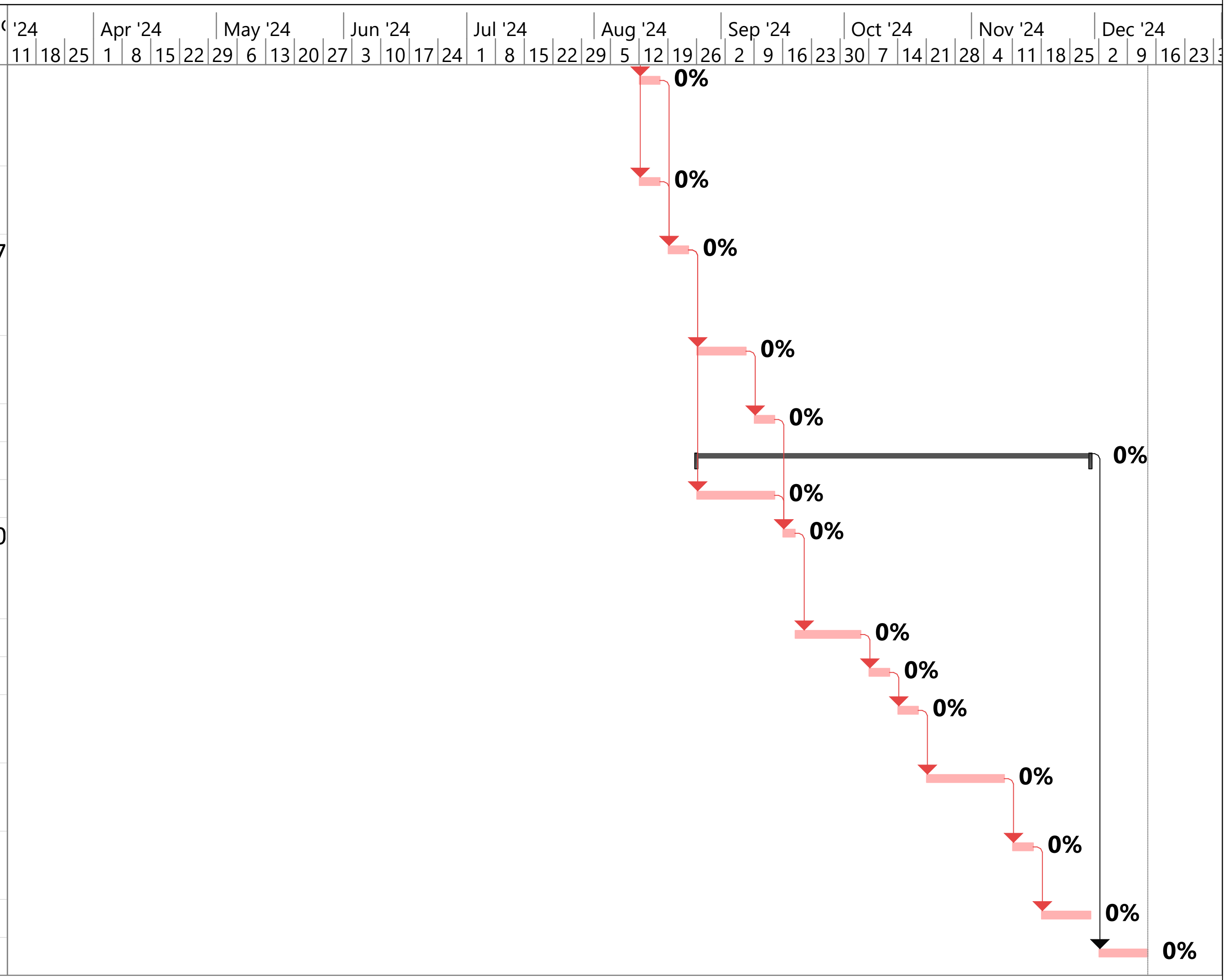
2024 Darkwood Bridges Program 5.7.23 - preferred

ID	Engineer	Task Name	Duration	Start	Finish	Predec
1	**2024**	**Coastal Works - Darkwood Bridges Program 2024**	**185 days**	**Mon 1/04/24**	**Fri 13/12/24**	
2		**Site Establishment all 3 sites**	**10 days**	**Mon 1/04/24**	**Fri 12/04/24**	
3	Crew 1	Main laydown & compound setup at Hobarts + major material deliveries	5 days	Mon 1/04/24	Fri 5/04/24	
4	Crew 1	ALL 3 SITES - vegetation clearing, piling material deliveries, establish excavator access tracks for river banks, ERSD controls at first pile positions and laydown and spoil areas	5 days	Mon 8/04/24	Fri 12/04/24	3
5	Crew 2	ALL 3 SITES - establish rock bag areas - Hobarts headstock, Joyces west abutment, Justins headstock and floating booms installed	10 days	Mon 1/04/24	Fri 12/04/24	3SS
6		**Piling all 3 sites**	**25 days**	**Mon 22/04/24**	**Fri 24/05/24**	
7	Crew 1	HOBARTS - mob, rock anchors (32) drilled, grouted	5 days	Mon 22/04/24	Fri 26/04/24	14
8	Crew 1	JUSTINS - rock anchors (10) and grouted incl. move	2 days	Mon 29/04/24	Tue 30/04/24	7
9	Crew 2	HOBARTS - mob, bored piles (5), pile reo & concrete pours	5 days	Mon 22/04/24	Fri 26/04/24	14
10	Crew 1	JUSTINS - bored piles (9) and poured, incl mob/demob	8 days	Mon 29/04/24	Wed 8/05/24	9
11	Crew 1	JOYCES - bored piles (16) & remove/stockpile rock bags	10 days	Thu 9/05/24	Wed 22/05/24	10
12	Crew 1	Contingency - days between to keep up, wet weather	2 days	Thu 23/05/24	Fri 24/05/24	11
13		**Hobarts Bridge (BSC)**	**75 days**	**Mon 15/04/24**	**Fri 26/07/24**	
14	Crew 2	Prepare all pile locations - box outs, blindings, ERSD controls, rock anchor bunds	5 days	Mon 15/04/24	Fri 19/04/24	5
15	Crew 2	Cast in-situ headstocks and abutments (during remaining piling works)	20 days	Mon 29/04/24	Fri 24/05/24	9
16	Both Crews	Cast in-situ headstocks and abutments completed both crews incl. scour rock in front of abutments and mortar pads	10 days	Mon 27/05/24	Fri 7/06/24	12,15
17	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove access tracks into creek, crane pads and landing prep	5 days	Mon 10/06/24	Fri 14/06/24	16
18	Both Crews	Land beams (2 days) & CoastalWorks beams stitch pours (3 days)	5 days	Mon 17/06/24	Fri 21/06/24	17
19	Both Crews	Plank span deck pour & approach slabs	10 days	Mon 24/06/24	Fri 5/07/24	18
20	Crew 2	Road works on approaches, swap traffic over, install kerbs and brackets	5 days	Mon 8/07/24	Fri 12/07/24	19
21	Crew 2	Demolition, final rock scour, full restoration, pack up & contingency	10 days	Mon 15/07/24	Fri 26/07/24	20
22		**Justins Bridge**	**50 days**	**Mon 8/07/24**	**Fri 13/09/24**	
23	Crew 1	Relocate compound from Hobarts, ERSD controls etc.	5 days	Mon 8/07/24	Fri 12/07/24	19
24	Crew 1	Cast in-situ headstocks and abutments (3) incl. elevated temporary support for headstock at start	10 days	Mon 15/07/24	Fri 26/07/24	23
25	Both Crews	Cast in-situ headstocks and abutments incl. scour rock in front of abutments	10 days	Mon 29/07/24	Fri 9/08/24	24





ID	Engineer	Task Name	Duration	Start	Finish	Predec
26	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove rock bags area, crane pads and landing prep	5 days	Mon 12/08/24	Fri 16/08/24	25
27	Both Crews	Steel girders deliverd and put together with franna on west side	5 days	Mon 12/08/24	Fri 16/08/24	25
28	Both Crews	Land beams and deck panels (2 days) & CoastalWorks beams stitch pour & complete steel girder deck bolting and grouting	5 days	Mon 19/08/24	Fri 23/08/24	26,27
29	Crew 1	Road works on approaches, install kerbs and brackets, swap traffic over	10 days	Mon 26/08/24	Fri 6/09/24	28
30	Crew 1	Demolition, final rock scour, full restoration, pack up	5 days	Mon 9/09/24	Fri 13/09/24	29
31		**Joyces Bridge**	**70 days**	**Mon 26/08/24**	**Fri 29/11/24**	
32	Crew 2	Precast 3x Joyces headstocks (CoastalWorks Precast Yard)	15 days	Mon 26/08/24	Fri 13/09/24	28
33	Both Crews	Relocate compound from Justins, re-install rock bag access for personnel access to headstocks only & crane pads	3 days	Mon 16/09/24	Wed 18/09/24	32,30
34	Both Crews	Cast in-situ abutments and bearing pads	12 days	Thu 19/09/24	Fri 4/10/24	33
35	Both Crews	Scour rock protection, approaches general fill	5 days	Mon 7/10/24	Fri 11/10/24	34
36	Both Crews	Land beams (2 days) & Coatalworks beams stitch pours (3 days)	5 days	Mon 14/10/24	Fri 18/10/24	35
37	Both Crews	Plank spans (2) deck pours & approach slabs & install kerb units	15 days	Mon 21/10/24	Fri 8/11/24	36
38	Both Crews	Road works on approaches, swap traffic over, install kerbs	5 days	Mon 11/11/24	Fri 15/11/24	37
39	Both Crews	Demolition, final rock scour, full restoration and pack up	10 days	Mon 18/11/24	Fri 29/11/24	38
40		**Contingency / wet weather**	**10 days**	**Mon 2/12/24**	**Fri 13/12/24**	31



Critical		Split		Finish-only		Baseline Milestone		Manual Summary		Inactive Task	
Critical Split		Task Progress		Duration-only		Milestone		Project Summary		Inactive Milestone	
Critical Progress		Manual Task		Baseline		Summary Progress		External Tasks		Inactive Summary	
Task		Start-only		Baseline Split		Summary		External Milestone		Deadline	

DARKWOOD 2024 PROGRAM NOTES

Coastal Works intend to undertake the 3 Darkwood Road bridges – Hobarts, Joyces, Justins – as a single program of works commencing in April 2024 to December 2024. Preferred program utilises a typical rock anchor installation small excavator rig with air drilling. Below outlines some of the key dates for the construction sequence:

Site Establishment – April 2024
- Main compound and laydown set up at Hobarts.
- Laydown and piling material deliveries at all 3 bridges.
- Vegetation clearing complete at all 3 bridges
- Establish access points down banks and first piling position at all 3 sites with rock bag setups – 1x headstock at Hobarts, western headstock at Joyces, headstock at Justins.
- Establish all piling positions at Hobarts
- Install erosion and sed controls at all 3 bridges for laydown and piling positions

Piling All 3 bridges – April to June 2024
- Start at Hobarts with the two piling setups concurrently, one 7t excavator rock anchor setup and one 24t excavator for bored piles – aim for completion all in 1 week
- Both setups to move onto Justins Bridge – rock anchor completed in 3 days and setup demobilised from site, bored piles continue – 1.5 weeks
- Bored piling setup moves onto Joyces bridge last, first at previously established western side access which is then removed and established on the east side for completion – 2 weeks
- Coastal Works crews with an excavator to follow the piling crews to manage laydowns, modify the access requirements, remove piling spoil and maintain and adjust environmental controls.
- Coastal Works crew complete the bored pile pours progressively along with the contractor
- Justins site rock bags to remain at headstock to remain, Joyces river access completely removed.

Hobarts Main Bridge Construction – May – August 2024
- Cast in-situ substructure works (6 weeks) to commence in May with one CoastalWorks crew once all piling is completed and piling is continuing at the other sites.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in June.
- Superstructure to be landed, poured, and completed in July with both crews.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in late July and into August.

Justins Main Bridge Construction – July – September 2024
- Relocate main compound setup from Hobarts to Justins in late July once the Hobarts superstructure is completed with second CoastalWorks crew.
- Cast in-situ substructure works (4 weeks) to commence in August with one CoastalWorks crew and completed by both crews once Hobarts is completed.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in late August.
- Superstructure to be landed, poured, and completed in early September.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in September.

Joyces Main Bridge Construction – July – September 2024
- While Justins being finished, 3x precast headstocks made with second crew at Precast Yard.
- Relocate main compound setup from Justins to Joyces in October and reinstate rock bag access to the headstocks for personnel only and crane pads positions for landing precast components.
- Cast in-situ abutments (2 weeks) to be completed in October with both crews.
- Scour rock at abutments placed and abutment backfill completed in late October.
- Superstructure to be landed, poured, and completed by mid-November with both crews.
- Remove rock bags and bank access and complete the roadworks, remaining scour rock protection, demolition, and restoration in late November and December.

Appendix E
Hobarts Bridge Construction Methodology

HOBARTS BRIDGE REPLACEMENT

Project Description

Coastal Works are replacing Hobarts Bridge over the Bellinger River on Darkwood Road, Darkwood under contract works for Bellingen Shire Council. The existing 48m five span, timber bridge will be removed and replaced adjacent with a new 54m four span, all concrete bridge on an improved alignment downstream. The site is located approx. 20km west of Bellingen, is highly flood prone and is in key habitat for the Bellinger River Snapping Turtle.

Existing Timber Bridge

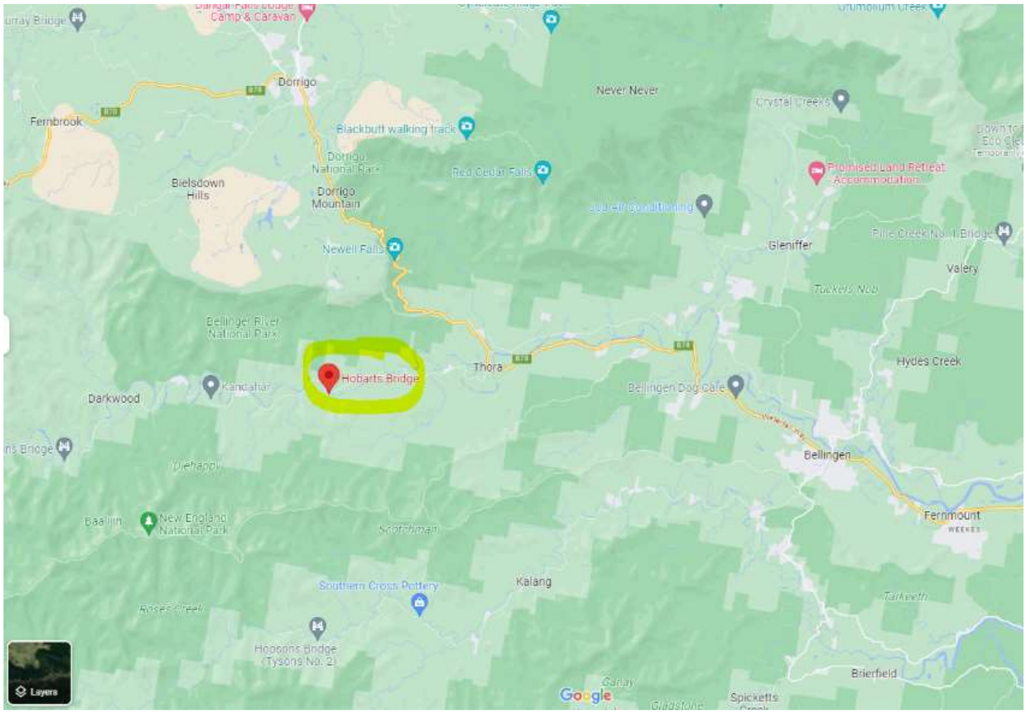
Form of Construction

Foundations – bored, cast in-situ concrete piles (600mm diameter) at one abutment and one headstock, rock anchors at the other abutments and two headstocks into high level rock

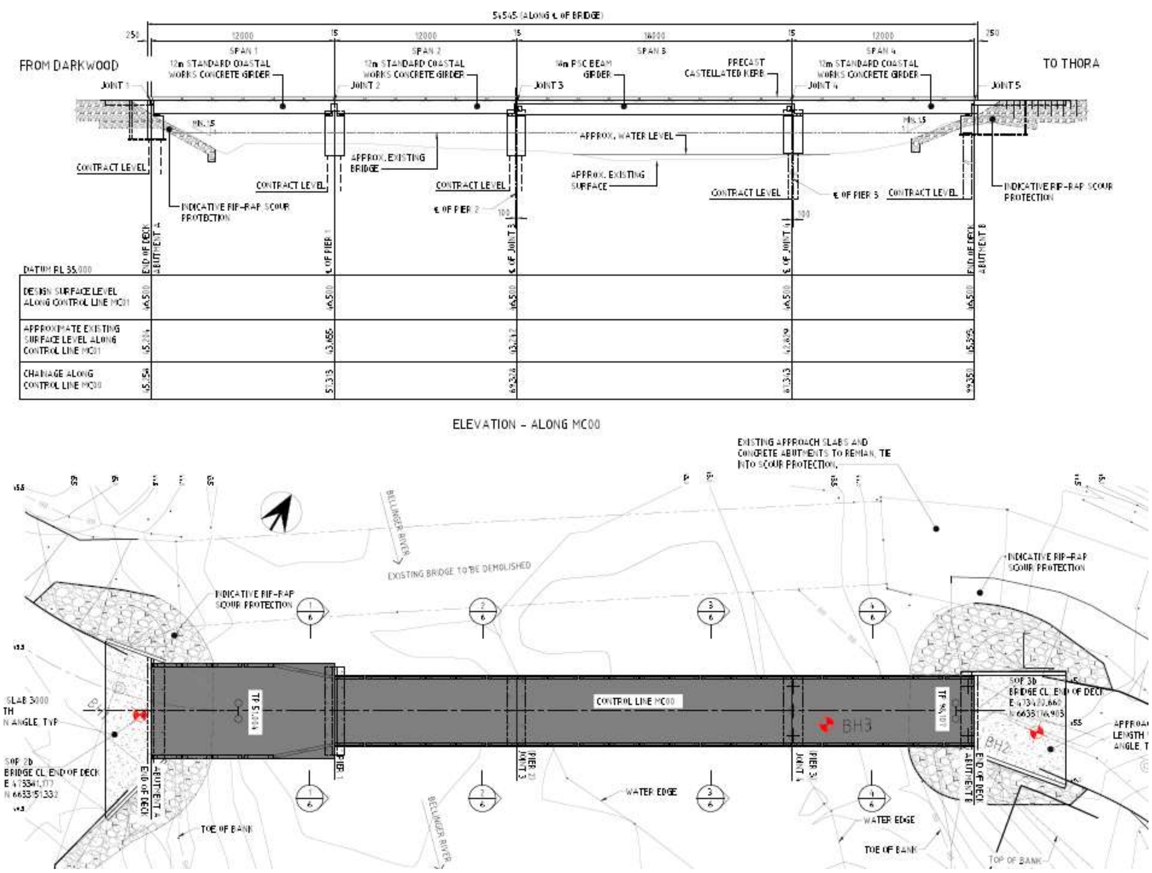
Substructure – cast in-situ reinforced concrete abutments and headstocks throughout, shorter at the two foundations with the bored piles and taller blade walls at the other rock anchor foundations poured directly onto the exposed high level rock shelf, rock scour protection on bank and around abutments

Superstructure - precast concrete CoastalWorks 12m bridge beams for 3 spans and one longer span using 18m PSC pre-stressed bridge planks and a cast in-situ deck pour, cast in-situ concrete approach slabs, bolt on concrete kerbs

Road approaches – 40m of road works one side and 50m the other side to tie into existing road, two coat bitumen seal, 6m wide plus fill formations, open swale drains



Location Map



New Bridge Design

Construction Methodology & Sequence

1) Establishment:
    a. Set up compound, laydown and stockpile areas in the Darkwood Road shoulder on the eastern approach off the road and above the high flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones,
    c. Installation of erosion and sediment controls for piling and river access ramps including booms in the water,
    d. Delivery of all piling and cast in situ work materials/formwork,
    e. Delivery of pre-filled rock bags,
    f. Establish bunded concrete washout and spoil areas at laydown area.

2) Access to riverbed from high banks:
    a. Clear and grub vegetation and topsoil from ramp areas, stockpile away from river for later rehabilitation works or remove from site,
    b. On Thora (East) side, the access ramp is to be immediately downstream of the abutment down to existing stable alluvial gravel shelf. If the alluvial shelf does not churn up with the excavator tracks, then it will be accessed as is and flattened off at completion. If this is not the case, the access ramp construction will extend onto this area also for stability,
    c. On the school side (West), the access ramp is to be between new and existing abutments (shortest bank height) down onto existing exposed rock shelf. Rock shelf is suitable for tracked machine and foot access without a need to import access track materials. A minor amount of loose deposited gravels on top of the rock shelf may be shifted for leveling of plant and equipment.
    d. Access ramps to be constructed with:
        i. Geofrabric underlay – extra length on the upstream side that can be used to wrap over the ramp and pinned down with rock bags during high flow events to prevent wash out,
        ii. 150mm thick, clean imported ballast (40-60mm) and/or gabion (50-200mm)

3) Prepare piling areas prior to piling contractor mobilization:
    a. Abutments (one bored, one rock anchors)
        i. Box down to underside of abutment plus 75mm for blinding layer, remove spoil to stockpile areas,
        ii. Level off adjacent area for positioning of piling rig,
        iii. Bench excavation for stability if needed and install edge delineation.
    b. At Pier 3 (bored piles, east side of water) – blinding slab to be used to aid in keeping piles in correct position and providing a slab for the cast in-situ blade wall style headstock works:
        i. Place approximately 10 rock bags wrapped in geofabric along the edge of the low flow creek line to pin down the edge of the alluvial riverbed material and provide containment for the working area,
        ii. Pull floating hydrocarbon boom tight to the water side of the rock bags and install sediment fencing around the inside of the bag rim,
        iii. Over a 5m x 1.5m area over the footprint of the bored piles, excavator to dig down 1m to remove any larger cobbles,
        iv. Stand up 3 short steel pile liners in the wet excavation,

        v. Pour a 0.5-1.0m deep reinforced concrete blinding slab 5m x 1.5m around the pile liners to approximately 200mm above low flow water level.

    c. At Pier 1 and 2 (rock anchors) – reverse blinding layer to be used around the outside of the blade wall plan area to contain the footprint for piling works and later cast in-situ works from the waterway:
        i. Clear loose debris and river gravel from the blade wall footprint by hand and excavator,
        ii. Pier 2 is in a dry position on the rock shelf – form blinding with timber formwork and pour reinforced blinding ring,
        iii. Pier 3 is 75% dry with one corner in shallow approx. 0.3m deep water. For this corner first place sandbags to above water level, then line with multiple layers of building plastic on the inside and then timber formwork on top of this in the water. Use a sucker truck to remove water from inside this corner as it is displaced by the concrete pour,
        iv. Drier concrete mix to be used to minimise risk of seepage into the adjacent water and lifters cast in so that the blinding can be easily and fully removed after completion of the blade wall.

4) <u>Bored piling works:</u>
    a. Plant & equipment –30t excavator with a 2t vibratory head attachment and pendulum drill head with Kelly bar for the auger.
    b. Abutment B – excavator positioned on existing ground behind abutment,
    c. Pier 3 – excavator positioned on existing river gravel shelf between Abutment B and pier.
    d. Vibratory head used to install permanent mild steel liners in position first from ground level. Abutment B may not require these, Pier 3 to have liners vibrated down inside the established blinding.
    e. Pile clean-out material placed either directly in a skip bin or on a geofabrics lined area adjacent the piling area so it can be removed from the riverbed area to the established stockpile area (or off site) daily. 2m screens of geofabric or ply to be erected along the line of rock bags at Pier 3 to deflect any loose material entering the water as the auger is pulled out.
    f. After piles are cleared, place cages and pour concrete with concrete boom pump up at existing road level behind the abutment. Sucker truck to remove water from the wet pile holes during concrete placement.
    g. Concrete overpour out of top of piles (typically 0.2m3 per pile) to be contained at Pier 3 with tarps. Overpour at Abutment B used as a blinding slab.

5) <u>Rock anchor works:</u>
    a. Plant & equipment – 7t-10t excavator with a specialist air drilling attachment with Down Hole Hammer (DHH) and on-site grout mixing station. DHH option keeps noise and vibration down the hole rather than an above ground hammer which is much noisier above.
    b. Install 2m high spray screens, using geofabric or ply, on 3 sides of the rock anchor areas to deflect any natural rock spray from entering the water.
    c. Excavator drill rig to be positioned on the rock shelf well clear of the water between Pier 1 and 2 and on the existing road level for Abutment A,
    d. Grout mixing station to be on the western existing road near Abutment A out of the riverbed and banks. Bund the area from overspill and grout hoses to

the rock anchor working area to be plastic wrapped or run in a larger diameter conduit to capture any potential break.

    e. Concrete revers blinding to be 200mm higher than rock level to act as containment for flushing of the rock anchor holes (water and rock sediment) and for containing grout overpour. These can be removed by sucker truck at end of works to tidy area ready for cast in-situ works.

6) Cast in-situ concrete sub-structure:
    a. Reinforcement placed and tied in place by hand inside reverse blindings at piers and on traditional blinding at abutments all above low flow water level.
    b. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
    c. Two blade walls will require elevated walkway up to the top of concrete which will all cantilever off the formwork and not require additional footprint on the riverbed other than a ladder.
    d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour all substructure works. Pump and concrete trucks to be brought to the respective sides of the river for pours so the boom line is not over the waterway at any time. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
    e. Strip all formwork and remove reverse blinding after concrete curing period,
    f. Install cantilevered walkway access platforms off new concrete for access to bearing pad level for piers,
    g. Complete mortar pads by hand mixed mortar to finish all substructures.

7) Fully remove piling access tracks – excavator to progressively remove rock bags, imported ramp materials and geofrabirc underlay working away from the water on each side back to the high banks. All imported rock to be re-used for road backfill.

8) Place scour rock around abutments – place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks. Excavator to place scour rock from established access ramps and then from behind abutments out of the riverbed area.

9) General fill and drainage zone behind abutments – place and compact area immediately behind abutments up to underside of approach slabs. Maintain access to existing bridge for road traffic. All trucks, rollers and excavators out of the creek and sediment fencing along the whole bank lines to contain from any wet weather during this period.

10) Establish crane outrigger positions – use rock bags placed either side either side of the existing timber bridge as outrigger positions, one set on the western end and one on the eastern end using an excavator from the existing bridge deck. Cranes to be positioned on the first 10m of the existing bridge for landing precast components under full road closure.

11) Land all precast beams and planks and tie cast in-situ deck and approach slabs – sealed soffit formwork to be used between planks and beams to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Temporary

access platforms to be installed along the outside edges for the 18m plank span for access and edge formwork.

12) <u>Pour beam and deck pours</u> – CoastalWorks 12m beam spans poured first, 18m plank span second with the approach slabs. Boom pumps to be again used from the respective sides without putting the line over the waterway. Curing of the deck pour to be done with clean water, soaker hoses and hessian.

13) <u>Install bolt on kerb units onto plank span</u>

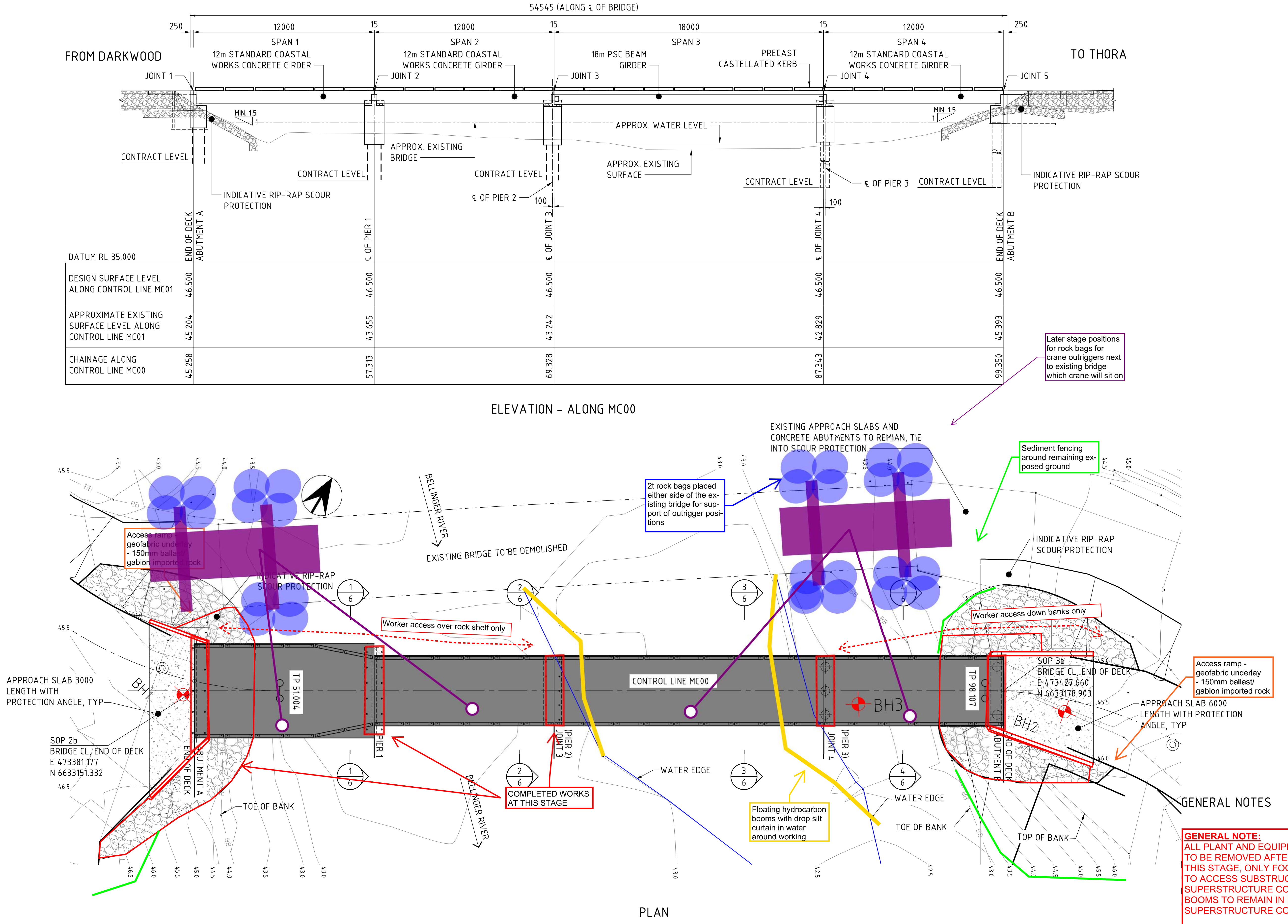
14) <u>Remove temporary works from headstocks and plank span</u> – use Franna crane and or HIAB truck on the new deck to lift out and load directly to laydown area.

15) <u>Complete approach roadworks</u> – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

16) <u>Demolish original bridge:</u>
    a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers.
    b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing ply and timber decking first followed by girders for each span. No access off deck required for this.
    c. Once deck fully removed, remove headstocks on the western side that are accessible outside of the low flow water area only. Use rock breaker on excavator to break up and then remove in largest possible pieces by excavator and by hand.
    d. For non-accessible headstocks in the water flow area, access via floating platform and remove timber components from above water with chainsaw and oxy cutting bolts down to top of concrete. Concrete headstocks to remain.
    e. Existing concrete abutments to remain in place along bank edges to maintain stable banks into the future as scour protection.
    f. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

17) <u>Complete rock scour protection</u> – on upstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

18) <u>Demobilise construction activities</u> – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.



GENERAL NOTE:
ALL PLANT AND EQUIPMENT ACCESS TO THE RIVER TO BE REMOVED AFTER CAST IN-SITU WORKS BY THIS STAGE, ONLY FOOT TRAFFIC FOR WORKERS TO ACCESS SUBSTRUCTURE DURING SUPERSTRUCTURE COMPLETION.
BOOMS TO REMAIN IN PLACE UNTIL SUPERSTRUCTURE COMPLETE

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
02	15/06/2023	100% DETAIL DESIGN	JR	DM	CR
01	05/05/2023	80% DETAIL DESIGN	JR	DM	CR

DESIGNER: bk. bridge knowledge ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE LTY PTD

CONTRACTOR: COASTAL WORKS — COASTAL WORKS

CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

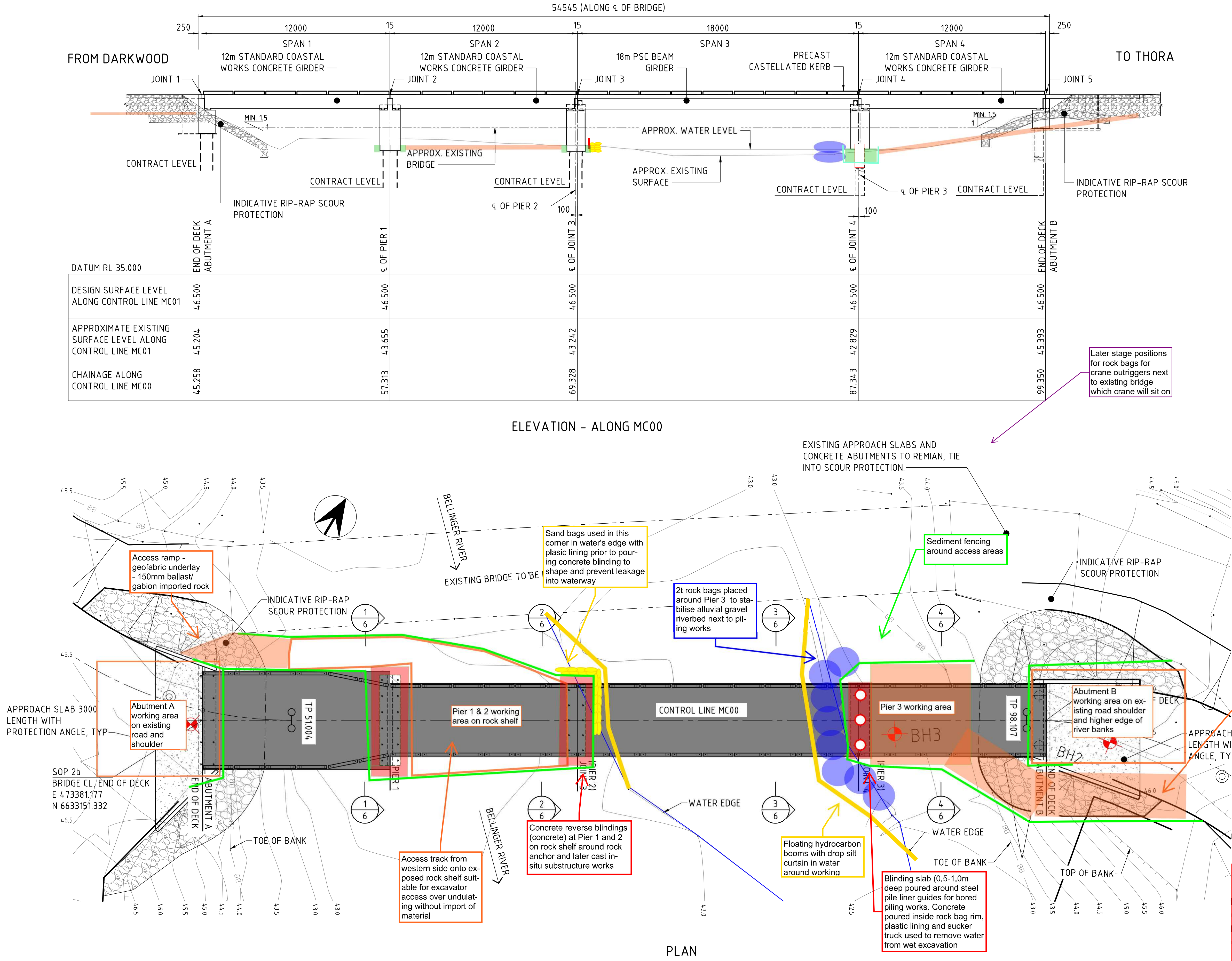
TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

HOBARTS BRIDGE
REPLACEMENT OVER BELLINGER RIVER

CRANAGE ACCESS PLAN

DRAWING SET No: BKP397-BSC
BRIDGE No: DRG-005
ISSUE STATUS: DETAIL DESIGN
ISSUE: 02 | No SHEETS: 34 | SHEET No: 05



GENERAL NOTE:
ALL ACCESS ARRANGEMENTS FOR ALL PILING AREAS, INCLUDING REVERS BLINDING CONTAINMENTS, TO BE IN PLCE PRIOR TO MOBILISATION OF PILING CONTRACTOR AND COMMENCEMENT OF ANY PILING OR ROCK ANCHOR WORKS.
ALL FULLY REMOVABLE - REVERSE BLINDINGS AT PIER 1 & 2 TO BE COMPLETELY REMOVED AFTE COMPLETION OF THE SUBSTRUCTURE.
BLINDING AT PIER 3 TO BE PERMANENT UNDERNEATH THE COMPLETED SUBSTRUCTURE.

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
02	15/06/2023	100% DETAIL DESIGN	JR	DM	CR
01	05/05/2023	80% DETAIL DESIGN	JR	DM	CR

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSE OF THE NOMINATED PROJECT

DESIGNER: bk. bridge knowledge — BRIDGE KNOWLEDGE LTY PTD
CONTRACTOR: COASTAL WORKS — COASTAL WORKS
CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL
HOBARTS BRIDGE
REPLACEMENT OVER BELLINGER RIVER
PILING ACCESS PLAN

DRAWING SET No: BKP397-BSC
BRIDGE No: DRG-005
ISSUE STATUS: DETAIL DESIGN
ISSUE: 02 | No SHEETS: 34 | SHEET No: 05

DARKWOOD ROAD 3 BRIDGES – EXAMPLE CONSTRUCTION METHODOLOGY PHOTOES

Excavator with 2t vibratory unit used to pitch steel pile liners

Excavator mounted pendulum pile boring rig with extendable Kelly bar and access ramps –

Excavator mounted rock anchor drilling setup (7-12t sized machine) with splatter screens used next to waterway

On-site grout mixing station for rock anchors up on banks away from anchors


Same smaller excavator (7t) rock anchor rig

Containment system used for pouring concrete bored piles to prevent concrete overpour entering the waterway

Kibble being used for on-site pours at headstocks near water to control concrete

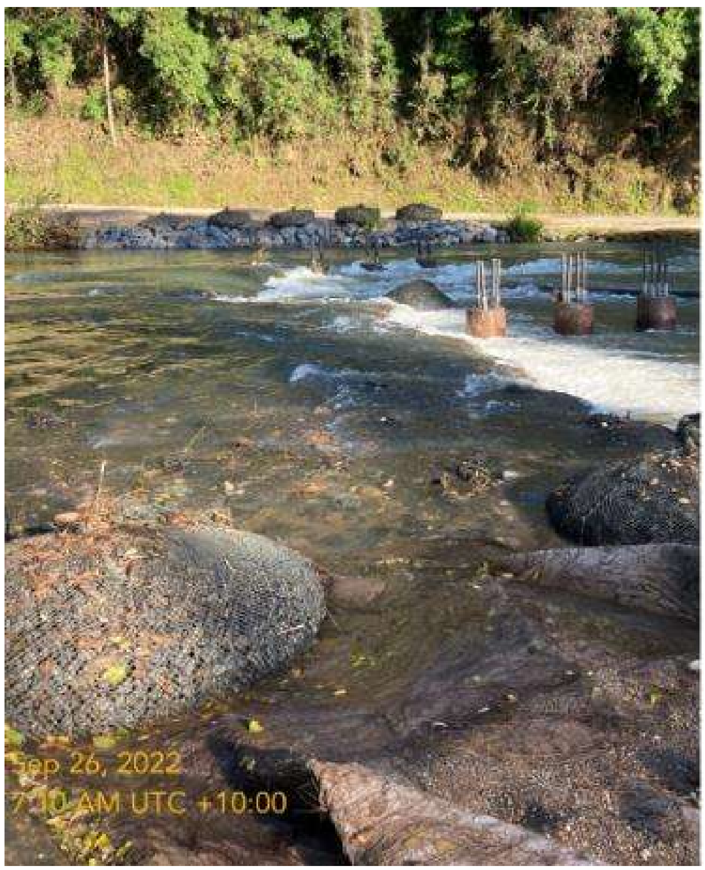
Cast in-situ headstock with elevated temporary works walkway around

Rock bags used as an access track and crane platform for landing precast components

Concrete deck pour with elevated walkway attached to bridge planks

Riverbank access ramp and working area and rock scour protection with excavator

Rock bags used to pin down geofabric with boom adjacent in water



Rock bag access track being overtopped and remaining in place without any material loss during high water flow conditions


Landing precast concrete panels onto steel girder span

2024 Darkwood Bridges Program 5.7.23 - preferred

ID	Engineer	Task Name	Duration	Start	Finish	Predec
1	**2024**	**Coastal Works - Darkwood Bridges Program 2024**	**185 days**	**Mon 1/04/24**	**Fri 13/12/24**	
2		**Site Establishment all 3 sites**	**10 days**	**Mon 1/04/24**	**Fri 12/04/24**	
3	Crew 1	Main laydown & compound setup at Hobarts + major material deliveries	5 days	Mon 1/04/24	Fri 5/04/24	
4	Crew 1	ALL 3 SITES - vegetation clearing, piling material deliveries, establish excavator access tracks for river banks, ERSD controls at first pile positions and laydown and spoil areas	5 days	Mon 8/04/24	Fri 12/04/24	3
5	Crew 2	ALL 3 SITES - establish rock bag areas - Hobarts headstock, Joyces west abutment, Justins headstock and floating booms installed	10 days	Mon 1/04/24	Fri 12/04/24	3SS
6		**Piling all 3 sites**	**25 days**	**Mon 22/04/24**	**Fri 24/05/24**	
7	Crew 1	HOBARTS - mob, rock anchors (32) drilled, grouted	5 days	Mon 22/04/24	Fri 26/04/24	14
8	Crew 1	JUSTINS - rock anchors (10) and grouted incl. move	2 days	Mon 29/04/24	Tue 30/04/24	7
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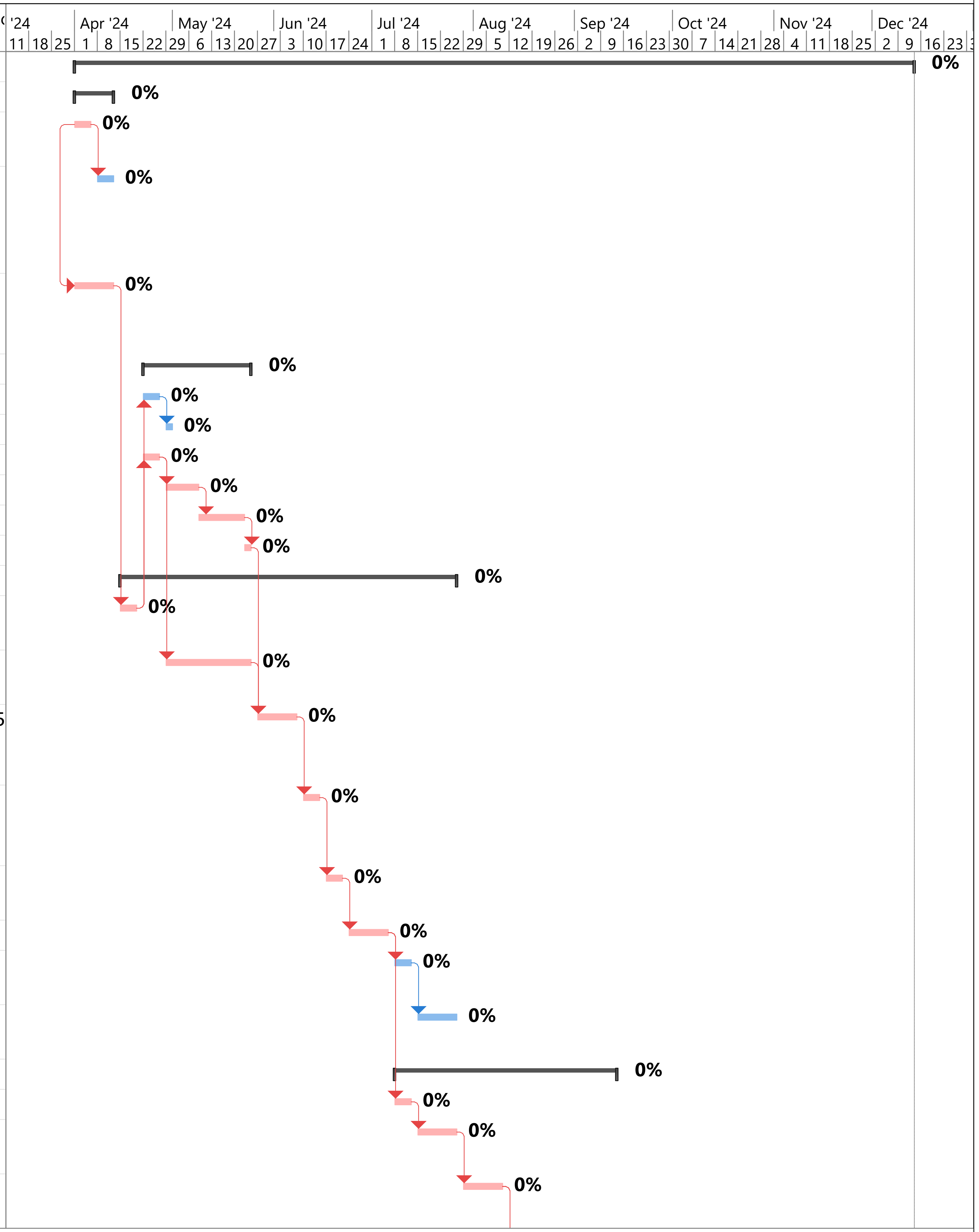
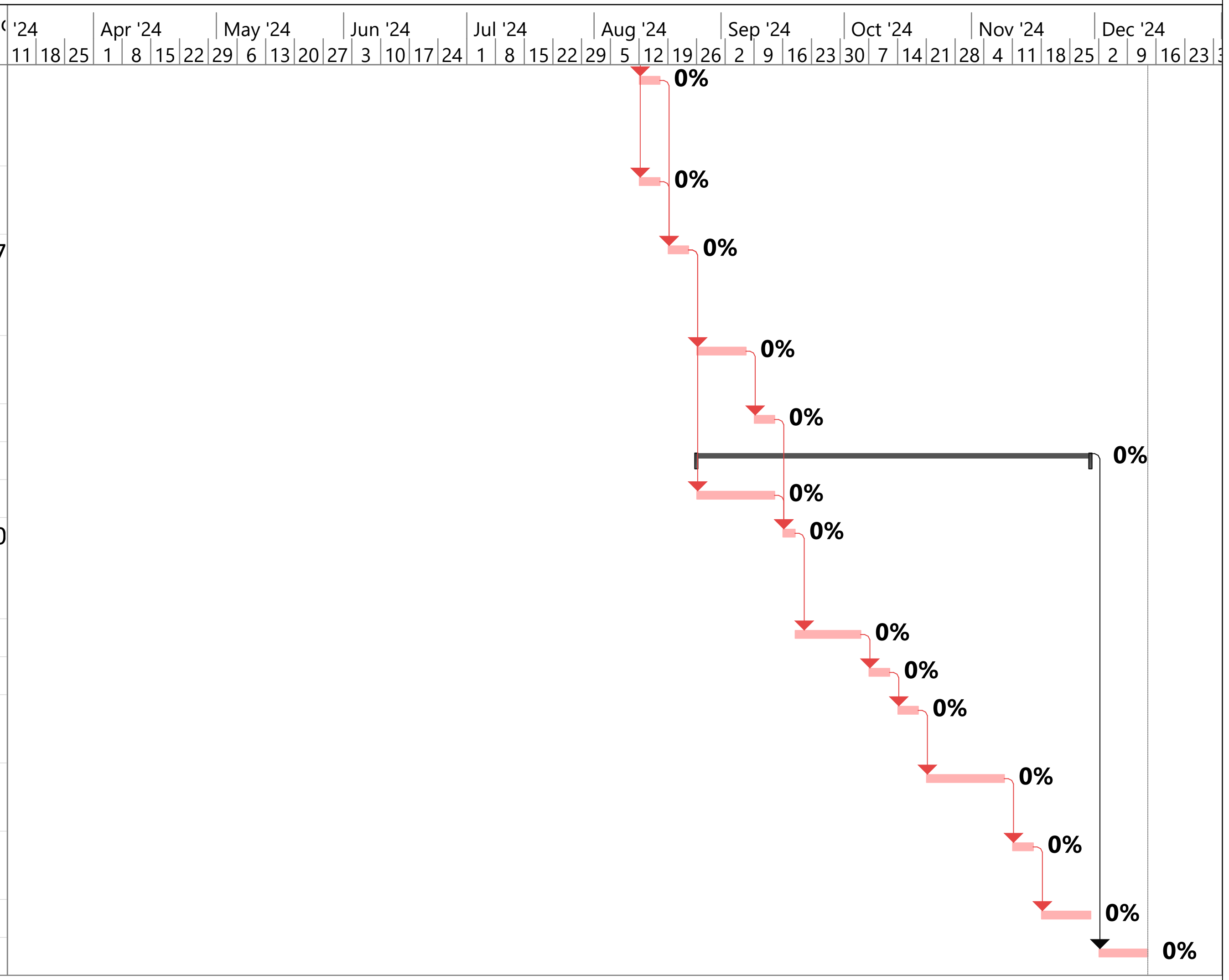
10	Crew 1	JUSTINS - bored piles (9) and poured, incl mob/demob	8 days	Mon 29/04/24	Wed 8/05/24	9
11	Crew 1	JOYCES - bored piles (16) & remove/stockpile rock bags	10 days	Thu 9/05/24	Wed 22/05/24	10
12	Crew 1	Contingency - days between to keep up, wet weather	2 days	Thu 23/05/24	Fri 24/05/24	11
13		**Hobarts Bridge (BSC)**	**75 days**	**Mon 15/04/24**	**Fri 26/07/24**	
14	Crew 2	Prepare all pile locations - box outs, blindings, ERSD controls, rock anchor bunds	5 days	Mon 15/04/24	Fri 19/04/24	5
15	Crew 2	Cast in-situ headstocks and abutments (during remaining piling works)	20 days	Mon 29/04/24	Fri 24/05/24	9
16	Both Crews	Cast in-situ headstocks and abutments completed both crews incl. scour rock in front of abutments and mortar pads	10 days	Mon 27/05/24	Fri 7/06/24	12,15
17	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove access tracks into creek, crane pads and landing prep	5 days	Mon 10/06/24	Fri 14/06/24	16
18	Both Crews	Land beams (2 days) & CoastalWorks beams stitch pours (3 days)	5 days	Mon 17/06/24	Fri 21/06/24	17
19	Both Crews	Plank span deck pour & approach slabs	10 days	Mon 24/06/24	Fri 5/07/24	18
20	Crew 2	Road works on approaches, swap traffic over, install kerbs and brackets	5 days	Mon 8/07/24	Fri 12/07/24	19
21	Crew 2	Demolition, final rock scour, full restoration, pack up & contingency	10 days	Mon 15/07/24	Fri 26/07/24	20
22		**Justins Bridge**	**50 days**	**Mon 8/07/24**	**Fri 13/09/24**	
23	Crew 1	Relocate compound from Hobarts, ERSD controls etc.	5 days	Mon 8/07/24	Fri 12/07/24	19
24	Crew 1	Cast in-situ headstocks and abutments (3) incl. elevated temporary support for headstock at start	10 days	Mon 15/07/24	Fri 26/07/24	23
25	Both Crews	Cast in-situ headstocks and abutments incl. scour rock in front of abutments	10 days	Mon 29/07/24	Fri 9/08/24	24



Critical		Split		Finish-only		Baseline Milestone		Manual Summary		Inactive Task	
Critical Split		Task Progress		Duration-only		Milestone		Project Summary		Inactive Milestone	
Critical Progress		Manual Task		Baseline		Summary Progress		External Tasks		Inactive Summary	
Task		Start-only		Baseline Split		Summary		External Milestone		Deadline	

ID	Engineer	Task Name	Duration	Start	Finish	Predecessors
26	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove rock bags area, crane pads and landing prep	5 days	Mon 12/08/24	Fri 16/08/24	25
27	Both Crews	Steel girders deliverd and put together with franna on west side	5 days	Mon 12/08/24	Fri 16/08/24	25
28	Both Crews	Land beams and deck panels (2 days) & CoastalWorks beams stitch pour & complete steel girder deck bolting and grouting	5 days	Mon 19/08/24	Fri 23/08/24	26,27
29	Crew 1	Road works on approaches, install kerbs and brackets, swap traffic over	10 days	Mon 26/08/24	Fri 6/09/24	28
30	Crew 1	Demolition, final rock scour, full restoration, pack up	5 days	Mon 9/09/24	Fri 13/09/24	29
31		**Joyces Bridge**	**70 days**	**Mon 26/08/24**	**Fri 29/11/24**	
32	Crew 2	Precast 3x Joyces headstocks (CoastalWorks Precast Yard)	15 days	Mon 26/08/24	Fri 13/09/24	28
33	Both Crews	Relocate compound from Justins, re-install rock bag access for personnel access to headstocks only & crane pads	3 days	Mon 16/09/24	Wed 18/09/24	32,30
34	Both Crews	Cast in-situ abutments and bearing pads	12 days	Thu 19/09/24	Fri 4/10/24	33
35	Both Crews	Scour rock protection, approaches general fill	5 days	Mon 7/10/24	Fri 11/10/24	34
36	Both Crews	Land beams (2 days) & Coatalworks beams stitch pours (3 days)	5 days	Mon 14/10/24	Fri 18/10/24	35
37	Both Crews	Plank spans (2) deck pours & approach slabs & install kerb units	15 days	Mon 21/10/24	Fri 8/11/24	36
38	Both Crews	Road works on approaches, swap traffic over, install kerbs	5 days	Mon 11/11/24	Fri 15/11/24	37
39	Both Crews	Demolition, final rock scour, full restoration and pack up	10 days	Mon 18/11/24	Fri 29/11/24	38
40		**Contingency / wet weather**	**10 days**	**Mon 2/12/24**	**Fri 13/12/24**	**31**



Critical	Split	Finish-only	Baseline Milestone	Manual Summary	Inactive Task
Critical Split	Task Progress	Duration-only	Milestone	Project Summary	Inactive Milestone
Critical Progress	Manual Task	Baseline	Summary Progress	External Tasks	Inactive Summary
Task	Start-only	Baseline Split	Summary	External Milestone	Deadline

DARKWOOD 2024 PROGRAM NOTES

Coastal Works intend to undertake the 3 Darkwood Road bridges – Hobarts, Joyces, Justins – as a single program of works commencing in April 2024 to December 2024. Preferred program utilises a typical rock anchor installation small excavator rig with air drilling. Below outlines some of the key dates for the construction sequence:

<u>Site Establishment – April 2024</u>

- Main compound and laydown set up at Hobarts.
- Laydown and piling material deliveries at all 3 bridges.
- Vegetation clearing complete at all 3 bridges
- Establish access points down banks and first piling position at all 3 sites with rock bag setups – 1x headstock at Hobarts, western headstock at Joyces, headstock at Justins.
- Establish all piling positions at Hobarts
- Install erosion and sed controls at all 3 bridges for laydown and piling positions

<u>Piling All 3 bridges – April to June 2024</u>

- Start at Hobarts with the two piling setups concurrently, one 7t excavator rock anchor setup and one 24t excavator for bored piles – aim for completion all in 1 week
- Both setups to move onto Justins Bridge – rock anchor completed in 3 days and setup demobilised from site, bored piles continue – 1.5 weeks
- Bored piling setup moves onto Joyces bridge last, first at previously established western side access which is then removed and established on the east side for completion – 2 weeks
- Coastal Works crews with an excavator to follow the piling crews to manage laydowns, modify the access requirements, remove piling spoil and maintain and adjust environmental controls.
- Coastal Works crew complete the bored pile pours progressively along with the contractor
- Justins site rock bags to remain at headstock to remain, Joyces river access completely removed.

<u>Hobarts Main Bridge Construction – May – August 2024</u>

- Cast in-situ substructure works (6 weeks) to commence in May with one CoastalWorks crew once all piling is completed and piling is continuing at the other sites.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in June.
- Superstructure to be landed, poured, and completed in July with both crews.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in late July and into August.

<u>Justins Main Bridge Construction – July – September 2024</u>

- Relocate main compound setup from Hobarts to Justins in late July once the Hobarts superstructure is completed with second CoastalWorks crew.
- Cast in-situ substructure works (4 weeks) to commence in August with one CoastalWorks crew and completed by both crews once Hobarts is completed.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in late August.
- Superstructure to be landed, poured, and completed in early September.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in September.

<u>Joyces Main Bridge Construction – July – September 2024</u>

- While Justins being finished, 3x precast headstocks made with second crew at Precast Yard.
- Relocate main compound setup from Justins to Joyces in October and reinstate rock bag access to the headstocks for personnel only and crane pads positions for landing precast components.
- Cast in-situ abutments (2 weeks) to be completed in October with both crews.
- Scour rock at abutments placed and abutment backfill completed in late October.
- Superstructure to be landed, poured, and completed by mid-November with both crews.
- Remove rock bags and bank access and complete the roadworks, remaining scour rock protection, demolition, and restoration in late November and December.

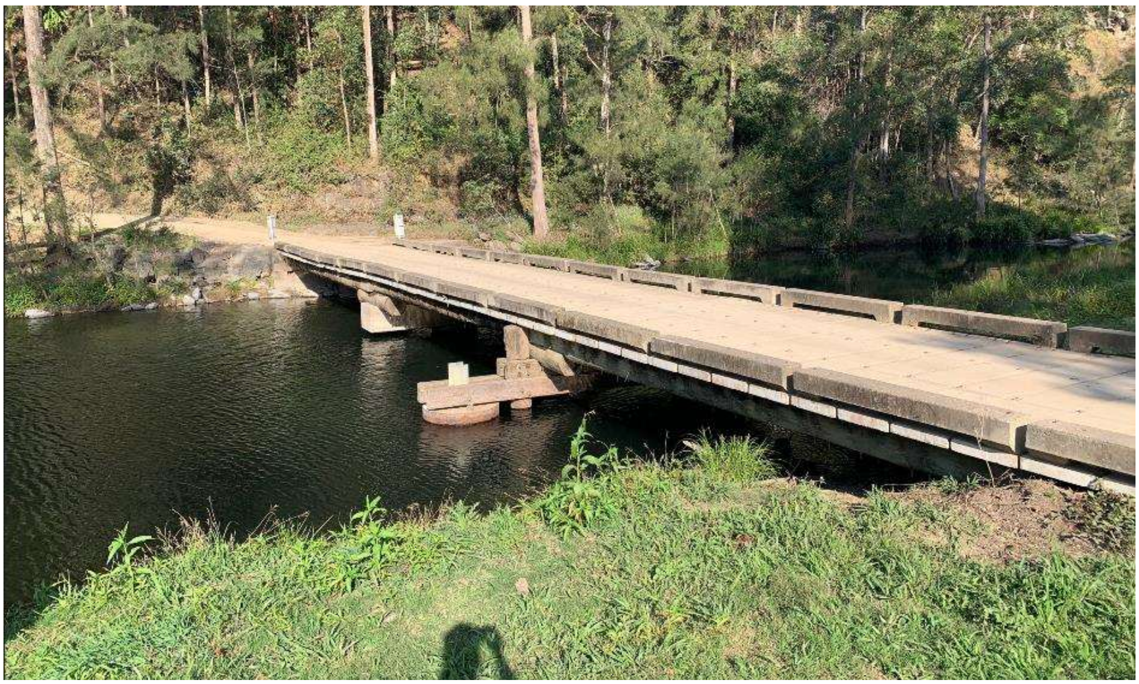
Appendix F

Justins Bridge Construction Methodology

JUSTINS BRIDGE REPLACEMENT

Project Description

Coastal Works are replacing Justins Bridge over the Bellinger River on Darkwood Road, Darkwood under contract works for Bellingen Shire Council. The existing 32m four span, timber bridge will be removed and replaced adjacent with a new 32m two span, concrete and steel bridge on a raised alignment downstream. The site is located approx. 35km west of Bellingen, is highly flood prone and is in key habitat for the Bellinger River Snapping Turtle.



Existing Timber Bridge

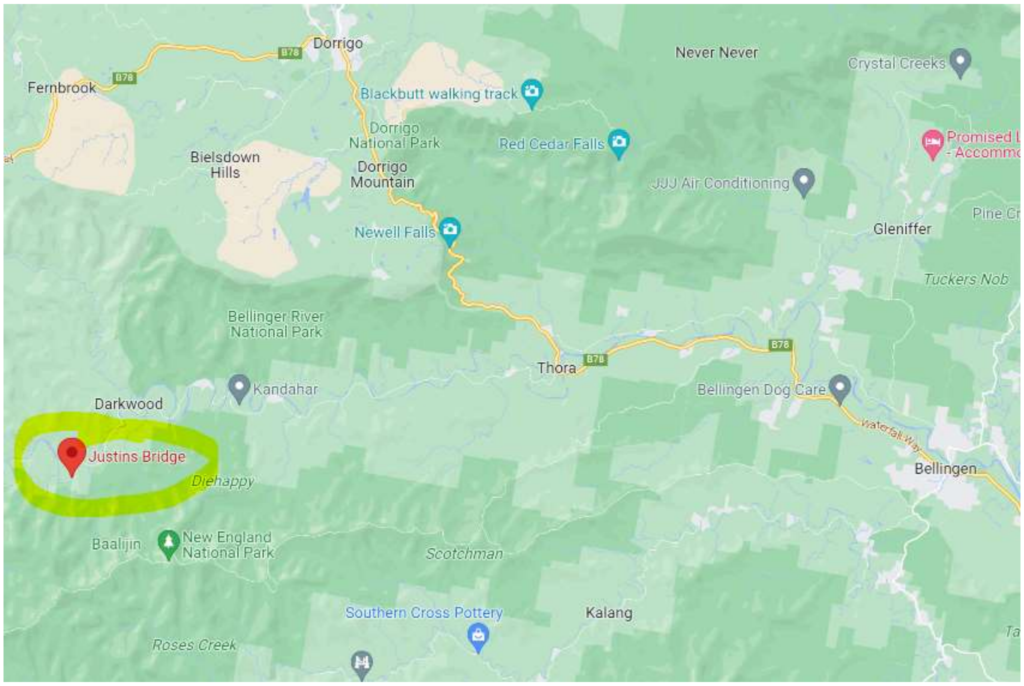
Form of Construction

Foundations – bored, cast in-situ concrete piles (600mm diameter) at one abutment and one headstock, rock anchors at the other abutment into high level rock

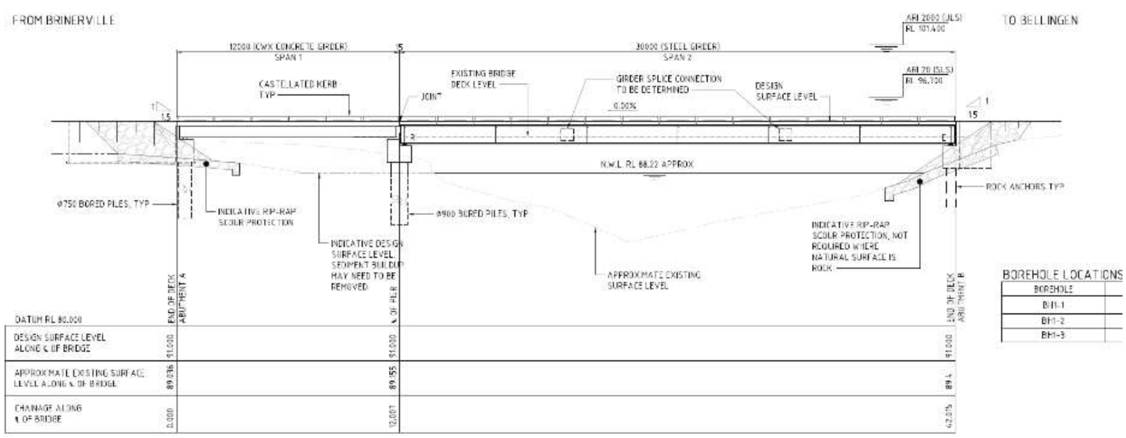
Substructure – cast in-situ reinforced concrete abutments and headstocks poured direct onto existing ground levels on top of piles including direct onto foundation rock at the rock anchor abutment, rock scour protection on banks and around abutments

Superstructure – one span is precast concrete CoastalWorks 12m bridge beams, one span is 30m long over the low flow area over the creek using spliced steel girders with CoastalWorks precast concrete deck panels, bolt on concrete kerbs

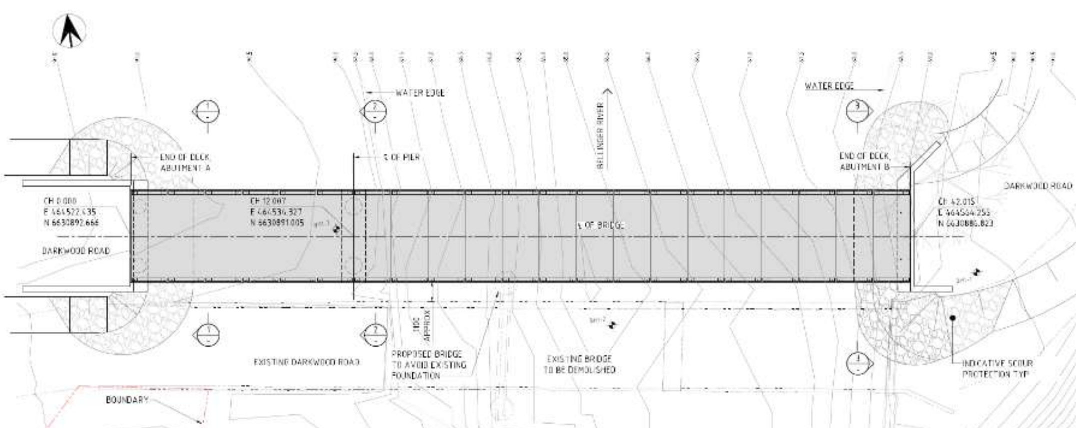
Road approaches – 20-30m of road works each side to tie into existing road, two coat bitumen seal, 6m wide plus fill formation formations, open swale drains



Location Map



ELEVATION
EXISTING BRIDGE NOT SHOWN FOR CLARITY



PLAN

New Bridge Design

Construction Methodology & Sequence

1) <u>Establishment:</u>
    a. Set up compound, laydown and stockpile areas in the Darkwood Road shoulder and private property paddock on the eastern approach off the road and above the high flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones.
    c. Installation of erosion and sediment controls for piling areas including booms in the water.
    d. Delivery of all piling materials.
    e. Delivery of pre-filled rock bags.
    f. Establish bunded concrete washout and spoil areas at laydown area.

2) <u>Access to and establishment of piling areas:</u>
    a. Clear and grub surface vegetation and topsoil from the three piling locations, stockpile away from river for later rehabilitation works or remove from site.
    b. At Abutment B (east side, rock anchors), excavators can sit in existing road shoulder behind the abutment. Box out with 14t excavator to expose rock.
    c. At Abutment A (west side), no access establishment required, box out with 14t excavator down to pile cutoff level.
    d. At Headstock, no access ramp required, existing riverbanks will be stable enough for tracked machinery access and are to be re-profiled at the end of works. Keep access paths next to abutment and in between headstock and Abutment A. Place rock bags along river side of the piling set to stabilise banks and provide additional containment, pull floating boom tight to water line at rock bags. Minor box out to piles (<0.5m) and provide sediment fencing along inside of rock bags.
    e. Should any areas for excavator positioning become unstable or present unanticipated risk for becoming churned up, establish access platform with geofabric underlay and 150mm clean imported ballast and/or gabion rock with extra length of geofabric on the upstream side that can be used to wrap over and pinned down with rock bags during high flow events to prevent wash out.

3) <u>Rock anchor works:</u>
    a. Plant & equipment – 7t-10t excavator with a specialist air drilling attachment with Down Hole Hammer (DHH) and on-site grout mixing station. DHH option keeps noise and vibration down the hole rather than an above ground hammer which is much noisier above.
    b. Install 2m high spray screens, using geofabric or ply, on 3 sides of the rock anchor area to deflect any natural rock spray from entering the water.
    c. Grout mixing station to be on the eastern existing road immediately next to Abutment B works with minimal grout tube run. Bund the area from overspill and grout hoses to the rock anchor working area to be plastic wrapped.
    d. Box out will be sufficient to contain flushing of the rock anchor holes (water and rock sediment) and for containing grout overpour. These can be removed by sucker truck at end of works to tidy area ready for cast in-situ works.

4) <u>Bored piling works:</u>
    a. Plant & equipment – 30t excavator with a 2t vibratory head attachment and pendulum drill head with Kelly bar for the auger.

b. Vibratory head used to install permanent mild steel liners in position first at all 9 pile positions for western structures.
c. Use pendulum auger to bore out inside each with required rock sockets.
d. Pile clean-out material placed either directly in a skip bin or on a geofabrics lined area adjacent the piling area so it can be removed from the riverbed area to the established stockpile area (or off site) daily.
e. After piles are cleared, place cages and pour concrete with concrete boom pump up at existing road level on the western approach for both headstock and western abutment. Sucker truck to remove water from the wet pile holes during concrete placement.
f. Concrete overpour out of top of piles (typically 0.2m3 per pile) to be contained within the box out areas and become a blinding slab for cast in-situ works.

5) Cast in-situ concrete sub-structure:
   a. Reinforcement placed and tied in place by hand on blinding slabs.
   b. Ply formwork shutters pre-made and placed with excavator using the same access points used during piling. Personnel access to all from ground level.
   c. Elevated walkway required for taller abutments up to the top of concrete which will all cantilever off the formwork and not require additional footprint.
   d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour all substructure works. Pump and concrete trucks to be brought to the respective sides of the river for pours so the boom line is not over the waterway at any time. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
   e. Complete mortar pads by hand mixed mortar to finish all substructures and strip all formwork and elevated access platforms.

6) Fully remove piling temporary working areas and establish western crane position – excavator to progressively remove rock bags, any imported ramp materials (if needed) and geofrabirc underlay working away from the western water's edge. All imported rock to be re-used for road backfill. Reposition rock bags for a crane pad on the downstream side of Abutment A.

7) Cut and re-profile higher bank materials under the shorter western span – excavator to box out materials down to 200mm above the water ripple line from the existing western water line to the western abutment. Place direct into tipper trucks to remove from site.

8) Place scour rock around abutments – place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks, tip adjacent and behind abutments in manageable quantities for placement by 14t excavator.

9) Land all precast concrete beams, steel girders and precast deck panels – semis to deliver beams to western side, all beams and girders lifted in by crane on western side as well as half the steel girder span deck panels. Remaining deck panels placed by Franna crane progressively to Abutment B. Bolting down of panels all to be done from deck level, no scaffold required.

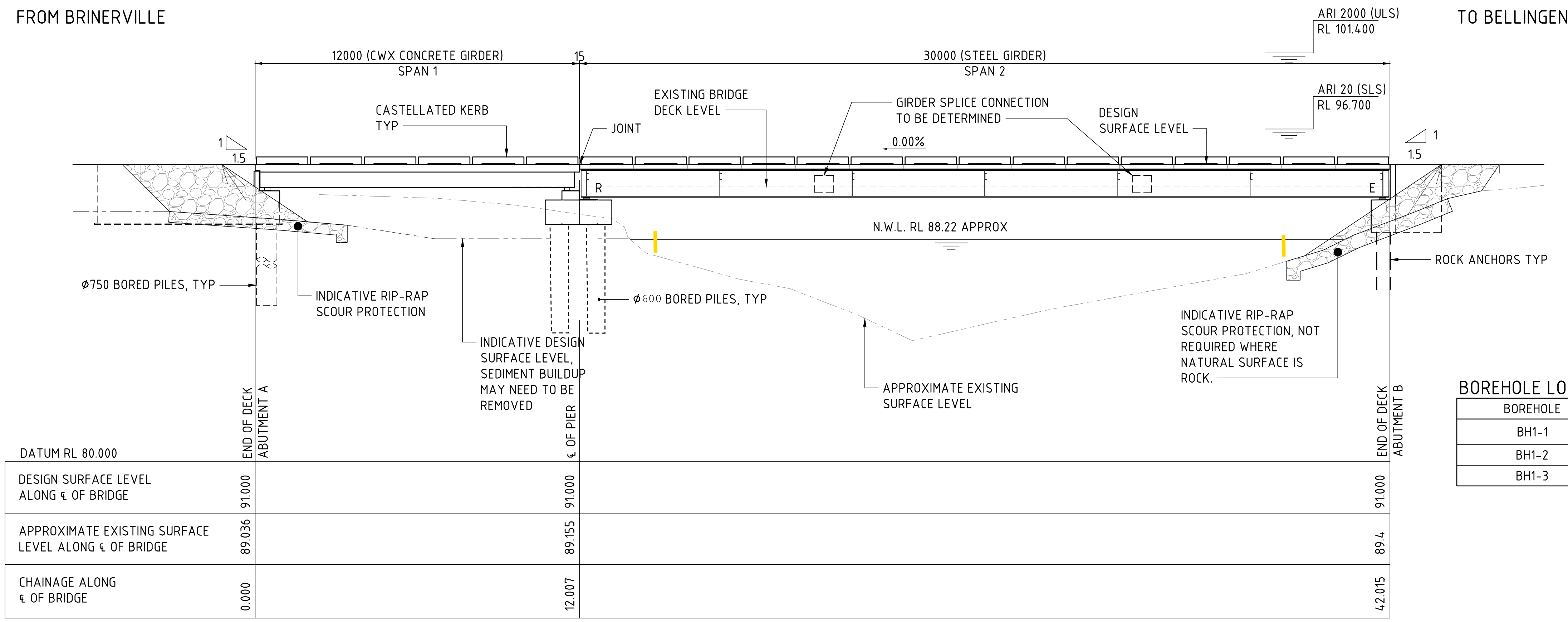
10) Pour 12m beam stitch pour – sealed formwork to be used between CoastalWorks planks to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Boom pump to used from western side again without putting the line over the waterway.

11) Complete approach roadworks – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

12) Demolish original bridge:
    a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers, Franna crane for lifting concrete deck panels.
    b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing concrete deck panels direct onto transport and timber girders for each span. No access off deck or in high banks required.
    c. For in-stream headstocks, install floating scaffold platforms out from each bank. Remove timber components of headstocks using chainsaw and protruding steel components with an oxy torch from platforms, removing all cut off items from the waterway. Concrete headstocks and piles to remain.
    d. Divers to be used with underwater chainsaws to remove timber piles. Floating barrels first attached to the timber before cutting and roped to the banks for full removal.
    e. For abutments and existing western headstock outside the water area, use rock breaker on excavator to break up concrete footings and then remove in largest possible pieces by excavator and by hand down to ground level.
    f. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

13) Complete rock scour protection – on upstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

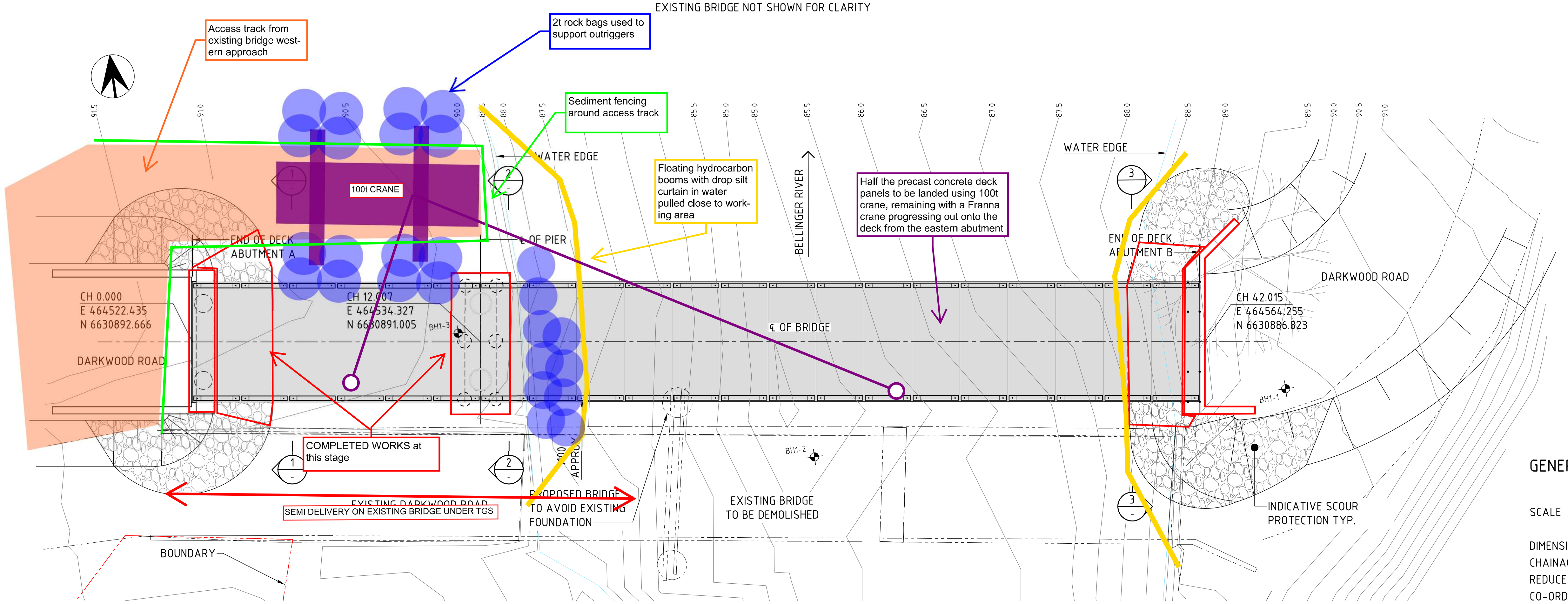
14) Demobilise construction activities – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.



ELEVATION
EXISTING BRIDGE NOT SHOWN FOR CLARITY

BOREHOLE LOCATIONS

BOREHOLE	EASTING	NORTHING	RL
BH1-1	464567	6630884	89.8
BH1-2	464547	6630884	84.8
BH1-3	464533	6630891	89.3



PLAN

GENERAL NOTES

SCALE 0 1 2 3 4 5m OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
02	29/05/2023	CONCEPT DESIGN	JR	DM	CR
01	25/05/2023	CONCEPT DESIGN	JR	DM	CR

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSE OF THE NOMINATED PROJECT

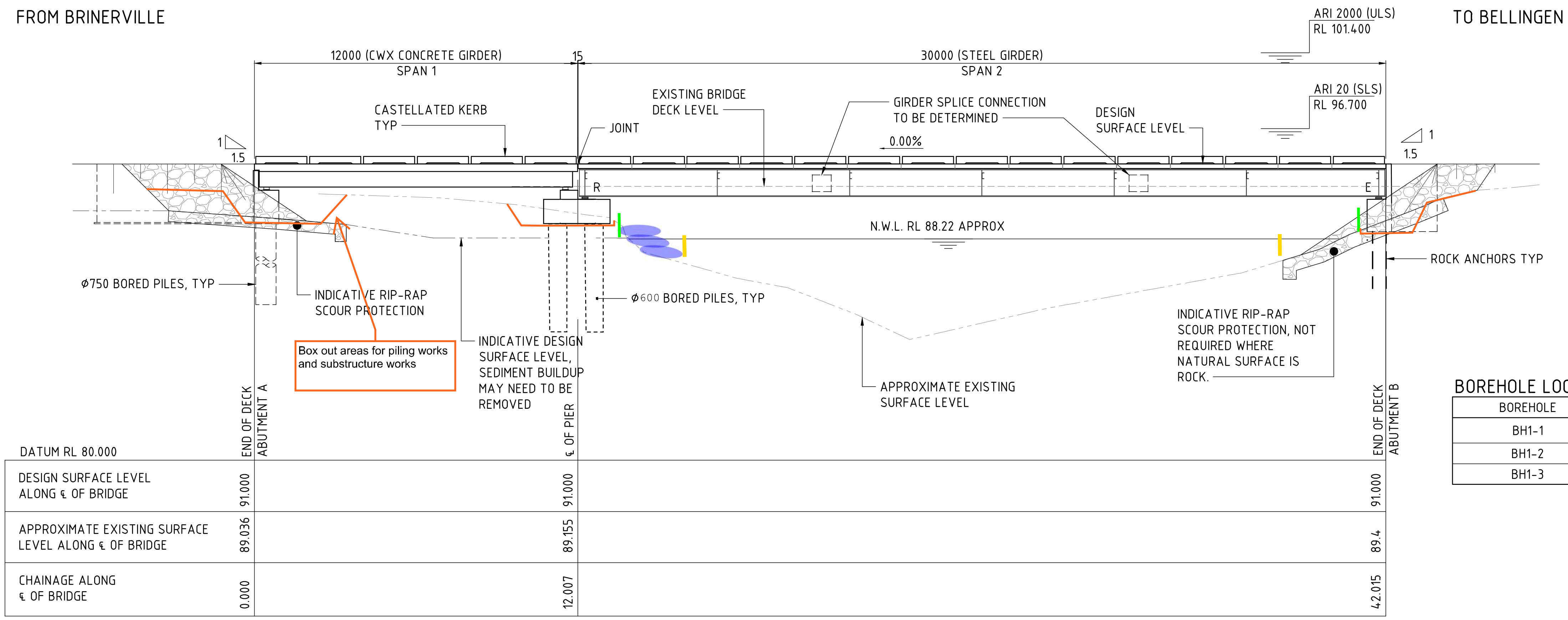
	PREPARED	CHECKED
DESIGN	D. MERRIKIN	C. RILEY
DRAWING	J. REN	D. MERRIKIN

PREPARED BY
bk. bridge knowledge. ENGINEERING CONSULTING SERVICES
DANIEL MERRIKIN
STRUCTURAL ENGINEER

BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

DARKWOOD ROAD
ADELE HOUSE
CONCEPT REDESIGN
FIXING COUNTRY BRIDGE PROGRAM
JUSTINS BRIDGE
CRANAGE ACCESS PLAN

DRAWING SET No BKP414-BR104
DRAWING No BR104-DRG-02
ISSUE STATUS CONCEPT DESIGN
ISSUE 2 No SHEETS 3 SHEET No 02



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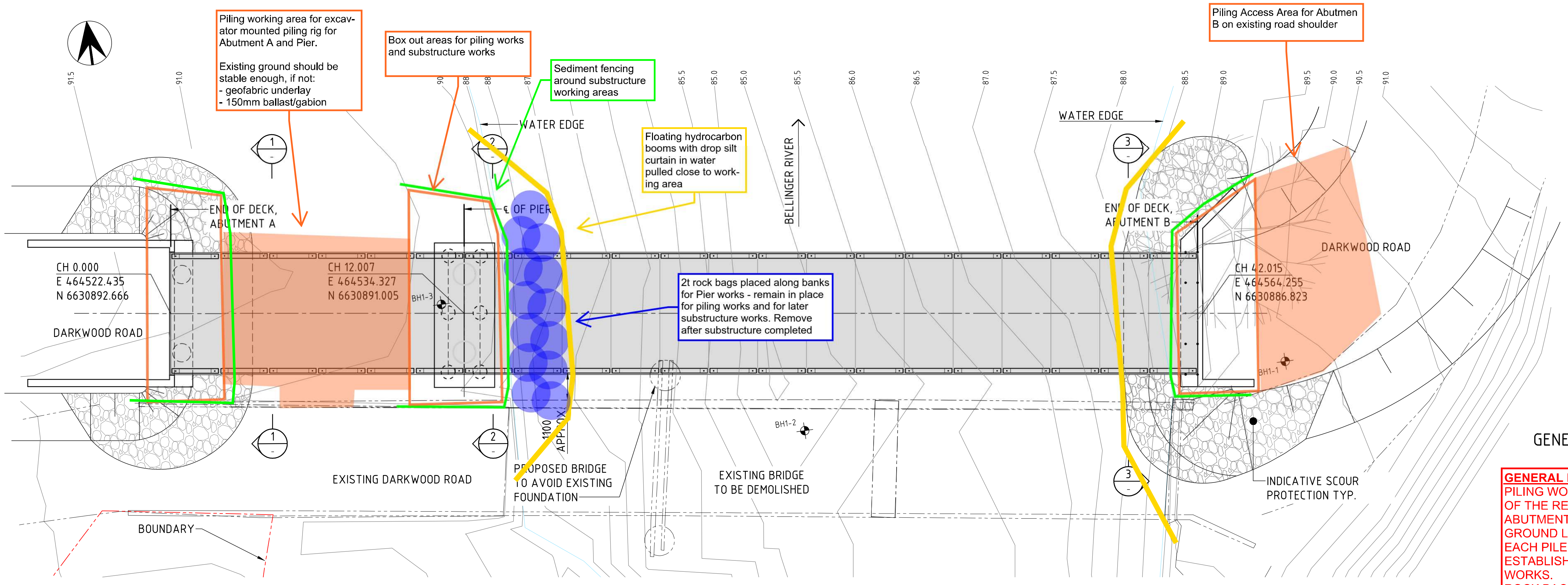

PLAN

GENERAL NOTES

GENERAL NOTE:
PILING WORKS TO OCCUR PRIOR TO PROGRESSION OF THE REMAINING STRUCTURE. BORED PILING AT ABUTMENT A AND PIER TO BE FROM EXISTING GROUND LEVEL A LIMIT TO SMALL BOX OUT LOCAL TO EACH PILE. CAP AND BACKFILL PILES UNTIL RE-ESTABLISHMENT AND PROGRESSION OF CAST IN-SITU WORKS.
ROCK BAGS TO REMAIN IN PLACE ALONG BANK EDGE FOR ONGOING STABILITY IN TIME PERIOD BETWEEN PILING AND CAST IN-SITU WORKS

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02	29/05/2023	CONCEPT DESIGN	JR	DM	CR
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DESIGN	D. MERRIKIN	C. RILEY
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PREPARED BY
bk. | bridge knowledge. ENGINEERING CONSULTING SERVICES
DANIEL MERRIKIN
STRUCTURAL ENGINEER

BELLINGEN SHIRE COUNCIL
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DARKWOOD ROAD
ADELE HOUSE
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FIXING COUNTRY BRIDGE PROGRAM
JUSTINS BRIDGE
PILING ACCESS PLAN

DRAWING SET No	BKP414-BR104
DRAWING No	BR104-DRG-02
ISSUE STATUS	CONCEPT DESIGN
ISSUE	2
No SHEETS	3
SHEET No	02

DARKWOOD ROAD 3 BRIDGES – EXAMPLE CONSTRUCTION METHODOLOGY PHOTOES

Excavator with 2t vibratory unit used to pitch steel pile liners

Excavator mounted pendulum pile boring rig with extendable Kelly bar and access ramps –

Excavator mounted rock anchor drilling setup (7-12t sized machine) with splatter screens used next to waterway

On-site grout mixing station for rock anchors up on banks away from anchors


Same smaller excavator (7t) rock anchor rig

Containment system used for pouring concrete bored piles to prevent concrete overpour entering the waterway


Kibble being used for on-site pours at headstocks near water to control concrete

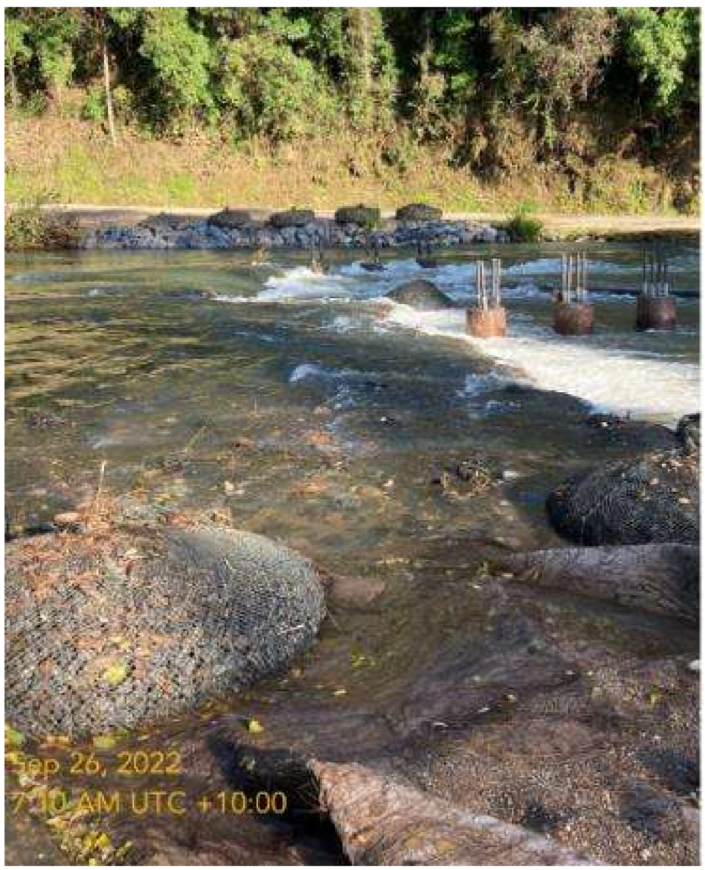
Cast in-situ headstock with elevated temporary works walkway around

Rock bags used as an access track and crane platform for landing precast components

Concrete deck pour with elevated walkway attached to bridge planks

Riverbank access ramp and working area and rock scour protection with excavator

Rock bags used to pin down geofabric with boom adjacent in water



Rock bag access track being overtopped and remaining in place without any material loss during high water flow conditions

Landing precast concrete panels onto steel girder span

2024 Darkwood Bridges Program 5.7.23 - preferred

ID	Engineer	Task Name	Duration	Start	Finish	Prede
1	**2024**	**Coastal Works - Darkwood Bridges Program 2024**	**185 days**	**Mon 1/04/24**	**Fri 13/12/24**	
2		**Site Establishment all 3 sites**	**10 days**	**Mon 1/04/24**	**Fri 12/04/24**	
3	Crew 1	Main laydown & compound setup at Hobarts + major material deliveries	5 days	Mon 1/04/24	Fri 5/04/24	
4	Crew 1	ALL 3 SITES - vegetation clearing, piling material deliveries, establish excavator access tracks for river banks, ERSD controls at first pile positions and laydown and spoil areas	5 days	Mon 8/04/24	Fri 12/04/24	3
5	Crew 2	ALL 3 SITES - establish rock bag areas - Hobarts headstock, Joyces west abutment, Justins headstock and floating booms installed	10 days	Mon 1/04/24	Fri 12/04/24	3SS
6		**Piling all 3 sites**	**25 days**	**Mon 22/04/24**	**Fri 24/05/24**	
7	Crew 1	HOBARTS - mob, rock anchors (32) drilled, grouted	5 days	Mon 22/04/24	Fri 26/04/24	14
8	Crew 1	JUSTINS - rock anchors (10) and grouted incl. move	2 days	Mon 29/04/24	Tue 30/04/24	7
9	Crew 2	HOBARTS - mob, bored piles (5), pile reo & concrete pours	5 days	Mon 22/04/24	Fri 26/04/24	14
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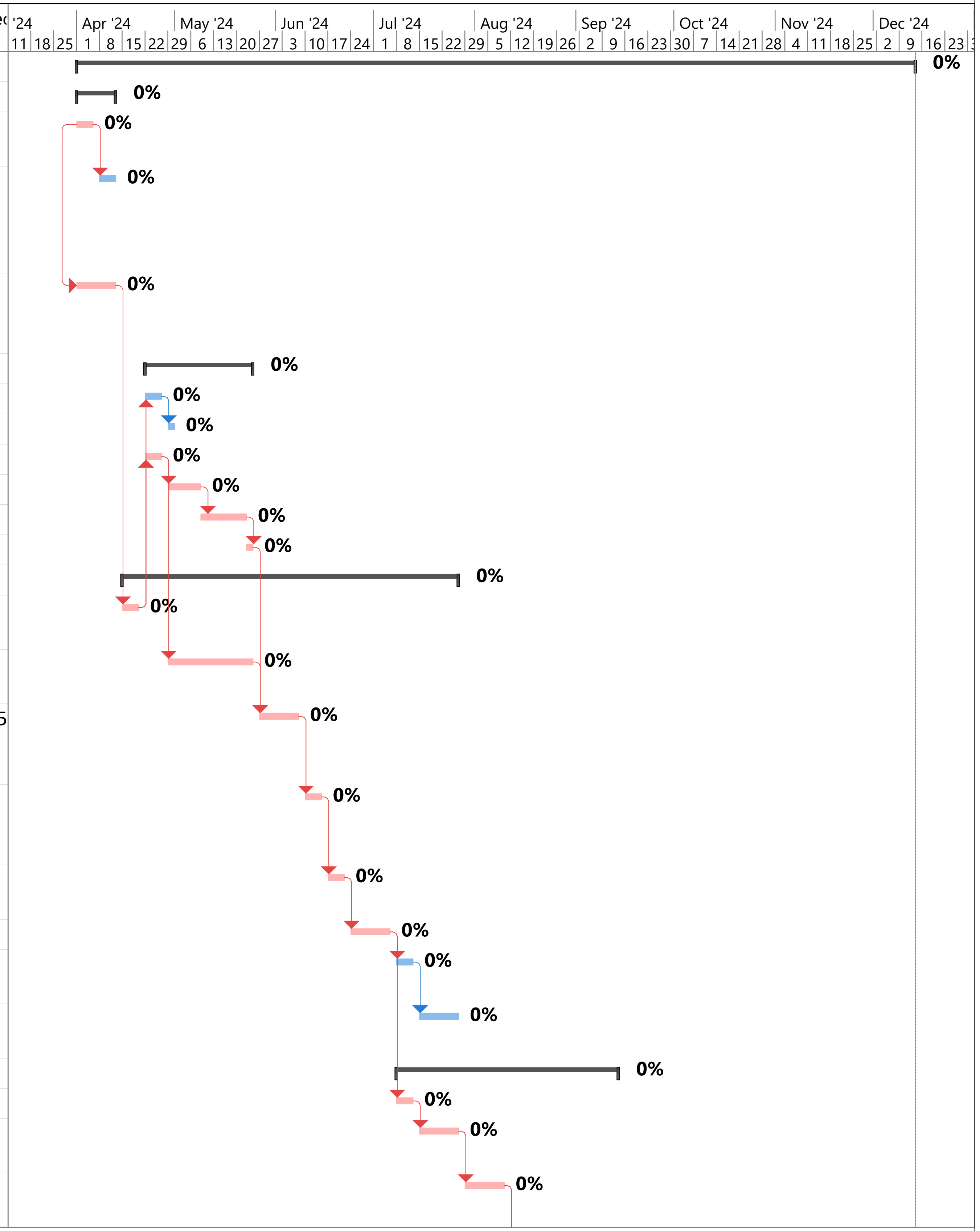
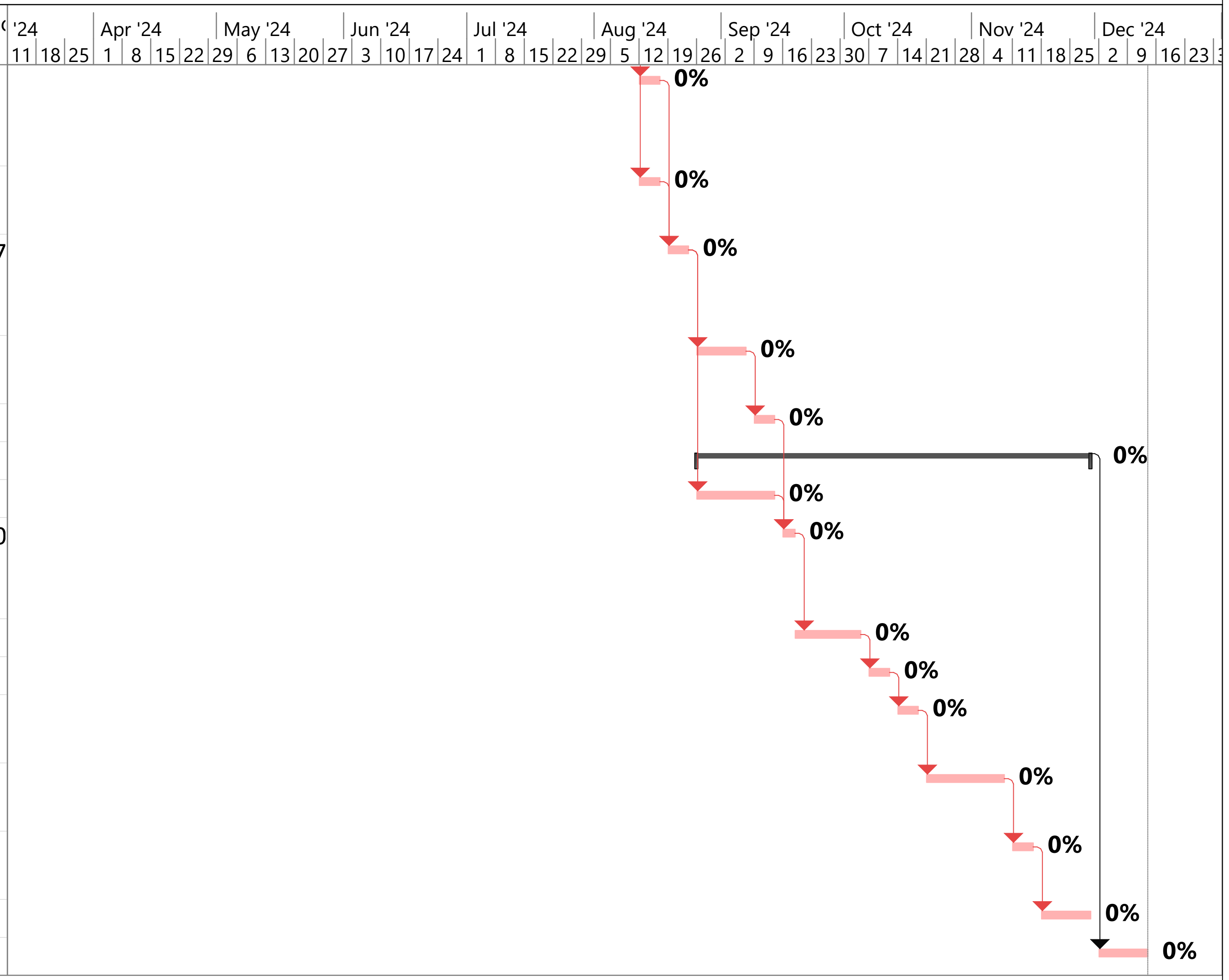
17	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove access tracks into creek, crane pads and landing prep	5 days	Mon 10/06/24	Fri 14/06/24	16
18	Both Crews	Land beams (2 days) & CoastalWorks beams stitch pours (3 days)	5 days	Mon 17/06/24	Fri 21/06/24	17
19	Both Crews	Plank span deck pour & approach slabs	10 days	Mon 24/06/24	Fri 5/07/24	18
20	Crew 2	Road works on approaches, swap traffic over, install kerbs and brackets	5 days	Mon 8/07/24	Fri 12/07/24	19
21	Crew 2	Demolition, final rock scour, full restoration, pack up & contingency	10 days	Mon 15/07/24	Fri 26/07/24	20
22		**Justins Bridge**	**50 days**	**Mon 8/07/24**	**Fri 13/09/24**	
23	Crew 1	Relocate compound from Hobarts, ERSD controls etc.	5 days	Mon 8/07/24	Fri 12/07/24	19
24	Crew 1	Cast in-situ headstocks and abutments (3) incl. elevated temporary support for headstock at start	10 days	Mon 15/07/24	Fri 26/07/24	23
25	Both Crews	Cast in-situ headstocks and abutments incl. scour rock in front of abutments	10 days	Mon 29/07/24	Fri 9/08/24	24



Critical	Split	Finish-only	Baseline Milestone	Manual Summary	Inactive Task
Critical Split	Task Progress	Duration-only	Milestone	Project Summary	Inactive Milestone
Critical Progress	Manual Task	Baseline	Summary Progress	External Tasks	Inactive Summary
Task	Start-only	Baseline Split	Summary	External Milestone	Deadline

ID	Engineer	Task Name	Duration	Start	Finish	Predecessors
26	Both Crews	Attach wingwalls, approaches general fill, strip structures, mortar pads, remove rock bags area, crane pads and landing prep	5 days	Mon 12/08/24	Fri 16/08/24	25
27	Both Crews	Steel girders deliverd and put together with franna on west side	5 days	Mon 12/08/24	Fri 16/08/24	25
28	Both Crews	Land beams and deck panels (2 days) & CoastalWorks beams stitch pour & complete steel girder deck bolting and grouting	5 days	Mon 19/08/24	Fri 23/08/24	26,27
29	Crew 1	Road works on approaches, install kerbs and brackets, swap traffic over	10 days	Mon 26/08/24	Fri 6/09/24	28
30	Crew 1	Demolition, final rock scour, full restoration, pack up	5 days	Mon 9/09/24	Fri 13/09/24	29
31		**Joyces Bridge**	**70 days**	**Mon 26/08/24**	**Fri 29/11/24**	
32	Crew 2	Precast 3x Joyces headstocks (CoastalWorks Precast Yard)	15 days	Mon 26/08/24	Fri 13/09/24	28
33	Both Crews	Relocate compound from Justins, re-install rock bag access for personnel access to headstocks only & crane pads	3 days	Mon 16/09/24	Wed 18/09/24	32,30
34	Both Crews	Cast in-situ abutments and bearing pads	12 days	Thu 19/09/24	Fri 4/10/24	33
35	Both Crews	Scour rock protection, approaches general fill	5 days	Mon 7/10/24	Fri 11/10/24	34
36	Both Crews	Land beams (2 days) & Coatalworks beams stitch pours (3 days)	5 days	Mon 14/10/24	Fri 18/10/24	35
37	Both Crews	Plank spans (2) deck pours & approach slabs & install kerb units	15 days	Mon 21/10/24	Fri 8/11/24	36
38	Both Crews	Road works on approaches, swap traffic over, install kerbs	5 days	Mon 11/11/24	Fri 15/11/24	37
39	Both Crews	Demolition, final rock scour, full restoration and pack up	10 days	Mon 18/11/24	Fri 29/11/24	38
40		**Contingency / wet weather**	**10 days**	**Mon 2/12/24**	**Fri 13/12/24**	**31**



Critical
Critical Split
Critical Progress
Task
Split
Task Progress
Manual Task
Start-only
Finish-only
Duration-only
Baseline
Baseline Split
Baseline Milestone
Milestone
Summary Progress
Summary
Manual Summary
Project Summary
External Tasks
External Milestone
Inactive Task
Inactive Milestone
Inactive Summary
Deadline

DARKWOOD 2024 PROGRAM NOTES

Coastal Works intend to undertake the 3 Darkwood Road bridges – Hobarts, Joyces, Justins – as a single program of works commencing in April 2024 to December 2024. Preferred program utilises a typical rock anchor installation small excavator rig with air drilling. Below outlines some of the key dates for the construction sequence:

Site Establishment – April 2024
- Main compound and laydown set up at Hobarts.
- Laydown and piling material deliveries at all 3 bridges.
- Vegetation clearing complete at all 3 bridges
- Establish access points down banks and first piling position at all 3 sites with rock bag setups – 1x headstock at Hobarts, western headstock at Joyces, headstock at Justins.
- Establish all piling positions at Hobarts
- Install erosion and sed controls at all 3 bridges for laydown and piling positions

Piling All 3 bridges – April to June 2024
- Start at Hobarts with the two piling setups concurrently, one 7t excavator rock anchor setup and one 24t excavator for bored piles – aim for completion all in 1 week
- Both setups to move onto Justins Bridge – rock anchor completed in 3 days and setup demobilised from site, bored piles continue – 1.5 weeks
- Bored piling setup moves onto Joyces bridge last, first at previously established western side access which is then removed and established on the east side for completion – 2 weeks
- Coastal Works crews with an excavator to follow the piling crews to manage laydowns, modify the access requirements, remove piling spoil and maintain and adjust environmental controls.
- Coastal Works crew complete the bored pile pours progressively along with the contractor
- Justins site rock bags to remain at headstock to remain, Joyces river access completely removed.

Hobarts Main Bridge Construction – May – August 2024
- Cast in-situ substructure works (6 weeks) to commence in May with one CoastalWorks crew once all piling is completed and piling is continuing at the other sites.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in June.
- Superstructure to be landed, poured, and completed in July with both crews.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in late July and into August.

Justins Main Bridge Construction – July – September 2024
- Relocate main compound setup from Hobarts to Justins in late July once the Hobarts superstructure is completed with second CoastalWorks crew.
- Cast in-situ substructure works (4 weeks) to commence in August with one CoastalWorks crew and completed by both crews once Hobarts is completed.
- Scour rock at abutments placed, rock bags removed, access tracks to the riverbank removed, crane positions established, and abutment backfill completed in late August.
- Superstructure to be landed, poured, and completed in early September.
- One CoastalWorks crew to complete the roadworks, remaining scour rock protection, demolition, and restoration in September.

Joyces Main Bridge Construction – July – September 2024
- While Justins being finished, 3x precast headstocks made with second crew at Precast Yard.
- Relocate main compound setup from Justins to Joyces in October and reinstate rock bag access to the headstocks for personnel only and crane pads positions for landing precast components.
- Cast in-situ abutments (2 weeks) to be completed in October with both crews.
- Scour rock at abutments placed and abutment backfill completed in late October.
- Superstructure to be landed, poured, and completed by mid-November with both crews.
- Remove rock bags and bank access and complete the roadworks, remaining scour rock protection, demolition, and restoration in late November and December.

Appendix G

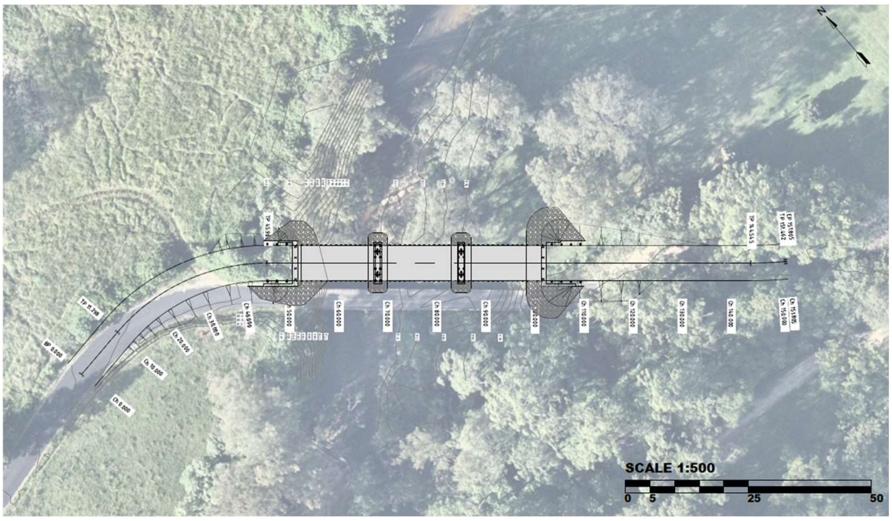
Duffys Bridge Construction Methodology

DUFFYS BRIDGE REPLACEMENT

Project Description

Bellingen Shire Council (BSC) are replacing Duffys Bridge over the Kalang River on Kalang Road, Kalang under the Fixing Country Bridges Program (Round 2B). The works will be self-performed by the BSC bridge teams with some specialised construction activities under contract works.

The existing single lane 44m four span, timber bridge will be removed and replaced adjacent with a new dual lane 51.6m bridge consisting of three spans, all concrete bridge on an improved alignment downstream. The site is located approx. 7km west of Bellingen, is highly flood prone and is in potential key habitat for the Bellinger River Snapping Turtle.



Existing Timber Bridge

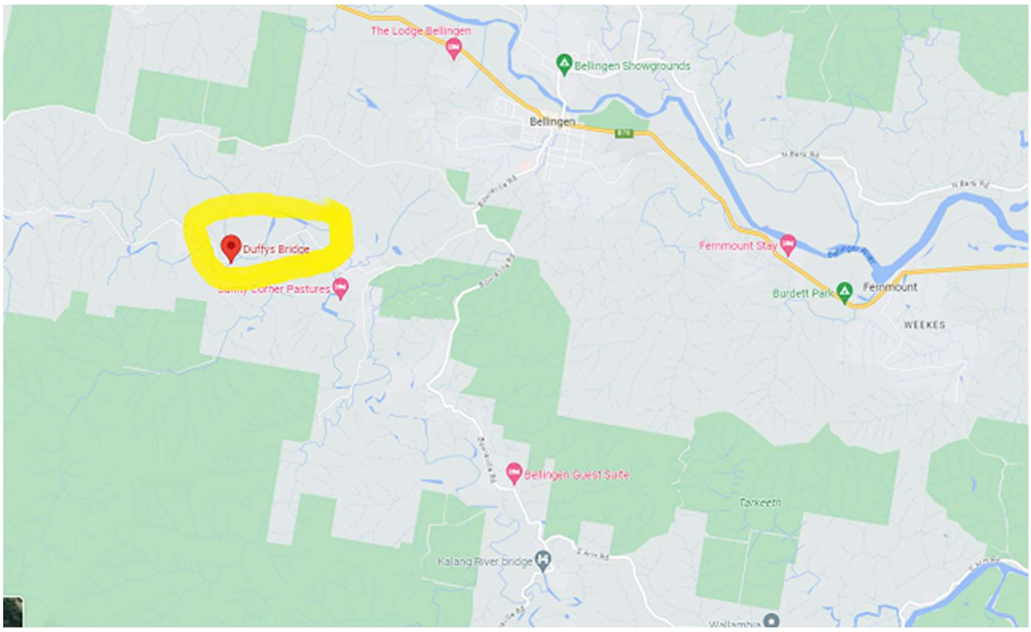
Form of Construction

Foundations – 24 x driven piles to an estimated depth of 5-7m, into moderately and slightly weathered Metasiltstone which based off geotechnical investigations in between 4-8m from ground level.

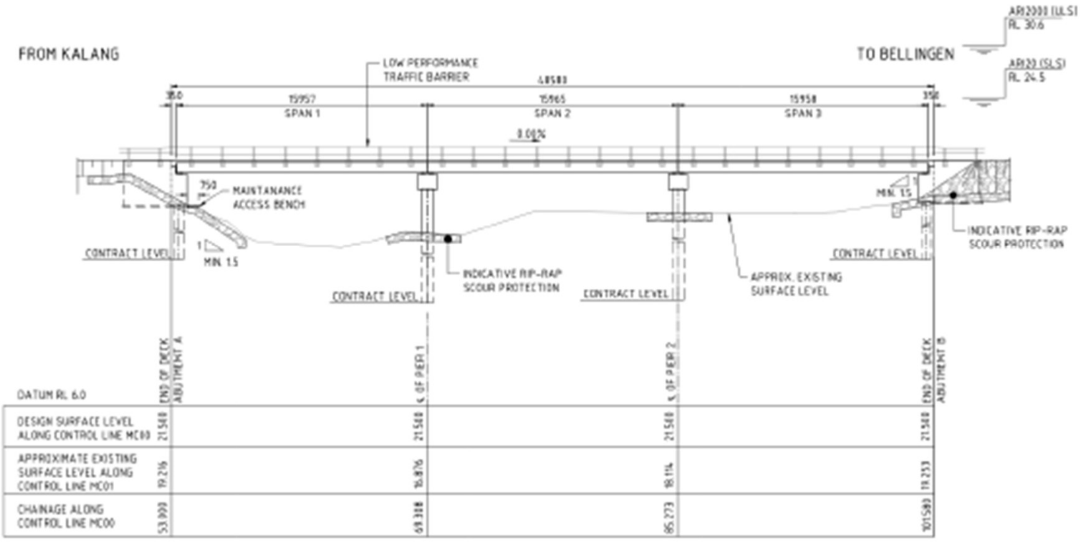
Substructure – Cast in-situ reinforced concrete abutments, pile caps, columns and headstocks throughout.

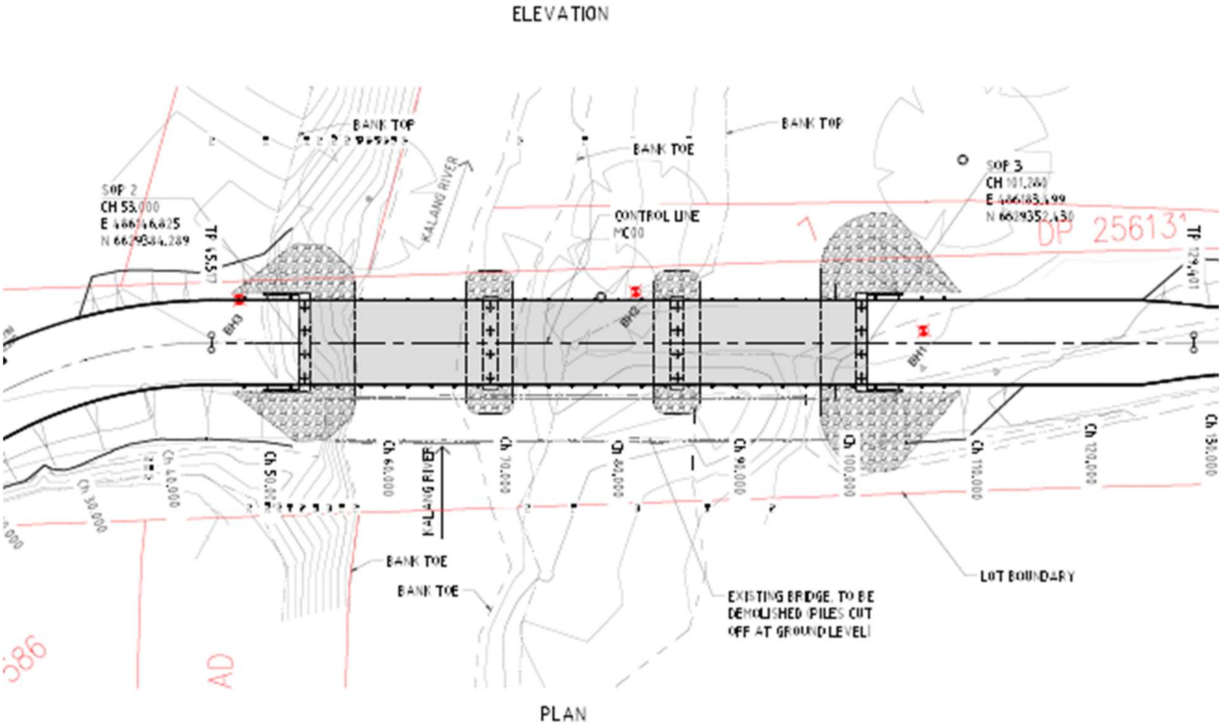
Superstructure - Three spans using 17m PSC pre-stressed bridge planks, and a cast in-situ deck pour and side mounted guard rail.

Road approaches – 50m on either side to tie into existing road, two coat bitumen seal, 7.2m wide plus shoulder and fill formations, open swale drains.



Location Map





New Bridge Design

Construction Methodology & Sequence

Works within Low Risk works period - Start February 2025

1) Establishment:
    a. Set up compound, laydown and stockpile areas on high ground (road reserve and private property) on the northern side of Kalang River and the Kalang Road shoulder on the eastern approach off the road and above the high-water flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones,
    c. Installation of erosion and sediment controls for piling and river access ramps including booms in the water,
    d. Delivery of all piling and cast in situ work materials/formwork,
    e. Delivery of pre-filled rock bags,
    f. Establish bunded concrete washout and spoil areas at laydown area.

Works within high Risk works period - Start March to End of June 2025

2) Access to riverbed from high banks:
    a. Clear and grub vegetation and topsoil from ramp areas, stockpile away from river for later rehabilitation works or remove from site,

b. On Bellingen side (East) side, the access ramp is to be immediately downstream of the abutment down to existing stable alluvial material.
c. Access to both Pier sets to be from the East side.
d. Pier 2 is located above the low flow channel and will be accessed from the access ramp with excavation to achieve the design levels for piling. This work will be outside of the water.
e. Pier 1 is located on the edge of the low flow channel and will be accessed from the access ramp with clean rock bags around the perimeter of the piles and to be placed to bridge any ponding water or low points between Pier 1 and Pier 2.
f. Access ramps to be constructed with:
    i. Geofrabric underlay – extra length on the upstream side that can be used to wrap over the ramp and pinned down with rock bags during high flow events to prevent wash out,
    ii. 150mm thick, clean imported ballast (40-60mm) and/or gabion (50-200mm)
g. Place scour rock across the face of abutments.

<u>3) Prepare piling areas prior to piling contractor mobilization:</u>

a. At Pier 1 / 2 (8 driven piles per pile cap) – blinding slab to be used to aid in keeping piles in correct position, seal the excavation and providing a slab for the cast in-situ pile caps
    i. Pier 1 - Place approximately 10 rock bags (or as required) wrapped in geofabric along the edge of the low flow creek line to pin down the edge of the alluvial riverbed material and provide containment for the working area.
    ii. Pull floating hydrocarbon boom tight to the water side of the rock bags and install sediment fencing around the inside of the bag rim,
    iii. Over a 10m x 2m area over the footprint of the bored piles, excavator to dig down 0.3m to remove any larger cobbles and reach the underside of blinding layer
    iv. Level off adjacent area for positioning of piling excavator,
    v. Bench excavation for stability if needed and install edge delineation.
    vi. Inside the rock bags if water is present, sandbags to be placed above water level, then line with multiple layers of building plastic on the inside and then timber formwork on top of this in the water. Use a sucker truck to remove water from inside this corner as it is displaced by the concrete pour,
    vii. Pour a 100mm deep reinforced concrete blinding slab 10m x 2m to approximately underside of abutment level.

b. Abutments (4 x 2 driven piles)
    i. Box down to underside of abutment plus 100mm for blinding layer, remove spoil to stockpile areas,
    ii. Level off adjacent area for positioning of piling excavator,
    iii. Bench excavation for stability if needed and install edge delineation.

4) Driven piling works

a. Plant & equipment –32t excavator with a 5t hammer attachment or 30t excavator and crane with drop hammer (subject to contractor)
b. Pier 1/2 – excavator has the flexibility to position itself from the eastern side of the pile locations on both pier sets on the existing river gravel shelf.
c. Abutment A/B – excavator positioned on existing high ground behind abutment,
d. The excavator mounted vibratory head or excavator with grabs is used to install steel piles into the correct position. Once piles are standing in position the piles are driven to design depth with a drop hammer.
e. Piles are cut off to required length

6) Cast in-situ concrete sub-structure (pile caps):

a. Reinforcement placed and tied in place by hand on blinding at abutments and piers all above low flow water level.
b. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
c. 32m length concrete boom pump to be positioned outside of the riverbed on the existing road approaches or access ramps to pour all substructure works. Pump and concrete trucks to be brought to the respective sides of the river for pours so the boom line is not over the waterway at any time. Concrete washout to either be off site or in established area up at the compound for later removal from site.
d. Strip all formwork after concrete curing period,

7) Cast in-situ concrete sub-structure (Columns and Headstocks):

a. Reinforcement placed and tied in place by hand in columns all above low flow water level.
b. Formwork pre-made and placed with excavator or Franna
c. Form and pour columns, from Scaffold or Elevated Work Platform if required.
d. Install falsework / scaffold around columns for headstock access.
e. Reinforcement placed and tied in place by hand from scaffold
f. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
g. 32m length concrete boom pump to be positioned outside of the riverbed
h. bearing pad level for piers,
i. Complete mortar pads by hand mixed mortar to finish all substructures.
j. Place scour rock around piers

Works within Medium Risk works period - Start July to End of September)

8) Cast in-situ concrete sub-structure (abutments)

a. Follow sequence from Item 6

9) Place scour rock around abutments

Place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks. Excavator to place scour rock from established access ramps and then from behind abutments out of the riverbed area.

10) General fill and drainage zone behind abutments

Place and compact area immediately behind abutments up to underside of approach slabs. Maintain access to existing bridge for road traffic. All trucks, rollers and excavators out of the creek and sediment fencing along the whole bank lines to contain from any wet weather during this period.

11) Establish crane pads – Crane pads on access ramp on Eastern side for span 2 and Span 3. Crane pad to be established behind abutment for Span 1 lift.

12) Land all precast beams and planks and tie cast in-situ deck – sealed soffit formwork to be used between planks and beams to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Temporary access platforms to be installed along the outside edges for the 17m plank span for access and edge formwork.

13) Pour beam and deck pours – Boom pumps to be again used from the respective sides without putting the line over the waterway. Curing of the deck pour to be done with clean water, soaker hoses and hessian.

Works within Low Risk works period - Start October

14) Install bridge barriers onto plank spans

15) Remove temporary works from headstocks and plank span – use Franna crane and or HIAB truck on the new deck to lift out and load directly to laydown area.

16) Complete approach roadworks – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

Works within High Risk works period – Start April

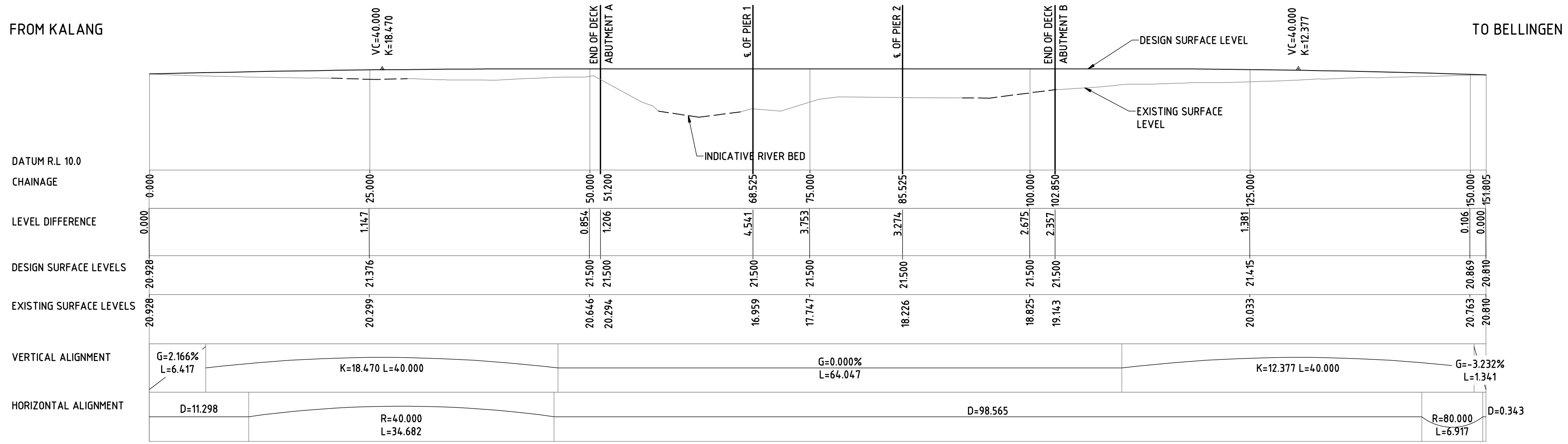
17) Demolish original timbe bridge:

a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers.
b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing timber decking first followed by girders for each span.
c. Once deck fully removed, remove timber headstocks by cutting piles and lift directly with crane onto truck or ground for further disassembly
d. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

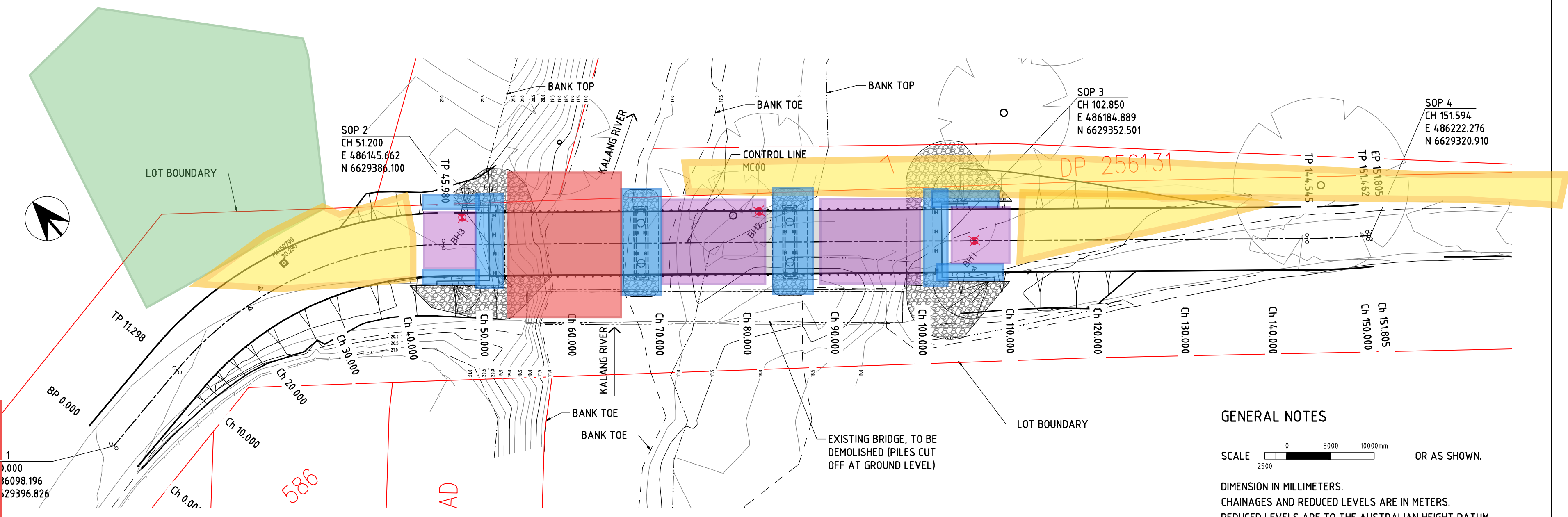
18) Complete rock scour protection – on up and downstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

19) Demobilise construction activities – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.

Site Establishment and Piling Works



LONG SECTION – ALONG MC00



PLAN

Red area - No access zone - low flow channel

Blue area - Piling and pile cap excavation limits

Green area - Site shed and laydown (not for stockpile of materials which is at council depot)

Yellow area - Access ramps to work zones

Purple area - piling excavator to be positioned on embankments out of any low flow water

GENERAL NOTES

SCALE 0 2500 5000 10000mm OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION.

FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
A	06/02/2024	ISSUE FOR CONSTRUCTION	JR	DM	CR

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DESIGN	YH. TANG	D. MERRIKIN
DRAWING	J. REN	D. MERRIKIN

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BRIDGE KNOWLEDGE

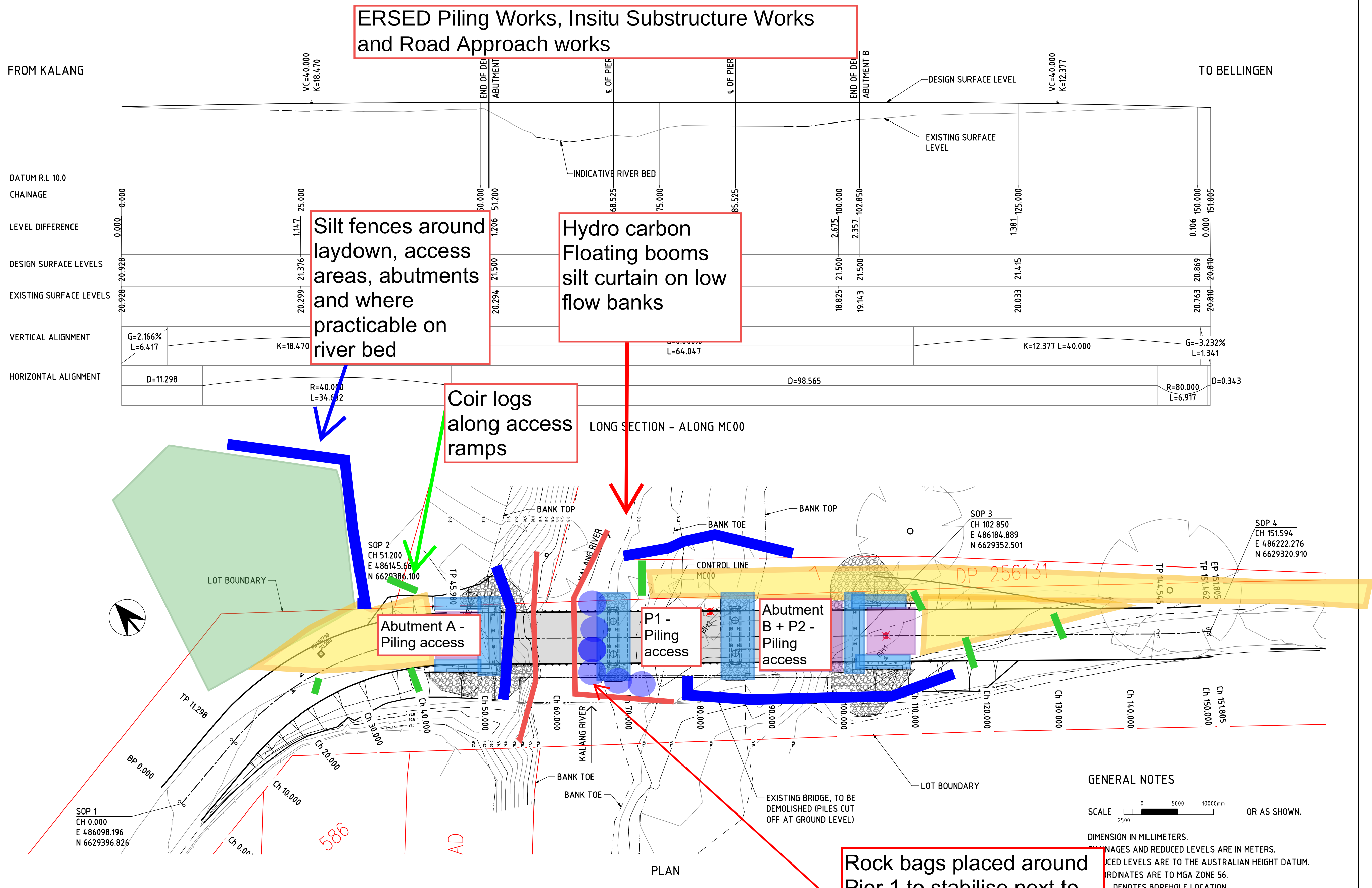
BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

KALANG ROAD — BELLINGEN SHIRE COUNCIL

DUFFYS BRIDGE REPLACEMENT
OVER KALANG RIVER

ROAD DESIGN - LONG SECTION AND PLAN

DRAWING SET No	BKP458
DRAWING No	DRG-002
ISSUE STATUS	ISSUE FOR CONSTRUCTION
ISSUE	A
No SHEETS	22
SHEET No	02



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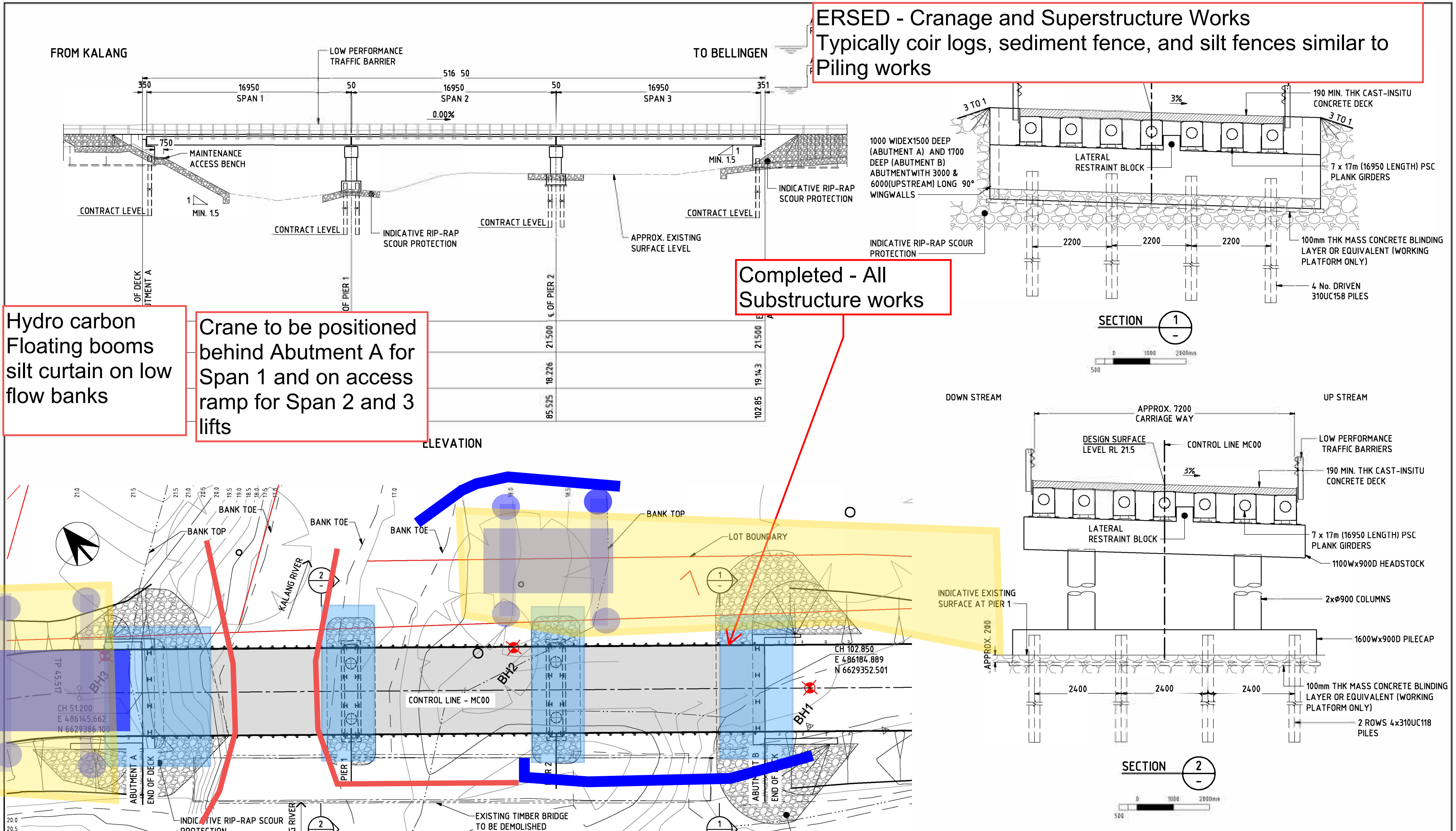
DUFFYS BRIDGE REPLACEMENT OVER KALANG RIVER

ROAD DESIGN - LONG SECTION AND PLAN

DRAWING SET No: BKP458
DRAWING No: DRG-002
ISSUE STATUS: ISSUE FOR CONSTRUCTION
ISSUE: A | No SHEETS: 22 | SHEET No: 02



GENERAL NOTES

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REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

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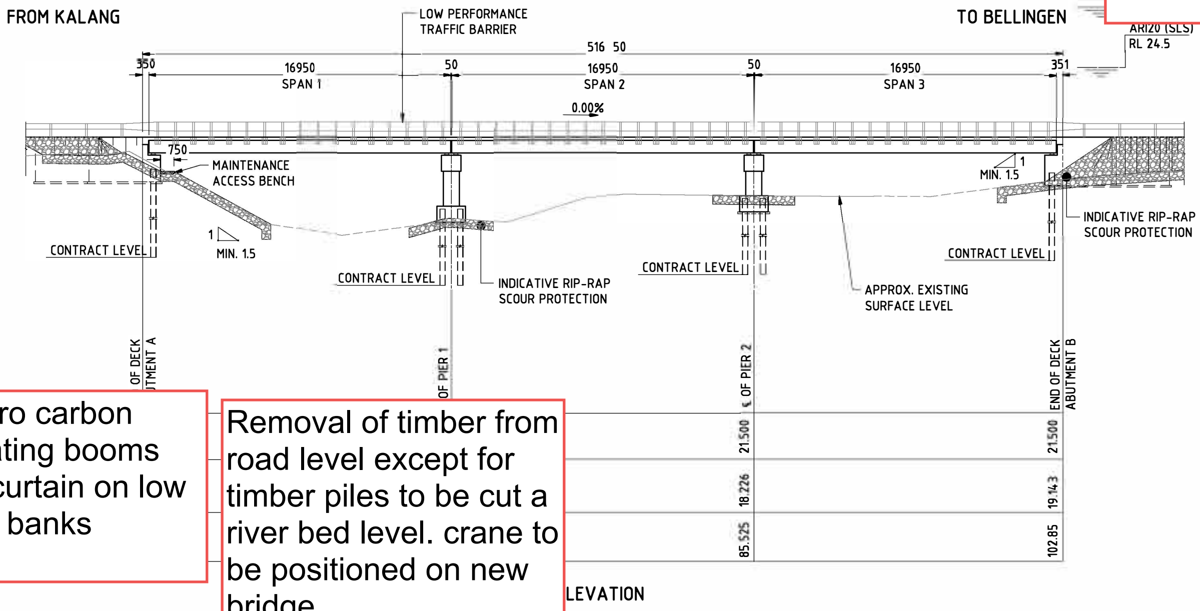
DUFFYS BRIDGE REPLACEMENT OVER KALANG RIVER

GENERAL ARRANGEMENT

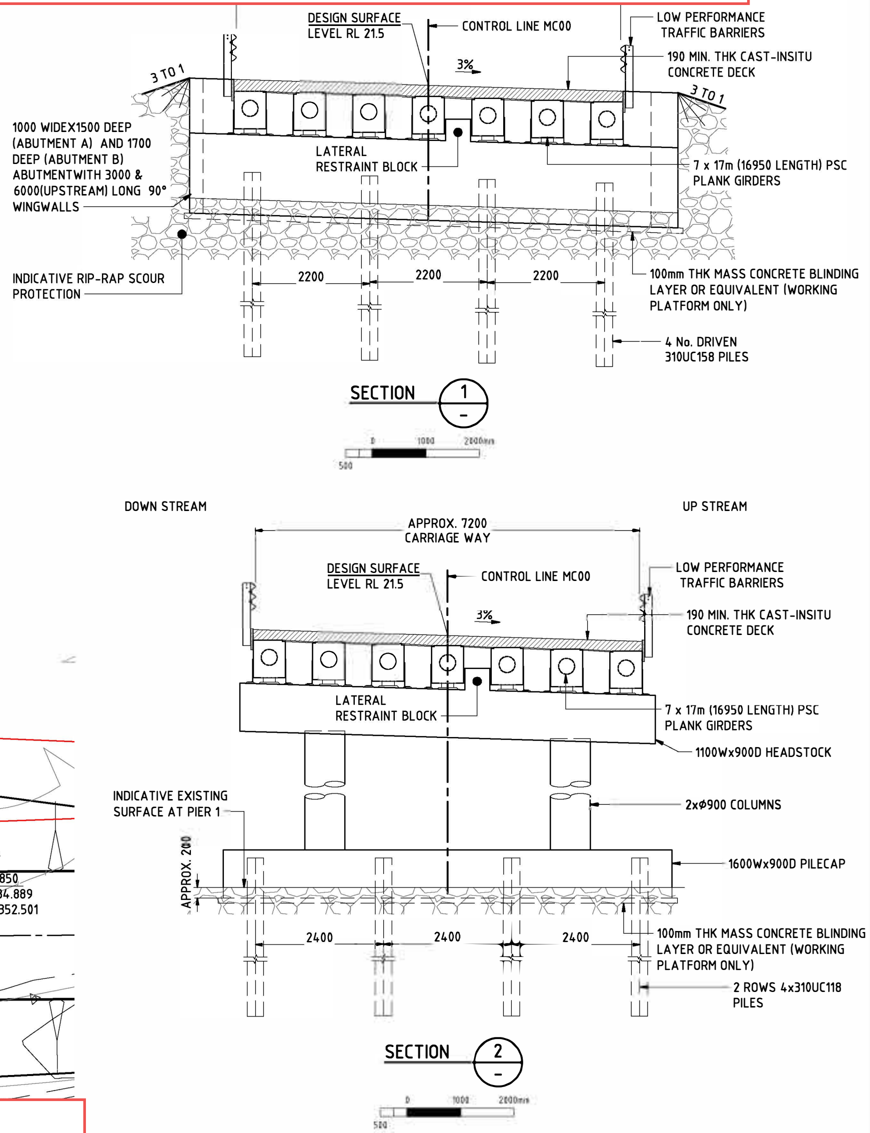
DRAWING SET No	BKP458
DRAWING No	DRG-05
ISSUE STATUS	ISSUE FOR CONSTRUCTION
ISSUE	A
No SHEETS	22
SHEET No	05

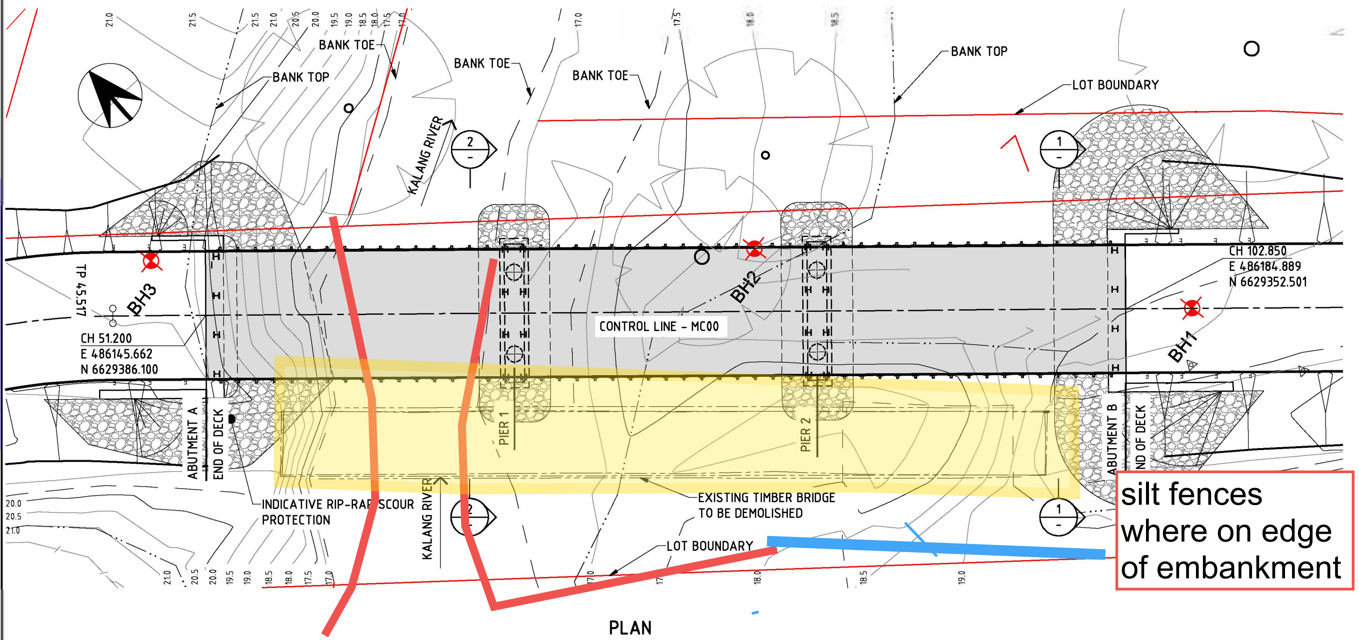
ERSED - Timber bridge removal



Hydro carbon Floating booms silt curtain on low flow banks

Removal of timber from road level except for timber piles to be cut a river bed level. crane to be positioned on new bridge





silt fences where on edge of embankment

GENERAL NOTES

SCALE 0 2500 5000mm 1000 OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

FOR CONSTRUCTION

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A	06/02/2024	ISSUE FOR CONSTRUCTION	JR	DM	CR

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DRAWING	J. REN	D. MERRIKIN

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BRIDGE KNOWLEDGE

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BELLINGEN SHIRE COUNCIL

KALANG ROAD — BELLINGEN SHIRE COUNCIL

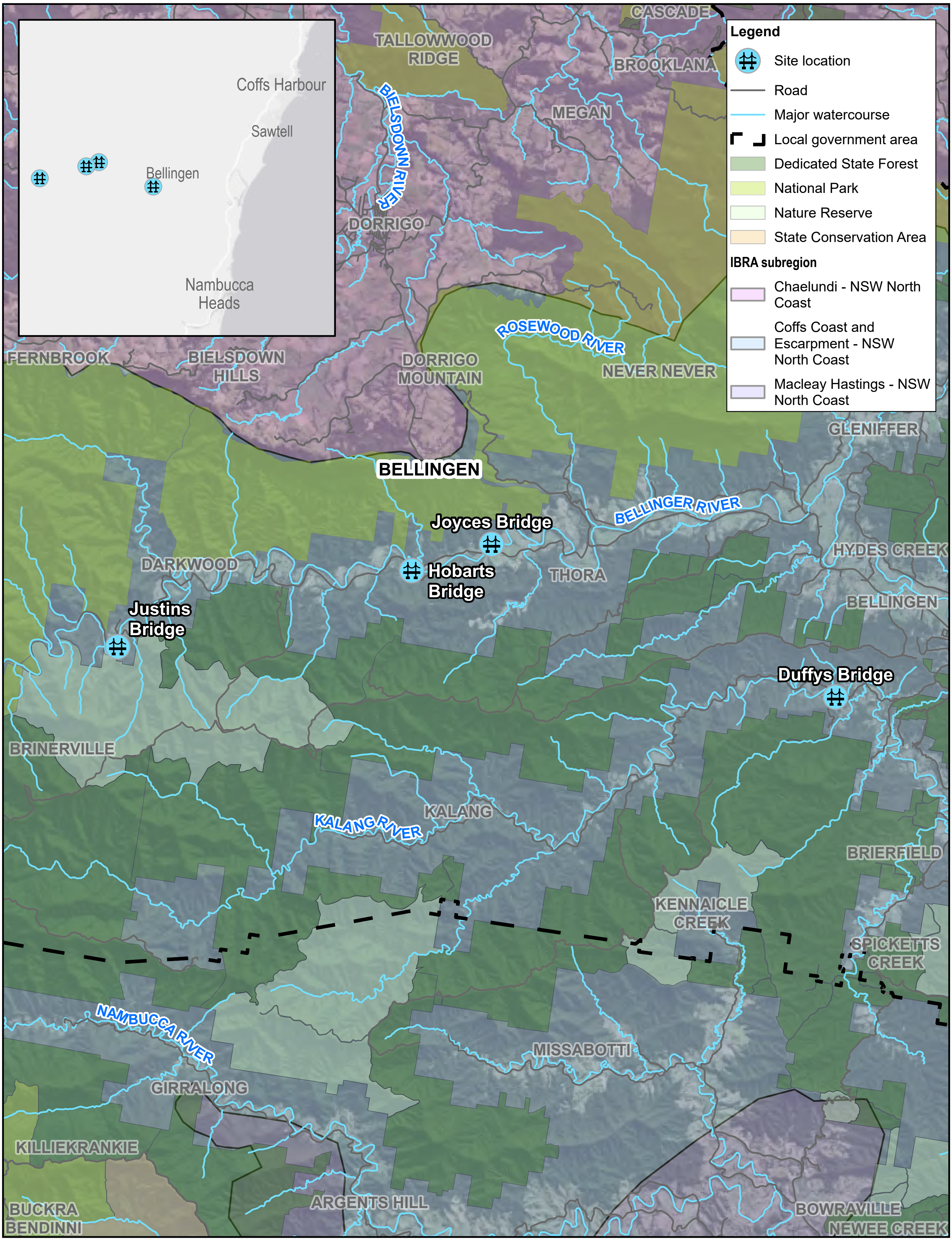
DUFFYS BRIDGE REPLACEMENT OVER KALANG RIVER

GENERAL ARRANGEMENT

DRAWING SET No: BKP458
DRAWING No: DRG-05
ISSUE STATUS: ISSUE FOR CONSTRUCTION
ISSUE: A | No SHEETS: 22 | SHEET No: 05

Appendix H

Environmental Management Plan



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Map Projection: Transverse Mercator
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Grid: GDA2020 MGA Zone 56

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Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

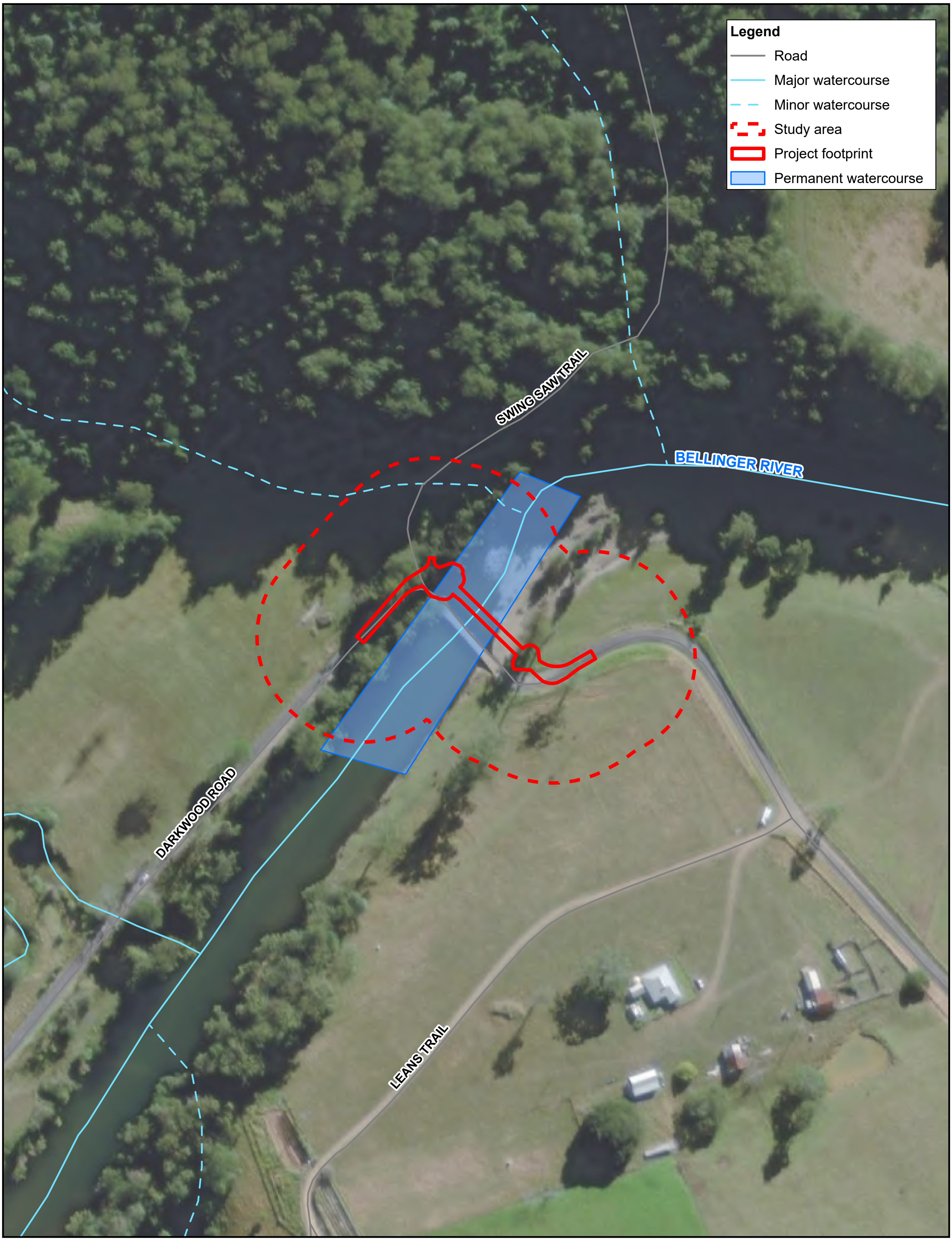
EPBC No. **2024/09805**
Project No. **12611463**
Revision No. **A**
Date **25/01/2024**

Project location

FIGURE 1

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_001_ProjectLocation
Print date: 25 Jan 2024 - 10:10

Data source: World Imagery: Earthstar Geographics
World Light Gray Canvas Base: Esri, HERE, Garmin, USGS. GHD: site locations (2023); NSWSS: roads, watercourse, suburbs (2023); DCCEEW: IBRA (2023); DFSI: reserves (2024); SEED: state forest (2018).
Created by: thunt2



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

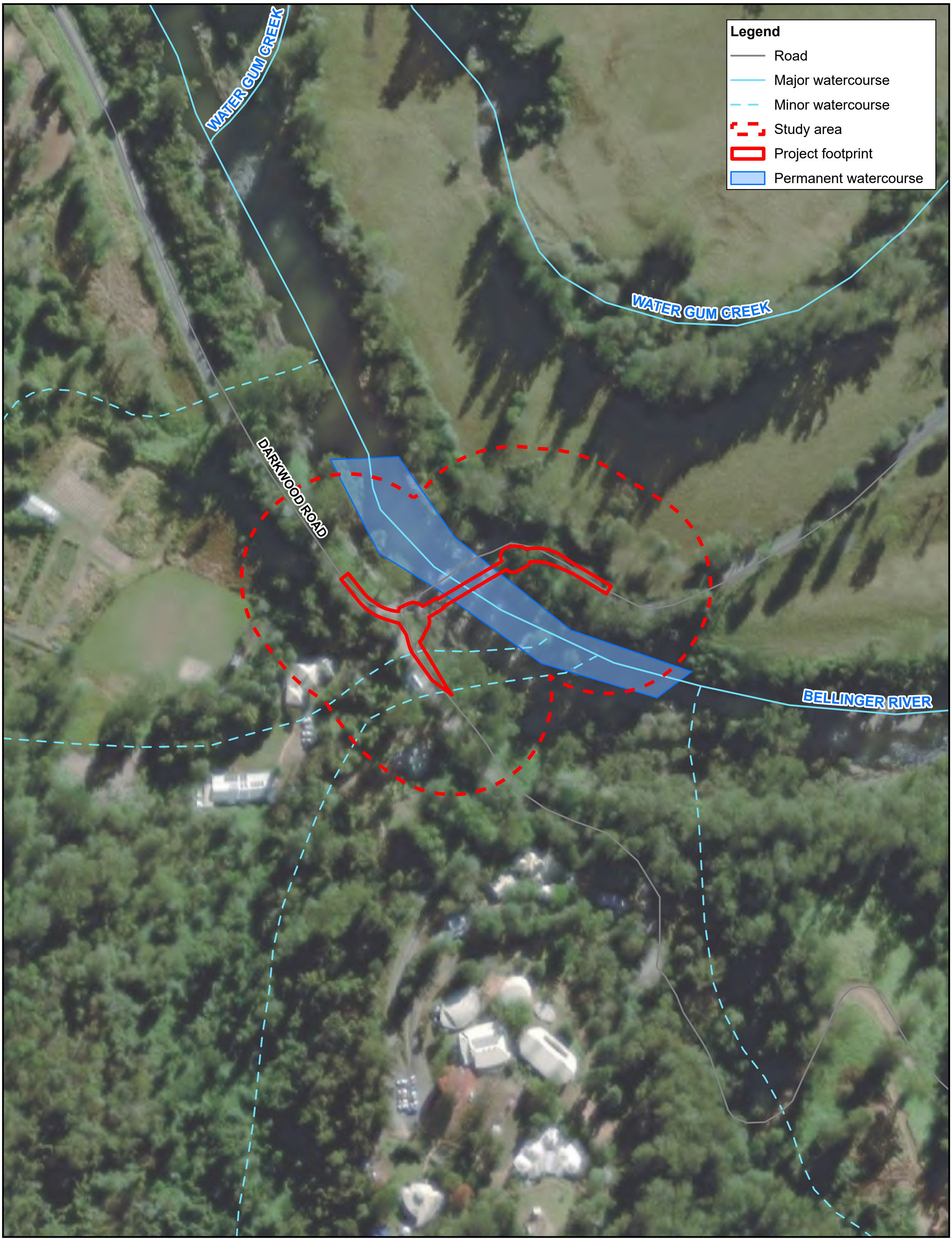
Joyces Bridge
Bellinger River snapping turtle
Survey results and mapped habitat

Project No. **12611463**
Revision No. **A**
Date **25/01/2024**

FIGURE 2

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_003_SnappingTurtle
Print date: 25 Jan 2024 - 10:15

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint (2024); NSWSS: roads, watercourse (2023), water feature (2024).
Created by: thunt2



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

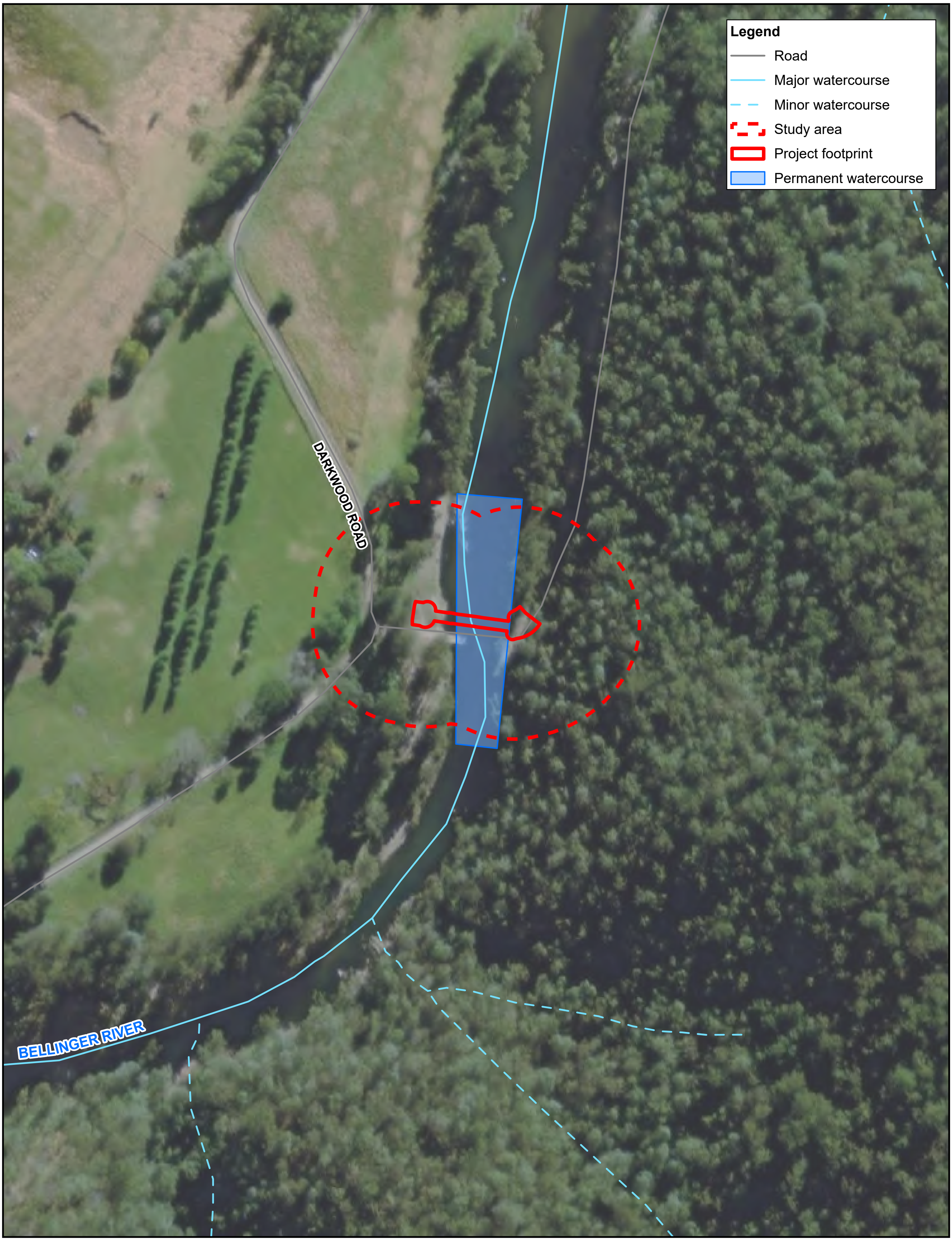
Hobarts Bridge
Bellinger River snapping turtle
Survey results and mapped habitat

Project No. **12611463**
Revision No. **A**
Date **25/01/2024**

FIGURE 3

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_003_SnappingTurtle
Print date: 25 Jan 2024 - 10:15

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint (2024); NSWSS: roads, watercourse (2023), water feature (2024).
Created by: thunt2



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

Justins Bridge
Bellinger River snapping turtle
Survey results and mapped habitat

Project No. **12611463**
Revision No. **A**
Date **25/01/2024**

FIGURE 4

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_003_SnappingTurtle
Print date: 25 Jan 2024 - 10:15

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint (2024); NSWSS: roads, watercourse (2023), water feature (2024).
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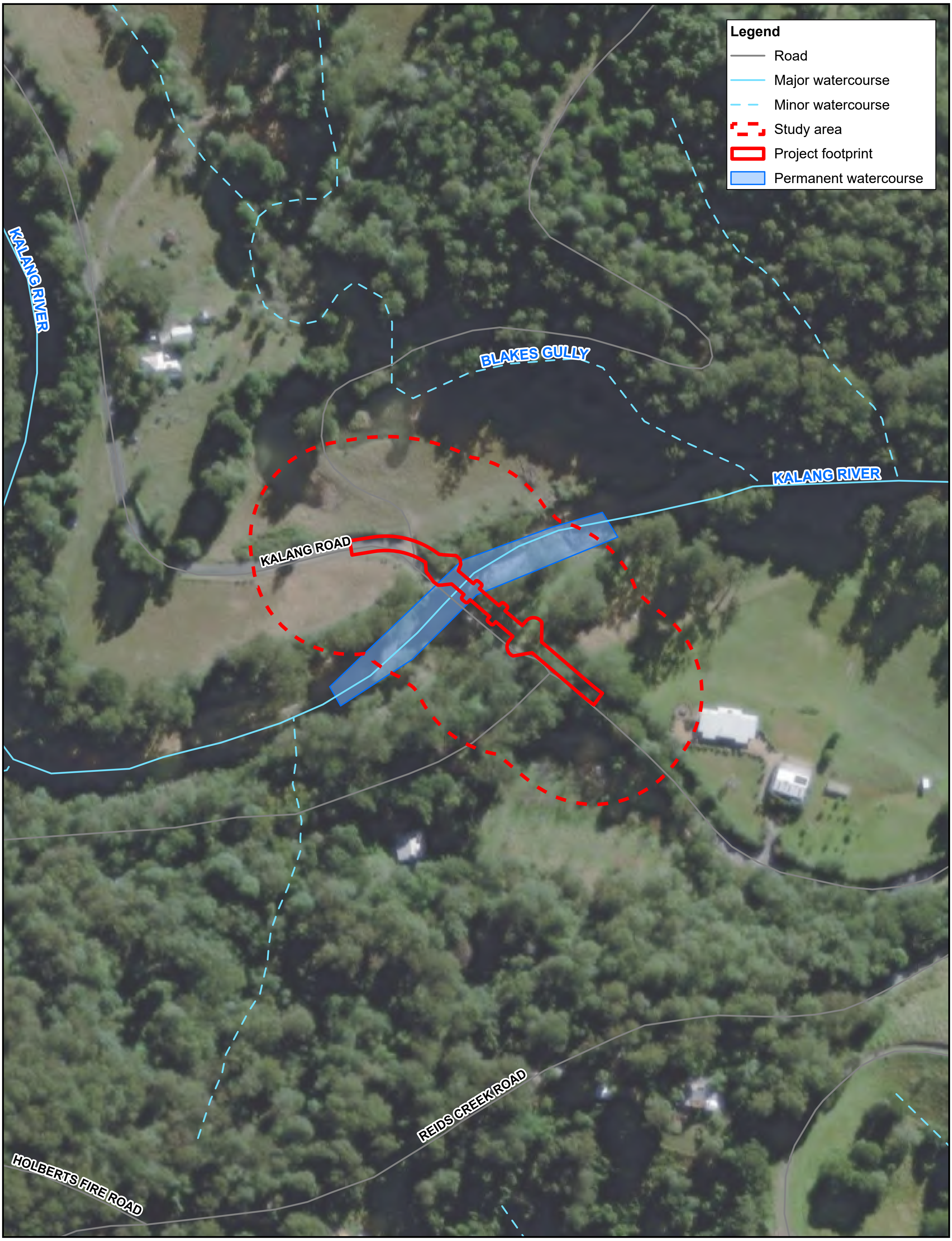

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

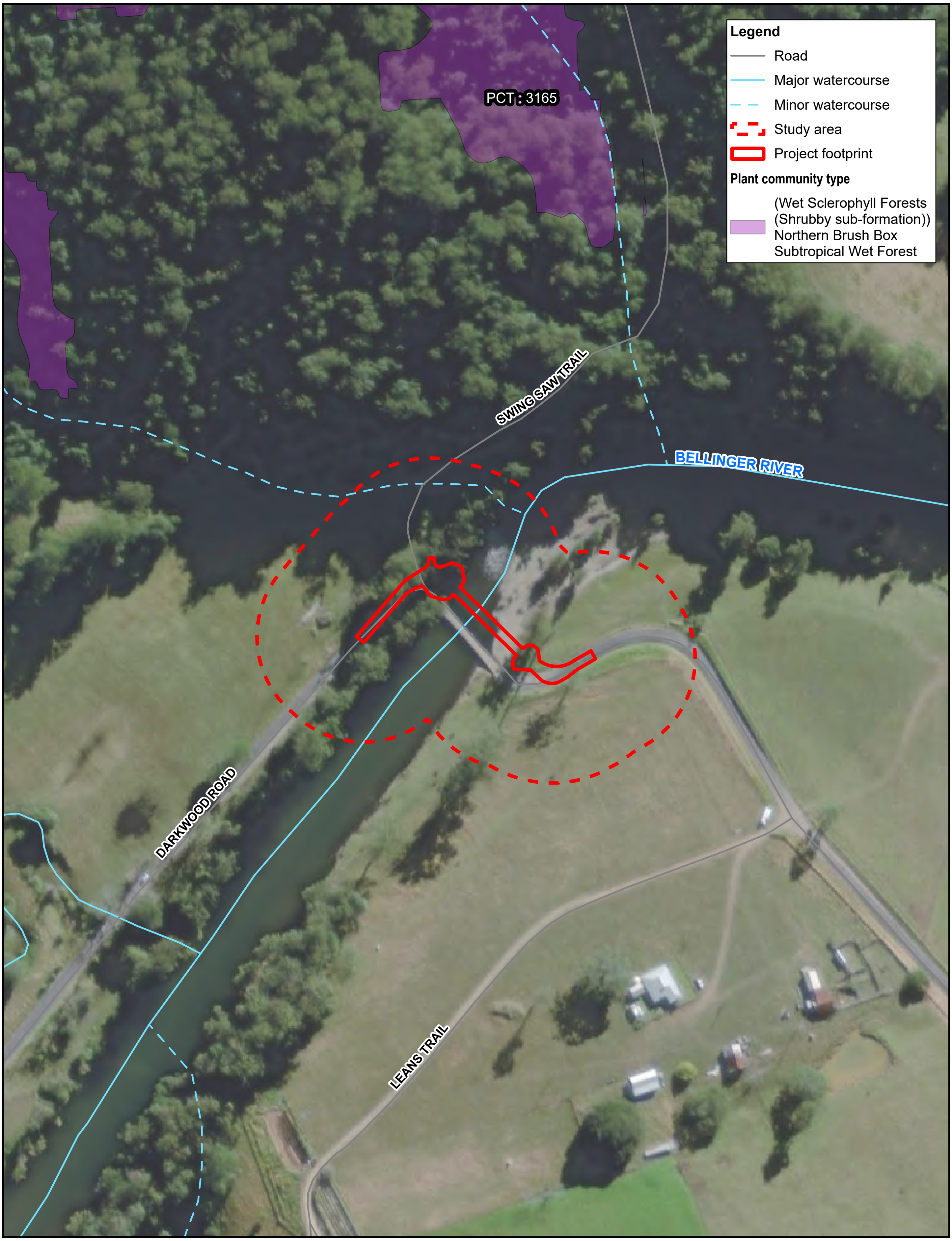
Duffys Bridge
Bellinger River snapping turtle
Survey results and mapped habitat

Project No. **12611463**
Revision No. **A**
Date **25/01/2024**

FIGURE 5

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_003_SnappingTurtle
Print date: 25 Jan 2024 - 10:15

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint (2024); NSWSS: roads, watercourse (2023), water feature (2024).
Created by: thunt2



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

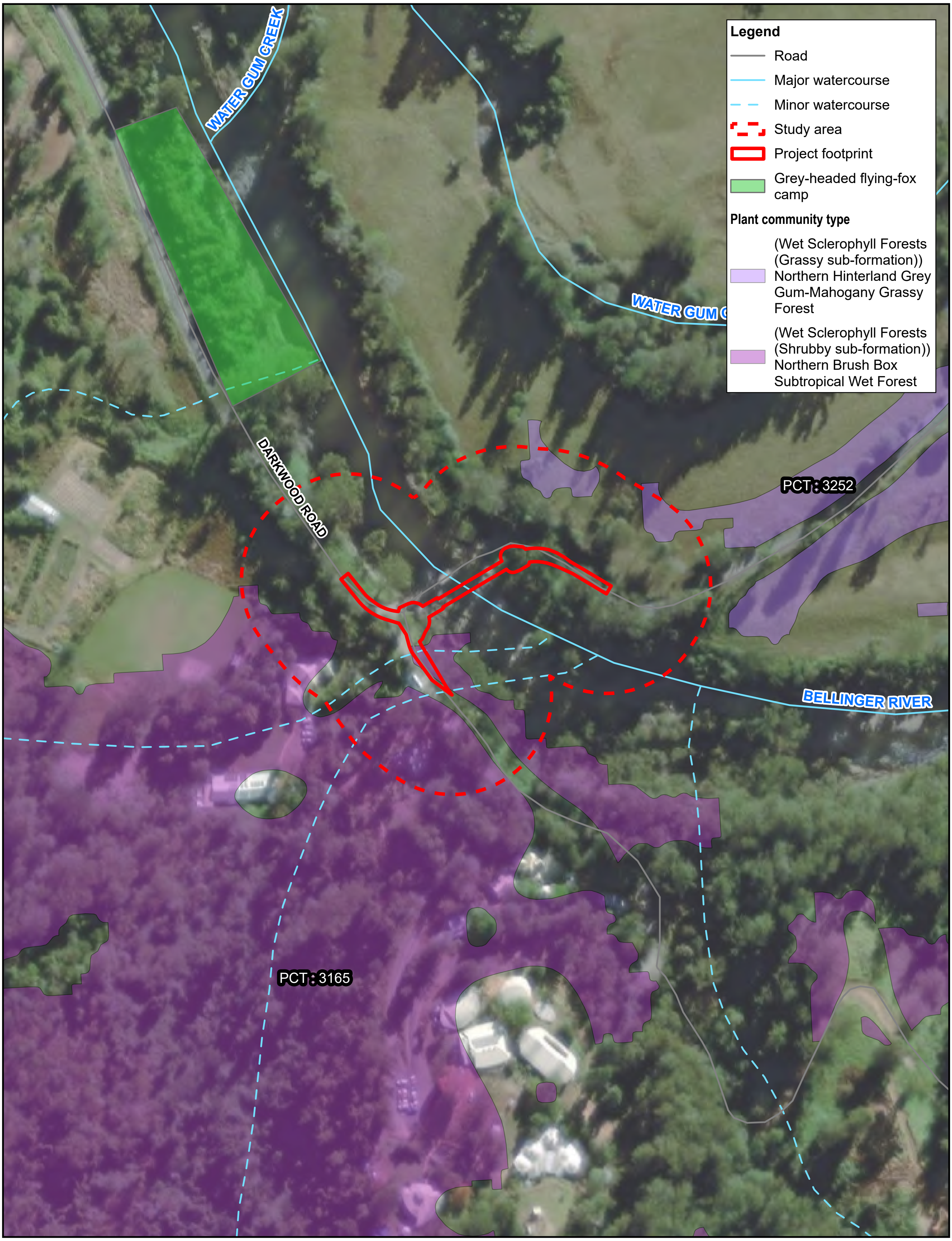
Joyces Bridge
Grey-headed flying-fox Survey results and mapped habitat

Project No. 12611463
Revision No. A
Date 25/01/2024

FIGURE 6

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_004_FlyingFox
Print date: 25 Jan 2024 - 10:44

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: thunt2



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

Hobarts Bridge
Grey-headed flying-fox Survey results and mapped habitat

Project No. **12611463**
Revision No. **A**
Date **29/01/2024**

FIGURE 7

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_004_FlyingFox
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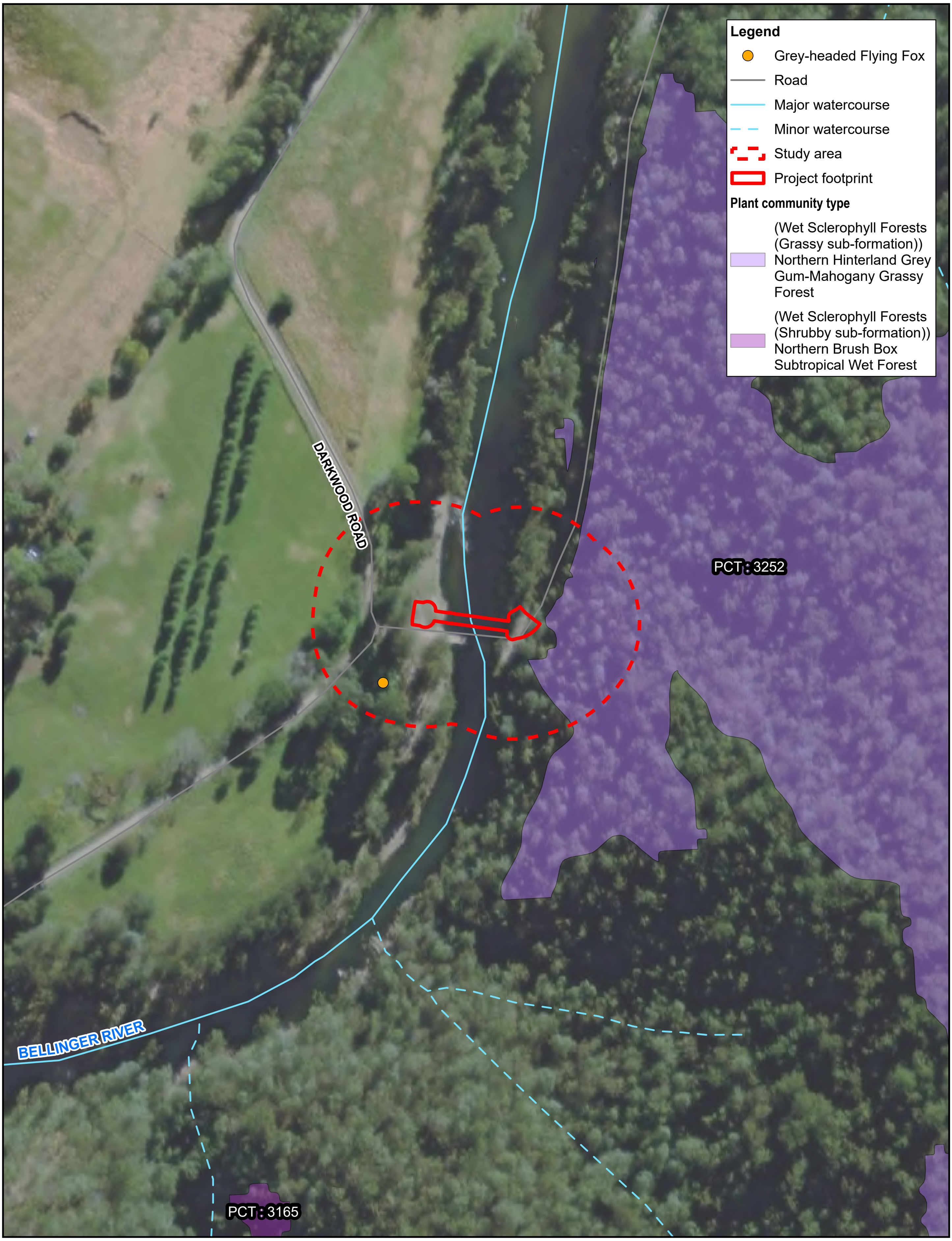
Created by: thunt2



Paper Size ISO A4

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Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

Justins Bridge
Grey-headed flying-fox Survey results and mapped habitat

Project No. **12611463**
Revision No. **A**
Date **25/01/2024**

FIGURE 8

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_004_FlyingFox
Print date: 25 Jan 2024 - 10:45

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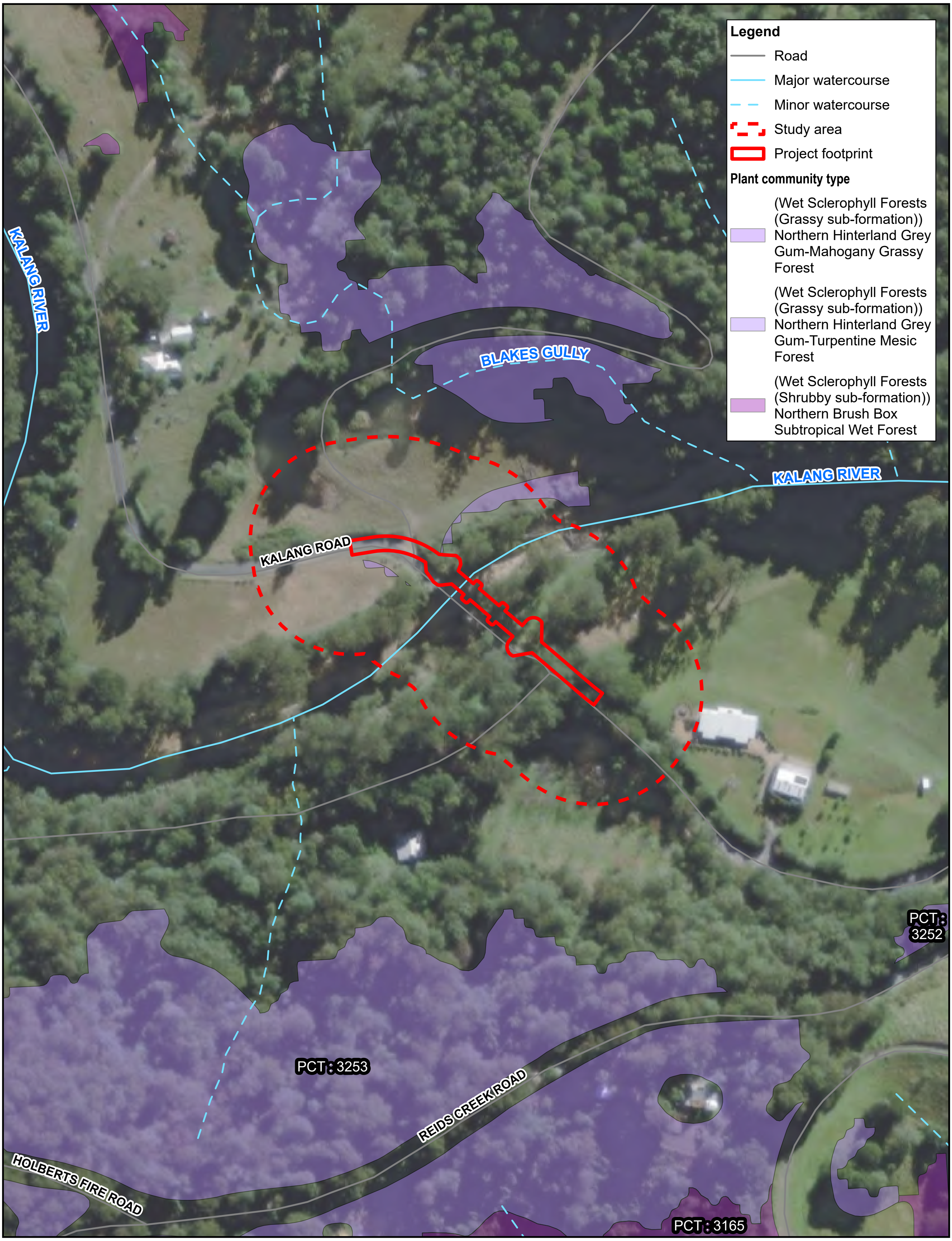


Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

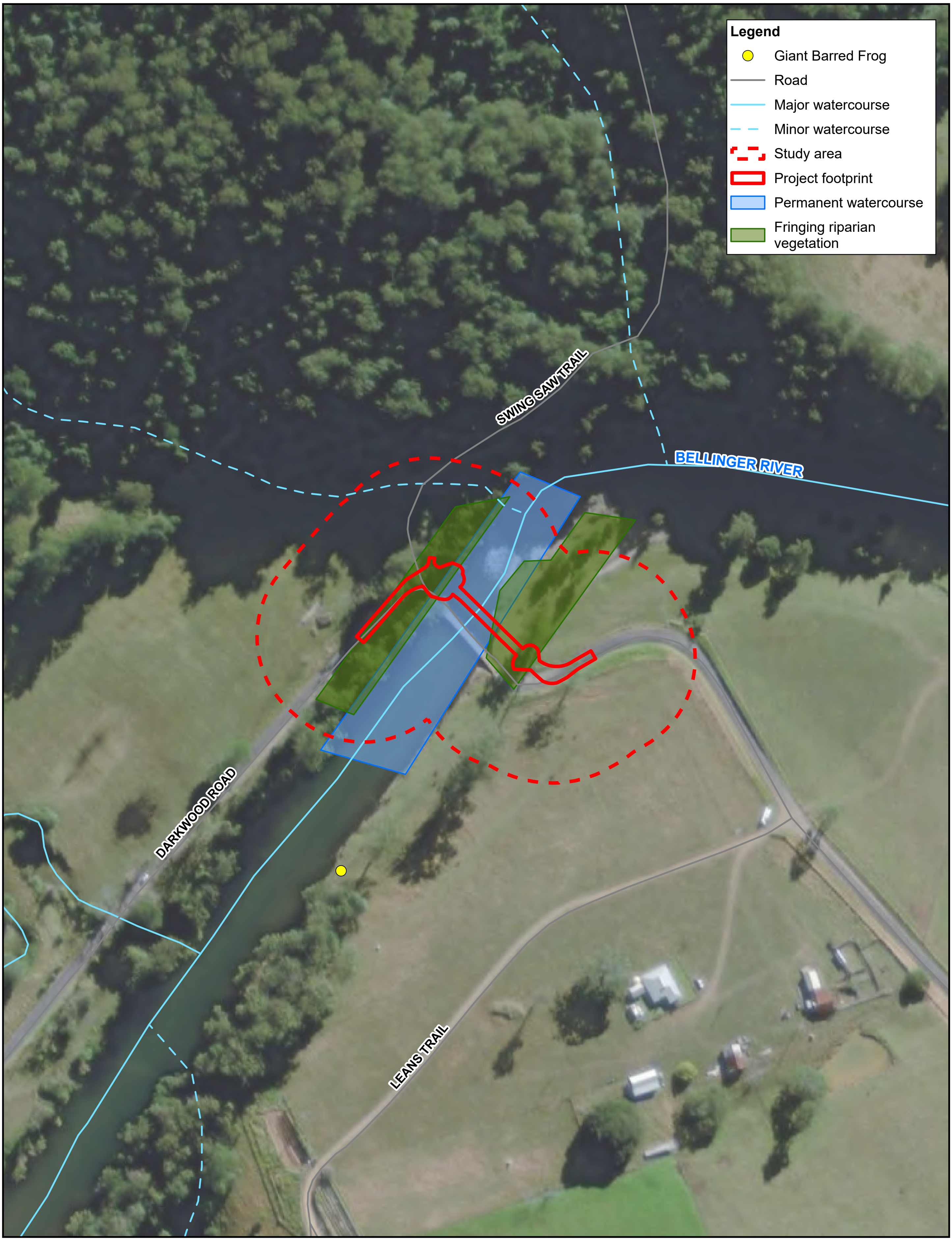
Duffys Bridge
Grey-headed flying-fox Survey results and mapped habitat

Project No. 12611463
Revision No. A
Date 25/01/2024

FIGURE 9

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_004_FlyingFox
Print date: 25 Jan 2024 - 10:45

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: thunt2



Paper Size ISO A4

0 25 50 75 100

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

Joyces Bridge
Giant barred frog Survey results and mapped habitat

Project No. 12611463
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Date 25/01/2024

FIGURE 10

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_005_GiantBarredFrog
Print date: 25 Jan 2024 - 10:18

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data, habitat type (2024); NSWSS: roads, watercourse (2023).
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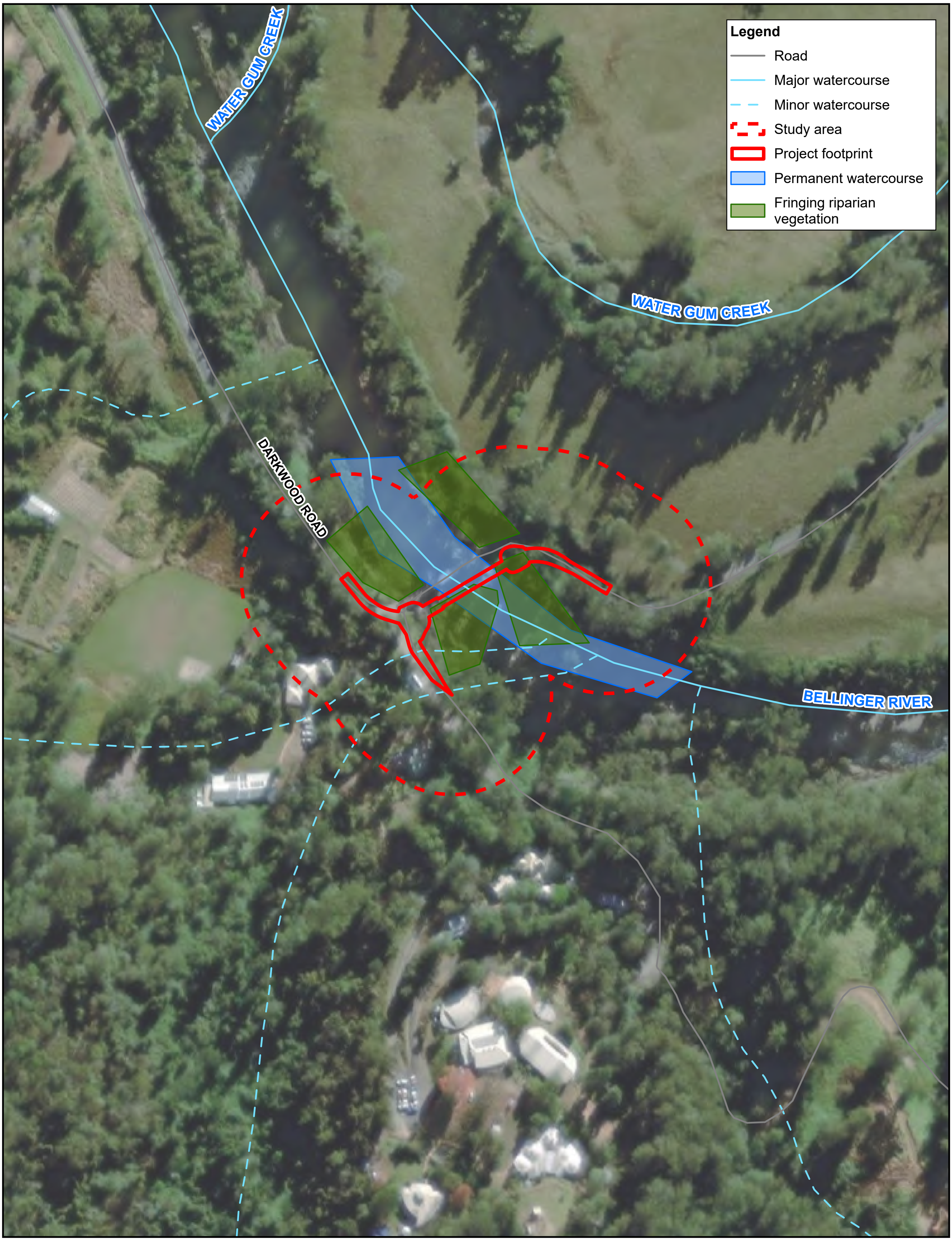

Paper Size ISO A4

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

Hobarts Bridge

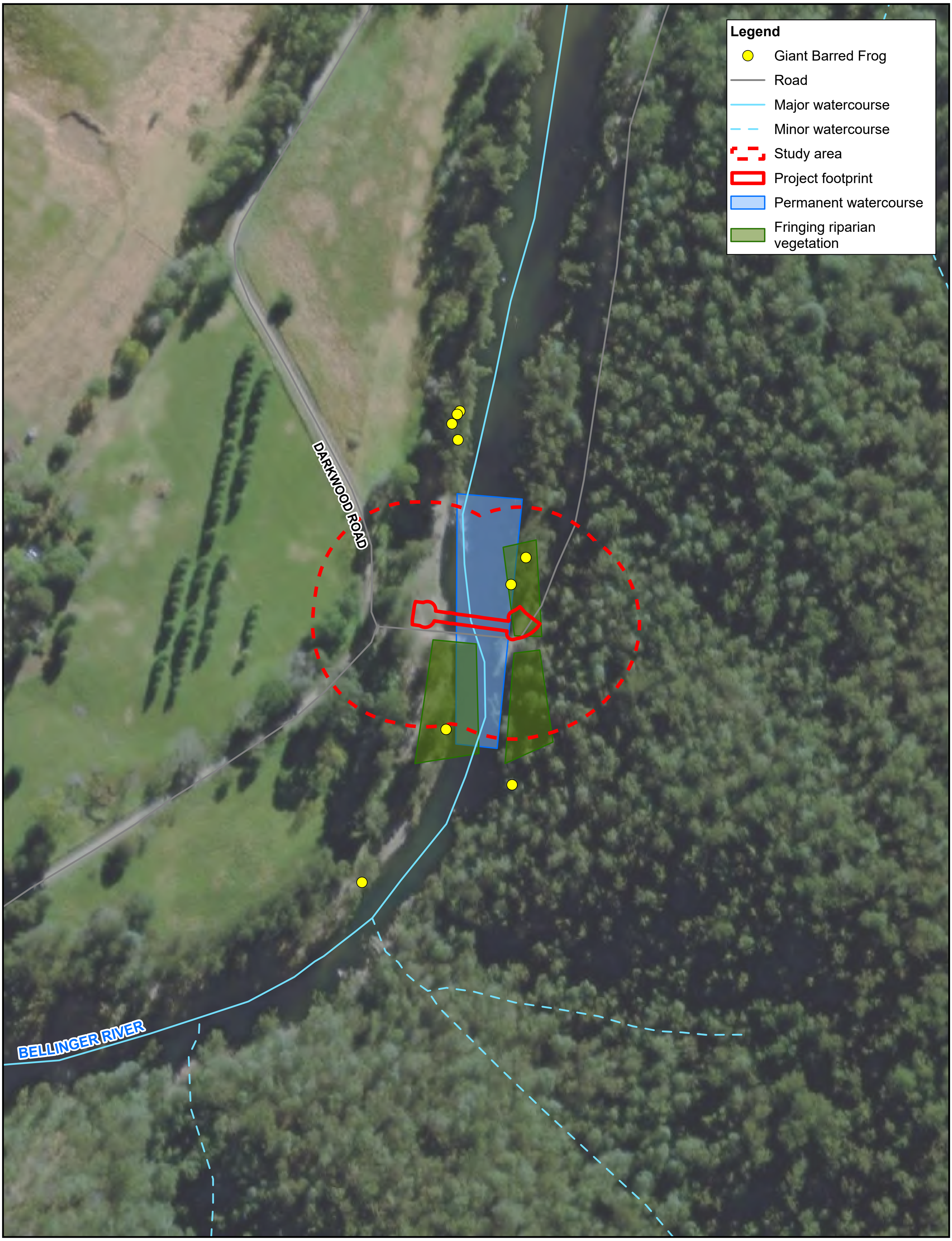
Giant barred frog Survey results and mapped habitat

Project No. **12611463**
Revision No. **A**
Date **25/01/2024**

FIGURE 11

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_005_GiantBarredFrog
Print date: 25 Jan 2024 - 10:18

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data, habitat type (2024); NSWSS: roads, watercourse (2023).
Created by: thunt2



Paper Size ISO A4

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Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

Justins Bridge
Giant barred frog Survey results and mapped habitat

Project No. **12611463**
Revision No. **A**
Date **25/01/2024**

FIGURE 12

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_005_GiantBarredFrog
Print date: 25 Jan 2024 - 10:18

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data, habitat type (2024); NSWSS: roads, watercourse (2023).
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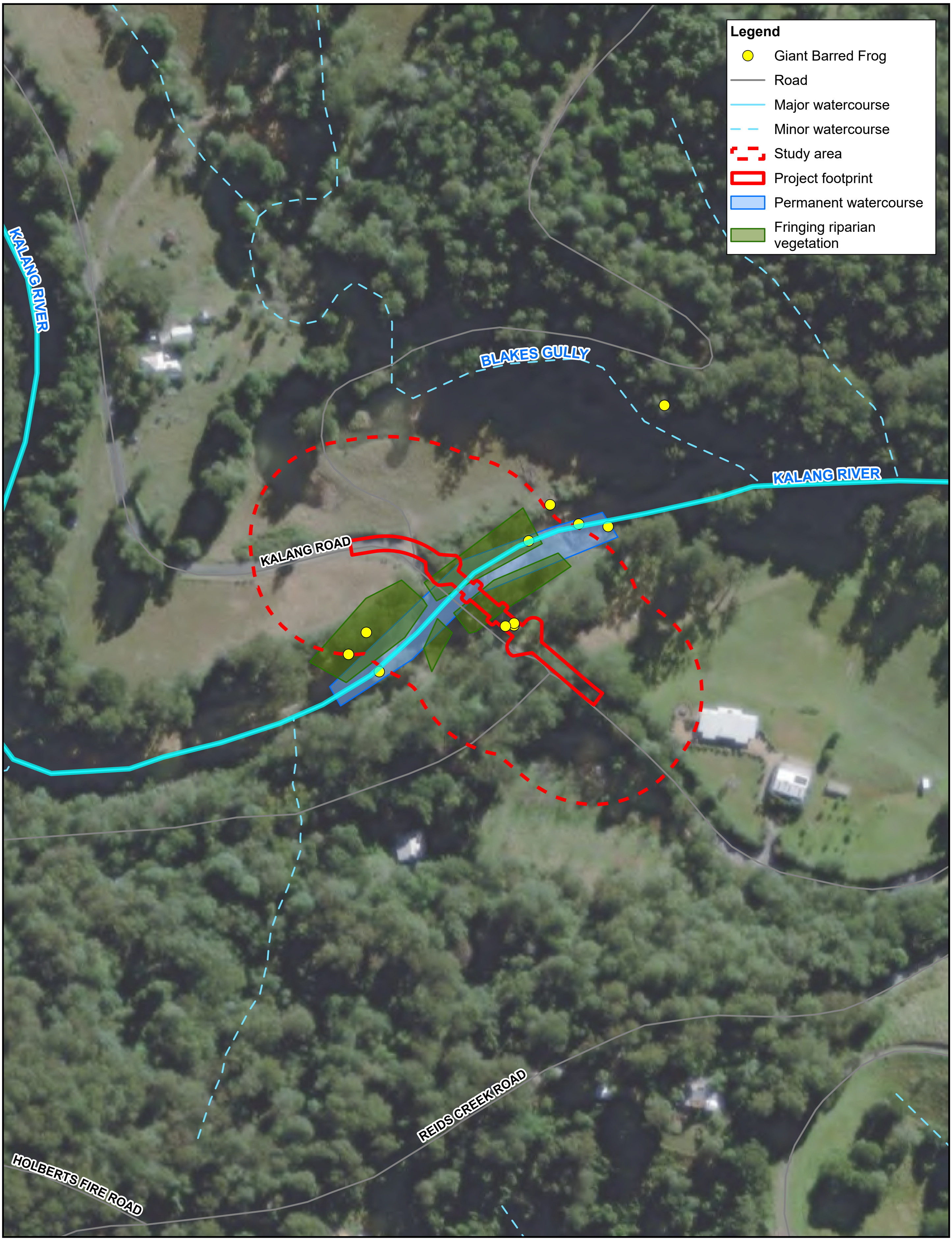

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

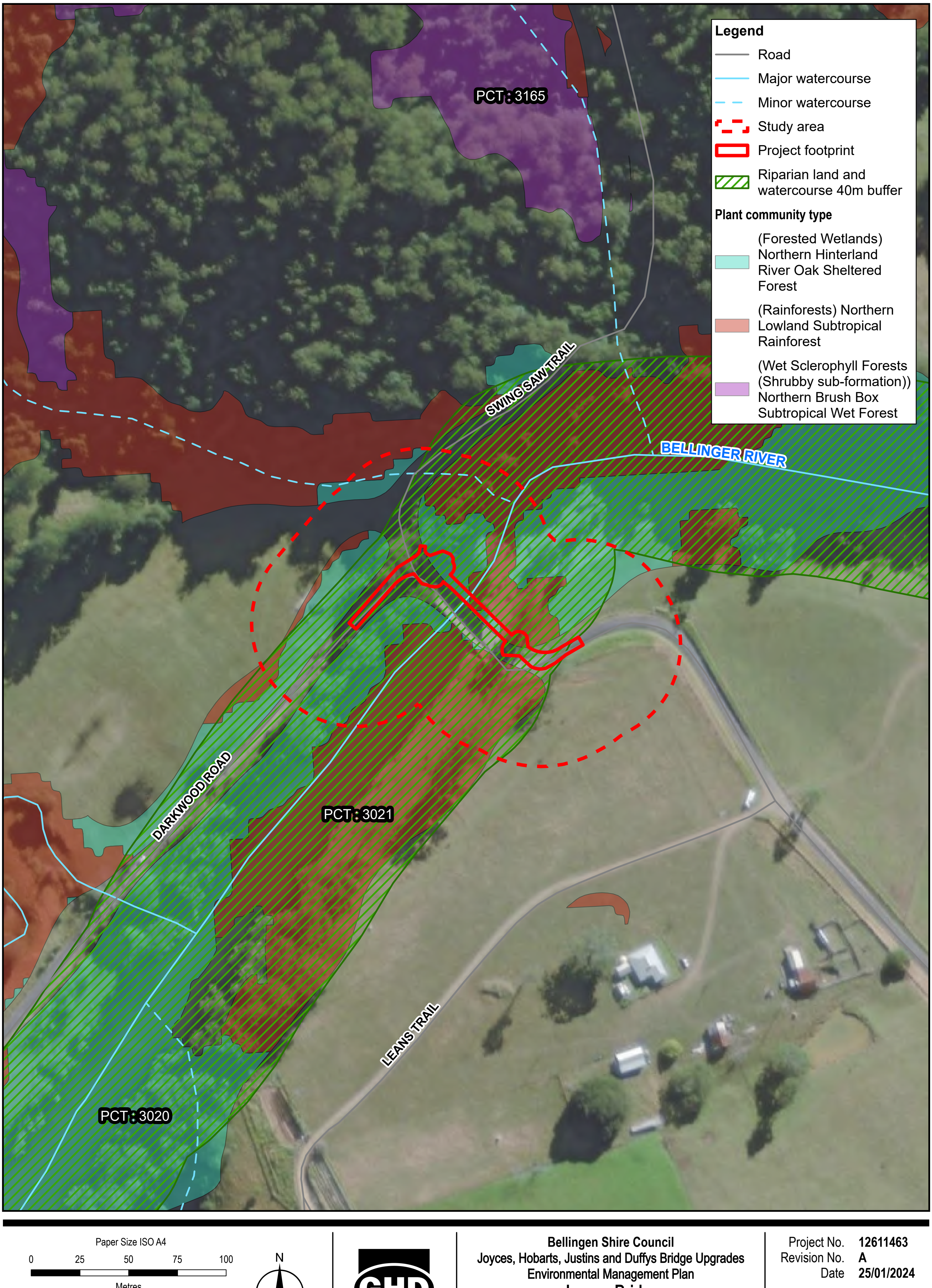
Duffys Bridge
Giant barred frog Survey results and mapped habitat

Project No. 12611463
Revision No. A
Date 25/01/2024

FIGURE 13

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_005_GiantBarredFrog
Print date: 25 Jan 2024 - 10:18

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data, habitat type (2024); NSWSS: roads, watercourse (2023).
Created by: thunt2



Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

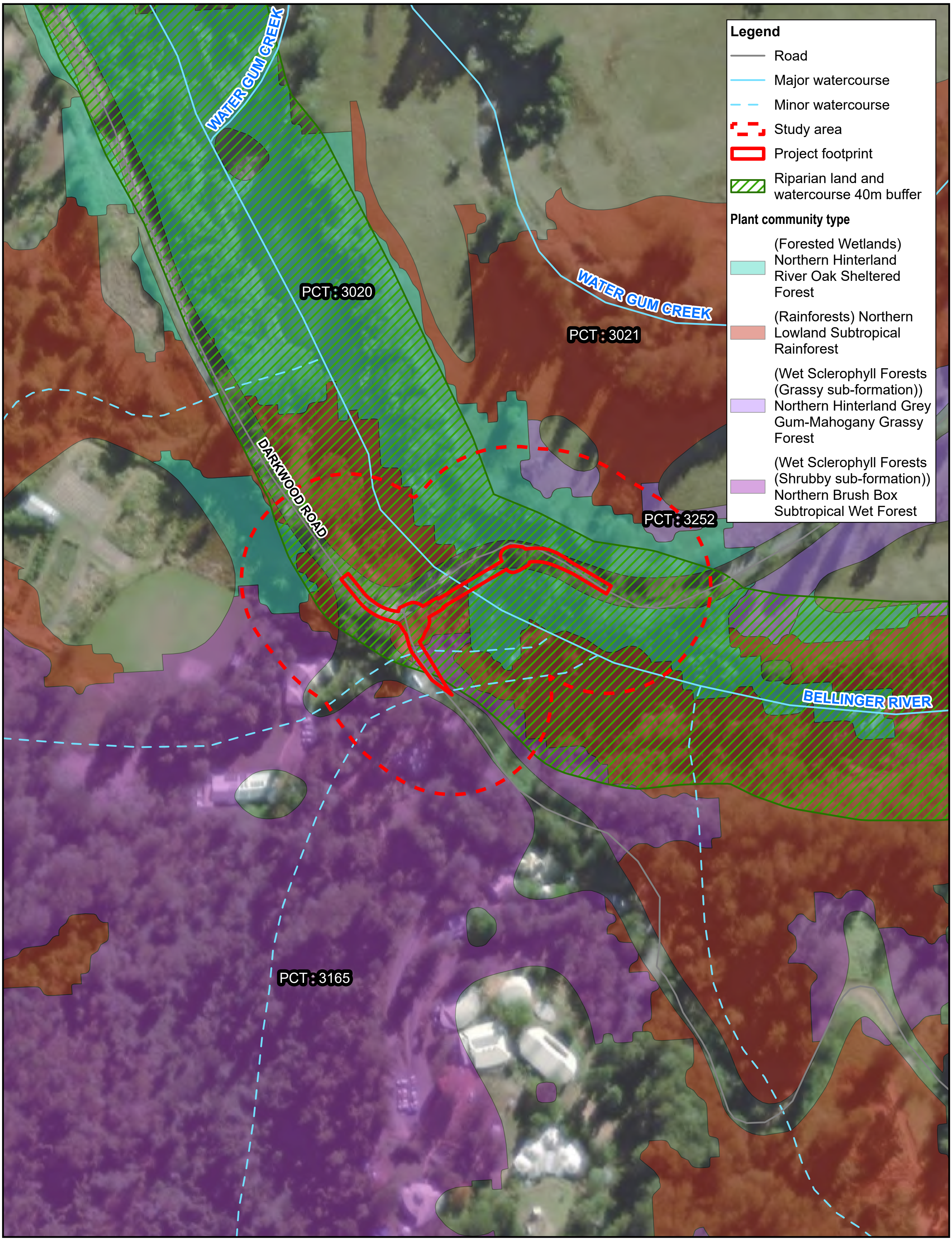
Joyces Bridge
Black-faced Monarch Survey results and mapped habitat

Project No.	12611463
Revision No.	A
Date	25/01/2024

FIGURE 14

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_006_BlackFacedMonarch
Print date: 25 Jan 2024 - 10:54

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data, riparian buffer (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: thunt2



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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

GHD

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

Hobarts Bridge
Black-faced Monarch Survey results and mapped habitat

Project No. **12611463**
Revision No. **A**
Date **25/01/2024**

FIGURE 15

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_006_BlackFacedMonarch
Print date: 25 Jan 2024 - 10:54

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data, riparian buffer (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
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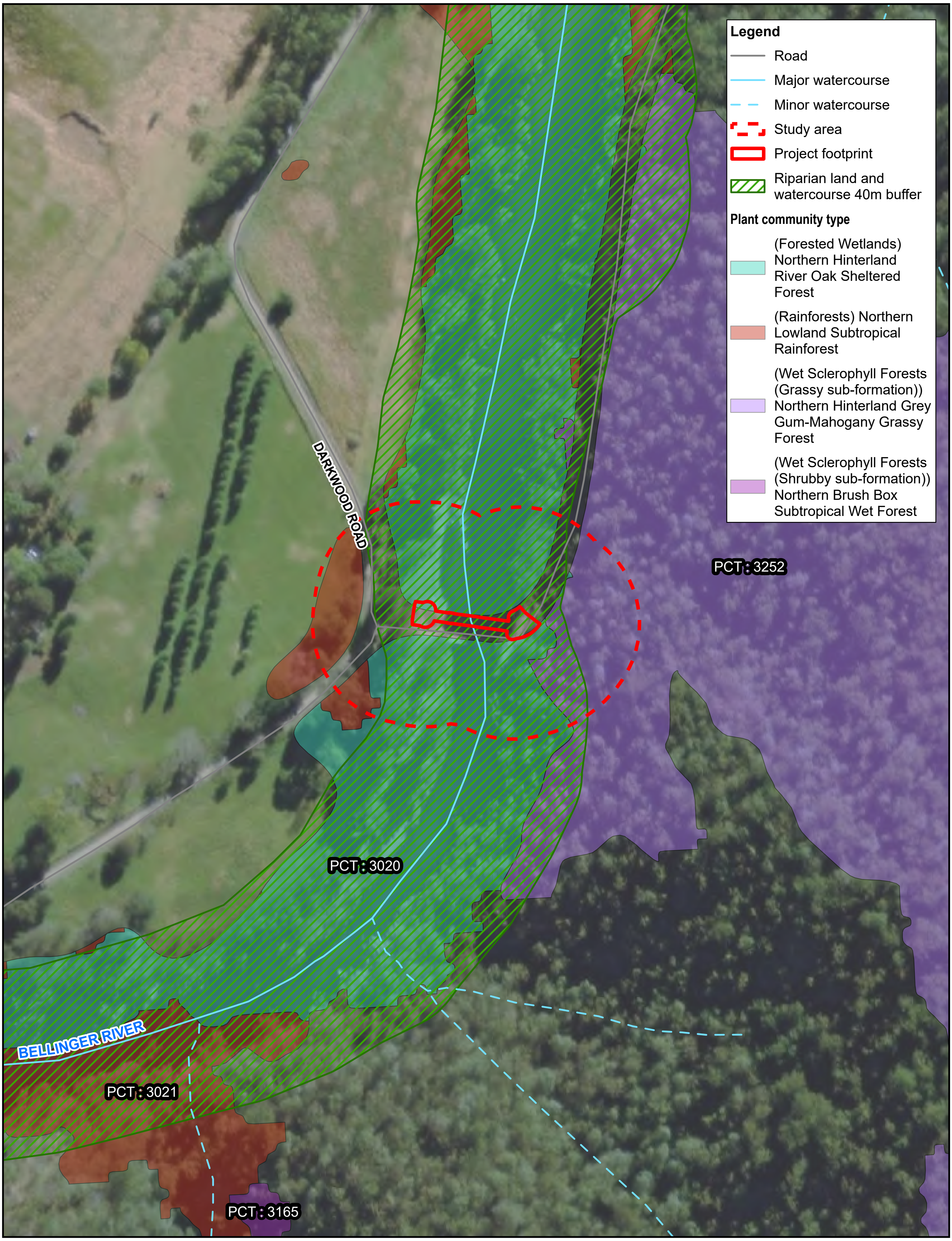

Paper Size ISO A4

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

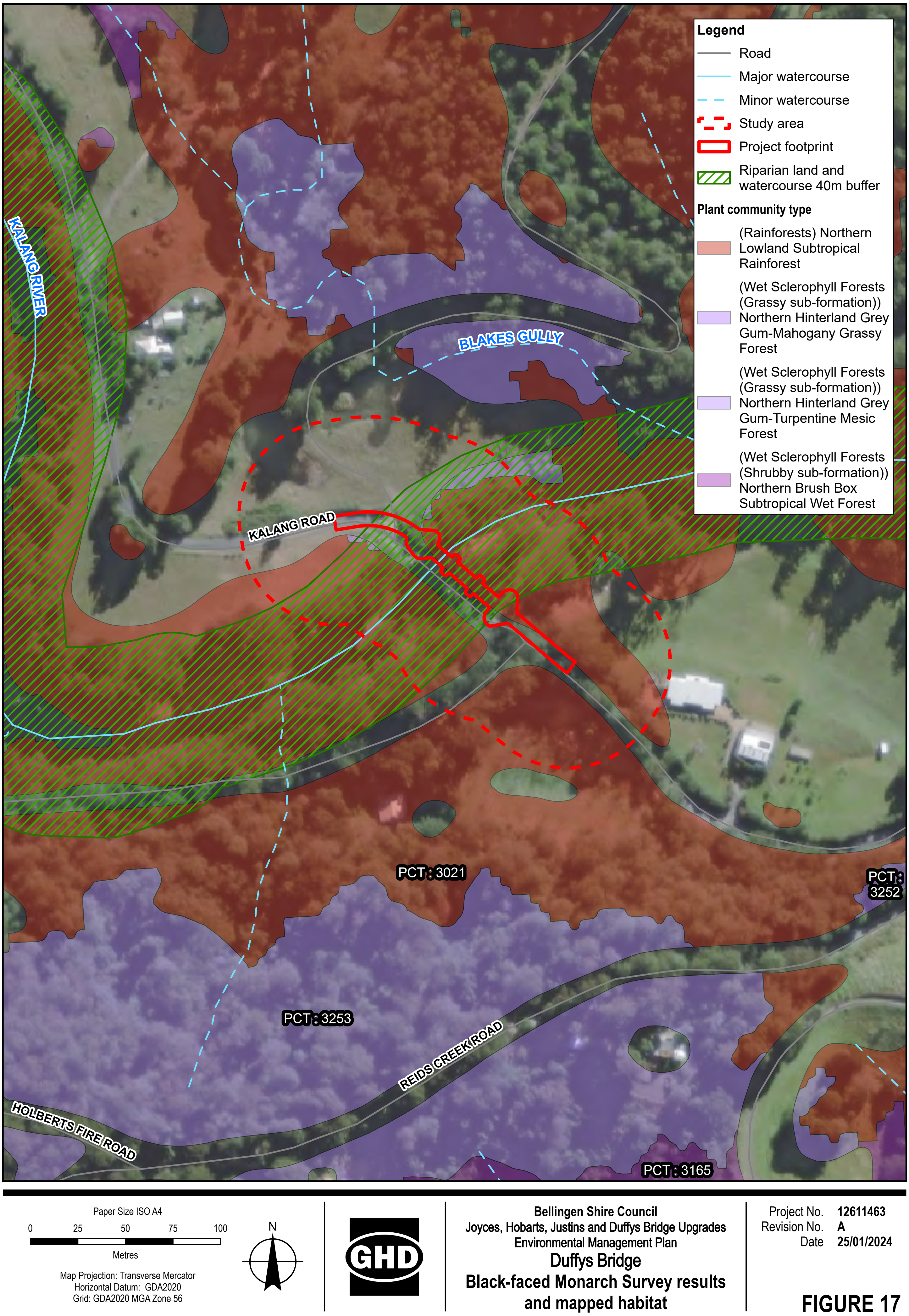
Justins Bridge
Black-faced Monarch Survey results and mapped habitat

Project No. 12611463
Revision No. A
Date 25/01/2024

FIGURE 16

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_006_BlackFacedMonarch
Print date: 25 Jan 2024 - 10:54

Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data, riparian buffer (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: thunt2



Bellingen Shire Council
Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Environmental Management Plan

Duffys Bridge
Black-faced Monarch Survey results and mapped habitat

Project No. 12611463
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FIGURE 17

\\ghdnet\ghd\AU\Brisbane\General\Services\GIS\Projects\12611463\GIS\Maps\Deliverables\12611463_MNES.aprx - 12611463_006_BlackFacedMonarch
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Data source: World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community. GHD: study area, project footprint, survey data, riparian buffer (2024); NSWSS: roads, watercourse (2023); DPE: plant community (2023).
Created by: thunt2

BELLINGEN SHIRE COUNCIL

Integrated Management System Environmental Management Plan

Document Number: CO10000-ENV-PLN-0001

EPBC Number:	EPBC 2024/09805
Project Name:	Joyces, Hobarts, Justins and Duffys Bridge Upgrades
Proponent:	Bellingen Shire Council
Proposed Action:	Replacement of 4 existing bridges on Darkwood Road and Kalang Road
Location of Action	Darkwood Road, Darkwood NSW 2454
CEMP Date:	19/08/2024

APPROVED COMPANY ISO 9001 Quality Management Systems
QMS Certification Services

APPROVED COMPANY ISO 45001 Occupational Health & Safety Management Systems
QMS Certification Services

APPROVED COMPANY ISO 14001 Environmental Management Systems
QMS Certification Services

Declaration of Accuracy

In making this declaration, I am aware that section 491 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. 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:	John Fyfe
Organisation:	Bellingen Shire Council
Date:	19/08/2024

1 Document Control

1.1 Control Version

This is a controlled document. Only registered holders of controlled copies will receive updates.

Controlled Copy	001	Date	19/08/2024
Issued to	DCCEEW	Issued by	John Fyfe
Document No.	ENV-PLN-0001	Revision No.	1.0

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1.2 Document Status

Revision	Date	Description	By	Checked	Approved
1.0	19/08/2024	Issued for use	HC	MR	JF

1.3 Change History

Revision	Date	Elements of Change	Amended by
1.0	19/08/2024	Initial document	H. Chapman

1.4 Document Overview

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Business Unit	Bellingen Shire Council – Infrastructure Services				
Client	Internal				
Project Title	Joyces, Hobarts, Justins and Duffys Bridge Upgrades				
Location:	Darkwood Road, Darkwood NSW 2454				
Document Title	Environmental Management Plan				
Document Number	ENV-PLN-0001	Revision	1.0	Date	19/08/2024
Document Manager	John Fyfe (Group Leader Infrastructure Services)				

1.5 Authorising Systems Officer

Name:	John Fyfe	Position:	Group Leader (IS)	Date	19/08/2024

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Appendices

2 Executive Summary

Bellingen Shire Council intends to replace four existing bridges on the Bellinger River and the Kalang River in the New South Wales Mid North Coast region (the Project). The four existing bridges are aging timber structures nearing the end of their serviceable life and will be replaced with concrete structures that will provide increased flood resilience to residents and maintain safety and a reliable crossing for road users. The four bridges are:

- Justins Bridge – a low-level crossing over the Bellinger River, located on Darkwood Road, Darkwood New South Wales (NSW) at latitude and longitude -30.453727, 152.630649
- Joyces Bridge – a low-level crossing over the Bellinger River, located on Darkwood Road, Darkwood NSW at latitude and longitude -30.426143, 152.748049
- Hobarts Bridge – a low-level crossing over the Bellinger River, located on Darkwood Road, Darkwood NSW at latitude and longitude -30.433247, 152.722993
- Duffys Bridge – a low-level crossing over the Kalang River, located on Kalang Road, Kalang NSW at latitude and longitude -30.467859, 152.855866.

The scope of the work for the Project includes:

- Construction of four new bridges, including bridge abutments and pilings. Each new bridge is to be constructed immediately downstream of the existing bridges.
- Removal of the current bridge structures at each site (note that the current bridges will be retained throughout the construction period to enable access across the rivers but will be removed following completion and commissioning of the new bridge structures).
- Installation of rock armour (scour protection).
- Realignment of the road approaches to each new bridge, including patching and resealing where required.
- Rehabilitation and revegetation of the riverbank in the area of works.

This Environmental Management Plan has been prepared in accordance with the Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024 Environmental Management Plan Guidelines to manage potential environmental impacts to matters of national environmental significance (MNES) protected under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999.

The following protected and migratory species have been identified to be potentially impacted by the works:

- Bellingen River Snapping Turtle – listed as critically endangered under the EPBC Act.
- Grey-headed Flying Fox – listed as vulnerable under the EPBC Act.
- Giant Barred Frog – listed as vulnerable under the EPBC Act.
- Black-faced Monarch – listed as migratory under the EPBC Act.

No other MNES were identified as likely to be impacted by the works. Potential impacts on these MNES were identified to include:

- Loss or degradation of habitat.

- Injury/mortality to fauna.
- Light, noise and vibration disturbance.
- Water quality degradation.
- Temporary restriction of instream connectivity.
- Introduction and spread of invasive weeds and pests.
- Exacerbation of infectious disease.

A MNES assessment has been completed which concluded that a significant impact on any of the identified MNES was unlikely provided the mitigation measures specified within this management plan are implemented. Broadly, the strategies intended to mitigate these impacts include:

- Restricting clearing and minimising the project footprint, including the use of cleared and previously disturbed areas
- Establishing erosion and sediment controls and monitoring of water quality
- Scheduling of construction activities outside of breeding seasons
- Traffic management and controlled movement of site machinery and personal
- Progressive rehabilitation and reinstatement
- Appropriate site hygiene, management and training in relation to waste and invasive and pest species and disease

3 Project Description

BSC is responsible for managing road-related transport infrastructure and providing safe and efficient access for the local government area (LGA) road network. The current Justins, Joyces, Hobarts and Duffys bridges are aging timber structures in poor condition that are nearing the end of their serviceable lives. The key objectives of the Project are to:

- Improve user safety, improve network reliability and reduce maintenance requirements into the future by replacing the existing bridge structures with new 100-year design life concrete structures.
- Meeting customer network needs.
- Minimising safety risks to the workforce carrying out the works.
- Minimising impacts to road users.
- Minimising environmental impacts from the Project.

3.1 Project Location and Surrounding Environment

The Project is located in the Mid North Coast area of NSW within the Bellingen Shire Council LGA, approximately 420 km north-northeast of Sydney. The project footprints consist of four separate sites within rural, forested areas at the locations described in Table 3-1. A figure showing the location of the sites is presented in Appendix A, Figure 1.

Table 3-1 – Locations of each site

Project Component	Location	Coordinates	River
Justins Bridge	Darkwood Road, Darkwood (approximately 35 km west of Bellingen)	-30.453727, 152.630649	Bellinger River
Joyces Bridge	Darkwood Road, Darkwood (approximately 18 km west of Bellingen)	-30.426143, 152.748049	Bellinger River
Hobart's Bridge	Darkwood Road, Darkwood (approximately 20 km west of Bellingen)	-30.433247, 152.722993	Bellinger River
Duffys Bridge	Kalang Road, Kalang (approximately 4 km southwest of Bellingen)	-30.467859, 152.855866	Kalang River

The Justins, Joyces and Hobarts bridges provide access across the Bellinger River via Darkwood Road. Darkwood Road is a two-way road, which is unsealed at the Justins Bridge and Hobarts Bridge locations and sealed at the Joyces Bridge location. Duffys Bridge provides access across the Kalang River, via Kalang Road, which is a two-way, sealed road. The bridges provide local access for remote, rural communities in the Thora and Kalang valleys. Land tenure, land use and zoning of each project site and surrounding areas are described in Table 3-2.

Table 3-2 – Surrounding land use and ownership.

Project Component	Tenure	Land Zoning	Surrounding Environment
Justins Bridge	Freehold	C3 - Environmental Management & C4 - Environmental Living	Bellinger River, agricultural land and nature reserve (Baalijin Nature Reserve). Bellingen Shire Council owns the road. The waterway is under the jurisdiction of Crown Lands.
Joyces Bridge	Freehold	C4 - Environmental Living	Bellinger River, agricultural and environmental land. Bellingen Shire Council owns the road. The waterway is under the jurisdiction of Crown Lands.
Hobart's Bridge	Freehold	C4 - Environmental Living	Bellinger River, agricultural and environmental land and Chrysalis School. Bellingen Shire Council owns the road. The waterway is under the jurisdiction of Crown Lands.

Project Component	Tenure	Land Zoning	Surrounding Environment
Duffys Bridge	Freehold	C4 - Environmental Living	Kalang River, agricultural and environmental land. Bellingen Shire Council owns the road. The waterway is under the jurisdiction of Crown Lands.

3.2 Description of Project Activities

3.2.1 Summary of Activities

The proposed Project works at each of the bridge sites will involve the following general construction activities:

- Vegetation clearing
- Installation of piers and rock anchors
- Construction of abutments and placement of decking units
- Installation of rock scour protection
- Realignment of approach roads
- Demolition of existing timber bridges
- Rehabilitation of site

Construction works are expected to be carried out over a 9-month period. The total instream and associated bank footprints are estimated to impact approximately 0.41 ha, across the four bridges. Further details on proposed site activities for each bridge are provided in the following sections.

3.2.2 Construction Activities

The general activities required for the construction of each bridge is presented below. The following is an indicative list of construction plant and equipment that may be required for the project:

- Heavy vehicles associated with earthwork activities and construction including excavator, backhoe, skid steer, tipper, spreaders, roller and delivery trucks.
- Machinery associated with construction activities including: an excavator mounted drilling rig, small excavator, mobile shotcrete plant, small mobile crane, and various hand tools.

Phase 1 – Preliminary Works and Installation of Piers:

Preliminary Works

- Set up site compound, laydown and stockpile areas outside of flood zones and roads.
- Clearing and grubbing surface vegetation and topsoil, stockpiling topsoil.
- Install erosion and sediment (ERSED) controls in accordance with the ERSED Control Plan for the project. For the Justins and Joyces bridges this will include sediment fencing and floating hydrocarbon booms with drop silt curtains around access pathways.

- Install access ramps to the waterways to exposed gravel/rock bars. These are mostly within the proposed bridge and scour rock footprints for each site. Access to the Justins Bridge site on the eastern side will be from the existing road shoulder.
- Repeated placement of two tonne rock bags to stabilise crane positions, controls and temporary access ways.
- Install low flow aquatic fauna passage pipes under the eastern access track at Joyces Bridge.

Installation of Piers:

- Justins Bridge – install two rows of 3 x 600 mm bored piles into the bed of the Bellinger River with a concrete headstock cast in situ.
- Joyces Bridge – install 9 x 600 mm piles (three per headstock) with three insitu concrete headstocks constructed above riverbed of the Bellinger River.
- Hobarts Bridge – install three concrete blade piers 1,300 mm wide x 4,655 – 6,240 mm long, each anchored into the bed of the Bellinger River by 3 x 600 mm bored piles or N28 anchors.
- Duffys Bridge – Pier 1 and 2 – install two rows of five driven piles (10 per pile cap) into the bed of the Kalang River with two concrete headstocks cast in situ.
- Remove piling access works.

Phase 2 – Substructure Construction:

- Justins Bridge – using prefabricated wing walls and casting the 1,000 mm wide, 900 mm deep abutments in place, with 2 x 600 mm piles bored into bedrock or rock anchors.
- Joyces Bridge – using prefabricated wing walls and casting the 950 mm wide abutments in place, each with 2 x 600 mm piles bored into bedrock.
- Hobarts Bridge – using prefabricated wing walls and casting the 1,200 mm high abutment in place, with 3 x 600 mm embedded piles bored into bedrock.
- Duffys Bridge – casting in situ abutments, wing walls, pile caps, columns and headstocks in place, with five driven piles per abutment. No anchors are to be used.

Phase 3 – Superstructure Construction:

- Install scour rock around abutments to the toe of the bank keyed into high banks upstream and downstream.
- Construction of bridge deck structures – place beams and girders, place or pour concrete decks, backfill to abutments, stitch pour where applicable.

Phase 4 – Road Construction:

- Reshape road approaches to bridges.

Phase 5 – Demolition of Existing Bridges and Rehabilitation:

- Justins Bridge – remove all decking and girders, remove timber headstocks and steel components, cut off timber piles to bed level, leaving concrete piers and headstocks over the water and removing existing abutments.

- Joyces Bridge – remove all decking and girders, partially remove abutments to improve tie-in, leaving existing piers, concrete headstocks and majority of abutments to minimise disturbance to bed and banks.
- Hobarts Bridge – remove decking, girders and headstocks outside of the low flow area (of those constructed of timber), but leaving existing abutments and concrete piers to minimise disturbance to bed and banks.
- Duffys Bridge – remove the deck, cutting the existing timber piers to bed level, but leaving the abutments to minimise disturbance to bed and banks.
- Finalise scour rock placement.
- Rehabilitate site, including plantings and temporary erosion and sediment controls to remain for three months or until stable.

3.2.3 Ancillary Works

A temporary construction compound is anticipated to be established near each project footprint. Construction compounds will be mostly within the road corridors with some requirement to use adjacent private property, with access to be negotiated with the relevant landholders. The location of the compound would be determined by the construction contractor and would be dependent on the order in which works are undertaken. The construction compound is likely to consist of the following:

- Small site shed
- Equipment laydown area
- Waste receptacles
- Construction materials

The construction compound would as a priority be located within cleared and previously disturbed areas and not be established under the dripline of any existing trees. Due to the rural nature of the project area, there is no high human activity expected within the area. Where refuelling, fuel decanting and vehicle maintenance work is required this would take place in a designated sealed and bunded area within the construction compound area or offsite.

3.2.4 Timing of Construction Activities

Construction will occur concurrently between March 2025 and May 2026 with site establishment to commence in February 2025. All high-risk works will be completed within the dry season and/or a period of low rainfall and minimal flow. This period will minimise the risk of erosion, run-off and transport of sediment downstream during flooding events. The construction schedule has also been designed to avoid high and medium risk works during key threatened fauna breeding seasons. High risk works include disturbance for piling access and approaches and works to construct the bridge substructure.

- High-risk works – disturbance for piling access and approaches, including vegetation clearing and/or earthworks on the riverbank, installation of piers and rock anchors, and instream substructure works. All work will be outside the full breeding season of the Bellinger River Snapping Turtle (including courtship, incubation and hatching - July to February inclusive) and outside key breeding of the Giant Barred Frog (November and February). Therefore, works are allowable from March – June inclusive (4 months).

- Medium risk works – Construction of abutments outside of waterway low flow channel, construction of superstructure and road approaches. All construction works will be outside nesting season of the Bellinger River Snapping Turtle (October to January inclusive) and outside the key breeding period of the Giant Barred Frog (November and February). Therefore, works are allowable from March-September inclusive (7 months).
- Low risk works - Finishing works comprising construction of roads and ancillary bridge components at road level only including barriers signage, road sealing, and concreting. No works on embankments or instream. These works are allowable during any period.

3.2.5 Operational Phase

Upon completion of the Project, the operational phase activities will largely comprise maintenance works consistent with current practices, including:

- Vegetation control (e.g., mowing, herbicide treatments, weed removals and grass slashing)
- Line marking, pavement repairs and road resurfacing
- Maintenance of drainage structures and stormwater quality devices, including removal of sediment and debris
- Repair and replacement of road furniture including guardrails, signs, barriers, fencing and guide markers
- Structure maintenance including bridges which is anticipated to be reduced due to the more durable materials and design.

3.2.6 Decommissioning

The design life of each bridge structure is 100 years. Decommissioning will be in accordance with the relevant legislation at the time of decommissioning.

4 Objectives of the Environmental Management Plan

This Environmental Management Plan has been prepared in accordance with the Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024 Environmental Management Plan Guidelines to manage potential environmental impacts to matters of national environmental significance (MNES) protected under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. Specific potential impacts associated with the works are discussed in section 0. The overall objectives of this management plan are to:

- Operate an effective Environmental Management System (EMS) to control the planning and implementation of environmental protection measures for the works.
- Identify statutory requirements, compliance limits and adverse environmental effects which could occur during execution of the work.
- Plan work activities and environmental protection measures to minimise environmental risks and comply with specified environmental protection requirements outlined in the Review of Environmental Factors (REF), and any permits, approvals and/or licences required for the works.

- Commission the planned environmental protection measures in accordance with relevant standards and guidelines and provide training to site personnel on environmentally sensitive items and environmental risks identified at the site.
- Monitor the effectiveness of the environmental protection measures.
- Set up response procedures which will initially contain, then remedy, any environmental damage that does arise.
- Specify procedures for communication of progress, near misses and environmental incidents.
- Specify reporting requirements and frequency.
- Improve environmental protection measures and revise the EMS and the EMP promptly when deficiencies are identified.

4.1 Project Environmental Performance Objectives and Targets

Council has established the following project specific performance objectives and targets presented in Table 4-1. These objectives and targets have been developed to address the impacts identified within GHD's Matters of National Environmental Significance Assessment Report - Joyces, Hobarts, Justins, and Duffys Bridges (2024).

Table 4-1 – Project specific environmental performance objectives and targets.

No.	Objective	Target
1	Ensure compliance with the National Parks and Wildlife Act 1974 (NSW) in relation to aboriginal heritage items.	100% of unexpected heritage artefact finds to be managed in accordance with the unexpected finds protocol.
2	Protect aboriginal and non-aboriginal heritage items.	0 heritage item incidents.
3	Minimise noise and vibration impacts on nearby sensitive receivers during construction.	Noise and vibration controls are found to be installed as per this EMP, function correctly and be maintained in a suitable condition in 90% of weekly audits.
4	Minimise vegetation removal and disturbance as far as reasonably practicable.	0 incidents of non-weed vegetation removal or disturbance outside areas to be cleared as part of design.
5	Minimise erosion and sediment associated with construction activities.	Erosion and sediment controls (including soil stabilisation, and clean water diversions and sediment fences/curtains) are found to be installed as per this EMP, function correctly and be maintained in a suitable condition in 80% of weekly audits.
6	Prevent pollution of the environment due to chemical and fuel storage and handling.	0 Incidents of contamination of water or soil and damage to vegetation as a result of the storage and handling of chemicals and fuels.
7	Minimise environmental risks associated with chemical and fuel use and storage.	Chemical storage and spill controls (including bunded areas, and spill kits) are found to be installed as per this EMP, function correctly and be maintained in a suitable condition in 90% of weekly audits.

No.	Objective	Target
8	Prevent injury and/or death of fauna.	0 incidents of injury or death of non-pest fauna.
9	Prevent the unlawful handling or disposal of waste.	0 incidents of waste being disposed off-site to a facility/site that is not lawfully able to accept the waste.
10	Management of waste to maintain the site in a cleanly condition, minimise the risk of waste release to the environment and minimise attraction of feral predators to the site.	Waste storage and management (including provision of waste amenities in secure locations, and regular maintenance of waste amenities) are found to be installed as per this EMP, function correctly and be maintained in a suitable condition in 90% of weekly audits.
11	Implement Hygiene procedures to prevent the spread of weed and/or disease at the sites.	Biosecurity/hygiene protocol as established in consultation with DPI is implemented. <3 Incidents per site of hygiene procedures not being implemented correctly.
12	Prevent vehicle movements in undesignated locations to minimise soil and vegetation disturbance and weed/pest spread.	0 incidents of vehicles not using designated parking and/or access tracks.
13	Identify all weed/pest infestations at the site.	100% of identified weed/pest infestations raised addressed within 2 business days of being raised.
14	Minimise vegetation disturbance which may result in the spread of weeds.	0 incidents of unauthorised access/disturbance to weed exclusion zones.
15	Control all declared weed infestations on the construction site throughout construction.	100% of identified weed infestations controlled in accordance with the Weed and Pest Management Plan.
16	Prevent the import of weed impacted materials and weed plants to the site.	0 incidents of weed impacted material or weeds being imported to site.
17	Monitor water quality to detect impacts early and ensure additional controls are implemented to prevent environmental harm where necessary.	90% of water quality monitoring results below criteria presented in Water Quality Monitoring Plan. 100% of water quality non-conformances action items completed within 2 business days of monitoring.
18	Monitor the works to ensure compliance with this plan and relevant legislation.	100% of scheduled inspections/audits completed
19	Identify environmental hazards and specify rectification actions promptly	100% of non-conformances raised within 2 business days of identification.
20	Promptly implement any rectification actions	100% of non-conformance rectification actions completed by required rectification date specified within non-conformance report.

5 Related Documents

The following documents listed in Table 5-1 have been considered in the preparation of this management plan and/or form sub-plans that have been developed to ensure the objectives of this plan are met. This environmental management plan should be read in conjunction with all documents listed below.

Table 5-1 – Related documents.

Document Number	Document Title
Subordinate Documents	
ENV-PLN-0001	Erosion and Sediment Control Plan
ENV-PLN-0002	Stockpile Management Plan
ENV-PLN-0003	Project Hygiene Plan
ENV-PLN-0004	Weed and Pest Management Plan
ENV-PLN-0005	Water Quality Monitoring Plan
WHS-PLN-0001	Emergency Response Plan
ENV-SOP-0002	Basic Hygiene Procedure
ENV-SOP-0003	Strict Hygiene Procedure
ENV-SOP-0TBC	Category X Spill Response Procedure
WHS-PRO-0008	Hazardous Chemical Procedure
WHS-FRM-0027	Training and Induction Record
WHS-FRM-0005	Daily Toolbox/Pre-Start Meeting Record
ENV-FRM-0002	Daily Environmental Inspection Checklist
ENV-FRM-0003	Weekly Environmental Inspection Checklist
QUA-FRM-0008	Non-Conformance Report
ENV-FRM-0006	Environmental Incident Report
QUA-FRM-0003	Internal Audit Report
ENV-REG-0003	Project Non-Conformance Register
Legislation and Standards	
N/A	Blue Book – Landcom 2004. Managing urban stormwater – soils and construction. Volume 1 (Fourth Edition)
N/A	North Coast Regional Strategic Weed Management Plan 2023-2027
N/A	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
N/A	Environmental Planning and Assessment Act 1979 (NSW)
N/A	Biodiversity Conservation Act 2016 (NSW)
N/A	Local Land Services Act 2013 (NSW)
N/A	Fisheries Management Act 1994 (NSW)
N/A	National Parks and Wildlife Act 1974 (NSW)

Document Number	Document Title
N/A	Heritage Act 1977 (NSW)
N/A	Protection of the Environment Operations Act 1997 (NSW)
N/A	Water Management Act 2000 (NSW)
N/A	Roads Act 1993 (NSW)
N/A	Biosecurity Act 2015 (NSW)
N/A	Crown Land Management Act 2016 (NSW)
N/A	Local Government Act 1993 (NSW)
N/A	Native Title Act 1993 (NSW)
N/A	Pesticides Act 1999 (NSW)

6 Roles and Responsibilities

6.1 Project Organisational Structure and Contact Details

Error! Reference source not found. outlines organisational structure for the project.

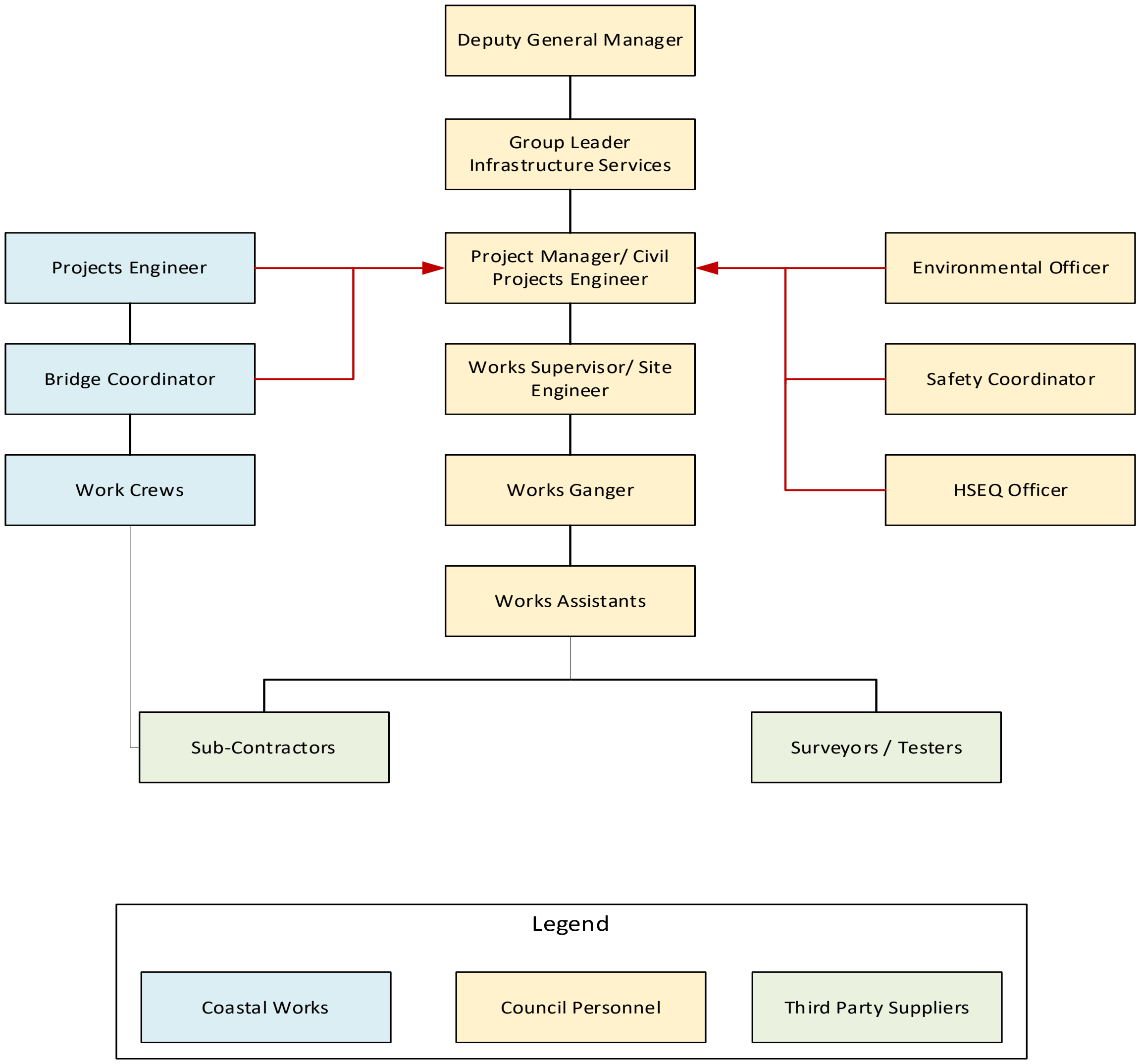


Figure 6-1 - Project organisation structure.

6.2 Project Management Team

Council will be constructing one of the 4 bridges. Contact details for Council's project team are provided in Table 6-1 below.

Table 6-1 – Council's project team contact details.

Position / Role	Name	Contact No.	Email Address
Group Leader Infrastructure Services	John Fyfe	0417 659 021	jfyfe@bellingen.nsw.gov.au
Project Manager / Civil Project Engineer	Marc Rouqueirol	0447 046 252	mrouqueirol@bellingen.nsw.gov.au
Site Engineer	Harrison Griffiths	0419 708 812	hgriffiths@bellingen.nsw.gov.au

Works Supervisor (Bridges / Structures)	Neil Bardsley / Corrie Verden	0417 775 937/ 0439 707 904	nbardsley@bellingen.nsw.gov.au / cverden@bellingen.nsw.gov.au
Works Ganger	Jake Suter	0422 582 206	jsuter@bellingen.nsw.gov.au
Environmental Officer	Harry Chapman	0491 287 288	harry.chapman@bellingen.nsw.gov.au
Safety Coordinator	Daniel Andronicus	0452 524 441	dandronicus@bellingen.nsw.gov.au
HSEQ Officer	TBC	-	-

6.3 Responsibilities of Project Personnel

6.3.1 Group Leader Infrastructure Services

Accountable to: Deputy General Manager Operations

The Manager Infrastructure Services is the Quality Assurance (QA) management representative (ISO9001:2015) for Council's Infrastructure Services Department and has the authority to resolve any management matters relating to Bellingen Shire Council's Integrated Management System (IMS). The Manager Infrastructure Services is responsible for:

- Determining Infrastructure Services organisational structure, in consultation with Deputy General Manager and arranging resources for each project.
- Authorising applicable IMS documents for use on the project.
- Issuing quality, environmental and WHS management plans and authorising and issuing technical procedures.
- Project review, including reviewing the effectiveness of the IMS and maintenance and construction work methods during the course of the project.
- Review of nonconformance resolutions.
- Assessing and implementing any corrective actions or preventive actions for the projects, monitor effectiveness of outcomes.
- Industrial matters.

The Manager Infrastructure Services is required to notify the Deputy General Manager of any problems experienced with the Integrated Management System.

6.3.2 Project Manager / Civil Project Engineer

Accountable to: Group Leader Infrastructure Services

The Project Manager/ Civil Project Engineer is responsible for overall management of projects and ensuring contractor compliance with any contract, applicable project plans and legislation, including time, cost, quality, safety, environmental considerations. The Project Manager/ Civil Project Engineer is Council's project representative and holds the following responsibilities:

- Issuing quality, environmental and WHS management plans, authorising and issuing technical procedures.
- Regular reporting on projects timelines costs etc.
- Reporting costing for project from daily costing sheets and general ledger.
- Reporting project cost fortnightly.
- Participating in and reviewing internal audits and reports.
- Keeping project QA records.
- Community and regulatory authority liaison.

The Project Manager / Civil Project Engineer is required to update the Manager Infrastructure Services regularly on the progress and quality status of the project and to notify the Manager Infrastructure Services of any deficiencies or potential problems with the project management plans.

6.3.3 Site Engineer

Accountable to: Project Manager / Civil Project Engineer

- Reviewing quality, environmental and WHS management plans, authorising and issuing technical procedures.
- Ensuring that construction / maintenance processes are carried out under controlled conditions, including periodic surveillance of work crews to confirm that correct work methods are being followed.
- Supervision during main activities such as piling and key construction milestones.
- Administering suppliers and subcontractors.
- Undertake procurement activities to support operational, design and project needs.
- Arranging delivery of pre-ordered materials.
- Keeping site records and material traceability records after completion project.
- Keeping project QA records.
- Ensuring effective surveillance of subcontractors is carried out.
- testing, inspection and review necessary to demonstrate conformance of the work with this plan and legislative requirements, closing out project sites (as required).
- Maintaining a nonconformance reporting system and closing out any nonconformances, including authority to restrict further work pending nonconformance resolution.
- Development and implementation of inspection and test plans (ITP’s).
- Preparing and reviewing subcontractor documentation.

6.3.4 Works Supervisor

Accountable to: Project Manager/Civil Project Engineer

The Works Supervisor is responsible for control of daily field operations, including:

- Ensuring that the quality, safety and environmental plans are properly implemented on the project.
- Scheduling weekly inspections.
- Day to day direction of works staff to suit the program.
- Allocating resources and delivery of pre-ordered materials (as required).
- Selecting plant and equipment with suitable capability for each activity.
- Costing project daily.
- In-process inspection and receipt of materials delivered to the site.
- Surveillance of subcontractors.
- Reporting nonconforming work to the Civil Project Engineer and Works Supervisor, including authority to restrict further work pending resolution of each nonconformance.

The works supervisor is required to report to the Civil Projects Engineer any defects or non-conformance with this plan and/or applicable legislation that have been observed by maintenance personnel.

6.3.5 Works Ganger

Accountable to: Works Supervisor

Each Ganger is responsible to the Works Supervisor for undertaking allocated activities with direct labour (Works Assistants and subcontractors) and plant assigned to them. They are required to report to the Works Supervisor, any defects or non-conformance with this plan and/or applicable legislation that have been observed by construction personnel.

6.3.6 Environmental Officer

Accountable to: Group Leader Technical Services

Maintain, update, and monitor implementation (in conjunction with Managers and Supervisors) of Council's IMS, lead and drive Councils environmental compliance functions in project works and to support project personnel achieve the project Environmental and objectives.

- Support project personnel from the initial environmental approval to onsite environmental audits, including the final close out of the delivery of project construction and maintenance works.
- Ensure environmental legislation and project plan compliance.
- Guide and work with Supervisors and Engineers in the planning and implementation of environmental requirements to ensure practical solutions are implemented.
- Guide and manage Council's environmental obligations in accordance with Legislation.
- Ensure quality of work and environmental controls meet the expected quality required by Council's IMS.
- Prepare and review 'Part 5 Assessments' in accordance with EP&A Act 1979, including review of environmental factors (REF) documentation.
- Complete necessary licence, permit and approval applications as required for the project.

- Develop and implement project specific environmental management plans and procedures.
- Undertake reviews of project specific environmental management plans and procedures and update to ensure effectiveness.
- Carry out site environmental inspections.
- Undertake erosion and sediment plans (ERSED) and maintenance inspections.
- Managing and analysing complex and sensitive environmental issues.
- Facilitating the engagement and input of a wide range of project stakeholders and managing expectations.
- Participate and carry out environmental audits.
- Carry out environmental risk assessments as required.
- Ensure the IMS and relevant project plans remain current with any Standard or Legislation changes or any procedural updates that may arise from project corrective actions.
- Review and maintain project and IMS environmental registers.
- Ensure all project personnel are systems compliant with legislative requirements and project plans.
- Assist coordination and delivery of induction and project specific training, both internal and external.
- Arranging internal audits.
- Reporting as required by Council, project plans, regulatory bodies, license/permit conditions and IMS requirements.
- Provide mentoring of staff to ensure competency and general understanding of technical requirements of environmental controls.
- Provide site support as required.
- Raise environmental non-conformances and manage subsequent investigations and corrective actions in conjunction with the project team.
- Assist with community and regulatory authority liaison in relation to environmental issues/queries.

6.3.7 Safety Coordinator

Accountable to: Group Leader Technical Services

This position is responsible for implementing and managing the overarching project safety management plan and ensuring consultation and collaboration with all project stakeholders and personnel.

- Collaborate with project team members, Management, Supervisors and regulatory authorities in the creation of a safe work environment and work practices.
- Implement, manage, and maintain the project safety management system ensuring systematic review of content, processes, and systems to ensure continuous improvement.

- Monitor and undertake regular audits related to the performance and effectiveness of the project safety management system.
- Implement policies and procedures related to WHS and employee wellbeing to ensure best practice during project delivery.
- Provide accurate and sound advice on matters related to WHS to build knowledge and expertise across all levels of project personnel and ensure matters are appropriately addressed.
- Facilitate WHS consultation, cooperation, and coordination with Council and contractors in line with Legislation, Code of Practices and relevant standards and guidelines.
- Oversee and/or carry out investigation of all accidents, incidents, and hazards to ensure appropriate controls and corrective actions are identified and initiated in order to prevent recurrence.
- Develop tools and processes including training and other methods to ensure project personnel can develop the knowledge and skills to discharge their WHS responsibilities, including operation of plant and equipment.
- Contribute to project reporting requirements.
- Undertake safety, environmental and traffic control inspections as needed.
- Assist with community and regulatory authority liaison in relation to safety issues/queries.

6.3.8 HSEQ Officer

Accountable to: Group Leader Technical Services

Provide support to the safety coordinator and environment officer for the development and implementation of project plans, undertaking site audits and provision of support to the project team. Any responsibilities held by the environment officer and safety coordinator may be delegated to the HSEQ Officer. In general, the HSEQ Officer is expected to have a higher site presence, ensuring the works are conducted in accordance with project plans and legislation, conducting audits, supporting field staff, providing support to manage incidents and reporting site information to the safety and environment officers. This allows the safety coordinator and environment officers to focus on development of project plans and procedures, ensuring compliance of these plans with legislation and Council's IMS, reporting to external bodies and maintaining project registers and records. It should be noted that while the HSEQ officer is expected to undertake largely site-based responsibilities, the safety coordinator and environment officer may delegate any responsibility including office-based responsibilities such as reporting and project plan development.

6.3.9 Contractor (Coastal Works)

Accountable to: Project Manager / Civil Project Engineer

Coastal Works have been engaged as the contractor to design and construct 3 of the 4 bridges, with the remaining bridge to be constructed by Council. The responsibilities of the contractor include:

- Undertake bridge design and construction works for 3 bridges in accordance with relevant legislation, this plan and all sub-plans and procedures for the project.

- Provide site compound, install all controls and implement all management measures required in accordance with this plan and sub-plans.
- Undertake daily environmental inspections and provide records to Council as part of weekly reporting.
- Attend project induction and ensure all workers and subcontractors attend the induction prior to starting works.
- Provide emergency procedures, project program, and site-specific sub-plans that comply with this plan.
- Allow Council to undertake, and assist with, all compliance inspections.
- Implement any corrective actions in a timely manner.
- Respond to any emergency situations in accordance with this plan and relevant sub-plans.
- Ensure all subcontractors comply with all relevant legislation, plans, sub-plans and procedures.

6.4 24-Hour Contacts

The Council on-call representatives are available 24-hours. They can liase directly with Council's Project Manager and have the authority to halt the progress of the works if necessary. They are the key emergency response personnel during an emergency.

If required in the contract documents the EPA must be given the contact details of the 24-hour contacts

6.5 Contractor (Coastal Works) Contacts

Contact details for Coastal Works (the contractor) project team are provided in Table 6-2 below.

Table 6-2 – Contractor (Coastal Works) project contact details.

Position / Role	Name	Contact No.	Email Address
Projects Engineer	Mark Hankinson	0438 096 544	mark.hankinson@coastalworks.com.au
Bridge Coordinator	Edmund Bailey	0400 817 458	edmund.bailey@coastalworks.com.au

6.6 External Agency Contacts

The details listed below in Table 6-3 outlines the external agency contacts potentially relevant to the project.

Table 6-3 – External agency contacts potentially relevant to the project.

Organisation	Contact Details	Contact No.
Police (Local)	All Enquiries	02 6655-1444
NSW Fire and Rescue (Local)	All Enquiries	02 6655-0351

Office of Environment & Heritage (OEH) / Environmental Protection Authority (EPA)	All Enquiries	131 555 (Environment Line) 02 9995 5000 (main switch) 02 6651 5946 (Environment Protection and Regulation, Heritage and Biodiversity Conservation, Coffs Harbour) 02 9873 8500 (Heritage Council) 02 6652 0900 (National Parks Office Coffs Harbour)
NSW DPI	All Enquiries	02 6391 3100 (Head Office, Orange)
NSW DPI Fisheries	All Enquiries	1300 550 474 (General) 1800 043 536 (Fishers Watch - Fish Kills) 02 6652 3977 (Coffs Harbour Office)
Aboriginal Land Council	All Enquiries	02 6659 1200 (Coffs Harbour) 02 6652 8740 (Coffs Harbour LALC)
Injured Wildlife Rescue Service (e.g. WIRES)	All Enquiries	1300 094 737 or 02 6564 8661 (Mid North Coast)
Bellingen Vet	All Enquiries	02 6655 1098

7 Reporting and Records

The following reports are required to assess project compliance with legislation, this plan and relevant sub-plans, ensure adequate records of site activities are kept and ensure that all relevant project contacts, stakeholders and/or regulatory authorities are notified of any deviations or incidents

7.1 Induction and Training Records

Records of all induction and training required under Section 8 of this plan must be maintained to demonstrate that all workers received the required training/induction prior to commencing works on-site. An Induction and training record must be completed for every induction or training session that is conducted. It is the responsibility of the person conducting the training or induction to prepare, ensure the information recorded is not false or misleading and submit/store this record correctly. An example of a suitable training record is provided as Appendix B.

A copy of the record must be stored at the site, and a digital copy stored within Council's project files. Where inductions or training are conducted by a contractor, records must be provided to Council as part of weekly contractor reporting discussed in Section 7.5.

7.2 Daily Toolbox/Pre-Start Meeting Records

Records of all Daily Toolbox Meetings must be maintained to demonstrate any environmental issues that were discussed and worker attendance at these meetings. This will also serve as a daily site attendance record to record the dates that each worker was present at the site. These records will facilitate any investigations into environmental and safety incidents as they will identify potential witnesses that may have valuable knowledge relevant to development of corrective actions and prevention of future incidents.

A toolbox meeting record must be prepared for every toolbox meeting. If more than one toolbox is undertaken in a day, one record must be prepared for each meeting. If a worker is late and is not present for the meeting, the site engineer must provide a summary of the items discussed and ensure the worker signs the record. It is the responsibility of the site engineer or person conducting the toolbox meeting to ensure toolbox records are prepared, the information recorded is not false or misleading and the record is submitted/stored correctly. An example of a suitable toolbox meeting record is provided as Appendix C.

A copy of the record must be stored at the site, and a digital copy stored within Council's project files. Where daily toolbox and sign on records are prepared by a contractor, records must be provided to Council as part of weekly contractor reporting discussed in Section 7.5.

7.3 Daily Environmental Inspection Record

Records of all daily environmental inspections must be maintained to demonstrate compliance with this plan and relevant sub-plans and demonstrate required controls are being implemented as required. The focus of these inspections is to address items that pose a risk to the environment in the short term such as items that may be impacted by weather events or items relevant to managing an environmental emergency. The objective of the inspections is to identify issues before they cause or exacerbate a near miss or incident. Where issues are identified, the person conducting the inspection must specify corrective action and a timeframe in which the corrective action must be completed.

The person conducting the inspection also has authority to raise a non-conformance which must be undertaken as described in Section 7.6. A non-conformance must be raised when the consequence of the identified issue has the potential to cause material harm to MNES or the Environment and/or does not comply with legislation. A non-conformance may be raised at the discretion of the inspector for other issues.

A daily environmental inspection record must be prepared for every daily environmental inspection. If more than one daily environmental inspection is undertaken in a day, one record must be prepared for each inspection. It is the responsibility of the site engineer, contractor or environmental officer conducting the inspection to ensure inspection records are prepared, the information recorded is not false or misleading and the record is submitted/stored correctly. An example of a suitable daily environmental inspection record is provided as Appendix D.

A copy of the record must be stored at the site, and a digital copy stored within Council's project files. Where daily environmental inspection records are prepared by a contractor, records must be provided to Council as part of weekly contractor reporting discussed in Section 7.5.

7.4 Weekly Environmental Inspection Record

Records of all weekly environmental inspections must be maintained to demonstrate compliance with this plan and relevant sub-plans and demonstrate required controls are being implemented and maintained as required. The focus of these inspections is to address items that pose a risk to the environment in the long term such as maintenance of controls and completion and recording of regular inspections. Weekly water quality monitoring will be conducted as part of these inspections. The objective of the inspections is to identify issues before they cause or exacerbate a near miss or incident. Where issues are identified, the person conducting the inspection must specify corrective action and a timeframe in which the corrective action must be completed. All weekly environmental inspections will be undertaken by Council's project site engineer or environmental officer, including inspections on sites managed by contractors. This inspection will involve a review of contractor daily environmental inspections and ensure council oversight of contractor operations.

The person conducting the inspection has authority to raise a non-conformance which must be undertaken as described in Section 7.6. A non-conformance must be raised when the consequence of the identified issue has the potential to cause material harm to MNES or the Environment and/or does not comply with legislation. A non-conformance may be raised at the discretion of the inspector for other issues.

A weekly environmental inspection record must be prepared for every weekly environmental inspection. If more than one weekly environmental inspection is undertaken in a week, one record must be prepared for each inspection. It is the responsibility of the site engineer, or environmental officer conducting the inspection to ensure inspection records are prepared, the information recorded is not false or misleading and the record is submitted/stored correctly. An example of a suitable daily environmental inspection record is provided as Appendix E.

A copy of the record must be stored at the site, and a digital copy stored within Council's project files. Contractors must be informed verbally of the outcome at the completion of the inspection and a copy of the inspection record issued to the contractor within 2 business days.

7.5 Weekly Contractor Progress Report

The contractor is required to provide daily, weekly and monthly progress reports to Council in accordance with the contract. The reports are intended to capture planned works for the next week, achieved works, delays, plant and personnel movements, project costs and any quality, safety and environment issues. As part of these reports, all records generated during the week must be provided as an attachment. This includes, induction and training records, toolbox meeting and daily sign on records, daily environmental inspection records and any self-raised non-conformance records.

A copy of the report must be stored at the site, and a digital copy stored within Council's project files. In accordance with the contract, the report must be provided to council by 9am Tuesday each week.

7.6 Non-Conformance Report

Non-conformance reports are a formal record that document when a safety, quality or environmental issue was identified, the rectification action specified and the implementation of the rectification action. A non-conformance must be raised when the consequence of the identified issue has the potential to cause material harm to MNES or the Environment and/or does not comply with legislation. A non-conformance may be raised at the discretion of the inspector for other issues. Council has adopted specific objectives within the EMP relating to promptly addressing raised non-conformances. Specifically, all non-conformance reports must be raised within 2 business days of the non-conformance being identified and all rectification actions must be implemented by the date specified on the non-conformance report. Progress of non-conformances will be tracked using a project non-conformance register.

Non-conformances may be prepared by Council's project site engineer, environmental officer or the contractor. However, the non-conformance report requires concurrence from all parties. A non-conformance is not considered raised until signatures recording concurrence of all parties are obtained. For both internal (Council) and external (contractor) non-conformances, this will require the signature of the person who identified the non-conformance, the site personnel/contractor responsible for implementing the rectification actions and the Council project manager.

If more than one non-conformance is identified in a single inspection, one report must be prepared for each non-conformance. It is the responsibility of the environmental officer to ensure non-conformance reports are prepared, the information recorded is not false or misleading and the report is submitted/stored correctly. In addition, it is the responsibility of the environmental officer to ensure that the non-conformance register is updated and correct. An example of a suitable non-conformance report is provided as Appendix F.

A copy of the report must be stored at the site, and a digital copy stored within Council's project files. Contractors must be informed verbally of the outcome at the completion of the inspection and a copy of the non-conformance report issued to the contractor as soon as possible for the contractors' concurrence. This must be signed and returned to Council for the non-conformance to be considered raised. Council has committed to all non-conformances being raised within 2 business days of the non-conformance being identified.

7.7 Environmental Incident Notification and Reporting

The purpose of environmental incident reports is to document the events that lead to the incident, site condition and controls implemented at the time of the incident, any environmental impact caused by the incident, rectification actions undertaken and/or proposed and ensure that relevant regulatory bodies are notified where required. The requirements for reporting and notification vary depending on the severity of the incident and type of environment that is impacted. Despite this, report structure remains the same for all cases. An example of a suitable environmental incident report is provided as Appendix G. The following sections detail report and notification requirements for different types of incidents.

7.7.1 Near Misses and Incidents That Do Not Cause Material Harm to MNES or The Environment

Near misses and incidents that do not cause material harm to MNES or the environment are not required to be reported to external or regulatory bodies. Despite this, these incidents offer opportunity for identifying shortcomings in current plans and procedures that could result in a more severe incident. As such, internal environmental incident reporting should be conducted and the outcomes communicated to all project and contractor staff.

It is the responsibility of the contractor and Council's project site engineer to notify Council's environmental officer of all environmental incidents and near misses. The environment officer should be notified of the incident as soon as the person responsible for notifying becomes aware. It is the responsibility of Council's environment officer to undertake incident investigations and prepare the incident report. The environment officer may engage a consultant to undertake or be involved in incident investigations and reporting.

If more than one near miss or incident is identified in a single inspection, a single report covering all near misses/incidents can be prepared. It is the responsibility of the environmental officer to ensure incident reports are prepared, the information recorded is not false or misleading and the report is submitted/stored correctly. In addition, it is the responsibility of the environmental officer to ensure that any non-conformance identified as a result of the investigation are raised and managed in accordance with Section 7.6. If the incident does not constitute a non-conformance, the report must specify rectification actions to address the current incident and mitigate the risk of future similar incidents. Where the incident highlights deficiencies in approved project plans, procedures or sub-plans, a review and amendment of the deficient documentation must be undertaken in accordance with Section 0.

A copy of the report must be stored at the site, and a digital copy stored within Council's project files. Contractors must be informed verbally of the outcome at the completion of the inspection and a copy of the incident report, and any relevant non-conformance report issued to the contractor as soon as possible. Once the report is issued, the findings should be communicated at pre-start/toolbox meeting and recorded as per Section 7.2.

7.7.2 Incidents That Cause Material Harm to MNES or The Environment

Incidents that cause material harm to MNES or the environment are required to be reported to external regulatory bodies. If there is reasonable doubt as to whether the incident has or will cause material harm, material harm must be assumed. Where a MNES is or will be materially harmed, DCCEEW must be notified within 7 days of becoming aware of the incident. Where the environment is or will be materially harmed, the NSW EPA must be notified of the incident as soon as practicable after the PCBU becomes aware of the contamination.

It is the responsibility of the contractor and Council's project site engineer to notify Council's environmental officer of all environmental incidents and near misses. The environment officer should be notified of the incident as soon as the person responsible for notifying becomes aware. It is the responsibility of Council's environment officer to undertake incident investigations and prepare the incident report. The environment officer may engage a consultant to undertake or be involved in incident investigations and reporting. It is the responsibility of the Council's environment officer to inform/notify regulatory authorities of incidents and provide any requested information.

If more than one near miss or incident is identified in a single inspection, a single report covering all near misses/incidents can be prepared. It is the responsibility of the environmental officer to ensure incident reports are prepared, the information recorded is not false or misleading and the report is submitted/stored correctly. In addition, it is the responsibility of the environmental officer to ensure that any non-conformance identified as a result of the investigation are raised and managed in accordance with Section 7.6. If the incident does not constitute a non-conformance, the report must specify rectification actions to address the current incident and mitigate the risk of future similar incidents. Where the incident highlights deficiencies in approved project plans, procedures or sub-plans, a review and amendment of the deficient documentation must be undertaken in accordance with Section 0.

A copy of the report must be stored at the site, and a digital copy stored within Council's project files. Contractors must be informed verbally of the outcome at the completion of the inspection and a copy of the incident report, and any relevant non-conformance report issued to the contractor as soon as possible. Once the report is issued, the findings should be communicated at pre-start/toolbox meeting and recorded as per Section 7.2.

7.7.3 Incidents That Cause Material Harm to Native Fauna

Incidents that cause material harm to native fauna are required to be reported to external regulatory bodies. If there is reasonable doubt as to whether the incident has or will cause material harm, material harm must be assumed. Where native fauna is or will be materially harmed, the NSW DPIE or National Parks Area Office must be notified as soon as reasonably practicable after becoming aware of the incident. If the wildlife is injured and not deceased, a local veterinarian must be contacted to request medical care for the fauna. It is the responsibility of the contractor or site engineer to engage wildlife medical services as this may be time sensitive and should not wait for off-site project team to be informed.

It is the responsibility of the contractor and Council's project site engineer to notify Council's environmental officer of all environmental incidents and near misses. The environment officer should be notified of the incident as soon as the person responsible for notifying becomes aware. It is the responsibility of Council's environment officer to undertake incident investigations and prepare the incident report. The environment officer may engage a consultant to undertake or be involved in incident investigations and reporting. It is the responsibility of the Council's environment officer to inform/notify regulatory authorities of incidents and provide any requested information.

If more than one near miss or incident is identified in a single inspection, a single report covering all near misses/incidents can be prepared. It is the responsibility of the environmental officer to ensure incident reports are prepared, the information recorded is not false or misleading and the report is submitted/stored correctly. In addition, it is the responsibility of the environmental officer to ensure that any non-conformance identified as a result of the investigation are raised and managed in accordance with Section 7.6. If the incident does not constitute a non-conformance, the report must specify rectification actions to address the current incident and mitigate the risk of future similar incidents. Where the incident highlights deficiencies in approved project plans, procedures or sub-plans, a review and amendment of the deficient documentation must be undertaken in accordance with Section 0.

A copy of the report must be stored at the site, and a digital copy stored within Council's project files. Contractors must be informed verbally of the outcome at the completion of the inspection and a copy of the incident report, and any relevant non-conformance report issued to the contractor as soon as possible. Once the report is issued, the findings should be communicated at pre-start/toolbox meeting and recorded as per Section 7.2.

8 Environmental Training

Mandatory environmental training will be conducted on the project to inform all workers of the importance of the local environment, risks posed by the works and controls and procedures implemented to mitigate the risk of the works impacting the environment. All workers must receive the following training prior to undertaking works at the Site. Induction and training records will be maintained in accordance with section 7.1 to demonstrate that workers have receive the required training.

The Council project manager is responsible for ensuring that the project team including contractors complete their induction prior to commencing works. The person conducting the induction or training is responsible for ensuring the training and induction record is completed, the information recorded is not false or misleading and the record is submitted/stored correctly.

8.1 Project Induction

A pre-work project induction will be conducted by Council and held before the planned start date for the project and will be run as required during the project when new workers are required to be inducted. Council's project manager may delegate the responsibility for conducting subsequent project inductions to other members of the project team and/or the contractor. This induction will cover environmental aspects of the project that are encountered at all sites, including:

- Local habitat, potential risks and avoidance, mitigation and management requirements.
- MNES habitat, potential risks and avoidance, mitigation and management requirements for the following:
    - The Bellinger River snapping turtle, including no-go zones subject to the findings of the pre-clearance surveys.
    - Grey-headed flying-fox.
    - Giant barred frog.
    - Black-faced monarch.
- Weed and pest management protocols.
- Project Hygiene Protocol Training as per section 8.2.

8.2 Project Hygiene Procedure Training

The project is located in a highly sensitive environment which includes flora and fauna that are sensitive to the spread of weeds, pests and disease. To address this risk, a key environmental management measure is the project hygiene protocols. All site staff must comply with the project hygiene protocols and as such, mandatory training is required prior to commencing works.

This training will address all aspects of the Project Hygiene Procedure Document. The training will be included as part of the pre-work project induction conducted by Council. Council's project manager may delegate the responsibility for conducting subsequent hygiene procedure training to other members of the project team and/or the contractor.

8.3 Site-Specific Induction

All other required inductions and training focus on procedures and risk at a project level, but do not address site specific considerations. A site-specific induction is therefore required which will address the following:

- Locations of hygiene stations, spill kits, bunded refuelling locations, rubbish bins, parking, etc.
- Site specific emergency procedures and contacts.
- Specific environmental risks associated with the site and required mitigation measures.
- Site project personnel and contacts.

Staff must receive a site-specific induction for each site they work on prior to commencing work. It is the responsibility of the person managing the site (project site engineer for council manager or the contractor for contractor managed sites) to ensure that all workers complete their induction prior to commencing works and the records are managed in accordance with Section 7.1.

9 Emergency Contacts and Procedures

An Emergency Response Plan has been prepared for this project as a sub plan. The Emergency Response Plan includes procedures for the management of the following:

- WHS emergencies including fire, medical emergency, vehicle accidents, etc.

- Environmental emergency incident response including floods, encountering contaminated materials, injured fauna, etc.
- Spill response procedure for spills both within a waterway and on land.

All staff are required to be inducted on the site-specific emergency procedures as per section 8.3.

9.1 Emergency Contacts

The details listed below in Table 9-1 outlines the project emergency contacts.

Table 9-1 – Emergency contact list.

Name	Contact Number
Emergency Services (Police, Fire, Ambulance)	000 or (112 mobile phone)
Pollution Hotline (EPA)	13 15 55
EnSafe (WHS / ENV) Incident Helpdesk	1300 131 469
Traffic Management Centre (TMC)	13 17 00
Bellingen Vet	(02) 6655 1098
Council Environment Officer	0491 287 288
Council Safety Coordinator	0452 524 441

10 Potential Environmental Impacts and Risks

10.1 Threats to Matters Protected Under the EPBC Act

GHD were engaged to prepare a review of environmental factors (REF) report as part of the approval process for the proposed bridge upgrade works. During the REF investigation, GHD identified potential impacts on MNES. A subsequent MNES assessment was conducted to assess potential impacts and specify proposed mitigation measures. This MNES assessment identified the following MNES that have potential to be impacted by the works:

- Bellingen River Snapping Turtle – listed as critically endangered under the EPBC Act. Key threats posed to this species include: disease, limited distribution and habitat requirements, predation by goannas and foxes, water quality and hybridisation with the Murray River turtle.
- Grey-headed Flying Fox – listed as vulnerable under the EPBC Act. Key threats posed to this species include: loss and degradation of foraging habitat, conflict with people resulting in disturbance and mortality, electrocution and entanglement and climate change.
- Giant Barred Frog – listed as vulnerable under the EPBC Act. Key threats posed to this species include: vegetation clearance and habitat fragmentation, climate change, chytrid fungus resulting in mortality, habitat degradation by feral pigs, domestic stock and invasive weeds, predation by feral cats, freshwater yabby and predatory fish species.

- Black-faced Monarch – listed as migratory under the EPBC Act. Key threats posed to this species include: invasive flora (vine species) and fauna (the black rat).

No other MNES were identified as likely to be impacted by the works.

10.2 Potential Impacts

Potential impacts on MNES identified above were assessed as part of GHDs MNES assessment to include:

1. Loss or degradation of habitat including vegetation clearing and instream and bank bridge construction works.
2. Injury/mortality to fauna due to direct disturbance by the works.
3. Light, noise and vibration disturbance which may impact aquatic fauna such as turtles that use sound to navigate, communicate and forage effectively or nocturnal species sensitive to light pollution.
4. Water quality degradation due to increased risk of erosion and sediment transport as a result of vegetation clearing and earthworks instream and within the riparian area.
5. Temporary restriction of instream connectivity due to construction activities disturbing the area and creating a non-physical barrier that fauna may be reluctant to pass through.
6. Introduction and spread of invasive weeds and pests. Construction activities have the potential to introduce and spread weeds and pests due to the established vegetation clearance, soil disturbance and import of people, plant and materials that may contain weed propagules.
7. Exacerbation of infectious disease. Multiple identified species are susceptible to disease which may be spread by human vectors and imported plant and materials.

10.3 Risk Assessment

A risk assessment has been completed in accordance with the DCCEEW 2024 Environmental Management Plan Guidelines and is presented in below.

Table 10-1 – Environmental risk assessment of potential impacts associated with the works.

Impact	Likelihood	Consequence	Risk	Mitigation Measures	Likelihood	Consequence	Residual Risk
Loss or degradation of habitat	Possible	High	Medium	As per Table 11-1	Rare	High	Low
Injury/mortality to fauna	Unlikely	Major	High	As per Table 11-2	Rare	Major	Medium
Light, noise and vibration disturbance	Highly Likely	Moderate	High	As per Table 11-3	Possible	Moderate	Medium
Water quality degradation	Likely	Major	High	As per Table 11-4	Unlikely	Major	High
Temporary restriction of instream connectivity	Highly Likely	Minor	Medium	As per Table 11-5	Likely	Minor	Low
Introduction and spread of invasive weeds and/or pests	Likely	Major	High	As per Table 11-6	Rare	Major	Medium
Exacerbation of infectious diseases	Possible	Major	High	As per Table 11-7	Rare	Major	Medium

Based on the MNES assessment report and the risk assessment above, a significant impact on any of the identified MNES is unlikely provided the recommended mitigation measures are implemented. These measures are discussed in section 11.

11 Environmental Management Measures

The following management measures have been developed to address the potential environmental impacts posed by the works. The following sections list the potential environmental impacts posed by the works as discussed in section 0. For each potential environmental impacts, the following will be addressed:

- Environmental management activities, controls and performance targets.
- Environmental maps and diagrams.
- Monitoring values with triggers for corrective actions.
- Corrective actions and non-compliance reporting.
- Environmental schedules.

It should be noted that some environmental management measures may be effective at managing multiple environmental impacts. For clarity, mitigation measures have not been duplicated and are only listed under their primary target impact. The MNES assessment provides a more detailed explanation of how mitigation measures may control multiple risks. All mitigation measures must be implemented as far as reasonably practicable.

11.1 Loss or Degradation of Habitat

11.1.1 Environmental Management Measures

Table 11-1 – Loss or degradation of habitat mitigation measures and performance targets.

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Minimising the project footprint to the smallest area needed for construction work. The project footprint for the bridges will be generally restricted to include the existing cleared road easement, as far as reasonably practicable.	Throughout project (i.e. Design and Phases 1 -5) and into operational phase.	4
Whole Project	Selection of optimal bridge locations and improved bridge designs to minimise impacts to surrounding environmental values. E.g. Locating the bridges within previously disturbed areas immediately adjacent to the existing bridges.	Design	4
Whole Project	Establish a designated access track network and restrict all vehicle movements to designated access tracks. Enforce no off-road driving.	Throughout project	12

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Rehabilitation and revegetating exposed surfaces and redundant road sections on completion of construction activities. Bank morphology will be restored to existing conditions.	End of Phase 5 when construction activities are complete.	5
Whole Project	Restrict clearing to the smallest area needed for construction of roads, services and access.	Throughout project	4
Whole Project	Locate laydown areas and other temporary works areas in areas already subject to existing disturbance wherever possible.	Throughout project	6, 10
Whole Project	Demarcate no-go areas of ecological sensitivity both on site and in construction plans, including all vegetation not to be cleared or habitat not to be disturbed. All vegetation to be retained should be surveyed and clearly demarcated.	Throughout project	4
Whole Project	Felled vegetation will be mulched and reused on site. Hollow logs and large debris will be salvaged for the use of habitat creation/enhancement during site rehabilitation.	Throughout project	4
Whole Project	Follow Spill Response Procedure and best practice for fuel and chemical storage protocols and spill responses.	Throughout project	6, 7, 10

*Objectives are presented in Section 4, Table 4-1.

11.1.2 Environmental maps and diagrams

Figures showing ecological survey results and suitable habitat surrounding the sites are presented as Figures 2 – 5 (Bellinger River snapping turtle), Figures 6 – 9 (grey-headed flying fox), Figures 10 – 13 (giant barred frog) and Figures 14 – 17 (Black-faced monarch). This identifies sensitive habitat which will be protected at each site.

11.1.3 Environmental Monitoring

Monitoring of the effectiveness of environmental management measures presented in Table 11-1 will be undertaken as part of daily and weekly environmental inspections. Records of these inspections will be completed and maintained in accordance with Section 7.3 and Section 7.4 respectively.

11.1.4 Corrective Actions and Non-compliance Reporting

Where non-compliance associated with any of the management measures presented in Table 11-1 is identified, a non-conformance report will be prepared in accordance with Section 7.6. The non-conformance report will specify the issue, required corrective actions, the timeframe in which the corrective actions must be implemented and who is responsible for implementing the corrective actions.

11.2 Injury/Mortality to Fauna

11.2.1 Environmental management measures

Table 11-2 – Injury/mortality to fauna mitigation measures and performance targets.

Site	Mitigation Measure	Timing	Performance Target*
Justins and Duffys Bridges	Piers for Justins and Duffys Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin.	Design	4, 8
Joyces Bridge	Piers one and two for Joyces Bridge have been relocated from within the low flow channel to the outside margins.	Design	4, 8
Hobarts Bridge	Piers for Hobarts Bridge have been removed completely from the channel with pier 1 relocated to the water edge margin. Piers two and three for Hobarts Bridge have been relocated from within the low flow channel to the outside margins.	Design	4, 8
Whole Project	Conducting pre-clearance surveys by a suitably qualified ecologist experienced in undertaking surveys for the species identified to be potentially impacted.	Implement at beginning of Phase 1. Must be repeated prior to accessing any undisturbed area including demolition in phase 5.	8
Whole Project	Scheduling the duration of construction works within the low flow channel to the minimum time necessary and outside the wet season (October to March), the giant barred frog peak breeding season (November to February) and the Bellingen River Snapping Turtle nesting season (October to January), therefore cause no direct impacts to breeding.	Throughout project	8

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Engage a suitably qualified ecologist, in consultation with BCD, experienced in undertaking surveys for the species identified to be potentially impacted and/or suitable breeding habitat for these species. Ecologist to: • Undertake pre-clearance surveys to identify and demarcate potential breeding sites for threatened fauna species prior to vegetation removal, • Undertake nocturnal surveys on suitable nights prior to construction to capture and relocate giant barred frogs prior to construction commencement. • Be present for fauna spotting/catching activities during any vegetation removal, abutment excavation and/or rock bag placement within areas of high ecological value.	During specified activities in phases 1, 2 and 5.	8
Whole Project	Minimising instream works through bridge design and construction methodology.	Throughout project	4, 8
Whole Project	Providing environmental training to site personnel through a site induction and toolbox talks on identified species, its habitat, potential risks and avoidance, mitigation and management requirements.	Prior to commencing works	4, 8
Whole Project	Informing BCD of any Bellinger River snapping turtles observed during the works and providing appropriately qualified veterinarian/wildlife carer assistant and/or rehabilitation to any turtles injured or suffering evidence of health concerns.	Throughout project	8
Hobarts Bridge	Construction of Hobarts Bridge will be undertaken outside of the breeding season for the grey-headed flying-fox (October to December).	Throughout project	8
Hobarts Bridge	The construction of Hobarts bridge will cease if the nearby camp contains females that are in the late stages of pregnancy or have dependant young that cannot fly on their own; and will cease during or immediately after climatic extremes (heat stress event, cyclone event) or during a period of significant food stress in the regional landscape.	Throughout project	8

Site	Mitigation Measure	Timing	Performance Target*
Hobarts Bridge	The construction should be supervised by a person with knowledge and experience relevant to the management of flying-foxes and their habitat to make an assessment on whether the activity can go ahead.	Throughout project	8
Whole Project	Enforce on-site speed limits to 40 km/hr in the vicinity of the works zone to restrict the incidence of vehicle strike.	Throughout project	8, 12
Whole Project	Fencing will be erected for the construction of the bridges, fencing will be barbed-wire free and netting-free to avoid grey-headed flying-fox entanglements.	Throughout project	8
Whole Project	Employ of sequential clearing practices.	Throughout project	4, 8
Whole Project	Erect warning signage near high-risk areas such as areas of roosting habitat for the grey-headed flying-fox.	Throughout project	8
Whole Project	Inspect trenches, excavations and machinery daily for the presence of trapped fauna. Minimise the time that excavations are open and place escape poles or structures within excavations to allow fauna to escape. Cover excavations and holes if possible. Place damp hessian sacks in excavations and holes where they cannot be covered to allow trapped fauna to hide under until collected and relocated.	Throughout project	8
Whole Project	Identify the closest vet or wildlife carer prior to construction commencing.	Design	8

*Objectives are presented in Section 4, Table 4-1.

11.2.2 Environmental maps and diagrams

Figures showing ecological survey results and suitable habitat surrounding the sites are presented as Figures 2 – 5 (Bellinger River snapping turtle), Figures 6 – 9 (grey-headed flying fox), Figures 10 – 13 (giant barred frog) and Figures 14 – 17 (Black-faced monarch). This identifies sensitive habitat which should be protected at each site.

11.2.3 Environmental monitoring

Monitoring of the effectiveness of environmental management measures presented in Table 11-2 will be undertaken as part of daily and weekly environmental inspections. Records of these inspections will be completed and maintained in accordance with Section 7.3 and Section 7.4 respectively.

11.2.4 Corrective Actions and Non-compliance Reporting

Where non-compliance associated with any of the management measures presented in Table 11-2 is identified, a non-conformance report will be prepared in accordance with Section 7.6. The non-conformance report will specify the issue, required corrective actions, the timeframe in which the corrective actions must be implemented and who is responsible for implementing the corrective actions.

11.3 Light, Noise and Vibration Disturbance

11.3.1 Environmental management measures

Table 11-3 – Light, noise and vibration disturbance mitigation measures and performance targets.

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Best practice construction methodology and equipment has been selected to minimise risks of noise and vibration disturbance, including use of driven piles which reduces the piling duration compared to bored piles, and to protect water quality/habitat conditions within and downstream of the footprints.	Throughout project	3
Whole Project	Noise blankets and soft starts will be used to manage noise impacts.	High noise and vibration generating actions throughout the project (e.g. piling, anchoring, road construction and demolition)	3
Whole Project	Using an air rock anchor machine and excavator mounted bored piling machine to minimise the noise and vibration generated within the river channel.	Phase 1 and 2	3
Whole Project	Minimising the duration of rock anchoring and piling to the shortest period possible.	Phase 1 and 2	3
Whole Project	Using noise dampening devices on machinery wherever practical and requiring that all equipment is maintained and serviced in accordance with manufacturer's instructions to reduce noise levels.	Throughout project	3
Whole Project	Requiring soft starts for a period of 5 minutes so that individuals have a chance to move away from the area before more intense noise and vibrations start.	Throughout project	3
Whole Project	Schedule construction to minimise the active works area needed at any time.	Throughout project	3

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Service and maintain all plant and equipment to minimise machinery noise as much as possible.	Throughout project	3
Whole Project	Develop and implement measures for the construction site to control construction vehicle movements and speeds and reduce the unnecessary generation of vehicular noise.	Throughout project	3

*Objectives are presented in Section 4, Table 4-1.

11.3.2 Environmental maps and diagrams

Figures showing ecological survey results and suitable habitat surrounding the sites are presented as Figures 2 – 5 (Bellinger River snapping turtle), Figures 6 – 9 (grey-headed flying fox), Figures 10 – 13 (giant barred frog) and Figures 14 – 17 (Black-faced monarch). This identifies sensitive habitat which should be protected at each site.

11.3.3 Environmental monitoring

Monitoring of the effectiveness of environmental management measures presented in Table 11-3 will be undertaken as part of daily and weekly environmental inspections. Records of these inspections will be completed and maintained in accordance with Section 7.3 and Section 7.4 respectively.

11.3.4 Corrective Actions and Non-compliance Reporting

Where non-compliance associated with any of the management measures presented in Table 11-3 is identified, a non-conformance report will be prepared in accordance with Section 7.6. The non-conformance report will specify the issue, required corrective actions, the timeframe in which the corrective actions must be implemented and who is responsible for implementing the corrective actions.

11.4 Water Quality Degradation

11.4.1 Environmental management measures

Table 11-4 – Water quality degradation mitigation measures and performance targets.

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Monitoring of water quality conditions (visual and *in situ* recordings) to identify the potential for water quality degradation within Bellinger River and allow for adaptive management. Water quality monitoring will be conducted weekly during works within the low flow channel.	Baseline monitoring prior to commencing works. Weekly monitoring during phase 1 and 2. Monthly monitoring during construction phases.	17
Whole Project	Preparing and implementing a project specific Erosion and Sediment Control Plan (ESCP) in accordance with the Blue Book (Landcom 2004).	Prepared prior to commencing works. Implemented throughout project	5
Whole Project	Installing erosion protection measures in the form of sediment fences or similar where required to minimise the transport of sediment into the river.	Throughout project	5
Whole Project	Retaining large woody debris, rocks, root balls from within the project footprint for reinstatement following the completion of construction.	Phases 1 – 5	4, 5
Whole Project	Minimising erosion potential through scour protection treatments at abutments.	Throughout project	5
Whole Project	Minimising vegetation clearing and the area of bare ground required for construction to only that which is necessary.	Throughout project	4, 5
Whole Project	Rehabilitate and revegetate disturbed/ temporary construction areas as soon as possible to minimise exposed surface periods.	Throughout project	5
Whole Project	Designate appropriate locations for soil stockpiles, rubbish and waste materials on site and safely secure until disposed material.	Throughout project	5, 6, 9, 10
Whole Project	Appropriately managing and protecting stockpiles. Stockpiles will be a maximum of 1.5 m high and will be set back at least 100 m from the Bellinger River and Kangal River.	Throughout project	5, 6, 9, 10

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Requiring all auxiliary works activities, including chemical and waste storage, will be located at least 100 m from Bellinger River.	Throughout project	5, 6, 7, 9, 10
Whole Project	Site management will in accordance with the waste management practices detailed in the Blue Book (Landcom 2004).	Throughout project	5
Whole Project	Empty bins for concrete and mortar slurries, paints, acid washings, lightweight waste materials and litter at least weekly and otherwise as necessary. Dispose of any waste in an approved manner.	Throughout project	6, 7, 9, 10
Whole Project	Waste material, other than vegetation and tree mulch, will not to be left on site once the works have been completed.	Throughout project	6
Whole Project	Working areas will be maintained, kept free of rubbish and cleaned up at the end of each working day.	Throughout project	10
Whole Project	A closed system reverse cycle circulation system with sediment trap will be used to collect all water and sediment released during drilling for rock anchors.	Throughout project	5
Whole Project	Drilling support fluid will be biodegradable and a vacuum truck used to dispose of material at the completion of drilling.	Throughout project	6, 7, 9
Whole Project	Installing rock bags, liners and blinding construction to create bunded work platforms to prevent spills.	Throughout project	5, 6, 7
Whole Project	Minimising instream works and downstream impacts through the use of rock bags, liners and blinding construction to create safe and dry work areas that prevent any discharge of sediment, drilling fluid or concrete into the waterway.	Implement at beginning of Phase 1. Remove at completion of Phase 2 when instream works are complete	5, 6, 7
Whole Project	Dust suppression controls will be implemented throughout the project. This will include fine mist sprays during rock anchoring and excavation in inaccessible areas and a water cart during accessible road construction activities.	Throughout project	6
Whole Project	Undertake routine dust suppression and visual monitoring during dry conditions to minimise dust dispersal during construction.	Throughout project	6

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Monitor weather conditions during construction and establish extreme weather stand-down and temporary control protocols to minimise adverse outcomes resulting from extreme weather events.	Throughout project	6

*Objectives are presented in Section 4, Table 4-1.

11.4.2 Environmental maps and diagrams

Figures showing ecological survey results and suitable habitat surrounding the sites are presented as Figures 2 – 5 (Bellinger River snapping turtle), Figures 6 – 9 (grey-headed flying fox), Figures 10 – 13 (giant barred frog) and Figures 14 – 17 (Black-faced monarch). This identifies sensitive habitat which should be protected at each site.

11.4.3 Environmental monitoring

Monitoring of the effectiveness of environmental management measures presented in Table 11-4 will be undertaken as part of daily and weekly environmental inspections. It should be noted that water quality monitoring has been included as part of the scope of weekly environmental inspections. Records of these inspections will be completed and maintained in accordance with Section 7.3 and Section 7.4 respectively.

11.4.4 Corrective Actions and Non-compliance Reporting

Where non-compliance associated with any of the management measures presented in Table 11-4 is identified, a non-conformance report will be prepared in accordance with Section 7.6. The non-conformance report will specify the issue, required corrective actions, the timeframe in which the corrective actions must be implemented and who is responsible for implementing the corrective actions.

11.5 Temporary Restriction of Instream Connectivity

11.5.1 Environmental management measures

Table 11-5 – Temporary restriction of instream connectivity mitigation measures and performance targets.

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Construction works will be restricted to daylight hours to allow periods of non-disturbance at night.	Throughout project	3
Whole Project	Scheduling the duration of construction works within the low flow channel to the minimum time necessary and outside the wet season (October to March).	Phase 1 and 2	3

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Best practice construction methods selected to minimise the duration of disturbance.	Throughout Project	3

*Objectives are presented in Section 4, Table 4-1.

11.5.2 Environmental maps and diagrams

Figures showing ecological survey results and suitable habitat surrounding the sites are presented as Figures 2 – 5 (Bellinger River snapping turtle), Figures 6 – 9 (grey-headed flying fox), Figures 10 – 13 (giant barred frog) and Figures 14 – 17 (Black-faced monarch). This identifies sensitive habitat which should be protected at each site.

11.5.3 Environmental monitoring

Monitoring of the effectiveness of environmental management measures presented in Table 11-5 will be undertaken as part of daily and weekly environmental inspections. Records of these inspections will be completed and maintained in accordance with Section 7.3 and Section 7.4 respectively.

11.5.4 Corrective Actions and Non-compliance Reporting

Where non-compliance associated with any of the management measures presented in Table 11-5 is identified, a non-conformance report will be prepared in accordance with Section 7.6. The non-conformance report will specify the issue, required corrective actions, the timeframe in which the corrective actions must be implemented and who is responsible for implementing the corrective actions.

11.6 Introduction and Spread of Invasive Weeds and Pests

11.6.1 Environmental management measures

Table 11-6 – Introduction and spread of invasive weeds and pests mitigation measures and performance targets.

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Undertake prevention and management of pest animal and invasive species in accordance with the weed and pest management plan	Throughout project	10, 11, 12 ,13, 14, 15, 16
Whole Project	Establish appropriate on-site waste-storage and disposal protocols, with designated waste-storage areas and appropriate (i.e. closed) waste receptacles and frequent waste disposal schedules to minimise attracting feral animals (e.g. foxes, dogs and pigs).	Phase 1 and 2	10
Whole Project	Include weed and pest management protocols in all site inductions.	Throughout Project	10, 11, 12 ,13, 14, 15, 16

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Prohibit employees from bringing domestic animals onto the construction site.	Throughout Project	13
Whole Project	Enforce strict hygiene protocols including weed-washdowns, inspections and weed and seed certifications of all vehicles, machinery and plant prior to entering the construction site. Wash-downs and inspections should also be undertaken regularly for vehicles travelling to different parts of the site to minimise internal spread of weeds within the works area as well as to mitigate the spread of chytrid fungus.	Throughout Project	11
Whole Project	Undertake pre-construction inventory and mapping of all weed-affected areas and identify areas of high risk that should be designated as no-go areas or areas requiring active weed management during and after construction.	Throughout Project	13, 15
Whole Project	Undertake periodic inspections of weed-affected areas throughout the construction period and implement weed control to weeds of management concern, including declared and environmental weeds.	Throughout Project	13, 15
Whole Project	Identify and control all declared weed infestations on the construction site throughout construction.	Throughout Project	13, 15
Whole Project	Monitor treated areas to assess the success of declared pest/weed eradication.	Throughout Project	13, 15
Whole Project	Utilise site-won topsoil and mulched vegetation during landscaping and revegetation.	Throughout Project	14, 16
Whole Project	Utilise native species endemic to the region in revegetation to minimise importation of plants.	Throughout Project	16
Whole Project	Undertake regular post-construction monitoring of rehabilitation areas and high-risk weed areas.	Throughout Project	13, 15

*Objectives are presented in Section 4, Table 4-1.

11.6.2 Environmental maps and diagrams

Figures showing ecological survey results and suitable habitat surrounding the sites are presented as Figures 2 – 5 (Bellingen river snapping turtle), Figures 6 – 9 (grey-headed flying fox), Figures 10 – 13 (giant barred frog) and Figures 14 – 17 (Black-faced monarch). This identifies sensitive habitat which should be protected at each site.

11.6.3 Environmental monitoring

Monitoring of the effectiveness of environmental management measures presented in Table 11-6 will be undertaken as part of daily and weekly environmental inspections. Records of these inspections will be completed and maintained in accordance with Section 7.3 and Section 7.4 respectively.

11.6.4 Corrective Actions and Non-compliance Reporting

Where non-compliance associated with any of the management measures presented in Table 11-6 is identified, a non-conformance report will be prepared in accordance with Section 7.6. The non-conformance report will specify the issue, required corrective actions, the timeframe in which the corrective actions must be implemented and who is responsible for implementing the corrective actions.

11.7 Exacerbation of Infectious Diseases

11.7.1 Environmental management measures

Table 11-7 – Exacerbation of infectious diseases mitigation measures and performance targets.

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Extra vigilance for vehicles and machinery that have operated within the distribution of common eastern froglet (*Crinia signifera*), a known vector of chytrid fungus.	Throughout project	8, 11
Whole Project	Enforcing stringent hygiene procedures for all machinery and materials used for the project to minimise the risk of introducing/spreading disease.	Throughout project	8, 11
Whole Project	Implementing safe hygiene protocols when handling frogs. Frog salvage personnel will wear gloves and one bag one frog policy for relocating frogs (i.e. disposable gloves, disposable sample bags, sterile equipment).	Phase 1 and 2	8, 11
Whole Project	Clean and dry all equipment and wet or muddy footwear before and between visiting frog sites. This may include cleaning the tyres of your vehicle before visiting known high-risk sites where threatened frog species may live.	Throughout Project	8, 11
Whole Project	Avoid translocating giant barred frog individuals further than necessary if individuals are located within the construction Project footprint to minimise the potential spread of chytrid.	Throughout Project	8, 11
Whole Project	Carry cleaning utensils and a disinfectant for use between sites.	Throughout Project	8, 11

Site	Mitigation Measure	Timing	Performance Target*
Whole Project	Record any chytrid-infected frogs and contact Frogwatch Helpline on 0419 249 728.	Throughout Project	8, 11

*Objectives are presented in Section 4, Table 4-1.

11.7.2 Environmental maps and diagrams

Figures showing ecological survey results and suitable habitat surrounding the sites are presented as Figures 2 – 5 (Bellingen river snapping turtle), Figures 6 – 9 (grey-headed flying fox), Figures 10 – 13 (giant barred frog) and Figures 14 – 17 (Black-faced monarch). This identifies sensitive habitat which should be protected at each site.

11.7.3 Environmental monitoring

Monitoring of the effectiveness of environmental management measures presented in Table 11-7 will be undertaken as part of daily and weekly environmental inspections. Records of these inspections will be completed and maintained in accordance with Section 7.3 and Section 7.4 respectively.

11.7.4 Corrective Actions and Non-compliance Reporting

Where non-compliance associated with any of the management measures presented in Table 11-7 is identified, a non-conformance report will be prepared in accordance with Section 7.6. The non-conformance report will specify the issue, required corrective actions, the timeframe in which the corrective actions must be implemented and who is responsible for implementing the corrective actions.

12 Auditing and Review

Audits and reviews will be undertaken periodically throughout the project to monitor the performance of the EMP and BSC and contractor compliance with the EMP.

12.1 Internal Auditing

Compliance with this plan and sub-plan by BSC and the contractor will be assessed through internal auditing. Internal auditing will be undertaken quarterly (every 3 months), unless an external audit is scheduled to occur in that quarter. The Environmental Officer is responsible for undertaking internal auditing and may include other members of the HSEQ team. During the audit, the Internal EMP Audit Form (ENV-FRM-00XX) will be used to assess performance of the EMP and BSC and contractor compliance with the EMP. Where non-conformances are identified, a non-conformance report will be prepared in accordance with Section 7.6. Where opportunities for improvement are identified, a review of the EMP will be undertaken in accordance with Section 12.3.

12.2 External Auditing

BSC will engage a consultant to undertake an external audit annually. The consultant will undertake the audit and prepare a report identifying all non-conformances and opportunities for improvement. BSC will prepare a non-conformance report in accordance with Section 7.6 for any identified non-conformances within the consultant's audit report. Where opportunities for improvement are identified within the consultant's audit report, a review of the EMP will be undertaken in accordance with Section 12.3.

12.3 Environmental Management Plan Review

Review of the EMP will be undertaken in the following circumstances:

- Following an environmental incident which does not result in a non-conformance. (i.e. An environmental incident has occurred despite all parties complying with the EMP).
- When opportunities for improvement are identified. This may be at any time throughout the project but both internal and external audits are required to identify opportunities for improvement that may trigger a review.
- Periodically every 12 months.
- Where the scope of the project increases. It should be noted that any additional scope will also require resubmission to the Minister for approval.

Records of amendments will be maintained by updating the document control at the start of the EMP including the change history. In addition, previous versions will be retained and stored digitally in a superseded folder within BSC's project files.

13 Glossary

The following terms and acronyms are used within this document:

Table 13-1 – Terms and acronyms.

Term or acronym	Description
BCD	Biodiversity and Conservation Division of Department of Planning and Environment
BSCMSM	Bellingen Shire Council Management System Manual
BSCPM	Bellingen Shire Council Procedure Manual
Blue Book	Landcom 2004. Managing urban stormwater – soils and construction. Volume 1 (Fourth Edition)
Council	Bellingen Shire Council
cth	Commonwealth of Australia
Contractor	Coastal Works
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	New South Wales Environmental Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (cth)
ERSED	Erosion and Sediment
HSEQ	Health, Safety, Environment and Quality
IMS	Integrated Management System
ITP	Inspection and Test Plans
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
PCBU	Person Conducting Business or Undertaking
POEO Act	Protection of the Environmental Operations Act 1997 (NSW)
QA	Quality Assurance
REF	Review of Environmental Factors
SDS	Safety Data Sheets
WHS	Work Health and Safety

Appendix A – Figures

Appendix B – Training & Induction Record

Appendix C – Daily Toolbox/Pre-Start Meeting Record

Appendix D – Daily Environmental Inspection Record

Appendix E – Weekly Environmental Inspection Record

Appendix F – Non-Conformance Report

Appendix G – Environmental Incident Report

Appendix I

Erosion and Sediment Control Plan – Joyces Bridge

JOYCES BRIDGE REPLACEMENT

Project Description

Coastal Works are replacing Joyces Bridge over the Bellinger River on Darkwood Road, Darkwood under contract works for Bellingen Shire Council. The existing 48m four span, timber bridge will be removed and replaced adjacent with a new 49.5m four span, all concrete bridge on an improved alignment downstream. The site is located approx. 18km west of Bellingen, is highly flood prone and is in key habitat for the Bellinger River Snapping Turtle.

Existing Timber Bridge

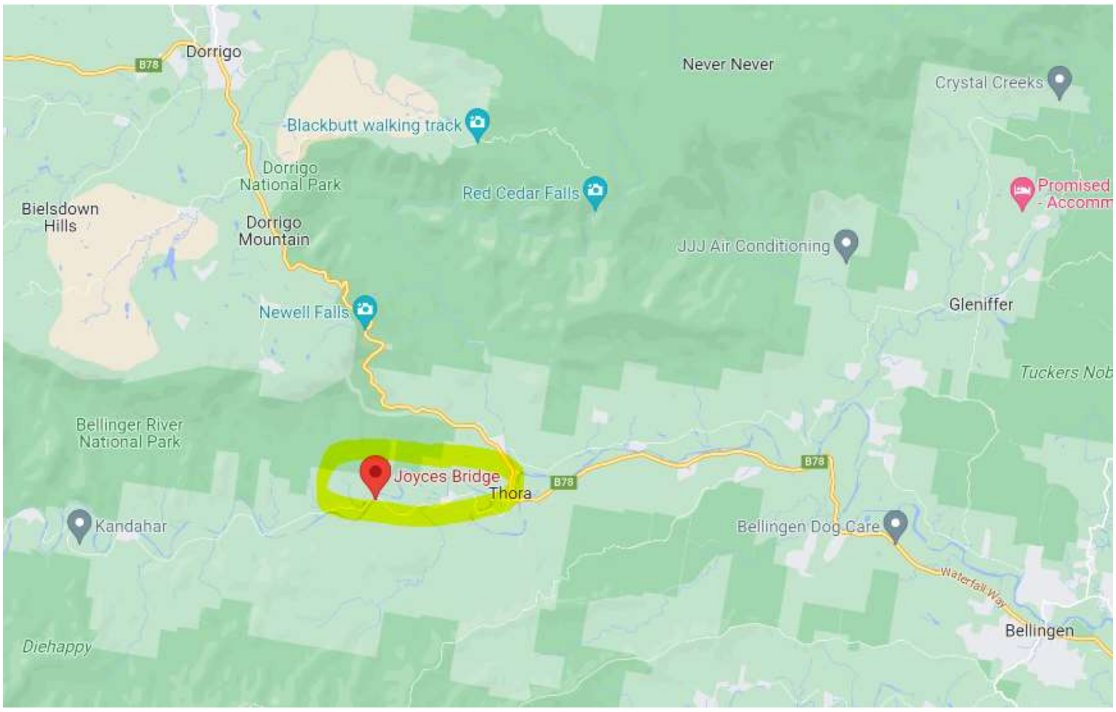
Form of Construction

Foundations – bored, cast in-situ concrete piles (600mm diameter) for all substructures

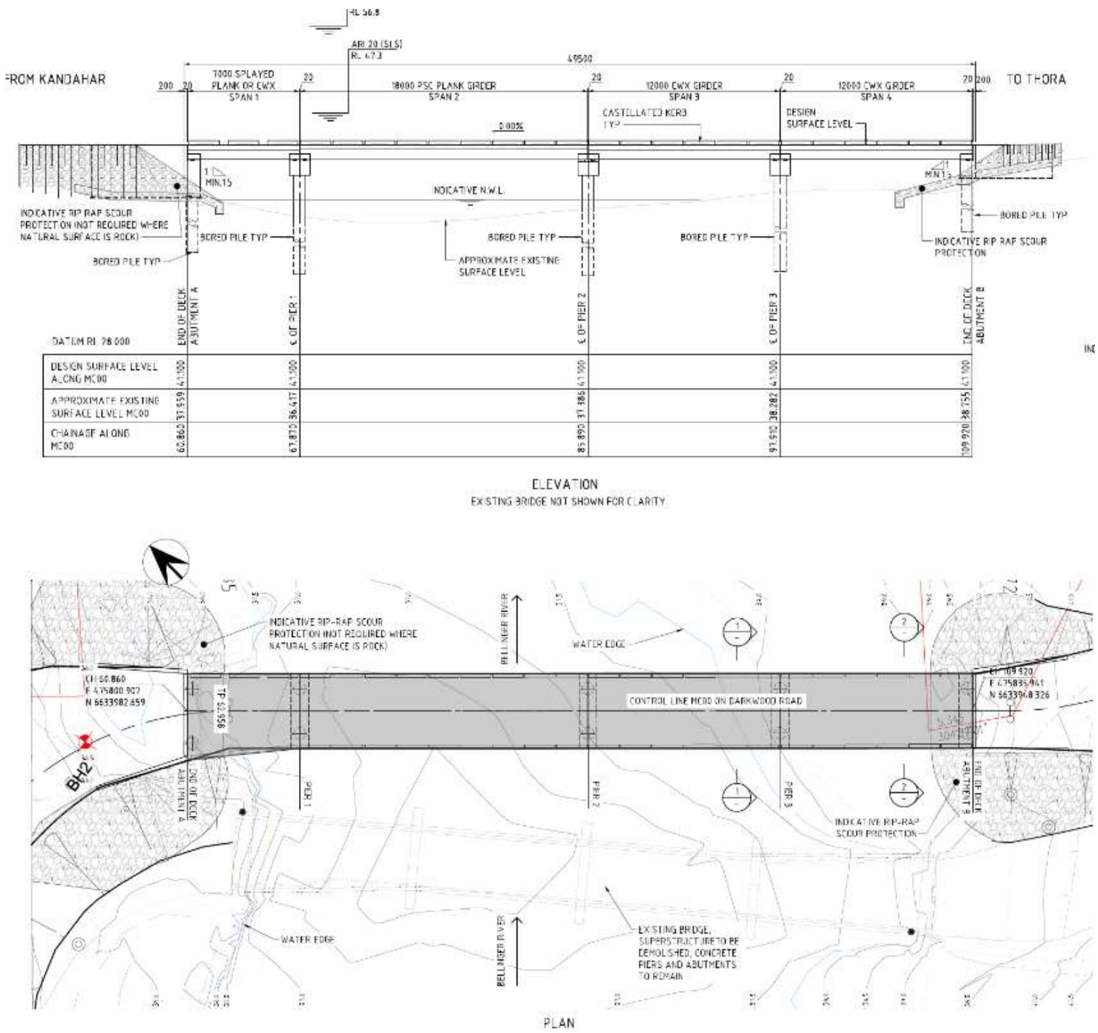
Substructure – cast in-situ reinforced concrete abutments and insitu concrete headstocks, rock scour protection on bank and around abutments

Superstructure - precast concrete CoastalWorks 12m bridge beams for 2 spans, one longer span using 18m PSC pre-stressed bridge planks, one shorter 7m PSC plank span at the western end, cast in-situ deck pours for the two planks spans, bolt on concrete kerbs

Road approaches – 35m of road works one side and 60m the other side to tie into existing road, two coat bitumen seal, 6m wide plus fill formations, cast in-situ concrete approach slabs, open swale drains



Location Map



New Bridge Design

Construction Methodology & Sequence

1) <u>Establishment:</u>
    a. Set up compound, laydown and stockpile areas in private property at the next bend east of the bridge off Darkwood Road above the high flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones,
    c. Installation of erosion and sediment controls for piling and river access ramps including booms in the water,
    d. Delivery of all piling and cast in situ work materials/formwork,
    e. Delivery of pre-filled rock bags,
    f. Establish bunded concrete washout and spoil areas at laydown area.

2) <u>Access to riverbed from high banks:</u>
    a. Clear and grub vegetation and topsoil from on land piling positions, stockpile away from river for later rehabilitation works or remove from site,
    b. On Thora (East) side, the access ramp is to be from the road edge immediately downstream of the abutment down to existing stable cobbly riverbed to Pier 3 and to the water's edge towards Pier 2.
    c. On the West side, the access ramp for piling is to be from the road edge down through Abutment A to the water's edge.
    d. Access ramps to be constructed with:
        i. Geofrabric underlay – extra length on the upstream side that can be used to wrap over the ramp and pinned down with rock bags during high flow events to prevent wash out,
        ii. 150mm thick, clean imported ballast (40-60mm) and/or gabion (50-200mm)

3) <u>Prepare piling areas prior to piling contractor mobilisation:</u>
    a. Abutments:
        i. Box down to underside of abutment plus 75mm for blinding layer, remove spoil to stockpile areas,
        ii. Level off adjacent area for positioning of piling rig,
        iii. Bench excavation for stability if needed and install edge delineation.
    b. At Pier 3 (out of waterway) – inside sediment fencing, excavator to dig down 1m to clear larger cobbles and use sieve bucket to sieve fines back into the excavation and cobbles onto adjacent cobble banks. Cobbles of this size (>200mm) particularly near the surface make 600 bored piling extremely difficult.
    c. At Pier 1 and 2:
        i. Access to both of these to be one at a time to limit the amount of afflux of the general water level and blockage of the wateryway,
        ii. Place rock bags with an excavator progressing out from the water's edge above the water level so an excavator can walk over them (on rubber mats to avoid tearing the bags)
        iii. Place a rock bag ring around the pile positions up to 300mm above water level to deflect the water flow/velocity around the area and provide a containment ring.
        iv. Lay geofabric on the inside of the rock bags with enough length to drape down to the bottom
        v. Fill inside the geofabric and bags with clean, imported, small aggregate (10mm-40mm) up to also 300mm above water level.

Aggregate will largely be self levelling and suitable for personnel access (not excavator tracks) and suitable for helping the pile liners to stand up before the high level rock strata

vi. Pull floating hydrocarbon boom tight to the bags

4) Bored piling works:
   a. Plant & equipment – 30t excavator with a 2t vibratory head attachment and pendulum drill head with Kelly bar for the auger.
   b. Abutments – excavator positioned on existing ground behind abutments,
   c. Pier 3 – excavator positioned on existing cobbly riverbed and access track.
   d. Pier 1 & 2 – excavator positioned on rock bags only not the aggregate infill area which will not be stable enough for excavator crawling only small plant, equipment and personnel.
   e. Vibratory head used to install permanent mild steel liners in position first
   f. Pile clean-out material placed either directly in a skip bin or on a geofabrics lined area adjacent the piling area so it can be removed from the riverbed area to the established stockpile area (or off site) daily. 2m screens of geofabric or ply to be erected along the line of rock bags at Pier 1 & 2 to deflect any loose material entering the water as the auger is pulled out.
   g. After piles are cleared, extend pile liners at the 3 pier sets by welding on extra sections up to the underside of headstock levels
   h. Place cages and pour concrete with concrete boom pump on the respective side of the river. Sucker truck to remove water from the wet pile holes during concrete placement.
   i. Concrete overpour out of top of piles (typically 0.2m3 per pile) to be contained within tarps area locally to the pile and then removed once dried the next day. At the abutments, overpour used as a blinding slab.

5) Remove in water piling access – remove piling rock bag areas in reverse order with excavator moving progressively out of the water. Excavator to scoop out imported aggregate from within the geofabric being carful not to tear. Last sections of aggregate removed by bunching, lashing and lifting sections of geofabric directly out of the waterway. Remove rock bags and stockpile until next stage.

6) Cast in-situ concrete sub-structure - abutments:
   a. Reinforcement placed and tied in place by hand on blinding slabs.
   b. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
   c. Elevated walkway up to the top of concrete which will all cantilever off the formwork and not require additional footprint on the banks.
   d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
   e. Strip all formwork after concrete curing period,
   f. Complete mortar pads by hand mixed mortar to finish all substructures.

7) Cast in-situ concrete sub-structure:

a. Temporary working platform to be fixed directly to piles projecting above riverbed which will be used as falsework for headstocks, reducing scaffold and works at on riverbed.
b. Ply formwork shutters pre-made and placed with excavator using the same access points used during piling. Personnel access to all from temporary working platform level.
c. Reinforcement placed and tied in place by hand.
d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour all substructure works. Pump and concrete trucks to be brought to the respective sides of the river for pours so the boom line is not over the waterway at any time. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
e. Complete mortar pads by hand mixed mortar to finish all substructures and strip all formwork and elevated access platforms.

8) Place scour rock around abutment fronts – place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks. Excavator to place scour rock from established access ramps and then from behind abutments out of the riverbed area.

9) Land all precast beams and planks and tie cast in-situ deck –
a. Place rock bags progressively out and tight around the in-river piles at Pier 1 and 2 for personnel access only to the top of piles (not for machinery),
b. Reinstate sufficient access track (as above) for crane and semi truck access down next to Pier 3 over the cobbly river bank
c. Use access track for larger PSC planks and CoastalWorks beams
d. Smaller Franna crane to land smaller 7m PSC planks in the western span from on existing road approach
e. beams sealed soffit formwork to be used between planks and beams to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Temporary access platforms to be installed along the outside edges for the 18m and 7m plank span for access and edge formwork.

10) General fill and drainage zone behind abutments – place and compact area immediately behind abutments up to underside of approach slabs. Maintain access to existing bridge for road traffic. All trucks, rollers and excavators out of the creek and sediment fencing along the whole bank lines to contain from any wet weather during this period.

11) Pour beam and deck pours – CoastalWorks 12m beam spans poured first, 18m and 7m plank span second with the approach slabs. Boom pumps to be again used from the respective sides without putting the line over the waterway. Curing of the deck pour to be done with clean water, soaker hoses and hessian.

12) Install bolt on kerb units onto plank span

13) Fully remove cranage access tracks and rock bags from around headstock piles – excavator to progressively remove rock bags, imported ramp materials and geofrabirc underlay working away from the water on each side back to the high banks. All imported rock to be re-used for road backfill. Rock bags removed from site.

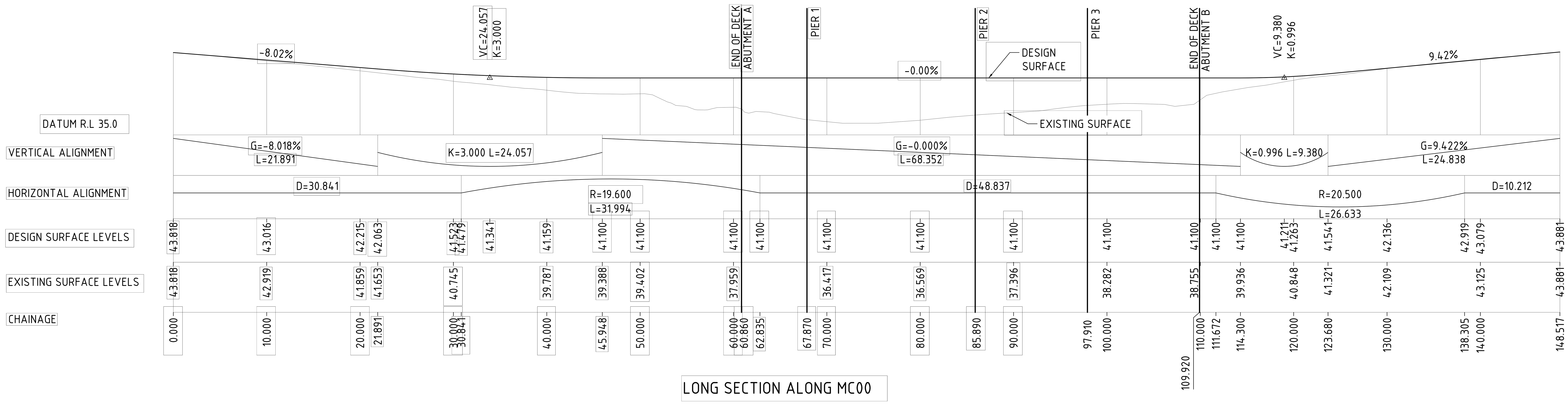
14) Remove temporary works from plank span – use Franna crane and or HIAB truck on the new deck to lift out and load directly to laydown area.

15) Complete approach roadworks – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

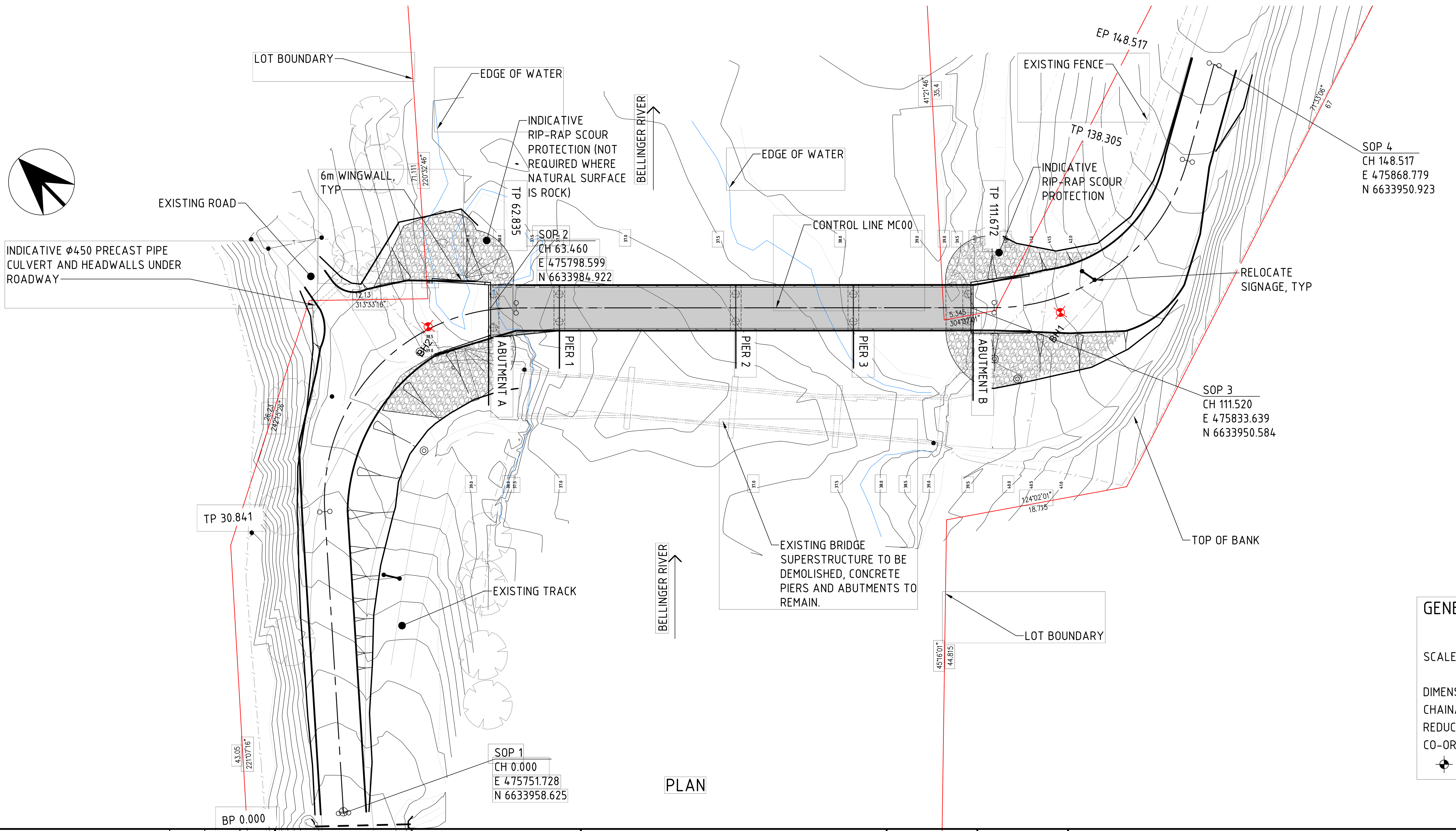
16) Demolish original bridge:
    a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers.
    b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing ply and timber decking first followed by girders for each span. No access off deck required for this.
    c. Once deck fully removed, remove protruding abutments to tie in better with the new scour rock and bank profile. Use rock breaker on excavator to break up and then remove in largest possible pieces by excavator and by hand.
    d. For non-accessible headstocks in the water flow area, access via floating platform and remove timber components from above water with chainsaw and oxy cutting bolts down to top of concrete. Concrete headstocks to remain.
    e. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

17) Complete rock scour protection – on upstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

18) Demobilise construction activities – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.



LONG SECTION ALONG MC00



PLAN

GENERAL NOTES

SCALE 0 2500 5000 10000mm OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
03	01/06/2023	MINOR AMMENDMENTS	JR	DM	CR
02	17/05/2023	MINOR AMMENDMENTS	JR	DM	CR
01	19/04/2023	CONCEPT DESIGN	JR	DM	CR

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSE OF THE NOMINATED PROJECT

bk. bridge knowledge. ENGINEERING CONSULTING SERVICES
BRIDGE KNOWLEDGE PTY LTD

BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

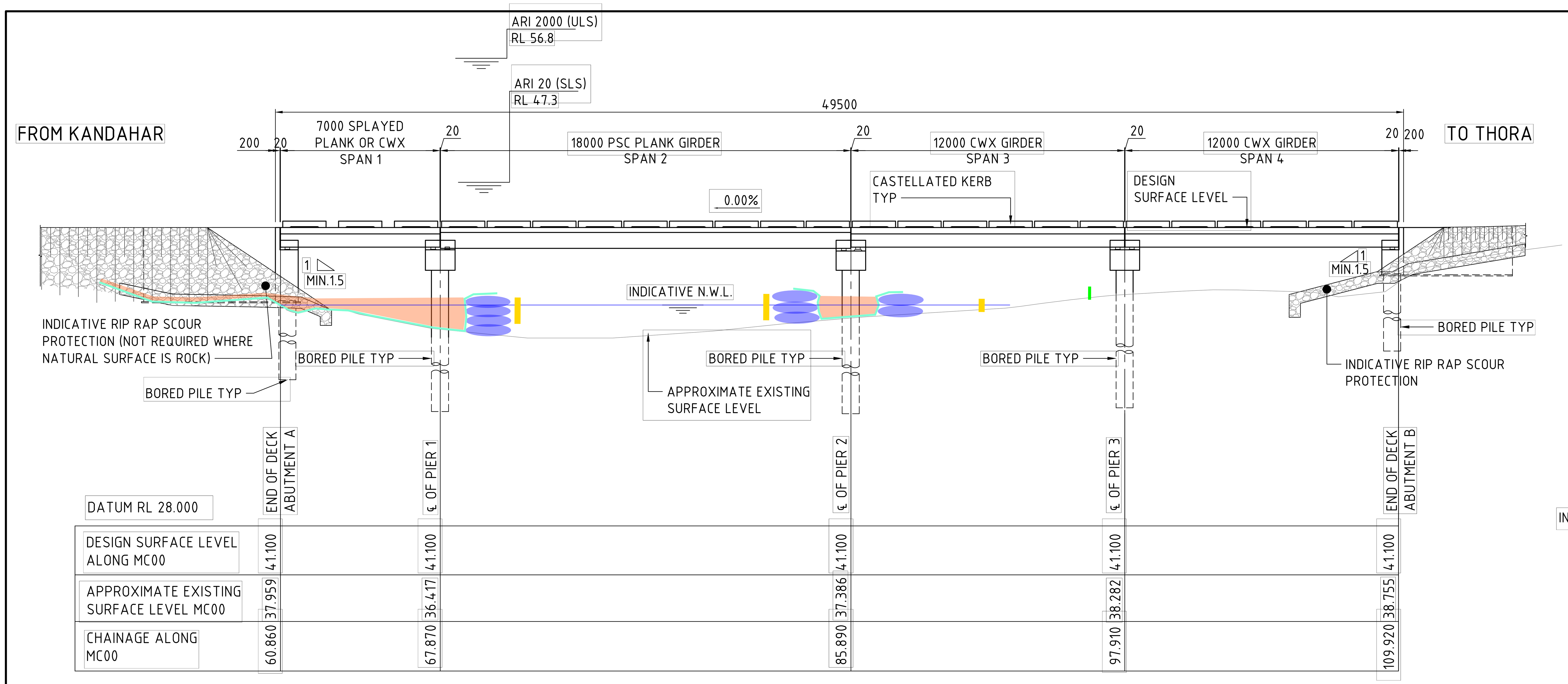
TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	YT
APPROVED	DM

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

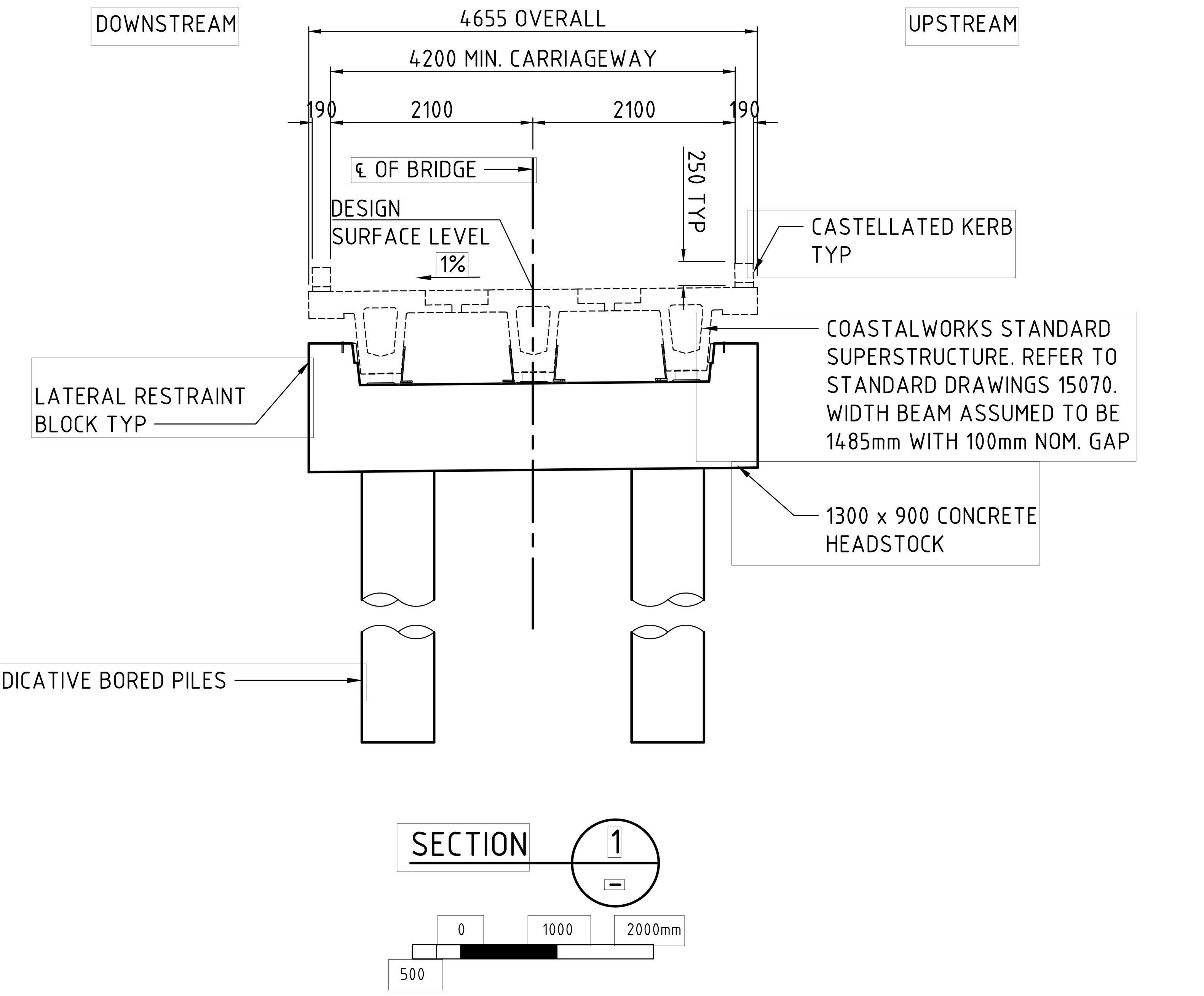
TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE

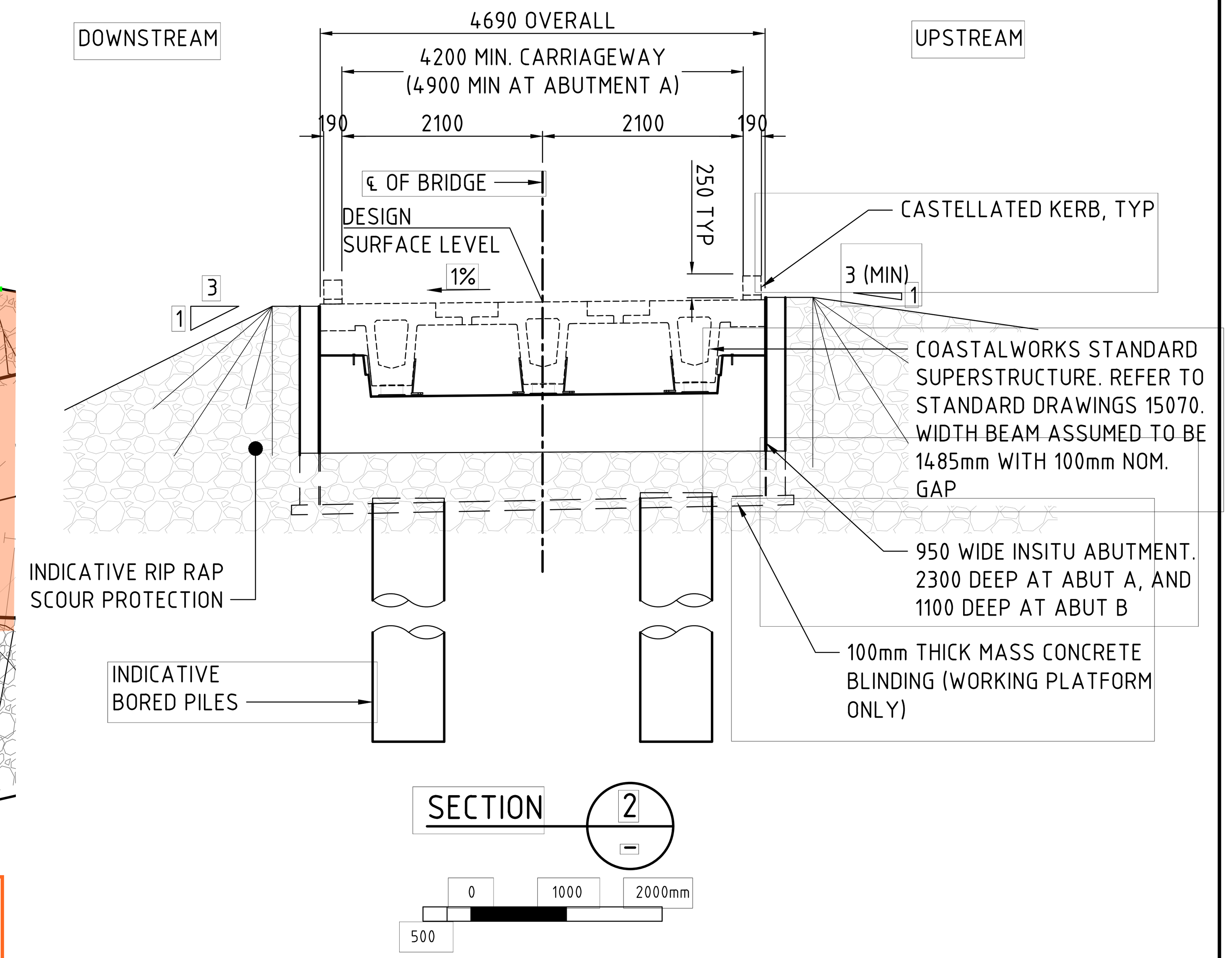
ROAD DESIGN - LONG SECTION AND PLAN

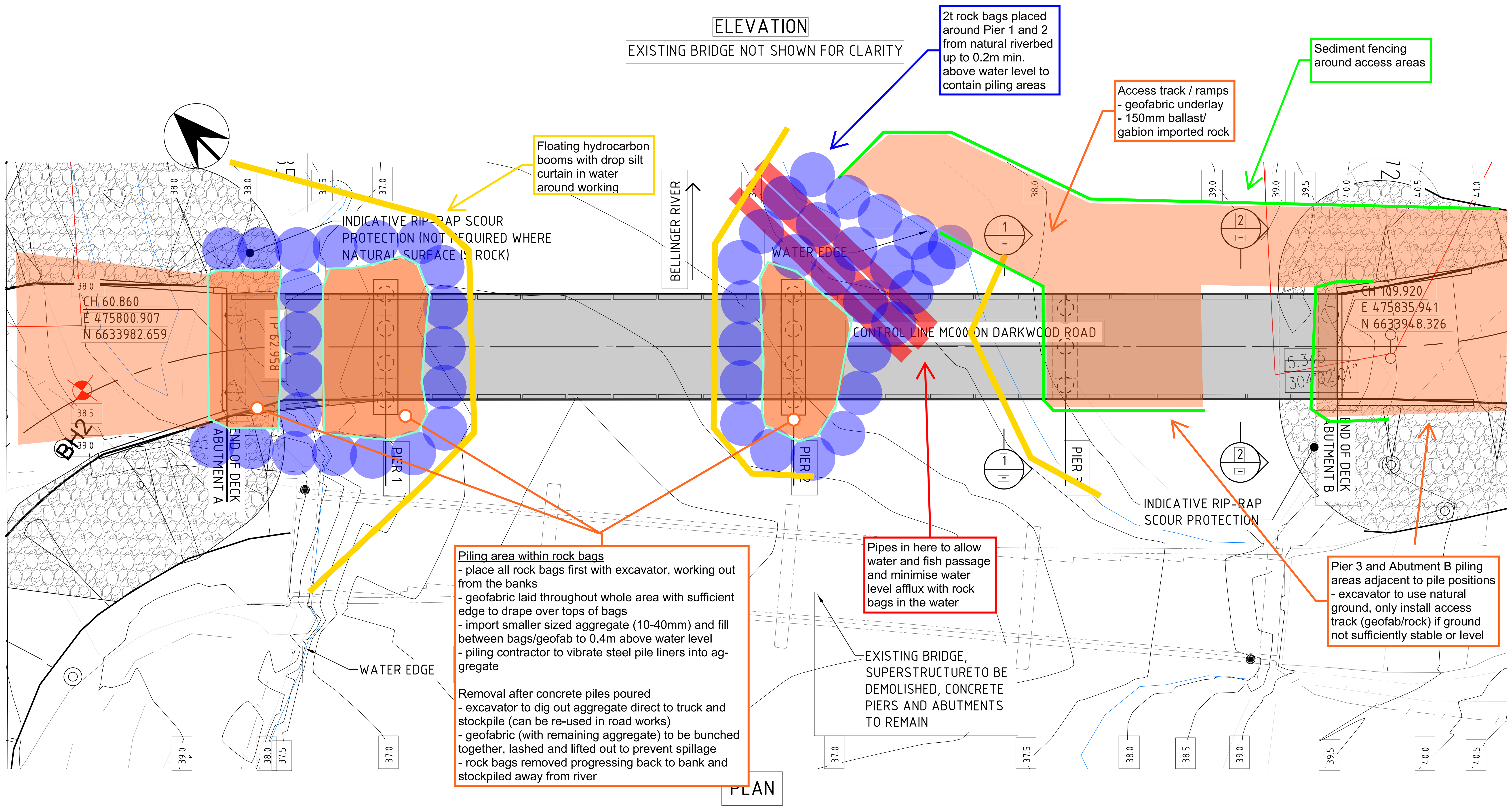
DRAWING SET No	BKP372-BSC
BRIDGE No	DRG-002
ISSUE STATUS	CONCEPT DESIGN
ISSUE	03
No SHEETS	5
SHEET No	02



DESIGN SURFACE LEVEL ALONG MC00	41.100	41.100	41.100	41.100	41.100
APPROXIMATE EXISTING SURFACE LEVEL MC00	37.959	36.417	37.386	38.282	38.755
CHAINAGE ALONG MC00	60.860	67.870	85.890	97.910	109.920







GENERAL NOTES

SCALE 0 1000 2500 5000mm OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
03	01/06/2023	MINOR AMMENDMENTS	JR	DM	CR
02	17/05/2023	MINOR AMMENDMENTS	JR	DM	CR
01	19/04/2023	CONCEPT DESIGN	JR	DM	CR

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BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

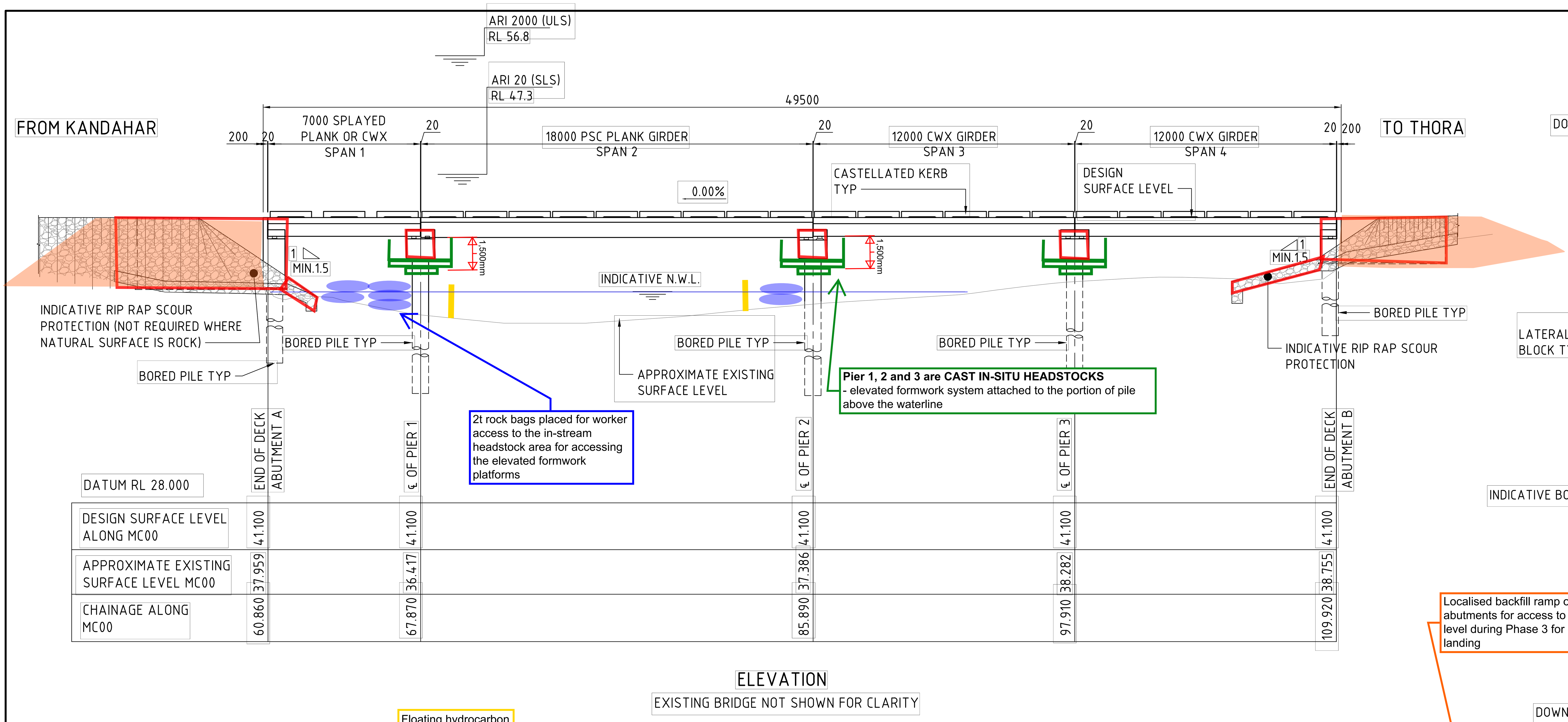
TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	YT
APPROVED	DM

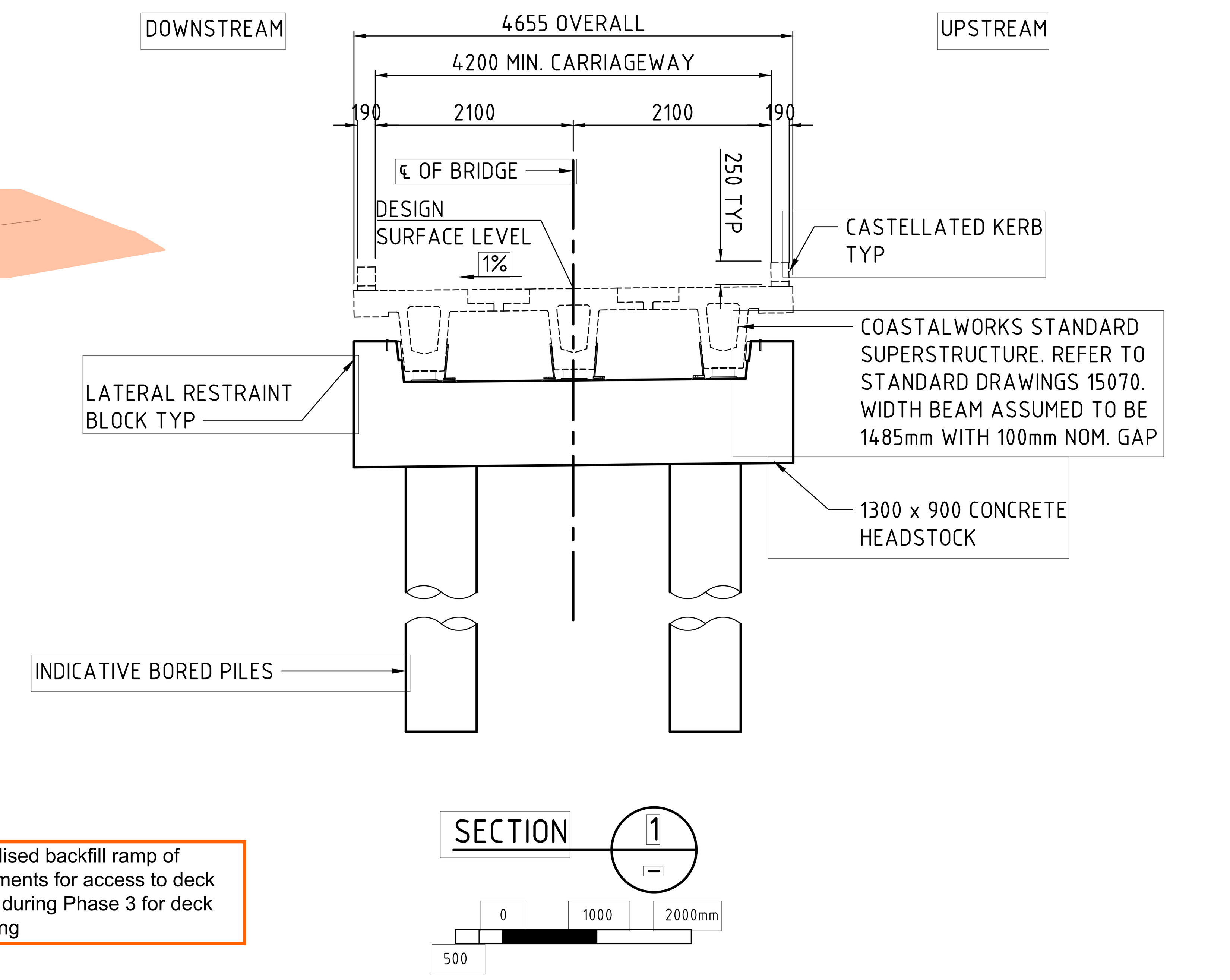
DARKWOOD ROAD
BELLINGEN SHIRE COUNCIL

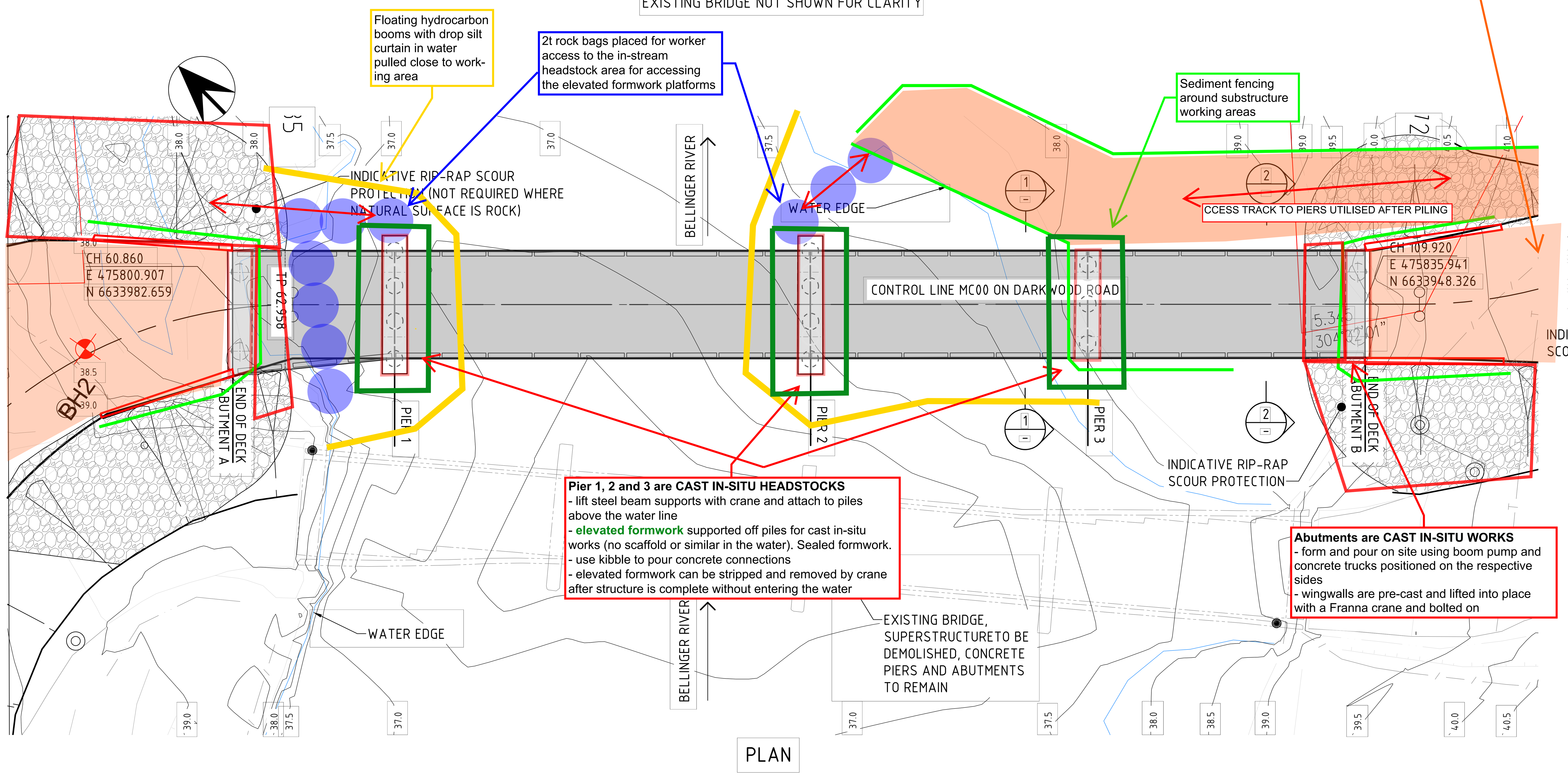
TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE

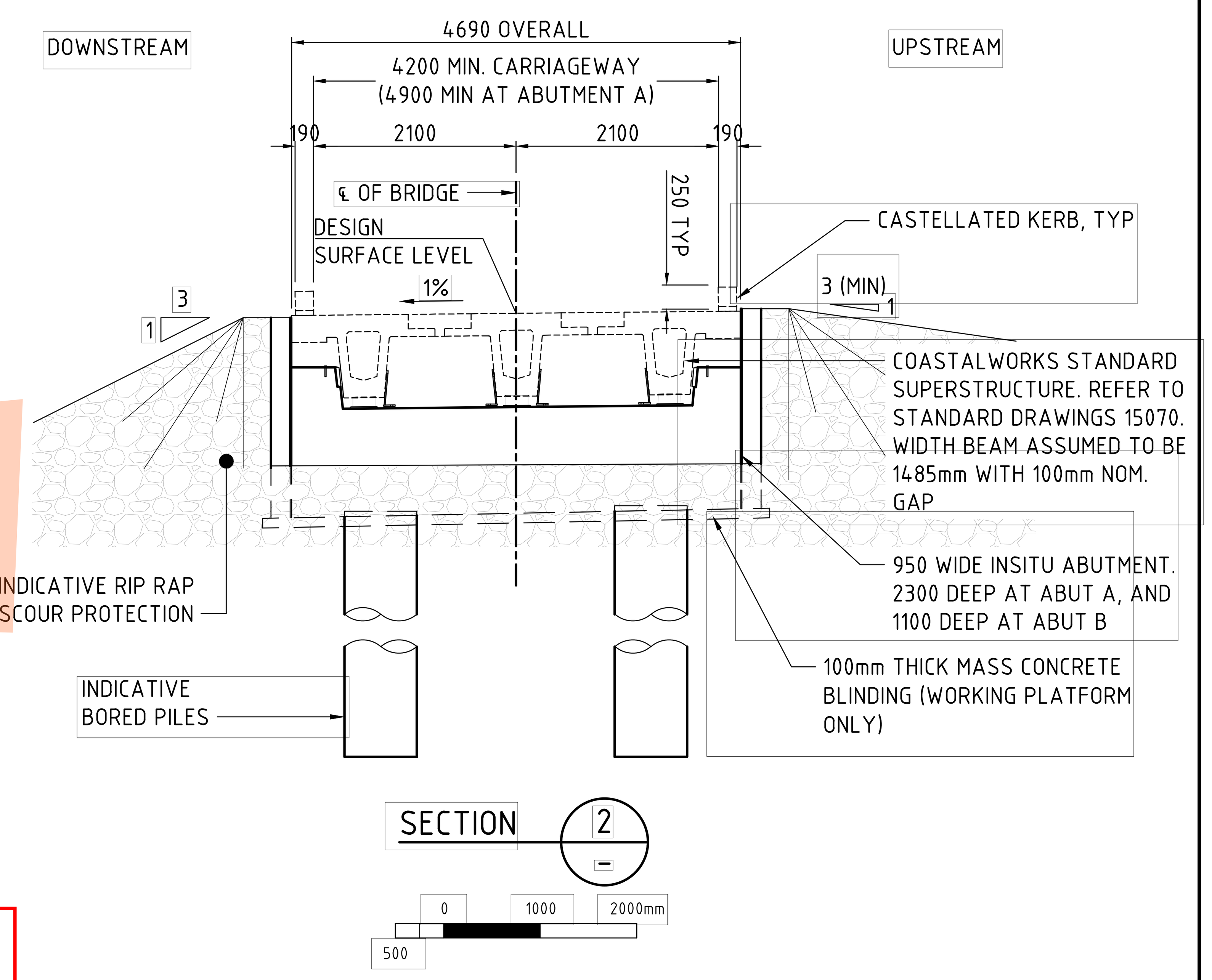
PHASE 1 - Establishment and Piling Access

DRAWING SET No BKP372-BSC
BRIDGE No DRG-005
ISSUE STATUS CONCEPT DESIGN
ISSUE 03 No SHEETS 5 SHEET No 05









GENERAL NOTE:
ROCK BAGS TO REMAIN IN PLACE FOR PERSONNEL ACCESS UNTIL THE SUPERSTRUCTURE WORKS ARE COMPLETED FOR CONTINUING ACCESS NEEDS FOR WORKERS TO THE ELEVATED WORK PLATFORM AREAS FOR PIERS AND BEARING PAD AREA.

CHAINAGES AND REDUCED LEVELS ARE IN METERS.
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DENOTES BOREHOLE LOCATION (APPROXIMATE).

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DESIGN CHECK	DM
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DRAWING CHECK	YT
APPROVED	DM

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE

PHASE 2 - Substructure Access Plan

DRAWING SET No	BKP372-BSC
BRIDGE No	DRG-005
ISSUE STATUS	CONCEPT DESIGN
ISSUE	03
No SHEETS	5
SHEET No	05

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
03	01/06/2023	MINOR AMMENDMENTS	JR	DM	CR
02	17/05/2023	MINOR AMMENDMENTS	JR	DM	CR
01	19/04/2023	CONCEPT DESIGN	JR	DM	CR

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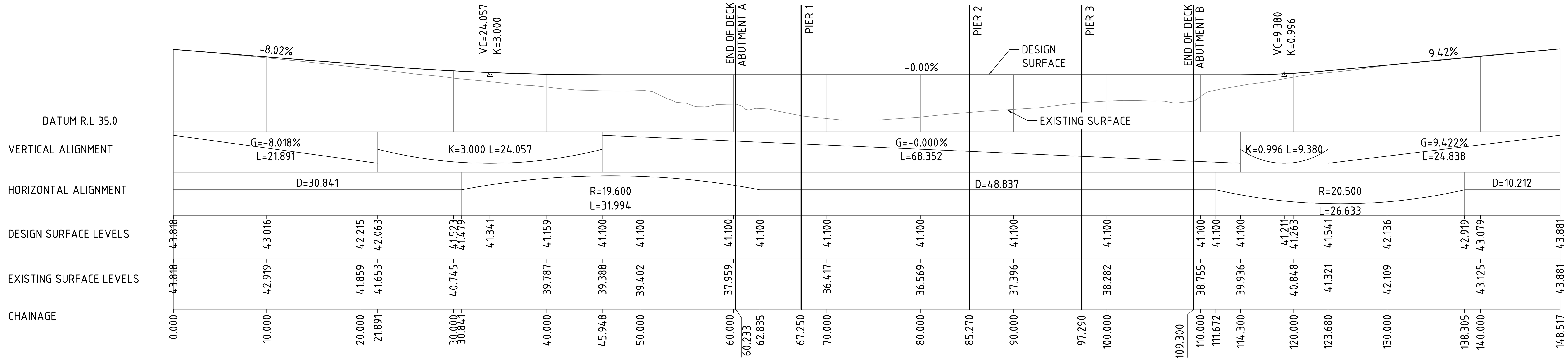
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	YT
APPROVED	DM

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

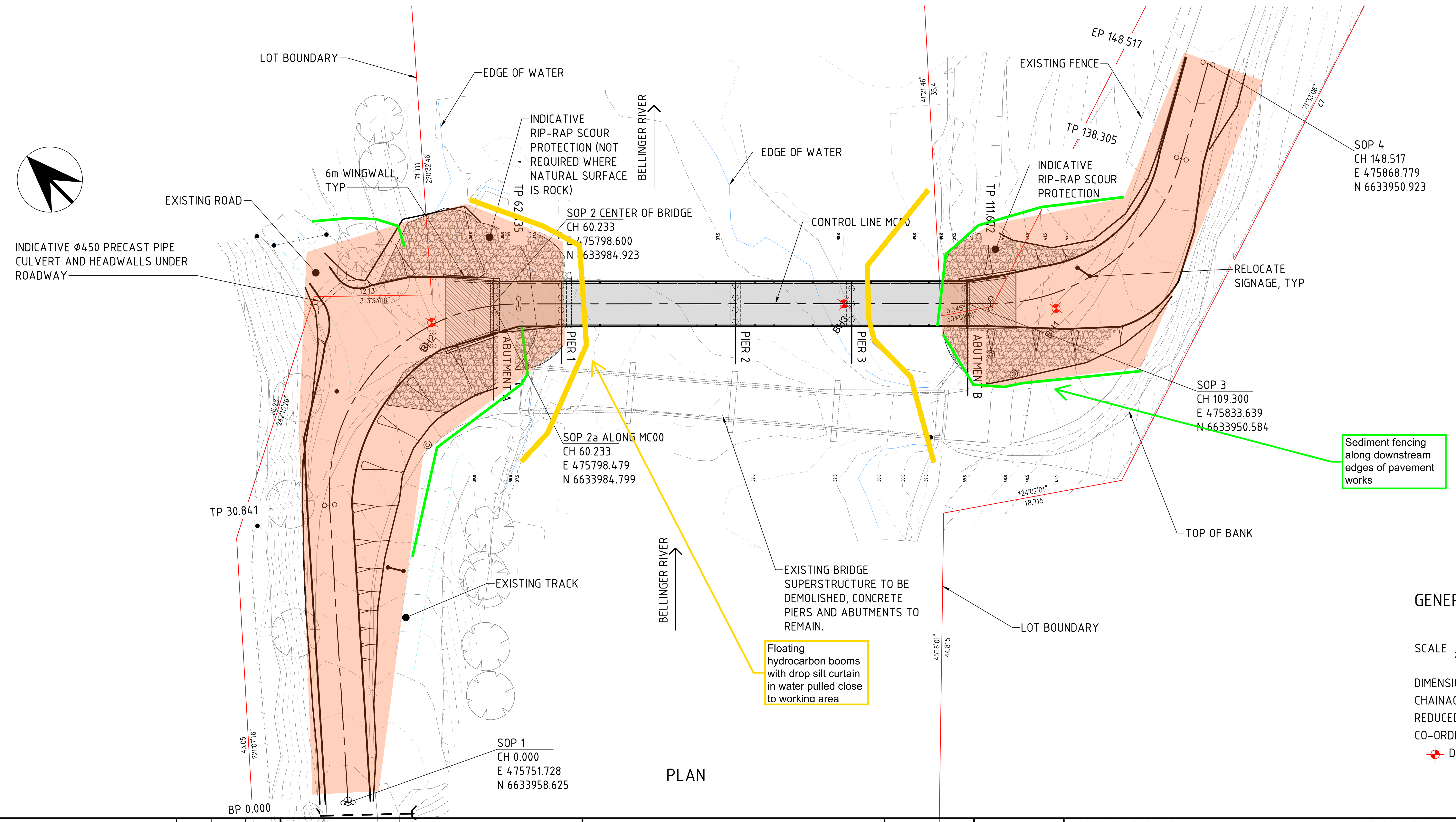
TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE

PHASE 3 - Superstructure Access Plan

DRAWING SET No: BKP372-BSC
BRIDGE No: DRG-005
ISSUE STATUS: CONCEPT DESIGN
ISSUE: 03 | No SHEETS: 5 | SHEET No: 05



LONG SECTION ALONG MC00



PLAN

GENERAL NOTES

SCALE 0 2500 5000 10000mm OR AS SHOWN.

DIMENSION IN MILLIMETERS.
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CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

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ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
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DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	YT
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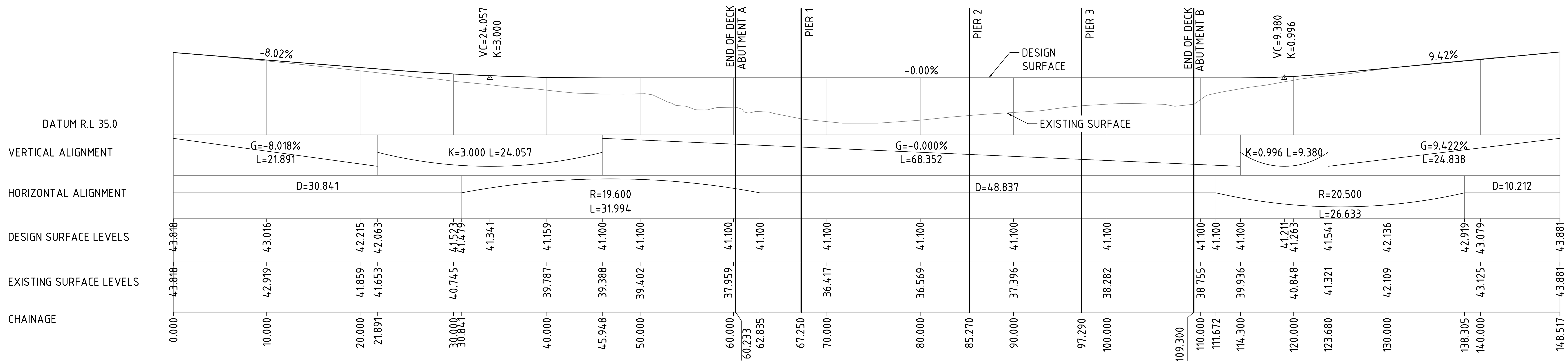
DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE

PHASE 4 - Roadworks Access Plan

DRAWING SET No	BKP428-BSC
BRIDGE No	DRG-002
ISSUE STATUS	DETAIL DESIGN
ISSUE 01	No SHEETS 17 / SHEET No 02



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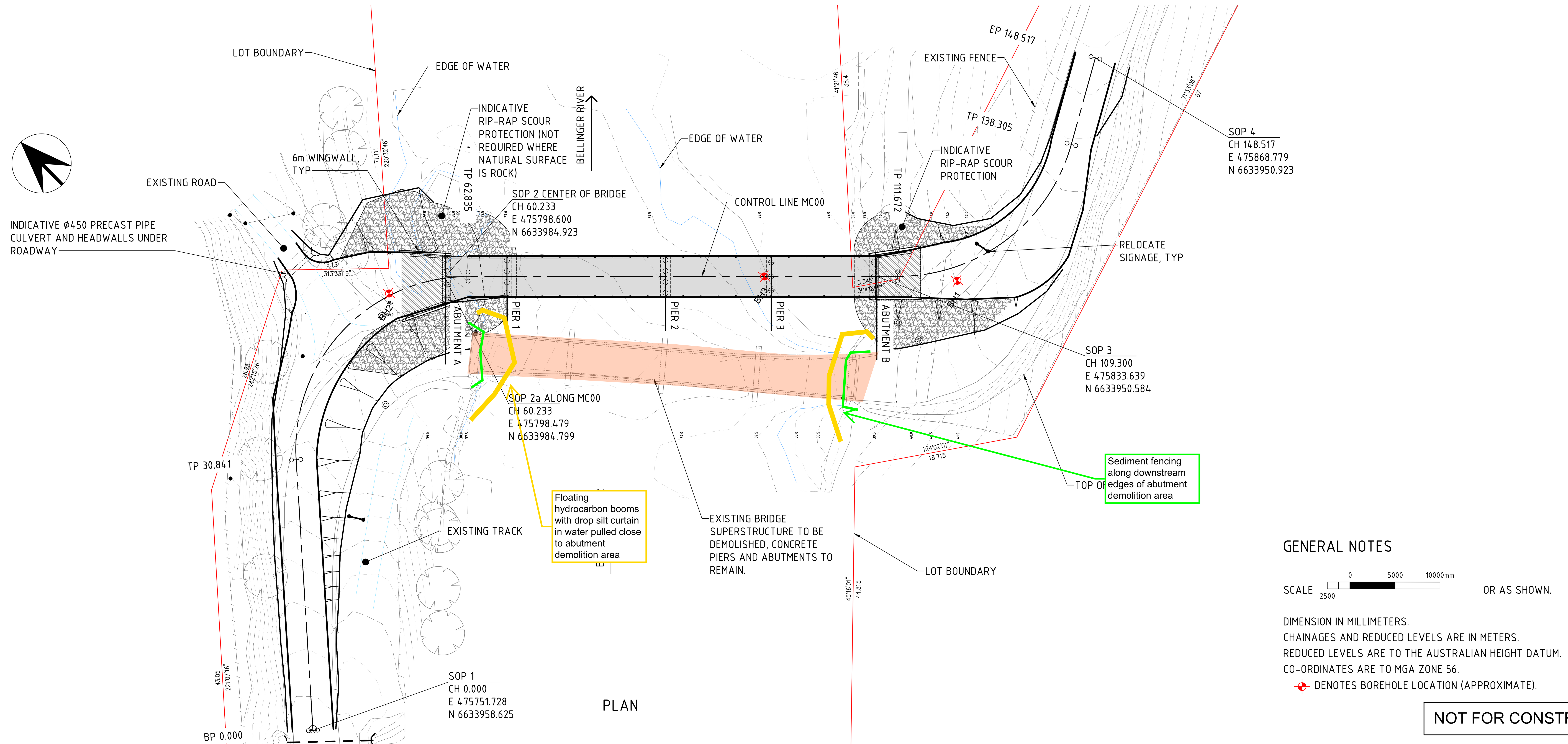

PLAN

GENERAL NOTES

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ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
01	29/04/2024	50% DETAIL DESIGN	JR	DM	CR

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DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	YT
APPROVED	DM

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TIMBER BRIDGE REPLACEMENT PROJECT
JOYCES BRIDGE

PHASE 5 - Demolition

DRAWING SET No	BKP428-BSC
BRIDGE No	DRG-002
ISSUE STATUS	DETAIL DESIGN
ISSUE 01	No SHEETS 17
SHEET No	02

Appendix J

Erosion and Sediment Control Plan – Hobarts Bridge

HOBARTS BRIDGE REPLACEMENT

Project Description

Coastal Works are replacing Hobarts Bridge over the Bellinger River on Darkwood Road, Darkwood under contract works for Bellingen Shire Council. The existing 48m five span, timber bridge will be removed and replaced adjacent with a new 54m four span, all concrete bridge on an improved alignment downstream. The site is located approx. 20km west of Bellingen, is highly flood prone and is in key habitat for the Bellinger River Snapping Turtle.

Existing Timber Bridge

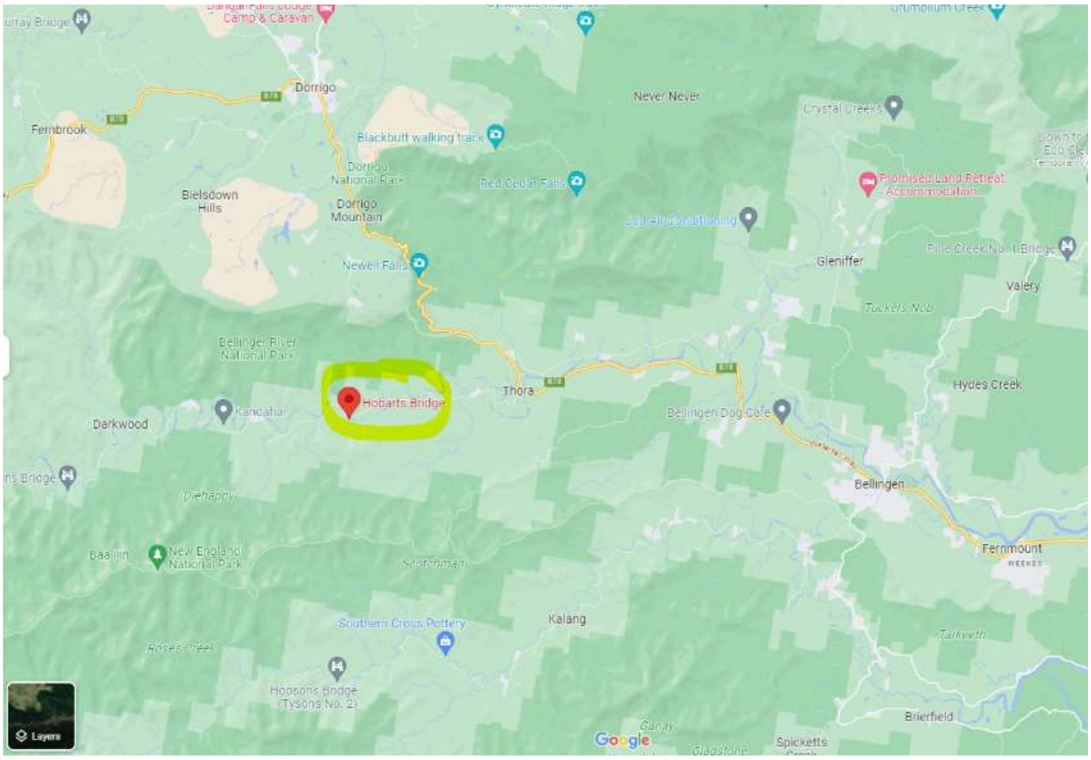
Form of Construction

Foundations – bored, cast in-situ concrete piles (600mm diameter) at one abutment and one headstock, rock anchors at the other abutments and two headstocks into high level rock

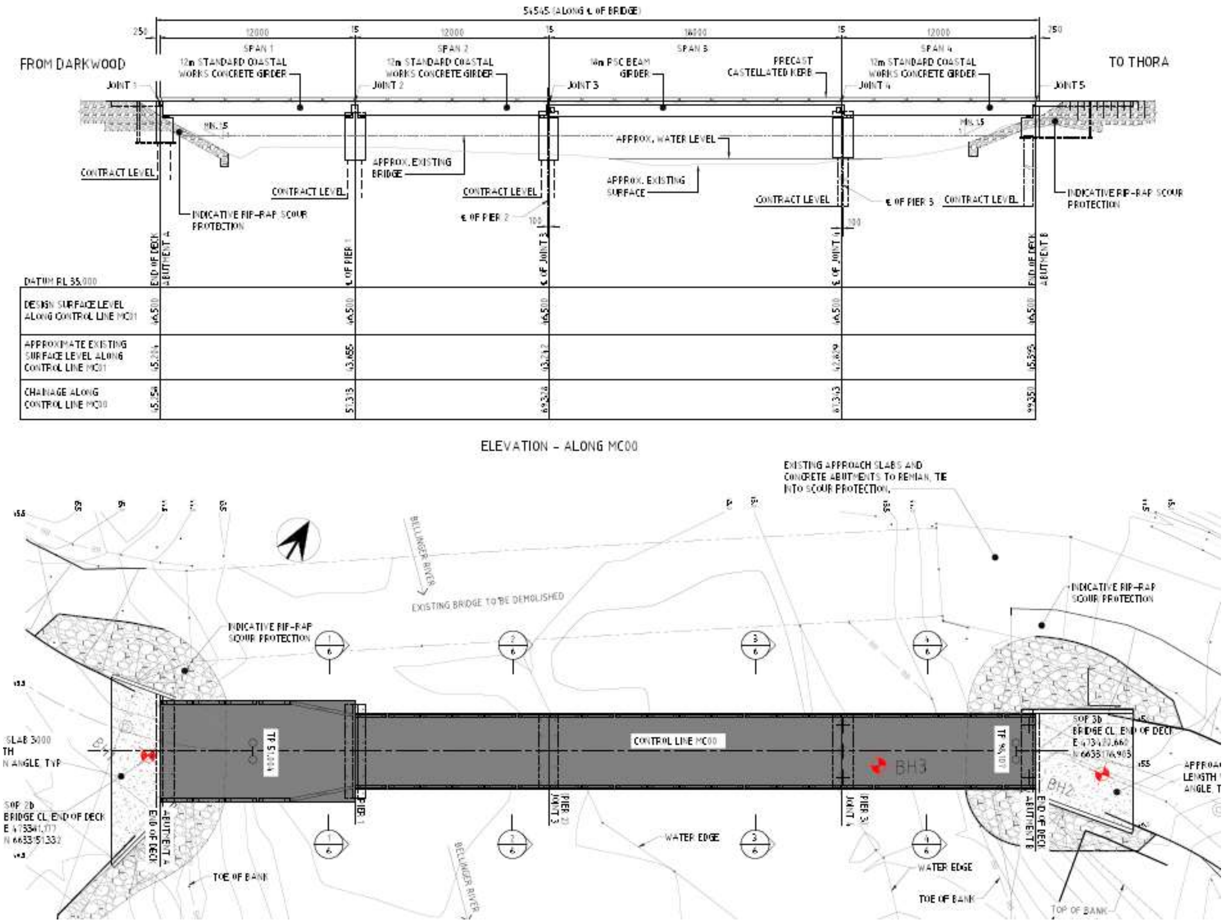
Substructure – cast in-situ reinforced concrete abutments and headstocks throughout, shorter at the two foundations with the bored piles and taller blade walls at the other rock anchor foundations poured directly onto the exposed high level rock shelf, rock scour protection on bank and around abutments

Superstructure - precast concrete CoastalWorks 12m bridge beams for 3 spans and one longer span using 18m PSC pre-stressed bridge planks and a cast in-situ deck pour, cast in-situ concrete approach slabs, bolt on concrete kerbs

Road approaches – 40m of road works one side and 50m the other side to tie into existing road, two coat bitumen seal, 6m wide plus fill formations, open swale drains



Location Map



New Bridge Design

Construction Methodology & Sequence

1) Establishment:
    a. Set up compound, laydown and stockpile areas in the Darkwood Road shoulder on the eastern approach off the road and above the high flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones,
    c. Installation of erosion and sediment controls for piling and river access ramps including booms in the water,
    d. Delivery of all piling and cast in situ work materials/formwork,
    e. Delivery of pre-filled rock bags,
    f. Establish bunded concrete washout and spoil areas at laydown area.

2) Access to riverbed from high banks:
    a. Clear and grub vegetation and topsoil from ramp areas, stockpile away from river for later rehabilitation works or remove from site,
    b. On Thora (East) side, the access ramp is to be immediately downstream of the abutment down to existing stable alluvial gravel shelf. If the alluvial shelf does not churn up with the excavator tracks, then it will be accessed as is and flattened off at completion. If this is not the case, the access ramp construction will extend onto this area also for stability,
    c. On the school side (West), the access ramp is to be between new and existing abutments (shortest bank height) down onto existing exposed rock shelf. Rock shelf is suitable for tracked machine and foot access without a need to import access track materials. A minor amount of loose deposited gravels on top of the rock shelf may be shifted for leveling of plant and equipment.
    d. Access ramps to be constructed with:
        i. Geofrabric underlay – extra length on the upstream side that can be used to wrap over the ramp and pinned down with rock bags during high flow events to prevent wash out,
        ii. 150mm thick, clean imported ballast (40-60mm) and/or gabion (50-200mm)

3) Prepare piling areas prior to piling contractor mobilization:
    a. Abutments (one bored, one rock anchors)
        i. Box down to underside of abutment plus 75mm for blinding layer, remove spoil to stockpile areas,
        ii. Level off adjacent area for positioning of piling rig,
        iii. Bench excavation for stability if needed and install edge delineation.
    b. At Pier 3 (bored piles, east side of water) – blinding slab to be used to aid in keeping piles in correct position and providing a slab for the cast in-situ blade wall style headstock works:
        i. Place approximately 10 rock bags wrapped in geofabric along the edge of the low flow creek line to pin down the edge of the alluvial riverbed material and provide containment for the working area,
        ii. Pull floating hydrocarbon boom tight to the water side of the rock bags and install sediment fencing around the inside of the bag rim,
        iii. Over a 5m x 1.5m area over the footprint of the bored piles, excavator to dig down 1m to remove any larger cobbles,
        iv. Stand up 3 short steel pile liners in the wet excavation,

v. Pour a 0.5-1.0m deep reinforced concrete blinding slab 5m x 1.5m around the pile liners to approximately 200mm above low flow water level.

c. At Pier 1 and 2 (rock anchors) – reverse blinding layer to be used around the outside of the blade wall plan area to contain the footprint for piling works and later cast in-situ works from the waterway:
   i. Clear loose debris and river gravel from the blade wall footprint by hand and excavator,
   ii. Pier 2 is in a dry position on the rock shelf – form blinding with timber formwork and pour reinforced blinding ring,
   iii. Pier 3 is 75% dry with one corner in shallow approx. 0.3m deep water. For this corner first place sandbags to above water level, then line with multiple layers of building plastic on the inside and then timber formwork on top of this in the water. Use a sucker truck to remove water from inside this corner as it is displaced by the concrete pour,
   iv. Drier concrete mix to be used to minimise risk of seepage into the adjacent water and lifters cast in so that the blinding can be easily and fully removed after completion of the blade wall.

4) <u>Bored piling works:</u>
   a. Plant & equipment –30t excavator with a 2t vibratory head attachment and pendulum drill head with Kelly bar for the auger.
   b. Abutment B – excavator positioned on existing ground behind abutment,
   c. Pier 3 – excavator positioned on existing river gravel shelf between Abutment B and pier.
   d. Vibratory head used to install permanent mild steel liners in position first from ground level. Abutment B may not require these, Pier 3 to have liners vibrated down inside the established blinding.
   e. Pile clean-out material placed either directly in a skip bin or on a geofabrics lined area adjacent the piling area so it can be removed from the riverbed area to the established stockpile area (or off site) daily. 2m screens of geofabric or ply to be erected along the line of rock bags at Pier 3 to deflect any loose material entering the water as the auger is pulled out.
   f. After piles are cleared, place cages and pour concrete with concrete boom pump up at existing road level behind the abutment. Sucker truck to remove water from the wet pile holes during concrete placement.
   g. Concrete overpour out of top of piles (typically 0.2m3 per pile) to be contained at Pier 3 with tarps. Overpour at Abutment B used as a blinding slab.

5) <u>Rock anchor works:</u>
   a. Plant & equipment – 7t-10t excavator with a specialist air drilling attachment with Down Hole Hammer (DHH) and on-site grout mixing station. DHH option keeps noise and vibration down the hole rather than an above ground hammer which is much noisier above.
   b. Install 2m high spray screens, using geofabric or ply, on 3 sides of the rock anchor areas to deflect any natural rock spray from entering the water.
   c. Excavator drill rig to be positioned on the rock shelf well clear of the water between Pier 1 and 2 and on the existing road level for Abutment A,
   d. Grout mixing station to be on the western existing road near Abutment A out of the riverbed and banks. Bund the area from overspill and grout hoses to

the rock anchor working area to be plastic wrapped or run in a larger diameter conduit to capture any potential break.

e. Concrete revers blinding to be 200mm higher than rock level to act as containment for flushing of the rock anchor holes (water and rock sediment) and for containing grout overpour. These can be removed by sucker truck at end of works to tidy area ready for cast in-situ works.

6) <u>Cast in-situ concrete sub-structure:</u>
    a. Reinforcement placed and tied in place by hand inside reverse blindings at piers and on traditional blinding at abutments all above low flow water level.
    b. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
    c. Two blade walls will require elevated walkway up to the top of concrete which will all cantilever off the formwork and not require additional footprint on the riverbed other than a ladder.
    d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour all substructure works. Pump and concrete trucks to be brought to the respective sides of the river for pours so the boom line is not over the waterway at any time. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
    e. Strip all formwork and remove reverse blinding after concrete curing period,
    f. Install cantilevered walkway access platforms off new concrete for access to bearing pad level for piers,
    g. Complete mortar pads by hand mixed mortar to finish all substructures.

7) <u>Fully remove piling access tracks</u> – excavator to progressively remove rock bags, imported ramp materials and geofrabirc underlay working away from the water on each side back to the high banks. All imported rock to be re-used for road backfill.

8) <u>Place scour rock around abutments</u> – place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks. Excavator to place scour rock from established access ramps and then from behind abutments out of the riverbed area.

9) <u>General fill and drainage zone behind abutments</u> – place and compact area immediately behind abutments up to underside of approach slabs. Maintain access to existing bridge for road traffic. All trucks, rollers and excavators out of the creek and sediment fencing along the whole bank lines to contain from any wet weather during this period.

10) <u>Establish crane outrigger positions –</u> use rock bags placed either side either side of the existing timber bridge as outrigger positions, one set on the western end and one on the eastern end using an excavator from the existing bridge deck. Cranes to be positioned on the first 10m of the existing bridge for landing precast components under full road closure.

11) <u>Land all precast beams and planks and tie cast in-situ deck and approach slabs</u> – sealed soffit formwork to be used between planks and beams to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Temporary

access platforms to be installed along the outside edges for the 18m plank span for access and edge formwork.

12) Pour beam and deck pours – CoastalWorks 12m beam spans poured first, 18m plank span second with the approach slabs. Boom pumps to be again used from the respective sides without putting the line over the waterway. Curing of the deck pour to be done with clean water, soaker hoses and hessian.

13) Install bolt on kerb units onto plank span

14) Remove temporary works from headstocks and plank span – use Franna crane and or HIAB truck on the new deck to lift out and load directly to laydown area.

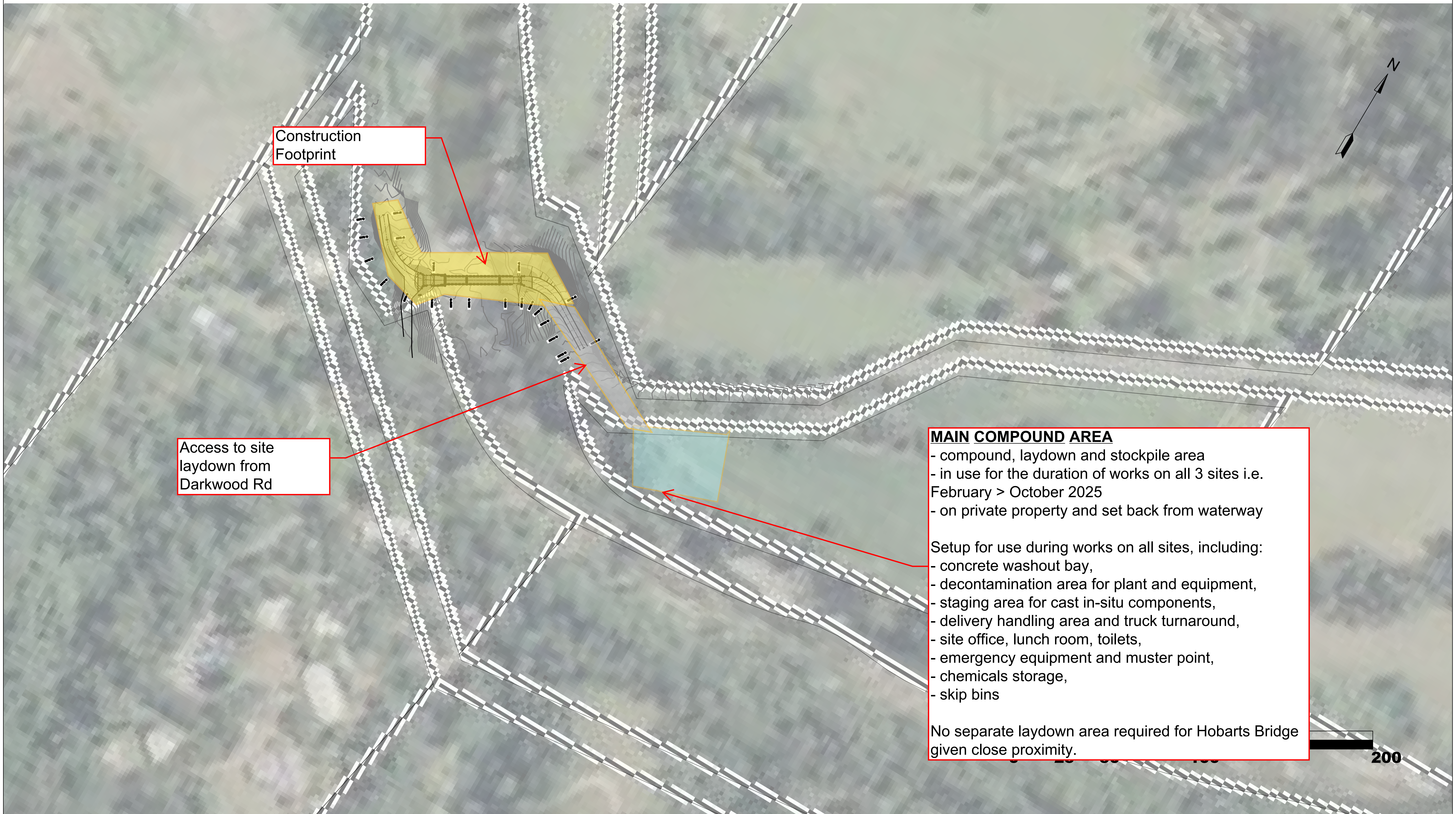
15) Complete approach roadworks – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

16) Demolish original bridge:
    a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers.
    b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing ply and timber decking first followed by girders for each span. No access off deck required for this.
    c. Once deck fully removed, remove headstocks on the western side that are accessible outside of the low flow water area only. Use rock breaker on excavator to break up and then remove in largest possible pieces by excavator and by hand.
    d. For non-accessible headstocks in the water flow area, access via floating platform and remove timber components from above water with chainsaw and oxy cutting bolts down to top of concrete. Concrete headstocks to remain.
    e. Existing concrete abutments to remain in place along bank edges to maintain stable banks into the future as scour protection.
    f. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

17) Complete rock scour protection – on upstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

18) Demobilise construction activities – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.

PROPOSED HOBARTS BRIDGE CONSTRUCTION FOOTPRINT



REV	REV DATE	REVISION DESCRIPTION	DR.BY	AP.BY
A	20.05.2024	SUPPORTING CONSTRUCTION IMPACTS	VGL	JC

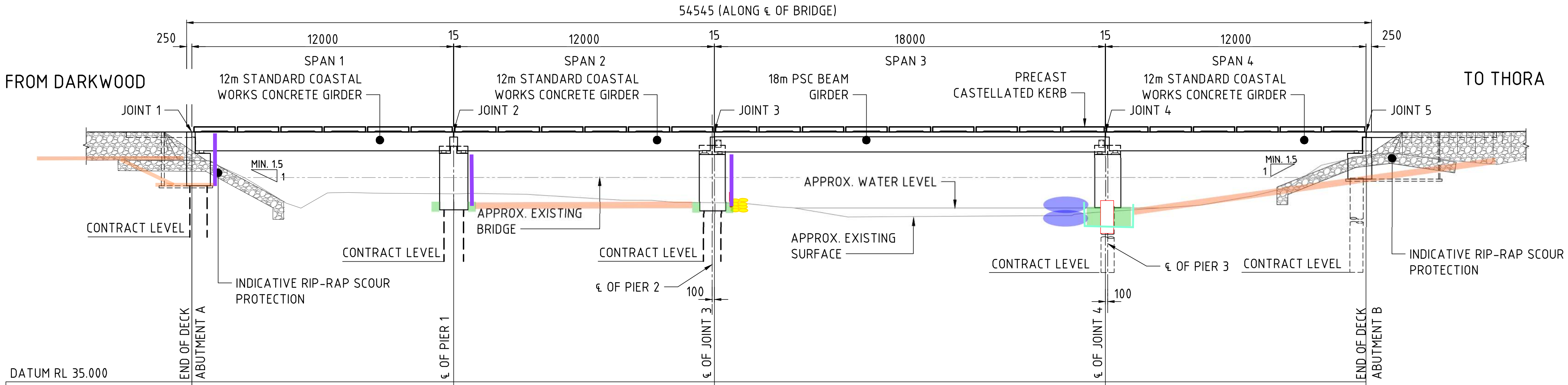
BELLINGEN SHIRE COUNCIL

GRID	GDA2020
HEIGHT DATUM	AHD
DRAWN BY	VGL
DESIGNED BY	VGL
CHECKED BY	JC
APPROVED BY	JC

PROJECT TITLE
HOBARTS BRIDGE CONSTRUCTION FOOTPRINT

DRAWING TITLE
LAYDOWN LOCATION RELATIVE TO BRIDGE

PROJECT NUMBER CE24011
DRAWING NUMBER C002
REVISION A



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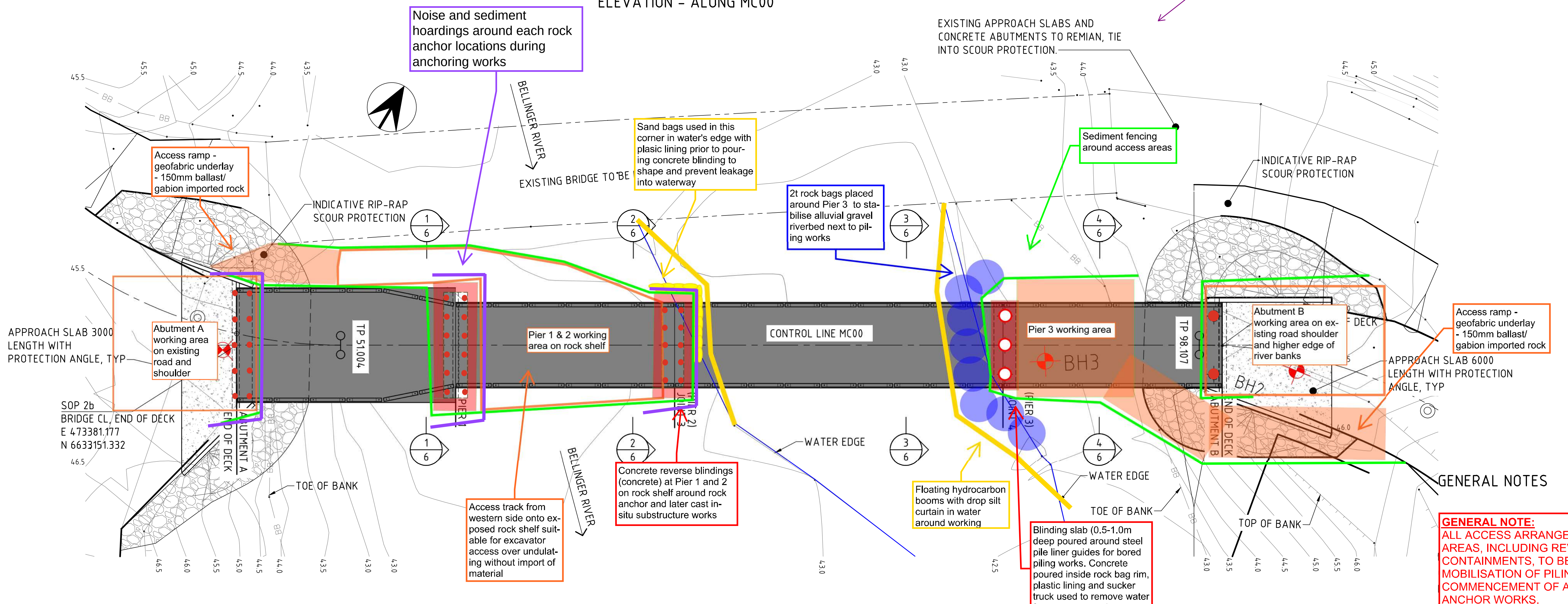
CHAINAGE ALONG CONTROL LINE MC00	45.258	57.313	69.328	87.343	99.350

Later stage positions for rock bags for crane outriggers next to existing bridge which crane will sit on

ELEVATION - ALONG MC00



PLAN

GENERAL NOTE:
ALL ACCESS ARRANGEMENTS FOR ALL PILING AREAS, INCLUDING REVERS BLINDING CONTAINMENTS, TO BE IN PLCE PRIOR TO MOBILISATION OF PILING CONTRACTOR AND COMMENCEMENT OF ANY PILING OR ROCK ANCHOR WORKS.
ALL FULLY REMOVABLE - REVERSE BLINDINGS AT PIER 1 & 2 TO BE COMPLETELY REMOVED AFTE COMPLETION OF THE SUBSTRUCTURE.
BLINDING AT PIER 3 TO BE PERMANENT UNDERNEATH THE COMPLETED SUBSTRUCTURE.

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
02	15/06/2023	100% DETAIL DESIGN	JR	DM	CR
01	05/05/2023	80% DETAIL DESIGN	JR	DM	CR

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DESIGNER: bk. bridge knowledge. ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE LTY PTD

CONTRACTOR: COASTAL WORKS — COASTAL WORKS

CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

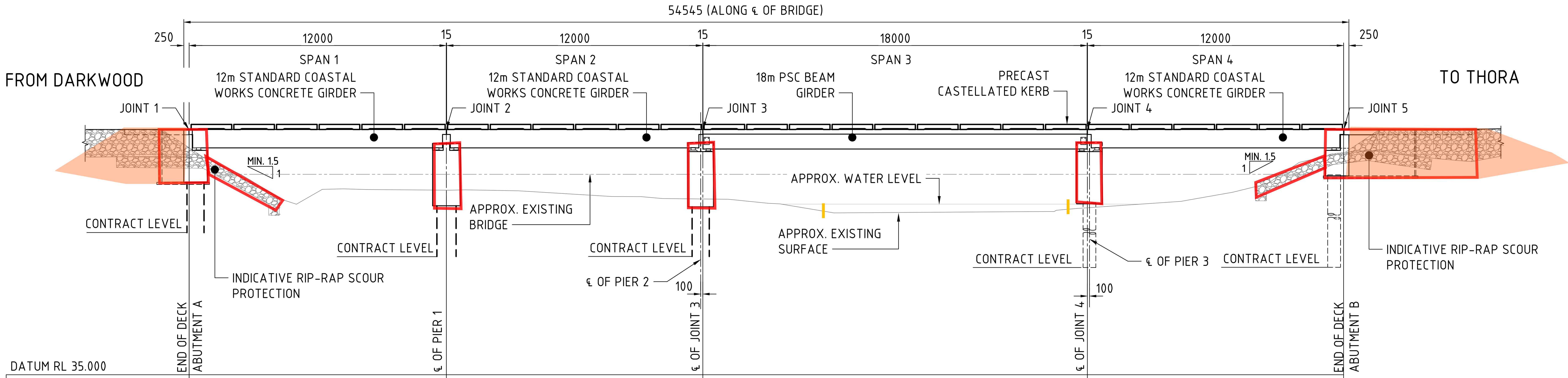
TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

HOBARTS BRIDGE
REPLACEMENT OVER BELLINGER RIVER

PHASE 1 - Establishment and Piling Access

DRAWING SET No: BKP397-BSC
BRIDGE No: DRG-005
ISSUE STATUS: DETAIL DESIGN
ISSUE: 02 | No SHEETS: 34 | SHEET No: 05



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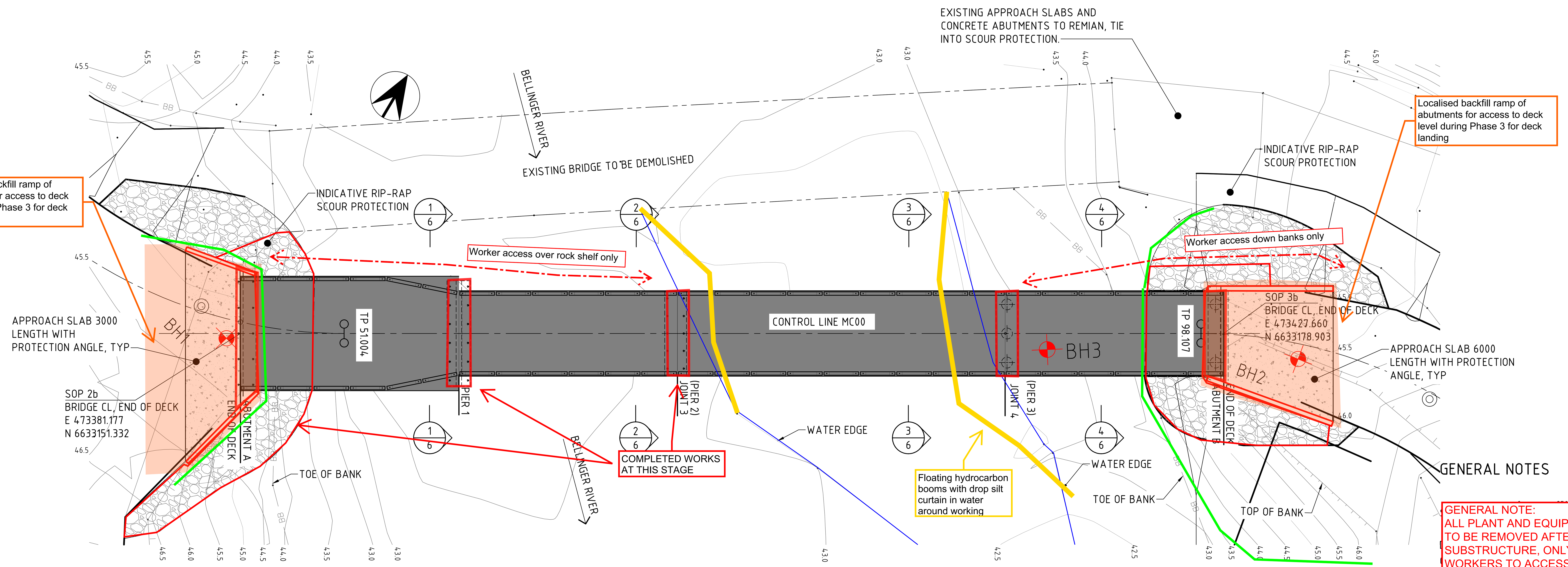
APPROXIMATE EXISTING SURFACE LEVEL ALONG CONTROL LINE MC01	45.204	43.655	43.242	42.829	45.393
CHAINAGE ALONG CONTROL LINE MC00	45.258	57.313	69.328	87.343	99.350

ELEVATION - ALONG MC00



PLAN

GENERAL NOTES

GENERAL NOTE:
ALL PLANT AND EQUIPMENT ACCESS TO THE RIVER TO BE REMOVED AFTER CAST IN-SITU SUBSTRUCTURE, ONLY FOOT TRAFFIC FOR WORKERS TO ACCESS SUBSTRUCTURE DURING SUPERSTRUCTURE COMPLETION.
BOOMS TO REMAIN IN PLACE UNTIL SUPERSTRUCTURE COMPLETE

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01	05/05/2023	80% DETAIL DESIGN	JR	DM	CR

DESIGNER: bk. bridge knowledge ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE LTY PTD

CONTRACTOR: CW COASTAL WORKS — COASTAL WORKS

CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

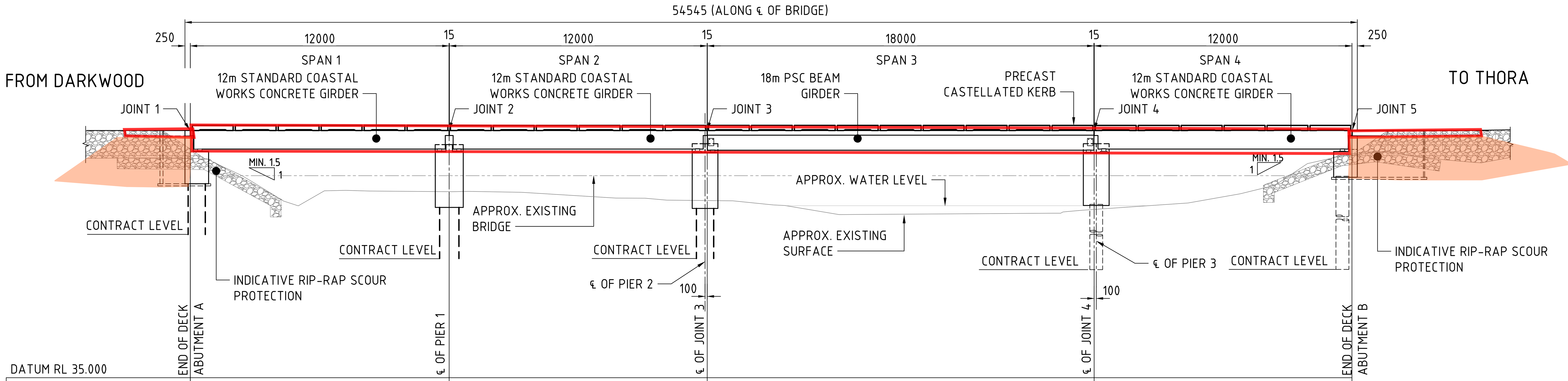
TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

HOBARTS BRIDGE
REPLACEMENT OVER BELLINGER RIVER

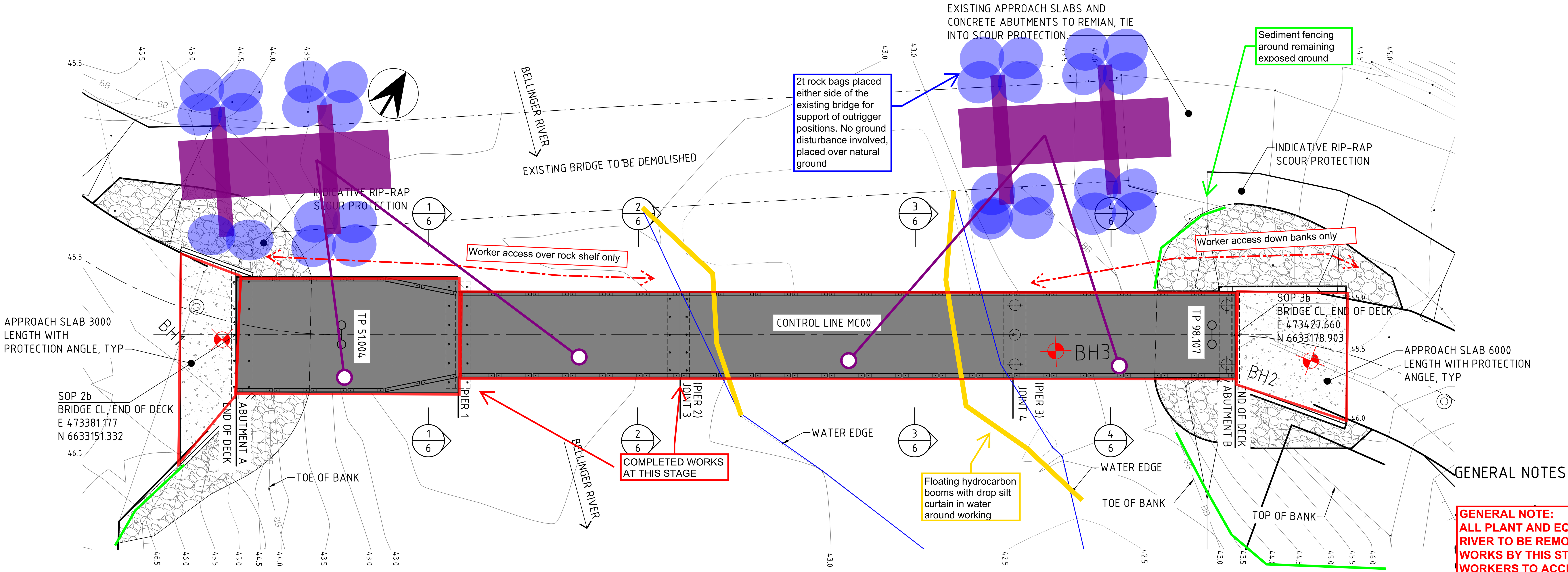
PHASE 2 - Substructure Access Plan

DRAWING SET No	BKP397-BSC
BRIDGE No	DRG-005
ISSUE STATUS	DETAIL DESIGN
ISSUE	02
No SHEETS	34
SHEET No	05



	END OF DECK ABUTMENT A	℄ OF PIER 1	℄ OF JOINT 3	℄ OF JOINT 4	END OF DECK ABUTMENT B
DESIGN SURFACE LEVEL ALONG CONTROL LINE MC01	46.500	46.500	46.500	46.500	46.500
APPROXIMATE EXISTING SURFACE LEVEL ALONG CONTROL LINE MC01	45.204	43.655	43.242	42.829	45.393
CHAINAGE ALONG CONTROL LINE MC00	45.258	57.313	69.328	87.343	99.350

ELEVATION - ALONG MC00



PLAN

GENERAL NOTES

GENERAL NOTE:
ALL PLANT AND EQUIPMENT ACCESS TO THE RIVER TO BE REMOVED AFTER CAST IN-SITU WORKS BY THIS STAGE, ONLY FOOT TRAFFIC FOR WORKERS TO ACCESS SUBSTRUCTURE DURING SUPERSTRUCTURE COMPLETION. ALL OTHER ACCESS TO SUPERSTRUCTURE OVER BEAMS AND PLANKS AND TEMPORARY ELEVATED STRCUTURES.
BOOMS TO REMAIN IN PLACE UNTIL SUPERSTRUCTURE COMPLETE

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
02	15/06/2023	100% DETAIL DESIGN	JR	DM	CR
01	05/05/2023	80% DETAIL DESIGN	JR	DM	CR

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DESIGNER: bk. bridge knowledge ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE LTY PTD

CONTRACTOR: CW COASTAL WORKS — COASTAL WORKS

CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

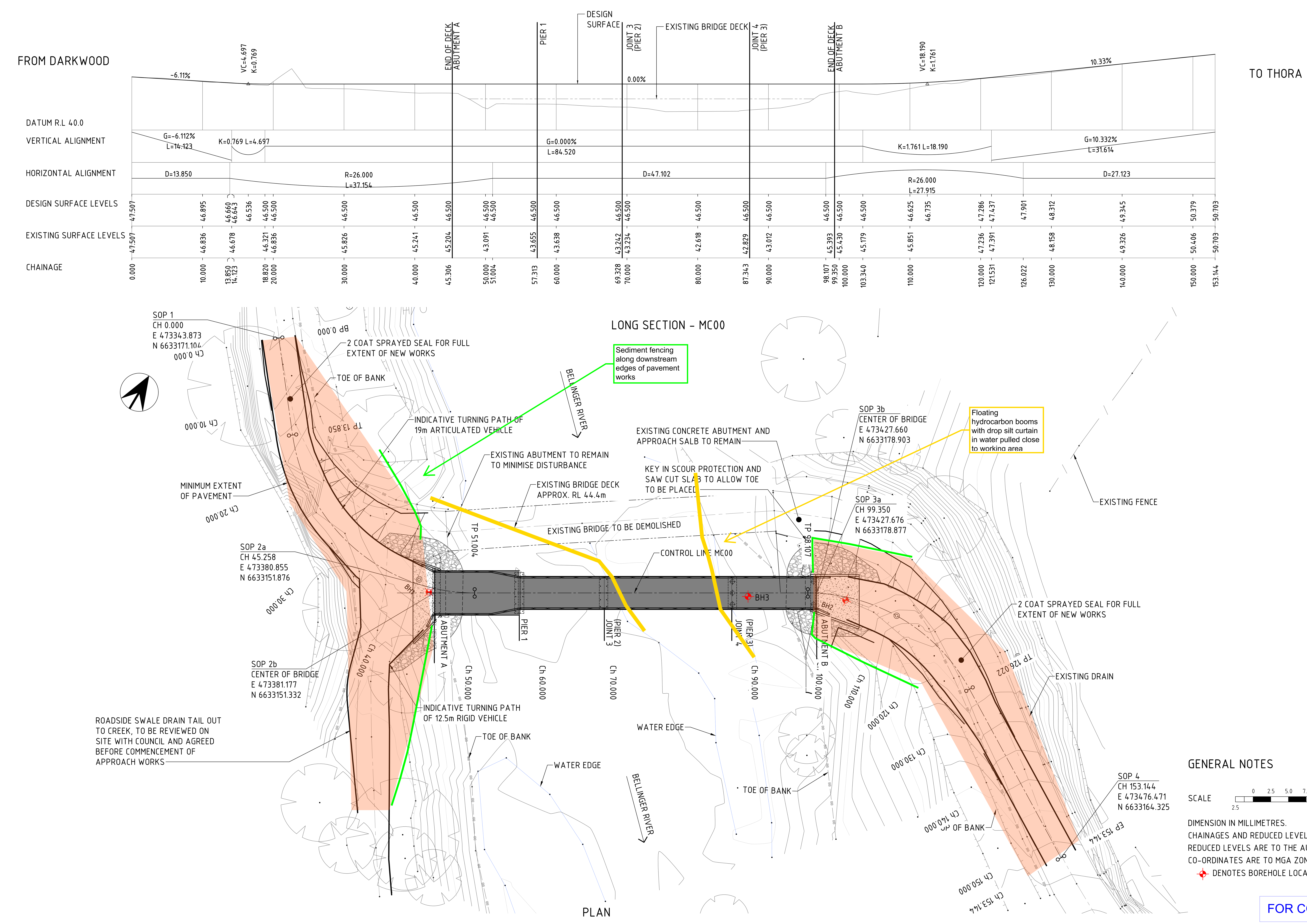
DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

HOBARTS BRIDGE
REPLACEMENT OVER BELLINGER RIVER

PHASE 3 - Superstructure

DRAWING SET No	BKP397-BSC
BRIDGE No	DRG-005
ISSUE STATUS	DETAIL DESIGN

ISSUE 02 | No SHEETS 34 | SHEET No 05



GENERAL NOTES

SCALE 0 2.5 5.0 7.5 10m OR AS SHOWN.

DIMENSION IN MILLIMETRES.
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
A	27/06/2024	ISSUE FOR CONSTRUCTION	JR	DM	CR

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DESIGNER: bk. bridge knowledge ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE LTY PTD

CONTRACTOR: COASTAL WORKS — COASTAL WORKS

CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

HOBARTS BRIDGE
REPLACEMENT OVER BELLINGER RIVER

PHASE 4 - Roadworks Access Plan

DRAWING SET No	BKP397
BRIDGE No	DRG-002
ISSUE STATUS	ISSUE FOR CONSTRUCTION
ISSUE	A
No SHEETS	35
SHEET No	02

GENERAL NOTES

SCALE 0 2.5 5.0 7.5 10m OR AS SHOWN.

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CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
A	27/06/2024	ISSUE FOR CONSTRUCTION	JR	DM	CR

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DESIGNER: bk. bridge knowledge ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE LTY PTD

CONTRACTOR: CW COASTAL WORKS — COASTAL WORKS

CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	DM
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — BELLINGEN SHIRE COUNCIL

HOBARTS BRIDGE
REPLACEMENT OVER BELLINGER RIVER

PHASE 5 - Demolition Access Plan

DRAWING SET No	BKP397
BRIDGE No	DRG-002
ISSUE STATUS	ISSUE FOR CONSTRUCTION
ISSUE A	No SHEETS 35 / SHEET No 02

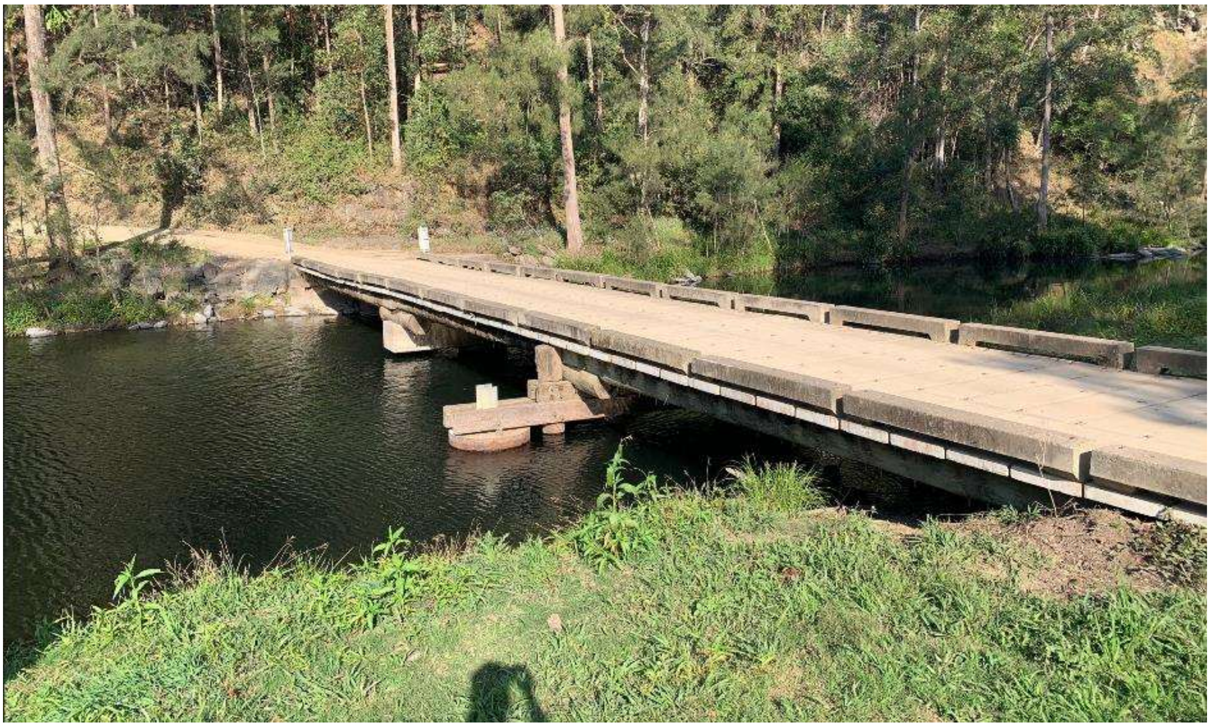
Appendix K

Erosion and Sediment Control Plan – Justins Bridge

JUSTINS BRIDGE REPLACEMENT

Project Description

Coastal Works are replacing Justins Bridge over the Bellinger River on Darkwood Road, Darkwood under contract works for Bellingen Shire Council. The existing 32m four span, timber bridge will be removed and replaced adjacent with a new 32m two span, concrete and steel bridge on a raised alignment downstream. The site is located approx. 35km west of Bellingen, is highly flood prone and is in key habitat for the Bellinger River Snapping Turtle.



Existing Timber Bridge

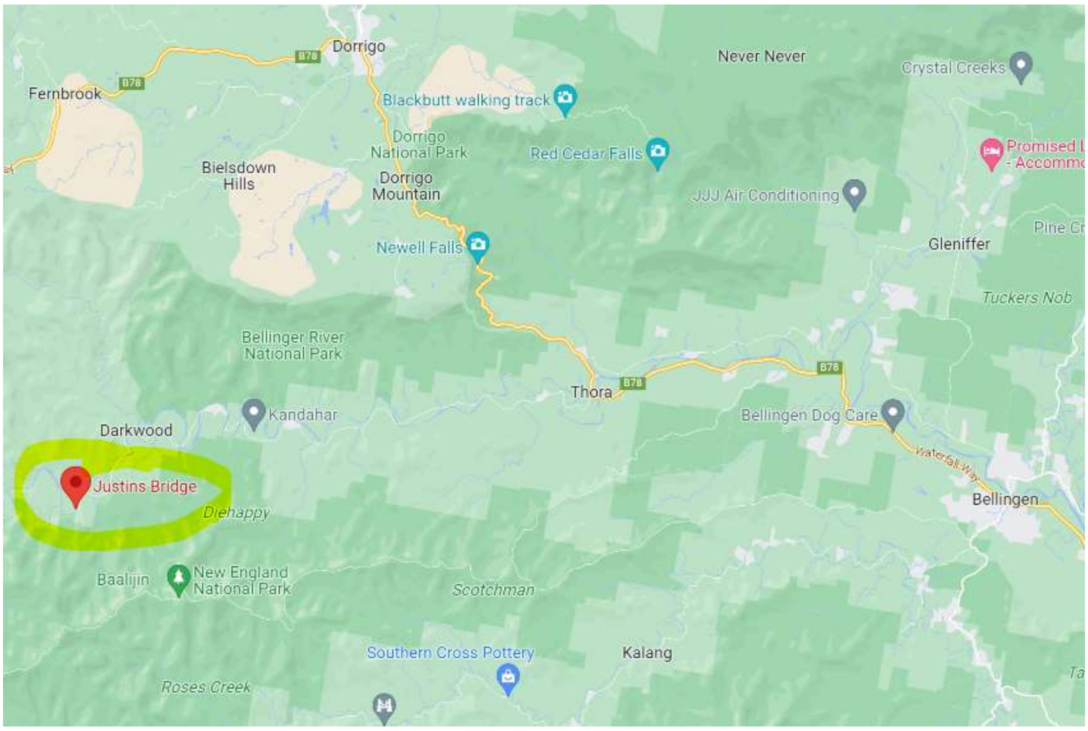
Form of Construction

Foundations – bored, cast in-situ concrete piles (600mm diameter) at one abutment and one headstock, rock anchors at the other abutment into high level rock

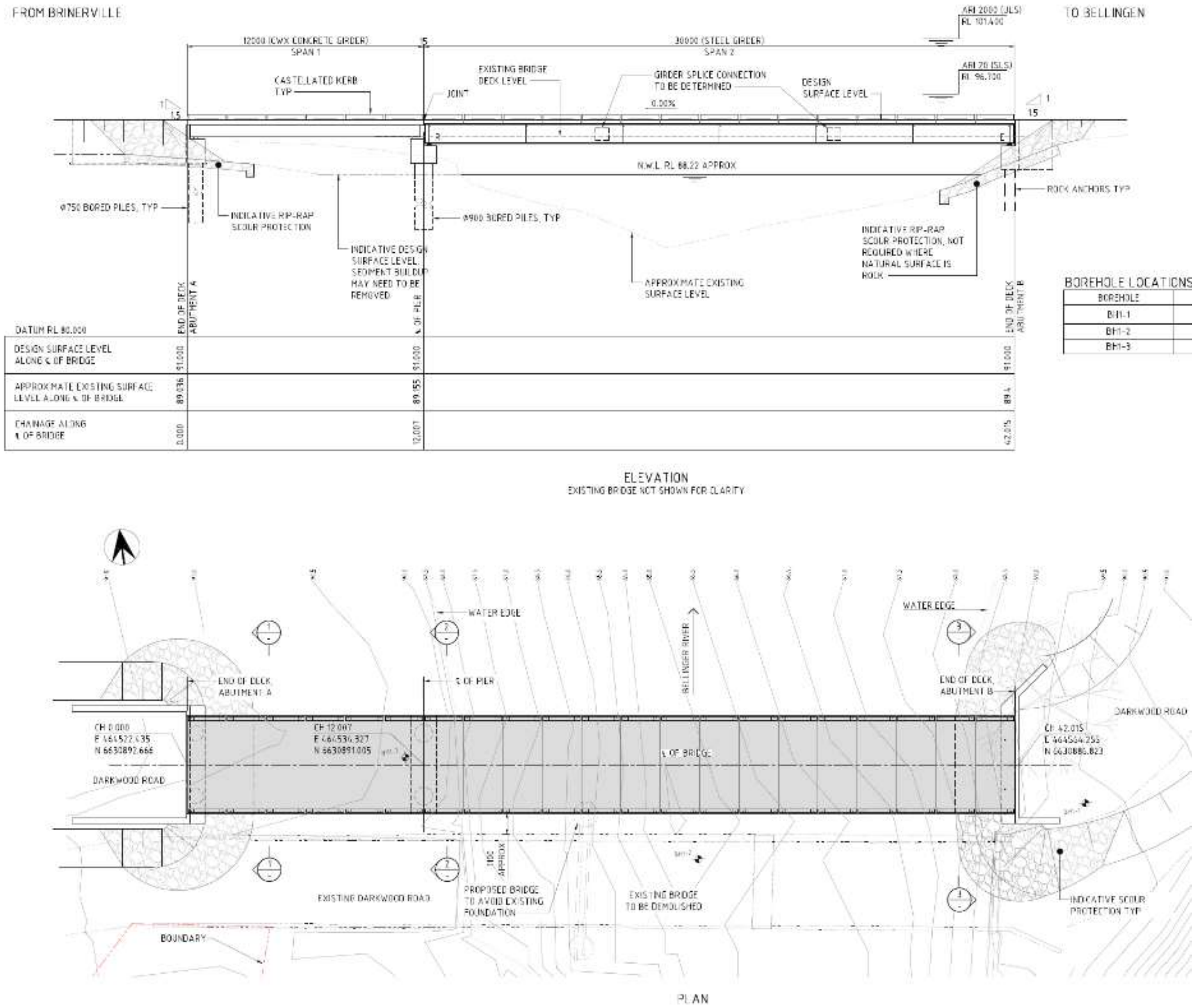
Substructure – cast in-situ reinforced concrete abutments and headstocks poured direct onto existing ground levels on top of piles including direct onto foundation rock at the rock anchor abutment, rock scour protection on banks and around abutments

Superstructure – one span is precast concrete CoastalWorks 12m bridge beams, one span is 30m long over the low flow area over the creek using spliced steel girders with CoastalWorks precast concrete deck panels, bolt on concrete kerbs

Road approaches – 20-30m of road works each side to tie into existing road, two coat bitumen seal, 6m wide plus fill formation formations, open swale drains



Location Map



New Bridge Design

Construction Methodology & Sequence

1) Establishment:
    a. Set up compound, laydown and stockpile areas in the Darkwood Road shoulder and private property paddock on the eastern approach off the road and above the high flood level,
    b. Survey setout of boundaries, piling and vegetation no go zones.
    c. Installation of erosion and sediment controls for piling areas including booms in the water.
    d. Delivery of all piling materials.
    e. Delivery of pre-filled rock bags.
    f. Establish bunded concrete washout and spoil areas at laydown area.

2) Access to and establishment of piling areas:
    a. Clear and grub surface vegetation and topsoil from the three piling locations, stockpile away from river for later rehabilitation works or remove from site.
    b. At Abutment B (east side, rock anchors), excavators can sit in existing road shoulder behind the abutment. Box out with 14t excavator to expose rock.
    c. At Abutment A (west side), no access establishment required, box out with 14t excavator down to pile cutoff level.
    d. At Headstock, no access ramp required, existing riverbanks will be stable enough for tracked machinery access and are to be re-profiled at the end of works. Keep access paths next to abutment and in between headstock and Abutment A. Place rock bags along river side of the piling set to stabilise banks and provide additional containment, pull floating boom tight to water line at rock bags. Minor box out to piles (<0.5m) and provide sediment fencing along inside of rock bags.
    e. Should any areas for excavator positioning become unstable or present unanticipated risk for becoming churned up, establish access platform with geofabric underlay and 150mm clean imported ballast and/or gabion rock with extra length of geofabric on the upstream side that can be used to wrap over and pinned down with rock bags during high flow events to prevent wash out.

3) Rock anchor works:
    a. Plant & equipment – 7t-10t excavator with a specialist air drilling attachment with Down Hole Hammer (DHH) and on-site grout mixing station. DHH option keeps noise and vibration down the hole rather than an above ground hammer which is much noisier above.
    b. Install 2m high spray screens, using geofabric or ply, on 3 sides of the rock anchor area to deflect any natural rock spray from entering the water.
    c. Grout mixing station to be on the eastern existing road immediately next to Abutment B works with minimal grout tube run. Bund the area from overspill and grout hoses to the rock anchor working area to be plastic wrapped.
    d. Box out will be sufficient to contain flushing of the rock anchor holes (water and rock sediment) and for containing grout overpour. These can be removed by sucker truck at end of works to tidy area ready for cast in-situ works.

4) Bored piling works:
    a. Plant & equipment – 30t excavator with a 2t vibratory head attachment and pendulum drill head with Kelly bar for the auger.

b. Vibratory head used to install permanent mild steel liners in position first at all 9 pile positions for western structures.
c. Use pendulum auger to bore out inside each with required rock sockets.
d. Pile clean-out material placed either directly in a skip bin or on a geofabrics lined area adjacent the piling area so it can be removed from the riverbed area to the established stockpile area (or off site) daily.
e. After piles are cleared, place cages and pour concrete with concrete boom pump up at existing road level on the western approach for both headstock and western abutment. Sucker truck to remove water from the wet pile holes during concrete placement.
f. Concrete overpour out of top of piles (typically 0.2m3 per pile) to be contained within the box out areas and become a blinding slab for cast in-situ works.

5) Cast in-situ concrete sub-structure:
   a. Reinforcement placed and tied in place by hand on blinding slabs.
   b. Ply formwork shutters pre-made and placed with excavator using the same access points used during piling. Personnel access to all from ground level.
   c. Elevated walkway required for taller abutments up to the top of concrete which will all cantilever off the formwork and not require additional footprint.
   d. Concrete boom pump to be positioned outside of the riverbed on the existing road approaches to pour all substructure works. Pump and concrete trucks to be brought to the respective sides of the river for pours so the boom line is not over the waterway at any time. Concrete washout to either be off site or in established area up at the compound for later removal from site. Flowable high slump concrete mix used to minimise any risk of line blockages/breaks.
   e. Complete mortar pads by hand mixed mortar to finish all substructures and strip all formwork and elevated access platforms.

6) Fully remove piling temporary working areas and establish western crane position – excavator to progressively remove rock bags, any imported ramp materials (if needed) and geofrabirc underlay working away from the western water's edge. All imported rock to be re-used for road backfill. Reposition rock bags for a crane pad on the downstream side of Abutment A.

7) Cut and re-profile higher bank materials under the shorter western span – excavator to box out materials down to 200mm above the water ripple line from the existing western water line to the western abutment. Place direct into tipper trucks to remove from site.

8) Place scour rock around abutments – place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks, tip adjacent and behind abutments in manageable quantities for placement by 14t excavator.

9) Land all precast concrete beams, steel girders and precast deck panels – semis to deliver beams to western side, all beams and girders lifted in by crane on western side as well as half the steel girder span deck panels. Remaining deck panels placed by Franna crane progressively to Abutment B. Bolting down of panels all to be done from deck level, no scaffold required.

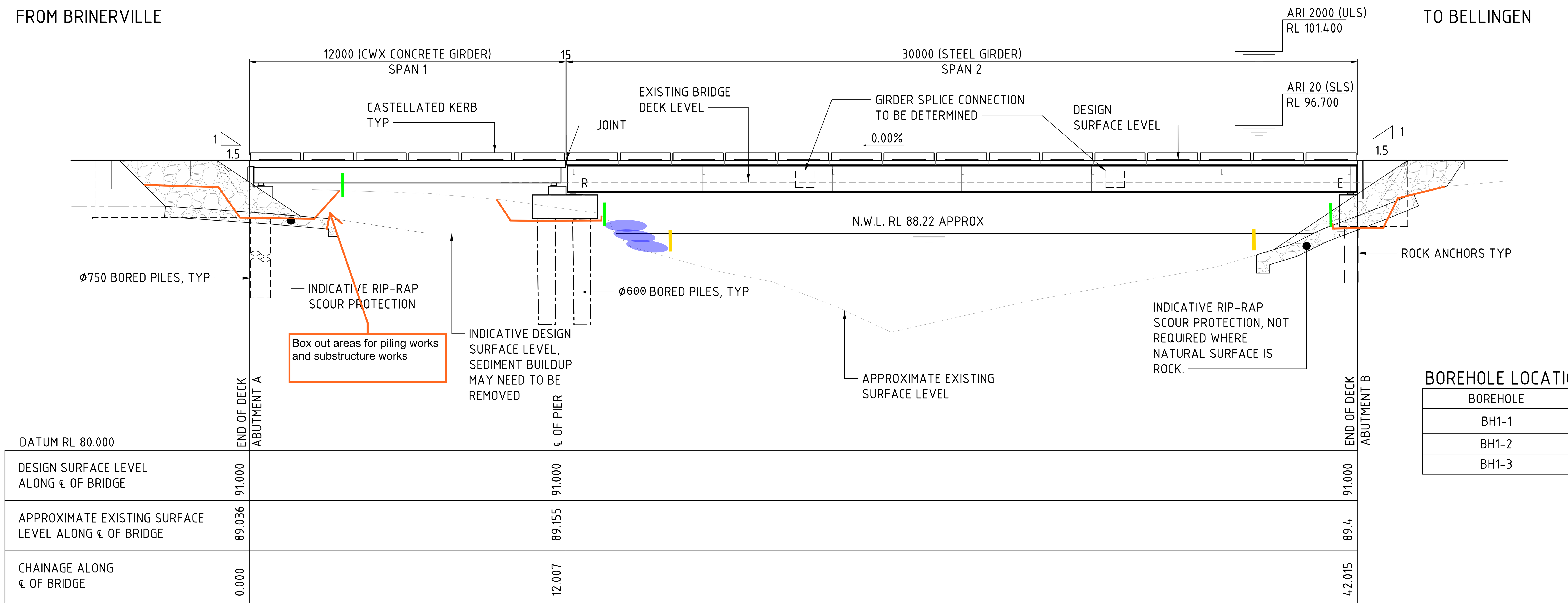
10) Pour 12m beam stitch pour – sealed formwork to be used between CoastalWorks planks to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Boom pump to used from western side again without putting the line over the waterway.

11) Complete approach roadworks – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

12) Demolish original bridge:
    a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers, Franna crane for lifting concrete deck panels.
    b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing concrete deck panels direct onto transport and timber girders for each span. No access off deck or in high banks required.
    c. For in-stream headstocks, install floating scaffold platforms out from each bank. Remove timber components of headstocks using chainsaw and protruding steel components with an oxy torch from platforms, removing all cut off items from the waterway. Concrete headstocks and piles to remain.
    d. Divers to be used with underwater chainsaws to remove timber piles. Floating barrels first attached to the timber before cutting and roped to the banks for full removal.
    e. For abutments and existing western headstock outside the water area, use rock breaker on excavator to break up concrete footings and then remove in largest possible pieces by excavator and by hand down to ground level.
    f. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

13) Complete rock scour protection – on upstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

14) Demobilise construction activities – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.

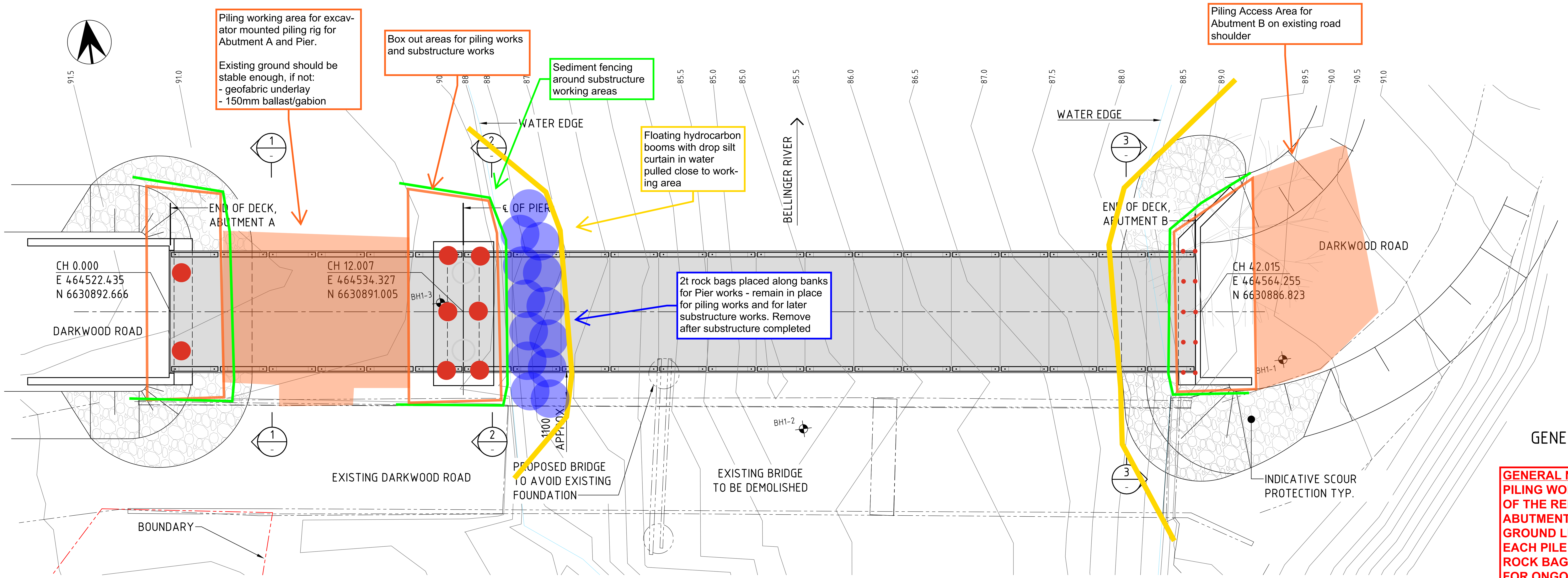


ELEVATION

EXISTING BRIDGE NOT SHOWN FOR CLARITY

BOREHOLE LOCATIONS

BOREHOLE	EASTING	NORTHING	RL
BH1-1	464567	6630884	89.8
BH1-2	464547	6630884	84.8
BH1-3	464533	6630891	89.3



PLAN

GENERAL NOTES

GENERAL NOTE:
PILING WORKS TO OCCUR PRIOR TO PROGRESSION OF THE REMAINING SUBSTRUCTURE. BORED PILING AT ABUTMENT A AND PIER TO BE FROM EXISTING GROUND LEVEL. LIMIT TO SMALL BOX OUT LOCAL TO EACH PILE AREA.
ROCK BAGS TO REMAIN IN PLACE ALONG BANK EDGE FOR ONGOING STABILITY UNTIL COMPLETION OF CAST IN-SITU WORKS

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
02	29/05/2023	CONCEPT DESIGN	JR	DM	CR
01	25/05/2023	CONCEPT DESIGN	JR	DM	CR

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	PREPARED	CHECKED
DESIGN	D. MERRIKIN	C. RILEY
DRAWING	J. REN	D. MERRIKIN

PREPARED BY: bk. bridge knowledge. ENGINEERING CONSULTING SERVICES

DANIEL MERRIKIN
STRUCTURAL ENGINEER

BELLINGEN SHIRE COUNCIL

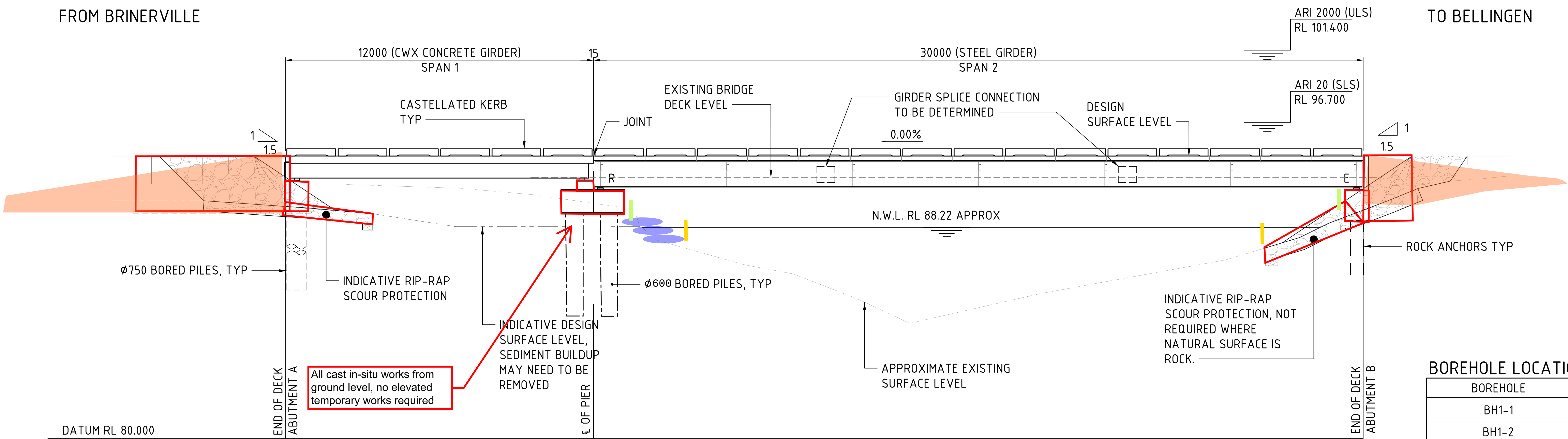
DARKWOOD ROAD | ADELE HOUSE

CONCEPT REDESIGN
FIXING COUNTRY BRIDGE PROGRAM
JUSTINS BRIDGE

PHASE 1 - Establishment and Piling Access Plan

DRAWING SET No	BKP414-BR104
DRAWING No	BR104-DRG-02
ISSUE STATUS	CONCEPT DESIGN

ISSUE	2	No SHEETS	3	SHEET No	02



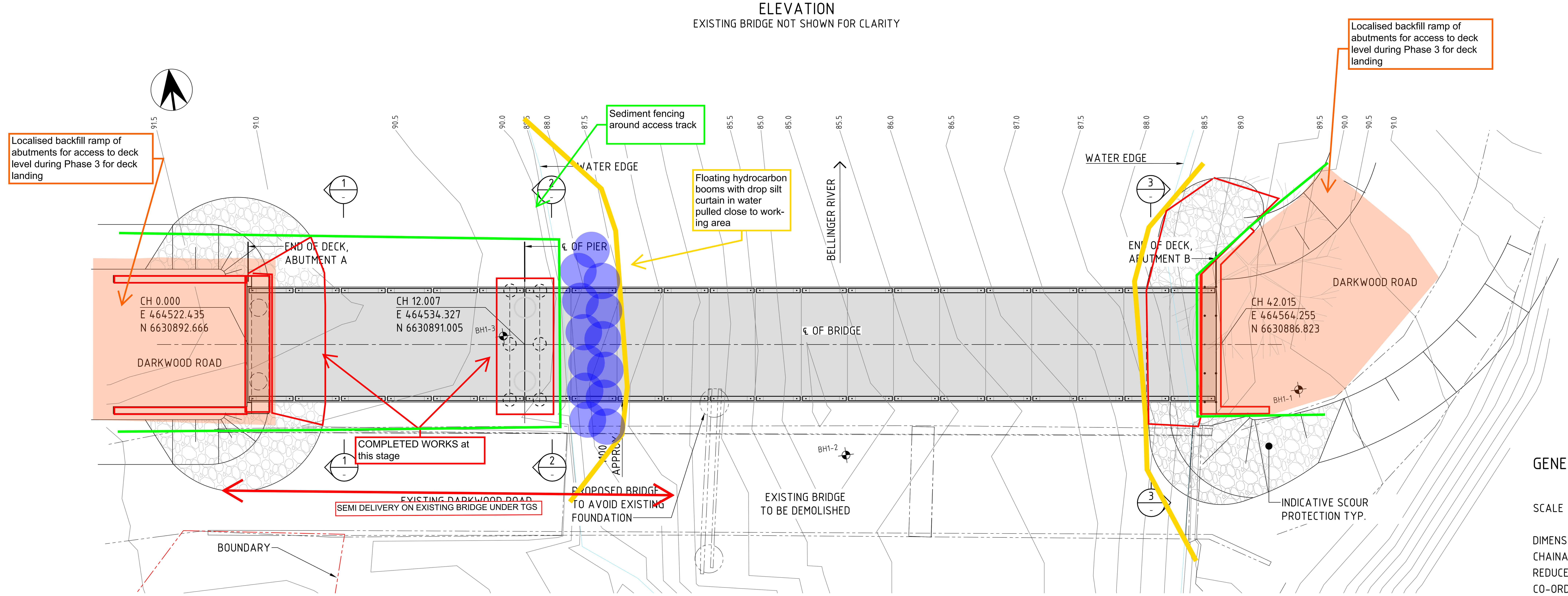
	END OF DECK ABUTMENT A	℄ OF PIER	END OF DECK ABUTMENT B
DESIGN SURFACE LEVEL ALONG ℄ OF BRIDGE	91.000	91.000	91.000
APPROXIMATE EXISTING SURFACE LEVEL ALONG ℄ OF BRIDGE	89.036	89.155	89.4
CHAINAGE ALONG ℄ OF BRIDGE	0.000	12.007	42.015

BOREHOLE LOCATIONS

BOREHOLE	EASTING	NORTHING	RL
BH1-1	464567	6630884	89.8
BH1-2	464547	6630884	84.8
BH1-3	464533	6630891	89.3

ELEVATION

EXISTING BRIDGE NOT SHOWN FOR CLARITY



PLAN

GENERAL NOTES

SCALE 0 1 2 3 4 5m OR AS SHOWN.

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CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

NOT FOR CONSTRUCTION

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	PREPARED	CHECKED
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DRAWING	J. REN	D. MERRIKIN

PREPARED BY
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DANIEL MERRIKIN
STRUCTURAL ENGINEER

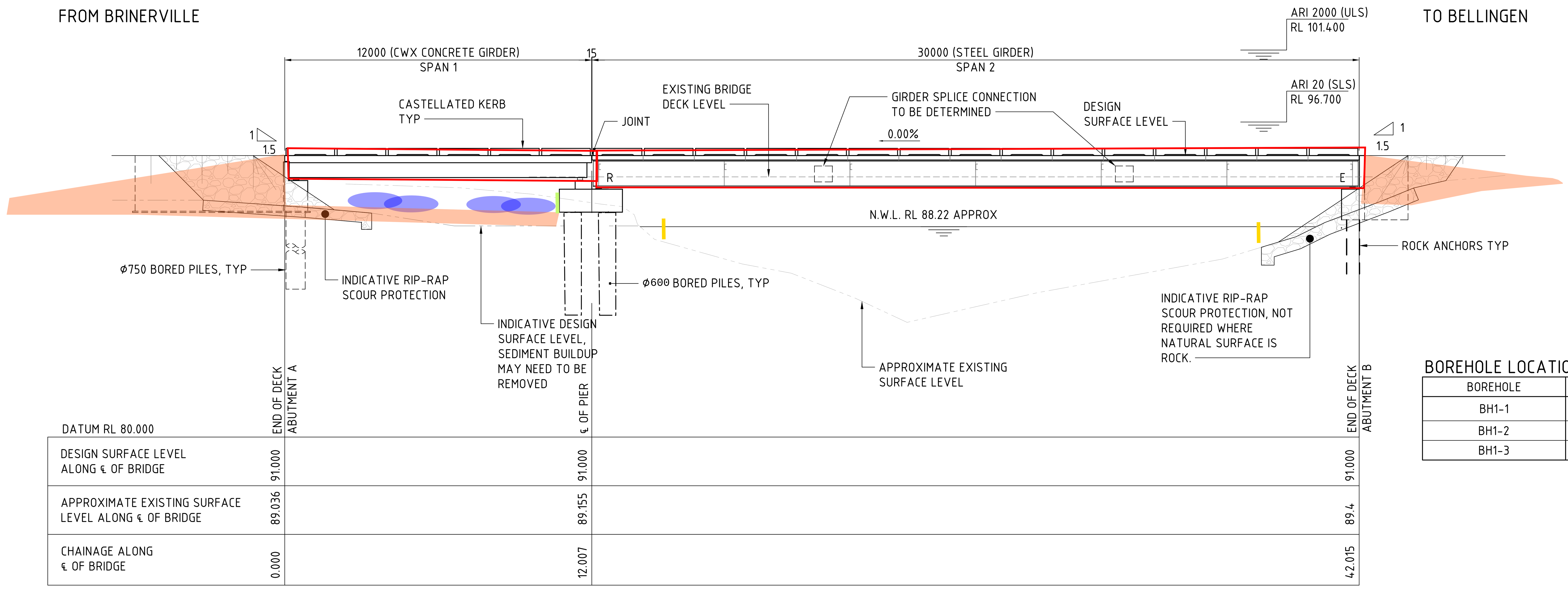
BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

DARKWOOD ROAD — ADELE HOUSE

CONCEPT REDESIGN
FIXING COUNTRY BRIDGE PROGRAM
JUSTINS BRIDGE

PHASE 2 - Substructure Access Plan

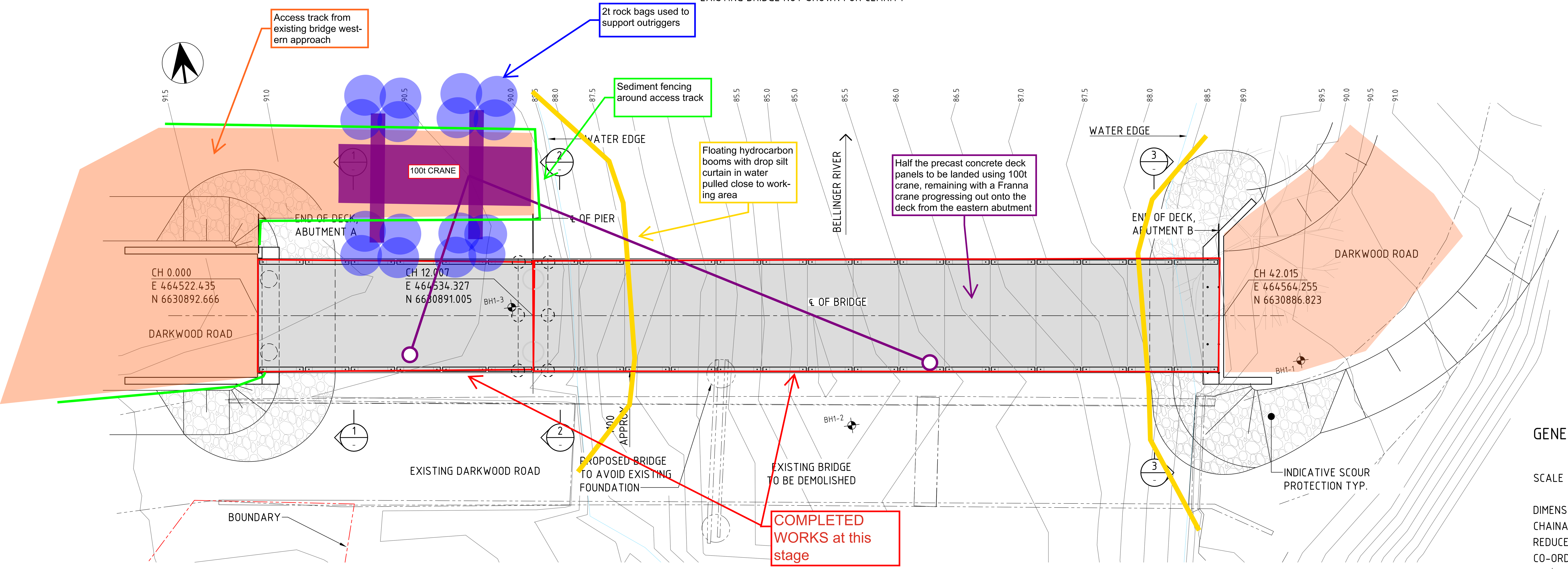
DRAWING SET No	BKP414-BR104
DRAWING No	BR104-DRG-02
ISSUE STATUS	CONCEPT DESIGN
ISSUE	2
No SHEETS	3
SHEET No	02



ELEVATION
EXISTING BRIDGE NOT SHOWN FOR CLARITY

BOREHOLE LOCATIONS

BOREHOLE	EASTING	NORTHING	RL
BH1-1	464567	6630884	89.8
BH1-2	464547	6630884	84.8
BH1-3	464533	6630891	89.3



PLAN

GENERAL NOTES

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01	25/05/2023	CONCEPT DESIGN	JR	DM	CR

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DRAWING	J. REN	D. MERRIKIN

PREPARED BY
bk. | bridge knowledge. ENGINEERING CONSULTING SERVICES
DANIEL MERRIKIN
STRUCTURAL ENGINEER

BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

DARKWOOD ROAD
ADELE HOUSE

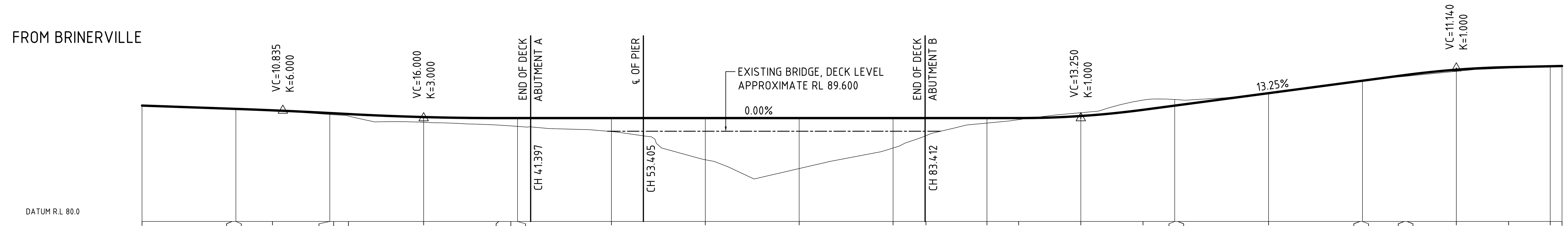
CONCEPT REDESIGN
FIXING COUNTRY BRIDGE PROGRAM
JUSTINS BRIDGE

PHASE 3 - Superstructure Access Plan

DRAWING SET No BKP414-BR104
DRAWING No BR104-DRG-02
ISSUE STATUS CONCEPT DESIGN
ISSUE 2 No SHEETS 3 SHEET No 02

FROM BRINERVILLE

TO BELLINGEN

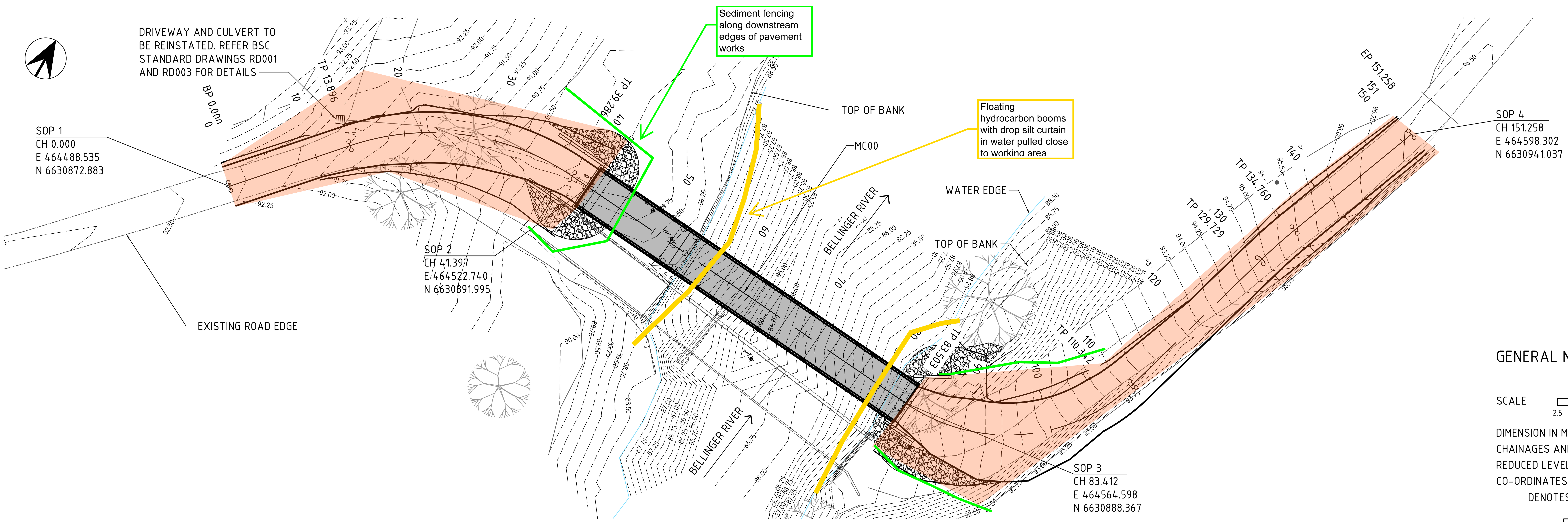


CHAINAGE	LEVEL DIFFERENCE	DESIGN SURFACE LEVELS	EXISTING SURFACE LEVELS
0.000	0.000	92.329	92.329
9.583	0.068	91.991	91.923
10.000	0.072	91.976	91.904
13.896	0.082	91.823	91.742
20.000	0.151	91.533	91.382
20.417	0.158	91.511	91.354
22.000	0.216	91.427	91.211
30.000	0.556	91.107	90.550
38.000	0.747	91.000	90.253
39.286	0.832	91.000	90.168
40.000	0.886	91.000	90.114
50.000	1.436	91.000	89.564
60.000	4.435	91.000	86.565
70.000	5.372	91.000	85.628
80.000	3.186	91.000	87.814
83.503	1.872	91.000	89.128
90.000	0.532	91.000	90.468
93.375	0.170	91.000	90.830
100.000	-0.349	91.219	91.569
106.625	-1.038	91.878	92.916
110.000	-0.649	92.325	92.974
110.342	-0.585	92.370	92.955
120.000	-0.064	93.650	93.714
129.729	0.037	94.939	94.902
130.000	0.038	94.975	94.937
134.430	0.132	95.562	95.430
134.760	0.143	95.605	95.462
140.000	0.174	96.145	95.970
145.570	0.108	96.418	96.310
150.000	0.024	96.511	96.487
151.258	0.000	96.538	96.538

HORIZONTAL ALIGNMENT: D=13.896 | R=27.500 L=25.390 | D=44.218 | R=19.600 L=26.839 | D=19.387 | R=60.000 L=5.031 | D=16.498

VERTICAL ALIGNMENT: G=-3.528% L=9.583 | K=6.000 L=10.835 | G=-5.333% L=1.583 | K=3.000 L=16.000 | G=0.000% L=55.375 | K=1.000 L=13.250 | G=13.250% L=27.805 | K=1.000 L=11.140 | G=2.110% L=5.688

ROAD DESIGN - LONG SECTION



ROAD DESIGN - PLAN

GENERAL NOTES

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DENOTES BOREHOLE LOCATION (APPROXIMATE).

NOT FOR CONSTRUCTION

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03	27/08/2024	100% DETAIL DESIGN	JR	DM	CR
02	22/05/2024	100% DETAIL DESIGN	JR	DM	CR
01	09/02/2024	50% DETAIL DESIGN	JR	DM	CR

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DESIGNER: bk. bridge knowledge. ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE LTY PTD

CONTRACTOR: COASTAL WORKS INVESTED IN INFRASTRUCTURE — COASTAL WORKS

CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

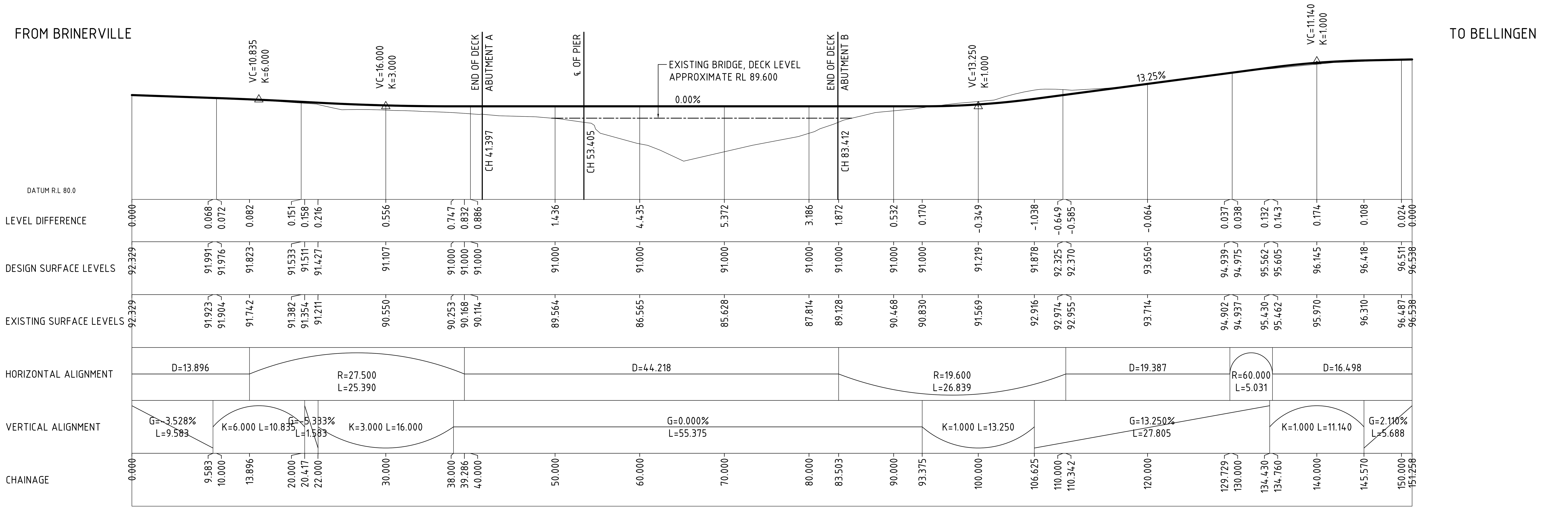
TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	CB
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — DARKWOOD

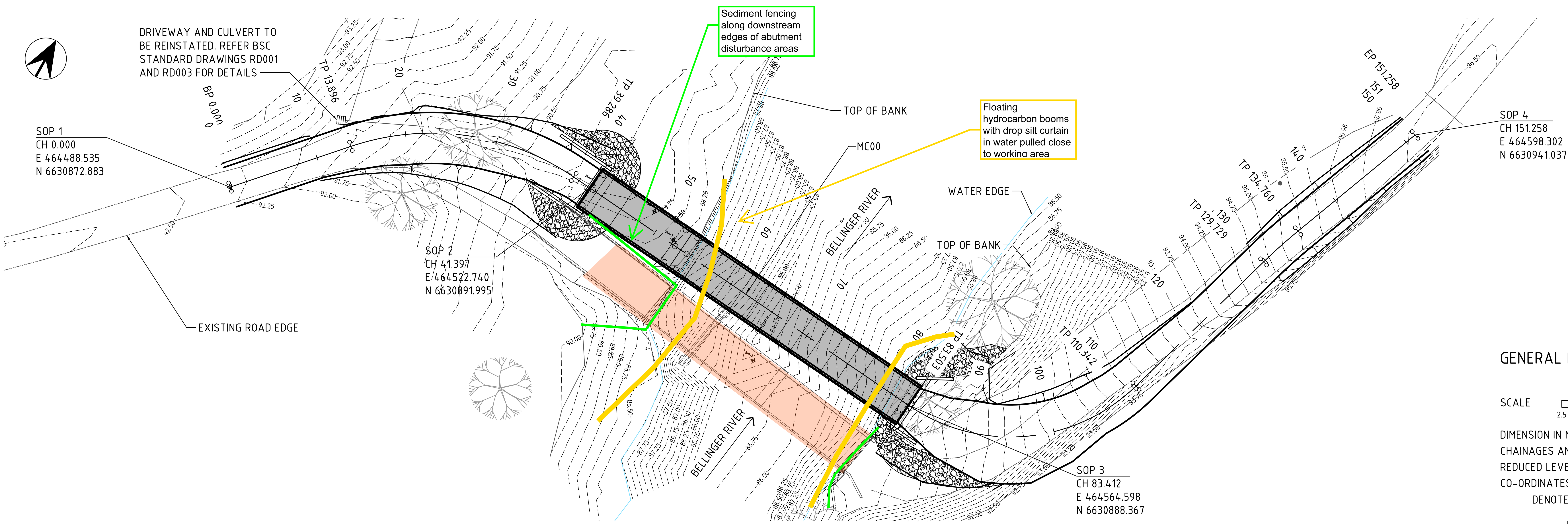
JUSTINS BRIDGE
OVER BELLINGER RIVER
FIXING COUNTRY BRIDGES PROGRAM

PHASE 4 - Roadworks Access Plan

DRAWING SET No: BKP429-BSC-BR104
DRAWING No: DRG-02
ISSUE STATUS: DETAIL DESIGN
ISSUE: 03 | No SHEETS: 29 | SHEET No: 02



ROAD DESIGN - LONG SECTION



ROAD DESIGN - PLAN

GENERAL NOTES

SCALE 0 2.5 5.0 7.5 10m OR AS SHOWN.

DIMENSION IN MILLIMETRES.
CHAINAGES AND REDUCED LEVELS ARE IN METRES.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION (APPROXIMATE).

NOT FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
03	27/08/2024	100% DETAIL DESIGN	JR	DM	CR
02	22/05/2024	100% DETAIL DESIGN	JR	DM	CR
01	09/02/2024	50% DETAIL DESIGN	JR	DM	CR

DESIGNER: bk. bridge knowledge. ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE LTY PTD

CONTRACTOR: COASTAL WORKS INVESTED IN INFRASTRUCTURE — COASTAL WORKS

CLIENT: BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

TITLE	PREPARED
DESIGN	YT
DESIGN CHECK	CB
DRAWING	JR
DRAWING CHECK	DM
APPROVED	CR

DARKWOOD ROAD — DARKWOOD

JUSTINS BRIDGE
OVER BELLINGER RIVER
FIXING COUNTRY BRIDGES PROGRAM

PHASE 5 - Demolition Access Plan

DRAWING SET No: BKP429-BSC-BR104
DRAWING No: DRG-02
ISSUE STATUS: DETAIL DESIGN
ISSUE: 03 — No SHEETS: 29 — SHEET No: 02

Appendix L

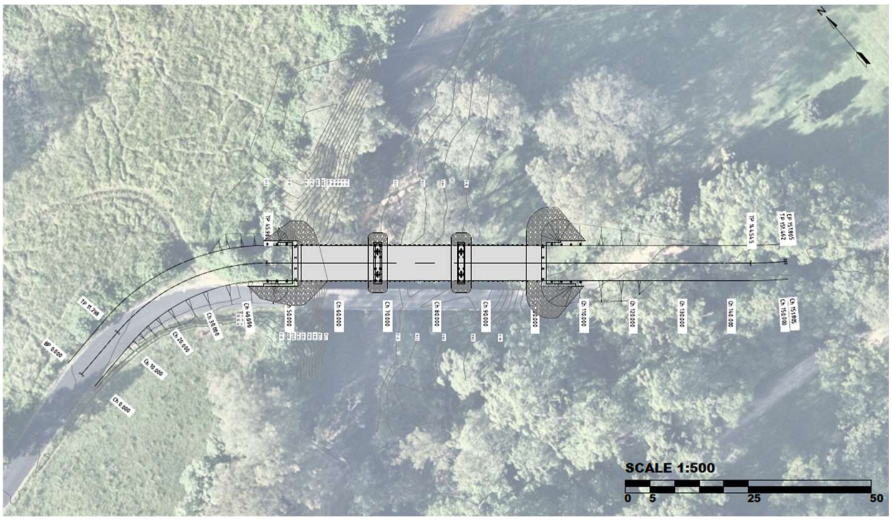
Erosion and Sediment Control Plan – Duffys Bridge

DUFFYS BRIDGE REPLACEMENT

Project Description

Bellingen Shire Council (BSC) are replacing Duffys Bridge over the Kalang River on Kalang Road, Kalang under the Fixing Country Bridges Program (Round 2B). The works will be self-performed by the BSC bridge teams with some specialised construction activities under contract works.

The existing single lane 44m four span, timber bridge will be removed and replaced adjacent with a new dual lane 51.6m bridge consisting of three spans, all concrete bridge on an improved alignment downstream. The site is located approx. 7km west of Bellingen, is highly flood prone and is in potential key habitat for the Bellinger River Snapping Turtle.



Existing Timber Bridge

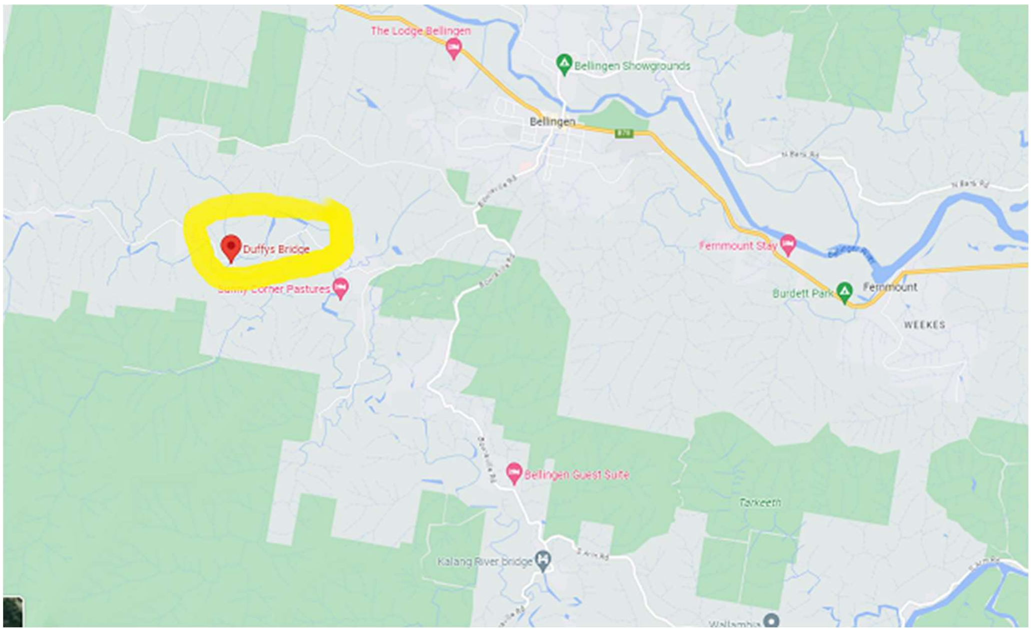
Form of Construction

Foundations – 24 x driven piles to an estimated depth of 5-7m, into moderately and slightly weathered Metasiltstone which based off geotechnical investigations in between 4-8m from ground level.

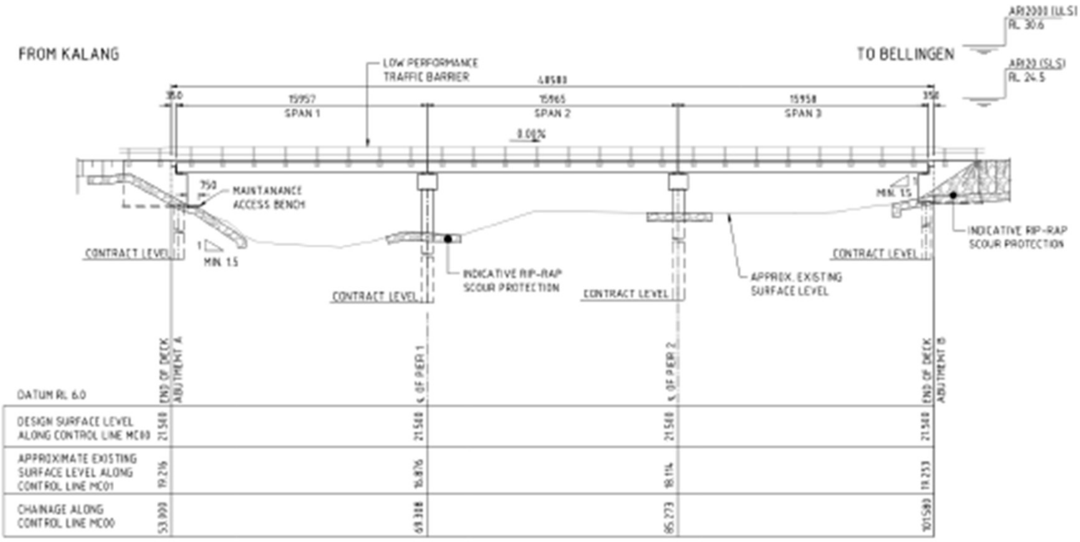
Substructure – Cast in-situ reinforced concrete abutments, pile caps, columns and headstocks throughout.

Superstructure - Three spans using 17m PSC pre-stressed bridge planks, and a cast in-situ deck pour and side mounted guard rail.

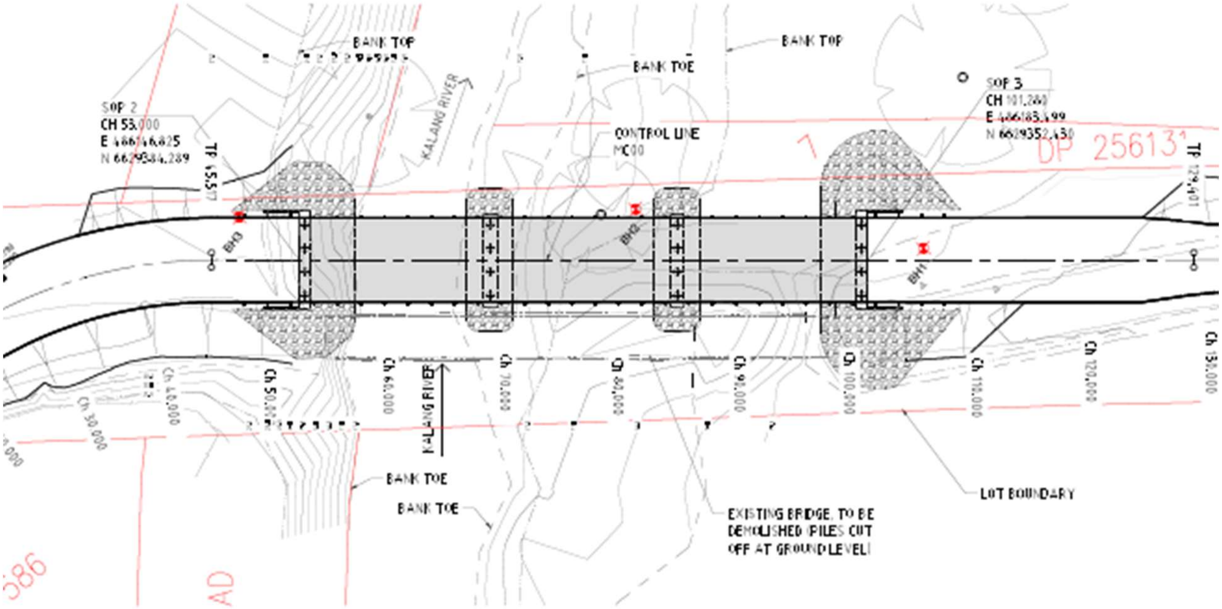
Road approaches – 50m on either side to tie into existing road, two coat bitumen seal, 7.2m wide plus shoulder and fill formations, open swale drains.



Location Map



ELEVATION



PLAN

New Bridge Design

Construction Methodology & Sequence

Works within Low Risk works period - Start February 2025

1) Establishment:
   a. Set up compound, laydown and stockpile areas on high ground (road reserve and private property) on the northern side of Kalang River and the Kalang Road shoulder on the eastern approach off the road and above the high-water flood level,
   b. Survey setout of boundaries, piling and vegetation no go zones,
   c. Installation of erosion and sediment controls for piling and river access ramps including booms in the water,
   d. Delivery of all piling and cast in situ work materials/formwork,
   e. Delivery of pre-filled rock bags,
   f. Establish bunded concrete washout and spoil areas at laydown area.

Works within high Risk works period - Start March to End of June 2025

2) Access to riverbed from high banks:
   a. Clear and grub vegetation and topsoil from ramp areas, stockpile away from river for later rehabilitation works or remove from site,

b. On Bellingen side (East) side, the access ramp is to be immediately downstream of the abutment down to existing stable alluvial material.
c. Access to both Pier sets to be from the East side.
d. Pier 2 is located above the low flow channel and will be accessed from the access ramp with excavation to achieve the design levels for piling. This work will be outside of the water.
e. Pier 1 is located on the edge of the low flow channel and will be accessed from the access ramp with clean rock bags around the perimeter of the piles and to be placed to bridge any ponding water or low points between Pier 1 and Pier 2.
f. Access ramps to be constructed with:
    i. Geofrabric underlay – extra length on the upstream side that can be used to wrap over the ramp and pinned down with rock bags during high flow events to prevent wash out,
    ii. 150mm thick, clean imported ballast (40-60mm) and/or gabion (50-200mm)
g. Place scour rock across the face of abutments.

<u>3) Prepare piling areas prior to piling contractor mobilization:</u>

a. At Pier 1 / 2 (8 driven piles per pile cap) – blinding slab to be used to aid in keeping piles in correct position, seal the excavation and providing a slab for the cast in-situ pile caps
    i. Pier 1 - Place approximately 10 rock bags (or as required) wrapped in geofabric along the edge of the low flow creek line to pin down the edge of the alluvial riverbed material and provide containment for the working area.
    ii. Pull floating hydrocarbon boom tight to the water side of the rock bags and install sediment fencing around the inside of the bag rim,
    iii. Over a 10m x 2m area over the footprint of the bored piles, excavator to dig down 0.3m to remove any larger cobbles and reach the underside of blinding layer
    iv. Level off adjacent area for positioning of piling excavator,
    v. Bench excavation for stability if needed and install edge delineation.
    vi. Inside the rock bags if water is present, sandbags to be placed above water level, then line with multiple layers of building plastic on the inside and then timber formwork on top of this in the water. Use a sucker truck to remove water from inside this corner as it is displaced by the concrete pour,
    vii. Pour a 100mm deep reinforced concrete blinding slab 10m x 2m to approximately underside of abutment level.

b. Abutments (4 x 2 driven piles)
    i. Box down to underside of abutment plus 100mm for blinding layer, remove spoil to stockpile areas,
    ii. Level off adjacent area for positioning of piling excavator,
    iii. Bench excavation for stability if needed and install edge delineation.

4) Driven piling works

a. Plant & equipment –32t excavator with a 5t hammer attachment or 30t excavator and crane with drop hammer (subject to contractor)
b. Pier 1/2 – excavator has the flexibility to position itself from the eastern side of the pile locations on both pier sets on the existing river gravel shelf.
c. Abutment A/B – excavator positioned on existing high ground behind abutment,
d. The excavator mounted vibratory head or excavator with grabs is used to install steel piles into the correct position. Once piles are standing in position the piles are driven to design depth with a drop hammer.
e. Piles are cut off to required length

6) Cast in-situ concrete sub-structure (pile caps):

a. Reinforcement placed and tied in place by hand on blinding at abutments and piers all above low flow water level.
b. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
c. 32m length concrete boom pump to be positioned outside of the riverbed on the existing road approaches or access ramps to pour all substructure works. Pump and concrete trucks to be brought to the respective sides of the river for pours so the boom line is not over the waterway at any time. Concrete washout to either be off site or in established area up at the compound for later removal from site.
d. Strip all formwork after concrete curing period,

7) Cast in-situ concrete sub-structure (Columns and Headstocks):

a. Reinforcement placed and tied in place by hand in columns all above low flow water level.
b. Formwork pre-made and placed with excavator or Franna
c. Form and pour columns, from Scaffold or Elevated Work Platform if required.
d. Install falsework / scaffold around columns for headstock access.
e. Reinforcement placed and tied in place by hand from scaffold
f. Ply formwork shutters pre-made and placed with excavator using the established access ramps and tracks.
g. 32m length concrete boom pump to be positioned outside of the riverbed
h. bearing pad level for piers,
i. Complete mortar pads by hand mixed mortar to finish all substructures.
j. Place scour rock around piers

Works within Medium Risk works period - Start July to End of September)

8) Cast in-situ concrete sub-structure (abutments)

a. Follow sequence from Item 6

9) Place scour rock around abutments

Place geofabric underlay first and use only clean imported quarry rock. No access for trucks inside high banks. Excavator to place scour rock from established access ramps and then from behind abutments out of the riverbed area.

10) General fill and drainage zone behind abutments

Place and compact area immediately behind abutments up to underside of approach slabs. Maintain access to existing bridge for road traffic. All trucks, rollers and excavators out of the creek and sediment fencing along the whole bank lines to contain from any wet weather during this period.

11) Establish crane pads – Crane pads on access ramp on Eastern side for span 2 and Span 3. Crane pad to be established behind abutment for Span 1 lift.

12) Land all precast beams and planks and tie cast in-situ deck – sealed soffit formwork to be used between planks and beams to prevent concrete leakage into the waterway using FC sheeting, silicone and backing rod. Temporary access platforms to be installed along the outside edges for the 17m plank span for access and edge formwork.

13) Pour beam and deck pours – Boom pumps to be again used from the respective sides without putting the line over the waterway. Curing of the deck pour to be done with clean water, soaker hoses and hessian.

Works within Low Risk works period - Start October

14) Install bridge barriers onto plank spans

15) Remove temporary works from headstocks and plank span – use Franna crane and or HIAB truck on the new deck to lift out and load directly to laydown area.

16) Complete approach roadworks – all imported, clean quarry materials (select fill, DGS, DGB) and 14/7 spray seal to finish. Swap traffic over to new bridge once completed.

Works within High Risk works period – Start April

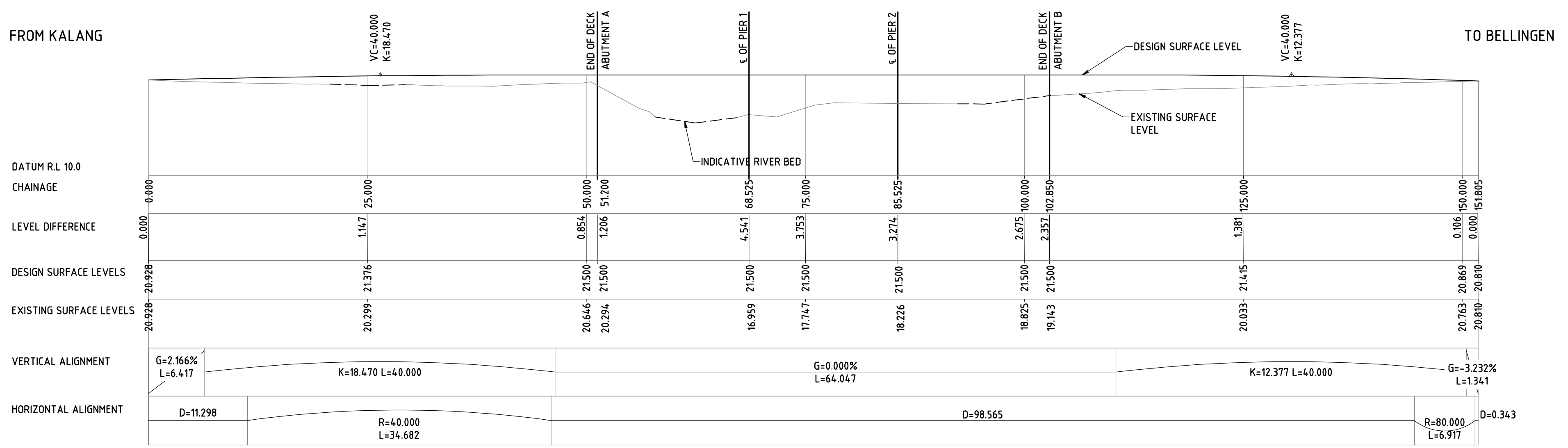
17) Demolish original timbe bridge:

a. Plant and equipment – 14t or 24t excavator with 360 degree rotating grab attachment, oxy torch for cutting bolts and chainsaw for cutting timbers.
b. Remove deck spans one by one starting out in the middle and working back to each abutment, removing timber decking first followed by girders for each span.
c. Once deck fully removed, remove timber headstocks by cutting piles and lift directly with crane onto truck or ground for further disassembly
d. All bridge timbers to be loaded directly onto trucks for load out directly to waste disposal facility on a daily basis, no mass stockpiling on site

18) Complete rock scour protection – on up and downstream side of abutments and banks to tie in with where the existing bridge that was demolished and edge of road formation.

19) Demobilise construction activities – rehabilitate site with plantings and seeding disturbed areas, install temporary final erosion and sediment controls to remain in place for 3 months or until established.

Site Establishment and Piling Works



CHAINAGE	LEVEL DIFFERENCE	DESIGN SURFACE LEVELS	EXISTING SURFACE LEVELS
0.000	0.000	20.928	20.928
25.000	1.147	21.376	20.299
50.000	0.854	21.500	20.646
51.200	1.206	21.500	20.294
68.525	4.541	21.500	16.959
75.000	3.753	21.500	17.747
85.525	3.274	21.500	18.226
100.000	2.675	21.500	18.825
102.850	2.357	21.500	19.143
125.000	1.381	21.415	20.033
150.000	0.106	20.869	20.763
151.805	0.000	20.810	20.810

LONG SECTION – ALONG MC00

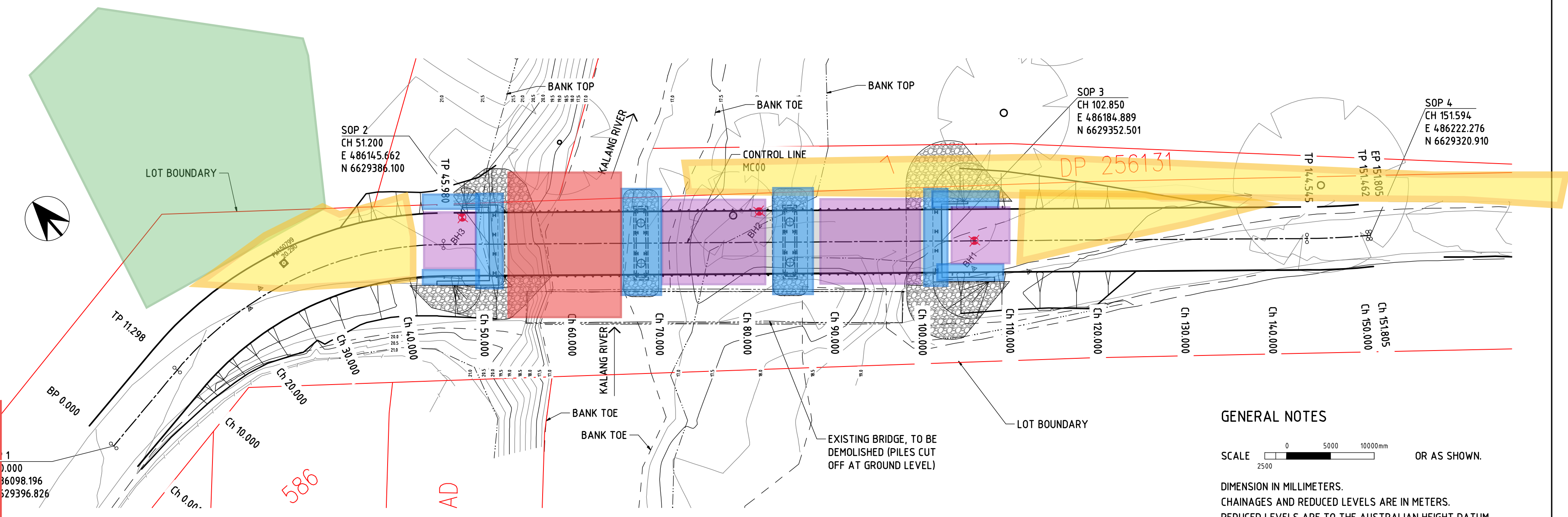
Red area - No access zone - low flow channel

Blue area - Piling and pile cap excavation limits

Green area - Site shed and laydown (not for stockpile of materials which is at council depot)

Yellow area - Access ramps to work zones

Purple area - piling excavator to be positioned on embankments out of any low flow water



PLAN

GENERAL NOTES

SCALE 0 2500 5000 10000mm OR AS SHOWN.

DIMENSION IN MILLIMETERS.
CHAINAGES AND REDUCED LEVELS ARE IN METERS.
REDUCED LEVELS ARE TO THE AUSTRALIAN HEIGHT DATUM.
CO-ORDINATES ARE TO MGA ZONE 56.
DENOTES BOREHOLE LOCATION.

FOR CONSTRUCTION

ISSUE	DATE	AMENDMENT DESCRIPTION	PREP	CHECK	AUTH
A	06/02/2024	ISSUE FOR CONSTRUCTION	JR	DM	CR

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSE OF THE NOMINATED PROJECT

	PREPARED	CHECKED
DESIGN	YH. TANG	D. MERRIKIN
DRAWING	J. REN	D. MERRIKIN

bk. bridge knowledge. ENGINEERING CONSULTING SERVICES — BRIDGE KNOWLEDGE

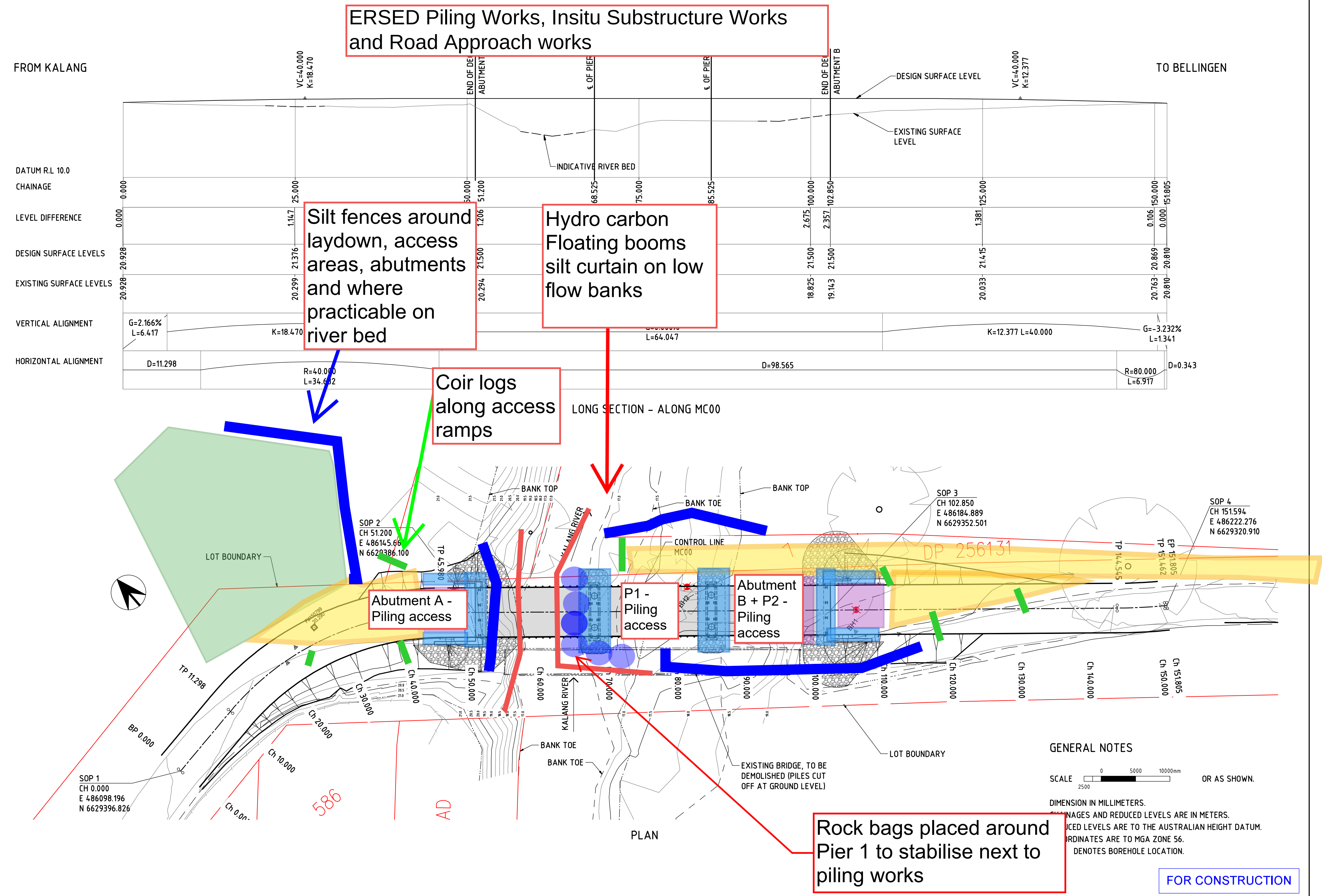
BELLINGEN SHIRE COUNCIL — BELLINGEN SHIRE COUNCIL

KALANG ROAD — BELLINGEN SHIRE COUNCIL

DUFFYS BRIDGE REPLACEMENT OVER KALANG RIVER

ROAD DESIGN - LONG SECTION AND PLAN

DRAWING SET No: BKP458
DRAWING No: DRG-002
ISSUE STATUS: ISSUE FOR CONSTRUCTION
ISSUE: A | No SHEETS: 22 | SHEET No: 02



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DUFFYS BRIDGE REPLACEMENT OVER KALANG RIVER

ROAD DESIGN - LONG SECTION AND PLAN

DRAWING SET No BKP458
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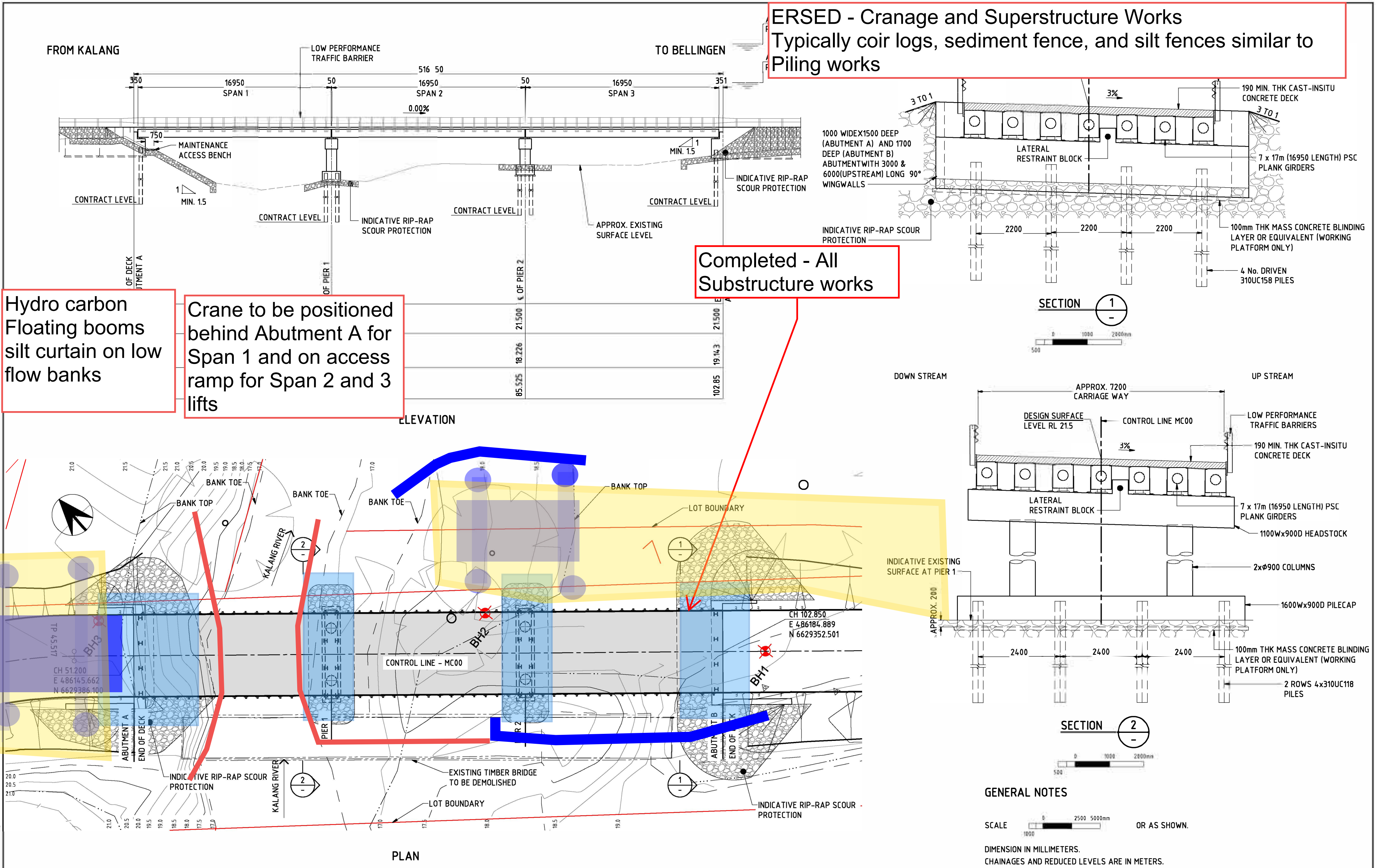

GENERAL NOTES

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DENOTES BOREHOLE LOCATION (APPROXIMATE).

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DESIGN	YH. TANG	D. MERRIKIN
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bk. bridge knowledge. ENGINEERING CONSULTING SERVICES
BRIDGE KNOWLEDGE

BELLINGEN SHIRE COUNCIL
BELLINGEN SHIRE COUNCIL

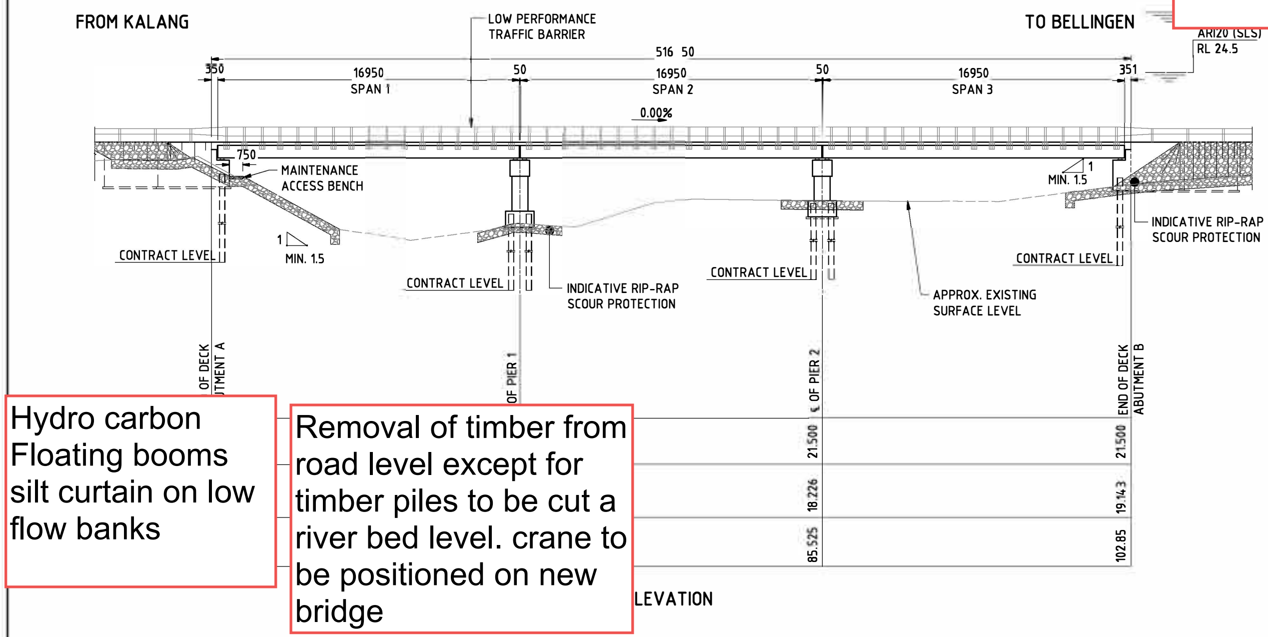
KALANG ROAD — BELLINGEN SHIRE COUNCIL

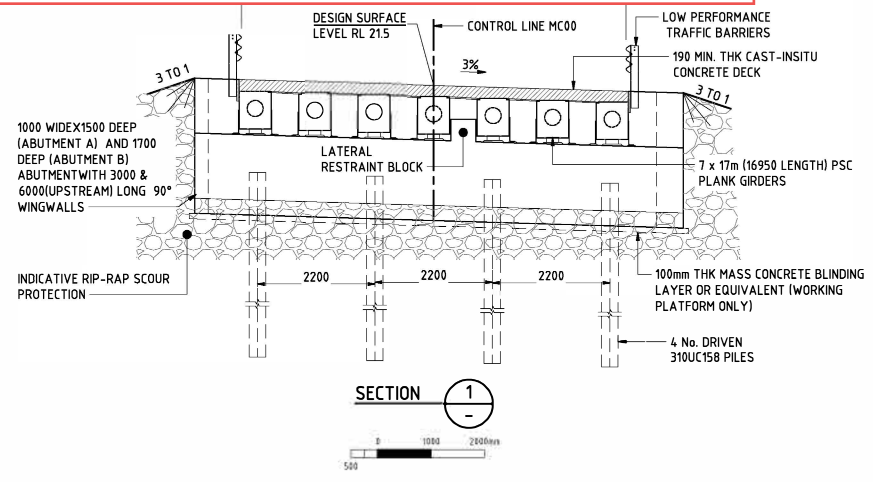
DUFFYS BRIDGE REPLACEMENT
OVER KALANG RIVER

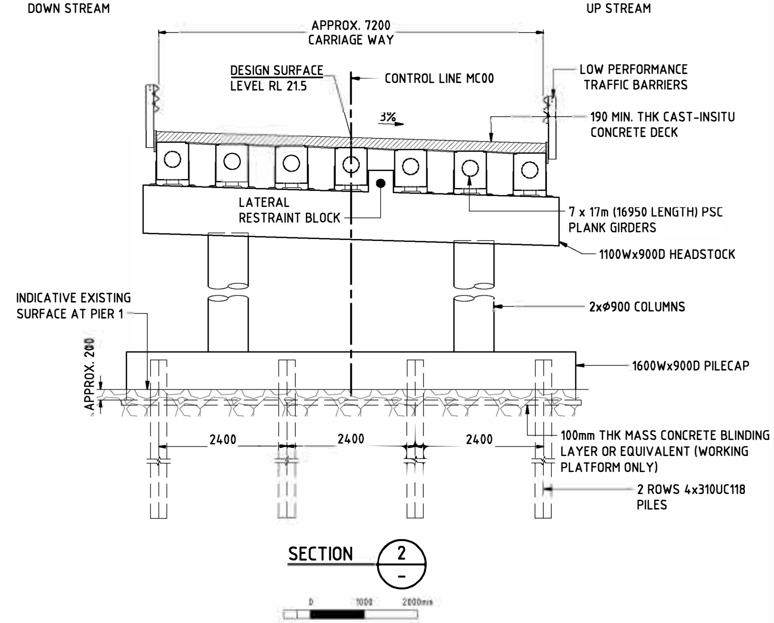
GENERAL ARRANGEMENT

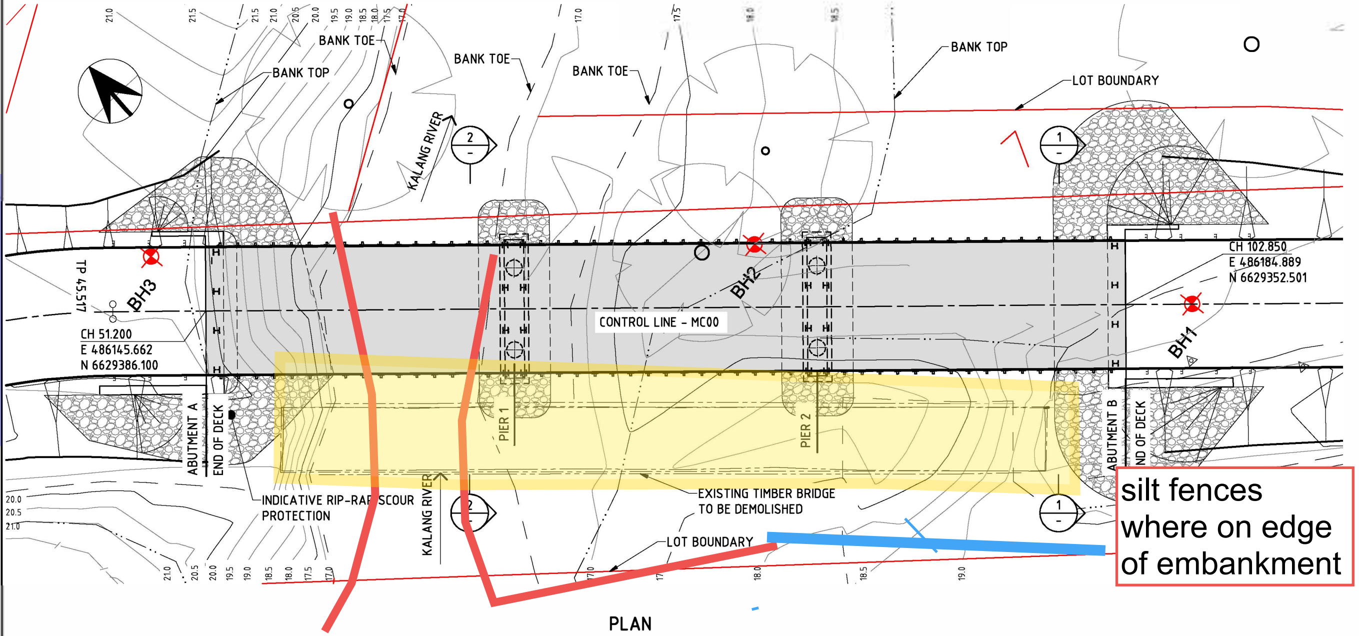
DRAWING SET No: BKP458
DRAWING No: DRG-05
ISSUE STATUS: ISSUE FOR CONSTRUCTION
ISSUE: A | No SHEETS: 22 | SHEET No: 05

ERSED - Timber bridge removal









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OVER KALANG RIVER

GENERAL ARRANGEMENT

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DRAWING No: DRG-05
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ISSUE: A | No SHEETS: 22 | SHEET No: 05

Appendix M

Bellingen Shire Council Environmental Management Policy

14 SECTION 14 – ENVIRONMENTAL MANAGEMENT

14.1 Scope (ISO 14001 cl.4.1)

This procedure describes Bellingen Shire Council's (BSC) environmental system and how it fits into Council's Integrated Management System (IMS).

This procedure sets the standards for the carrying out of environmental impact assessments and the preparation of environmental management plans for projects of varying costs and environmental impacts. Details on the assessment of environmental conditions, potential impacts and legislative requirements for maintenance, construction and building projects are included. In preparing this documentation Council aims to:

- Identify key internal and external stakeholders and/or issues early in the project planning process.
- Address environmental impacts through mitigation measures and communicate to all relevant stakeholders.
- Monitor environmental performance to identify opportunities for improvement.

The procedure is to be applied to all infrastructure projects including when environmental management is a requirement of the contract or when environmental triggers are identified during the planning or subsequent processes. (Clause 14.4, 14.5, 14.9, 14.11, 14.19 and 14.20).

14.2 References

ISO 14001:2015

Aus-Spec Specifications

TfNSW Specifications G36

TfNSW Specifications G38

NSW Threatened Species Conservation Act 1995.

14.3 Environmental Management Policy (ISO 14001 cl.4.2 & .4.3.2)

Bellingen Shire Council is committed to the protection of the environment through planning, carrying out and monitoring its operations in order to meet the following objectives:

- Comply with relevant legislation, policy, and standards to continually improve our environmental performance.
- Abide by all regulatory approvals and any additional customer requirements relating to the environment.
- Set environmental targets for each project site in an Environmental Control Checklist.
- Prevent pollution.
- Minimise waste through efficient material and plant utilisation, plus re-use or recycling of material when appropriate. Dispose of waste properly.
- Respond promptly to any emergency situation which could cause adverse environmental impacts.

- Support the principles of Ecologically Sustainable Development.
- Ensure all staff, contractors and suppliers are aware of and able to comply with their environmental responsibilities.
- Understand the interested parties and determine boundaries and applicability of the environmental management system relative to these parties.
- Consider opportunities for environmental improvement as outcome of project delivery.

Environmental compliance will be regularly reviewed. We aim to prevent problems from occurring and promote continuous improvement towards best practice in environmental management.

Appropriate training and instruction will be provided to ensure that project staff understand how to implement the Environmental Management Plan. Staffs are encouraged to offer suggestions about how environmental protection measures can be improved. Such suggestions will be assessed by Council management and implemented if appropriate.

Council is open about its environmental policy and will make it available to relevant interested parties.

14.4 Environmental Objectives and Targets (AS/NZS ISO 14001 cl.4.3.1, 4.3.33 & 4.4.2)

Section 1 of BSCMSM outlines council's objectives in its commitment to effective management of quality/ WHS/ environmental systems.

The following **objectives** are established for Council's Works Department to maintain a standard of work in construction and maintenance activities:

1. Eliminate incidents which may cause harm to people or the environment.		
Targets	**Responsibility**	**Outcome Evidence**
Establish environmental standards	Group Leader Infrastructure Services	Standards throughout council which are used in the field to initiate a standard of work for all projects / maintenance activities
Implement site specific environmental safeguards/controls	Environmental Representative	Environmental Safeguards
Ensure staff is educated in the implementation of environmental safeguards for each individual project/ maintenance.	Project Manager	Environmental inspection reports
Ensure external and internal issues are addressed.	Project Manager	Communication with client Monitoring client satisfaction during project Review client satisfaction at end of project
Ensure adequate supplies of materials required to fulfil environmental requirements are available onsite at all times	Site Supervisor	Allocate sufficient resources

2. Full compliance with legislation relating to construction and maintenance of BSC operations Department.

Targets	Responsibility	Outcome Evidence
Carry out environmental assessments for all minor and major projects	Environmental Representative	REF, Routine and minor works assessment form
Acquire any approvals, licences and permits from the relevant authorities	Project Manger	Approval, licence or permit
Produce an Environmental Management Plan or relevant documentation as required	Environmental Representative	EMP
Educate staff in the implementation of EMP	Environmental Representative	Site induction, toolbox talks
Stay up to date with daily, weekly, monthly inspections and audits throughout all levels of staffing	All staff	Environmental Monitoring schedule Standard checklists

3. All staff has adequate Environmental training for their assigned tasks.

Targets	Responsibility	Outcome Evidence
Provide sufficient time during project planning to ensure staff are trained or contract of staff can be procured	Group Leader Infrastructure Services	EMP
Hold site specific induction for each employee and subcontractor starting on site	Project Manager	Site induction package, toolbox talks
Hold regular toolbox/ meetings and work activity briefings on all sites and during changes of work crew/ gangs.	Site Supervisor	Record of toolbox talk
Provide sufficient time during work site establishment to follow environmental safeguards and recommendations, including erosion and sediment controls	Site Supervisor	Initial environmental site assessment

14.5 Environmental Legislation (ISO 14001 cl. 4.3.2)

Environmental legislation will be kept up to date as "controlled" reference documents in accordance with BSCPM Section 34. Each month, the Environmental Officer will check the OEH website (www.environment.nsw.gov.au) to ascertain if any changes to environmental legislation have been introduced. [Follow OEH's "environmental links" to access websites for related NSW government departments and to access Environment Australia's website for commonwealth environmental legislation.] When reviewing contract documents, REFs, EISs etc. for new projects (Section 14.9) they will note any new environmental legislation.

When legislation is amended or new legislation enacted, the Environmental Officer will promptly review the new legislation to identify any changes to the environmental conditions imposed on the Council's operations. If so, the Environmental Officer will update to the Applicable Legislation Checklist. For any changes to compliance limits in legislation or associated regulations, show these changes by updating the Applicable Legislation Checklist or the Monitoring Control column in the proforma Environmental Control Checklist.

14.5.1 Approvals, Permits and Licences

Approvals, agreements, licences and permits required through policy, legislation or industry standard will be identified during the planning process and acquired prior to commencement of works. Copies must be scanned into the electronic project folder and a copy kept onsite at all times. Notifications to relevant authorities will be sent as required and a copy kept within the folder. Any environmental requirements/compliance of the approval, agreement or licence must be communicated to all staff and contractors. Environmental safeguards will portray these requirements and compliance assessments included in the inspection checklists and monitoring schedule.

14.6 Relationship to other documents (ISO 14001 cl. 4.4.4.)

Environmental requirements are incorporated in the following BSCPM Procedures so that environmental issues can be addressed as part of our general management tasks:

Bellingen Shire Council – Integrated Management System Manual

(BSC- IMSP)

Bellingen Shire Council's Integrated Management System Plan (BSC-IMSP) is the base document for management of all road / construction / bridgeworks and other related projects delivered by Council. The BSC-IMSP incorporates all QA/WHS/Environmental issues and relevant management processes such as traffic management and document control within one base document satisfying Council, customer and legislative requirements.

Project Specific Plan- Construction (PSP-C)

Details the specific requirements for the management of individual projects; including an EMP as Appendix 8 which addresses environmental aspects and control measures to reduce Councils impacts to the environment and documents.

Bellingen Shire Councils Procedures Manual (BSCPM)

BSCPM Section 3	Initiating Projects
BSCPM Section 4	Planning and Managing on Projects
BSCPM Section 5	Keeping Records
BSCPM Section 6	Control Inspection and Testing
BSCPM Section 9	Calibration, Servicing and Use
BSCPM Section 11	Subcontractors and Suppliers
BSCPM Section 12	Control of Non-Conforming Work
BSCPM Section 15	Plant Maintenance
BSCPM Section 31	Corrective and Preventive Action
BSCPM Section 32	Staff Training and Induction
BSCPM Section 33	Document Authorisation and Distribution
BSCPM Section 34	Reference Document Control

BSCPM Section 35	Internal Audit Program
BSCPM Section 36	Audit Procedure
BSCPM Section 37	Management System Review

Specific corporate EMS requirements are covered in **BSCPM Section 14** while project environmental requirements are covered in our proforma EMP (Section 14.10).

14.7 Environmental Roles and Responsibilities (ISO 14001 cl. 5.3, RMS G36.3.7)

The **Deputy General Manager Operations** is the management representative for the Council's corporate environmental management system and has overall responsibility for:

- Setting environmental policy and objectives.
- Ensuring that environmental impact assessments and environmental management planning for each project are carried out by suitably qualified/experienced staff and/or environmental specialists.
- Promote continual improvement.

The **Group Leader Infrastructure Services** is responsible for:

- Regular communication with Project Manager and Works Supervisor about EMS implementation and improvement (via staff meetings, emails, phone discussions).
- Determine the level of project documentation; Routine and Minor Works Certification, LEVEL1, LEVEL 2 or LEVEL 3 (BSCPM Section 4.2).
- Ensuring all aspects of the IMS system follow environmental standards.
- Establishing environmental management procedures and EMP.
- Reviewing environmental management audits and checklists.
- Initiating corrective and preventive actions.
- Communicating any issues from audits to other senior management staff and advising them about the impacts of any changes to environmental legislation (Section 14.5).
- Reviewing the effectiveness of the environmental management system.
- Approving corrective and preventive actions.
- Ensuring environmental documents are current and available to all staff.
- Ensure resources needed for the environmental management system are available.
- Communicate the importance of effective environmental management and of conforming to the environmental management system requirements

The **Project Manager** is responsible for:
• Implementing the Environmental Management Plan. • Instruct and support project personnel on how to comply with the Council's Environmental Policy and procedures and contribute to its effectiveness. • Notifying the Group Leader Infrastructure Services promptly of any deficiencies or potential problems with the Environmental Management Plan or control measures.

The assigned **Site Engineer** is responsible for
• Implementing routine environmental control measures including regular inspections and maintenance as required, in accordance with the Environmental Management Plan. • Providing an adequate level of staff and resources on each project to fulfil the Council's environmental obligations.

The assigned **Environmental Officer** is responsible for:
• Advising on environmental matters council wide. • Assessing environmental impacts and legislative requirements of project/ maintenance activities. • Planning environmental controls. • Applying for any licences/ approvals or permits required under legislation. • Corresponding with relevant agencies. • Ensuring Environmental Management Plan (EMP) is established, implemented and maintained in compliance with legislative requirements. • Establishing environmental safeguards for the project and communicate requirements to Project Manager. • Delivering environmental induction and toolbox talks for all site personnel. • Carrying out regular inspections and auditing of the works to ensure that environmental safeguards are being followed. • Reporting non-conformances to Group Leader Infrastructure Services in accordance with BSCPM Section 31.

The assigned **Site Supervisor** is responsible for:
• Ensuring staff are adequately trained in the implementation of the required environmental protection measures and are aware of the legislative requirements of the project. • Ensuring adequate supplies of materials required to fulfil environmental requirements are available onsite at all times.

- Carrying out daily and weekly environmental inspections as stated in EMP and Environmental Monitoring Schedule.
- Actively encourage the identification and control of environmental hazards.
- Implementing routine environmental control measures including regular inspections and maintenance as required, in accordance with the Environmental Management Plan.
- Providing an adequate level of staff and resources on each project to fulfil the Council's environmental obligations.

14.8 Environmental Protection Management Process

The aim of this process is to balance the environmental, economic and legislative requirements of all BSC projects, construction and maintenance activities. A broad overview of the management procedure for environmental protection is shown below:

1. Operate an effective Environmental Management System to control the planning, implementation and monitoring of environmental aspects including environmental protection measures for each construction/ maintenance project.
2. Identify statutory requirements, compliance limits and adverse environmental effects which could occur during execution of each construction/ maintenance/ building project.
3. Assess the environmental impacts associated with the construction project, determining risk levels to environment, the community or the council. Identification of significant environmental risks will determine the level of documentation required (BSCPM cl 4.2)
4. Identify Environmental objectives and targets. Plan work activities and environmental protection measures to minimise environmental risks and comply with specified environmental protection requirements. The EMP is the outcome of this planning process.
5. Set up the planned environmental protection measures as per the EMP and train site personnel to be environmentally aware.
6. Monitor the effectiveness of the environmental protection measures as per the EMP.
7. Set up response procedures which will initially contain then remedy any environmental damage which does arise (refer EMP).
8. Review and assess project outcomes including environmental aspects, environmental planning, environmental protection measures and implementation of control measures by council staff
9. Improve environmental protection measures and revise job EMP, proforma EMP, stockpile management plan (SMP) and RWPM procedures when deficiencies are identified.

10. Consider opportunities for positive outcomes during review and project assessment with the objective to improve the environment.

14.9 Environmental Aspects (ISO 14001 cl.6.1.)

Environmental aspects are elements of maintenance/construction projects which could have either a negative or positive impact on the environment. BSC is obliged to identify, analyse and evaluate environmental aspects relevant to all activity's Council wide, with the aim of controlling both direct and indirect impacts to the environment. A list of regular environmental aspects is listed in Table 1.

During BSC maintenance/construction projects; routine activities are carried out on a regular basis, for these activities a set of standard environmental safeguards will be kept within the EMS and included within the project/maintenance folder when required. To identify impacts and required controls to include as environmental safeguards; proformas Environmental Impact Planning Checklist and Environmental Control Checklist contain checklists of environmental aspects at risk of being impacted by construction and maintenance activities and controls to be used in mitigation of those impacts.

Table 14-1 – List of environmental aspects regularly impacted by BSC projects.

Environmental aspect	Operational Control
Soils and Water	Section 22 BSC-IMSP TfNSW G38
Ecological	Section 14.9.2. Environmental assessments
Air, Noise and vibration	Section 23 BSC-IMSP
Aboriginal and Non-Aboriginal Heritage	Sections 27 & 28 BSC_IMSP
Waste	Section 20 BSC-IMSP
Invasive species	Section 4.24 BSC-IMSP
Pollution	Section 26 & 31 BSC-IMSP
Vegetation	Section 24 BSC-IMSP
Native Wildlife	Section 25 BSC-IMSP
Potential Contaminants	Section 26 BSC-IMSP
Materials with Recycled Content	Section 29 BSC-IMSP
Site Restoration	Section 30 BSC-IMSP
Spill prevention and containment	Section 31 BSC-IMSP

14.9.1 Management of Environmental Aspects (Operational Controls)

Risk Management

Introduction

Bellingen Shire Council (BSC) will manage environmental aspects and related negative impacts through a risk management process. Prior to commencement of works a Project Risk Management Plan will be prepared specifying key activities, hazard identification, the level of proposed risk, control actions, residual risk level and hold points for each activity.

Policy

Bellingen Shire Council Risk Management Policy.

Definitions

1. Key Activity

A key activity can be defined as a stage in construction which has the potential to directly or indirectly impact on the natural environment.

2. Hazard / Issue.

The direct or indirect impact on the natural environment which is the result of the above mentioned activity.

3. Risk level assessment.

Risk can be defined as the likelihood and consequence of an activity causing a negative impact on the natural environment. Assessment is the process of evaluating the likely hood of a negative impact occurring as a result of the activity and the consequences (Figure 1). Using the Risk Matrix in Figure 1 a risk level can be determined.

	Consequences						Likelihood				
							A	B	C	D	E
	People	Environment	Plant Property Assets	Program / Time	Regulatory / Cost	Reputation	Almost Certain	Likely	Possible	Unlikely	Rare
1	No incident or First Aid injury	Negligible Impact	Low $ Loss < $1,000	Less than 0.5 days	Fine < $1K	Minimal Publicity	High 15	Moderate 19	Low 22	Low 24	Low 25
2	Medical Treatment	Minor on site impact	Medium $ Loss > $1,000 - < $10K	0.5 to 1 day	Fine $1K - $10K	Some local media coverage	High 10	High 14	Moderate 18	Low 21	Low 23
3	Alternate work or lost time injury	Moderate onsite impact	High $ Loss > $10k - < $50K	1 day to week	Fine $10K - $50K	Media coverage at State Level	Extreme 6	High 9	High 13	Moderate 17	Moderate 20
4	Serious or Permanent injury	Minor offsite or Major onsite	Major $ Loss > $50K - < $100K	1 week to < month	Fine > $50K or legal proceedings	Adverse Publicity	Extreme 3	Extreme 5	Extreme 8	High 12	High 16
5	Fatality	Major offsite impact	Huge $ Loss > $100K	> 1 month	Shutdown project due to Regulatory Breach	Extreme Adverse Publicity	Extreme 1	Extreme 2	Extreme 4	Extreme 7	High 11

Figure 14-1 – Risk Matrix

4. Control

Controls are mitigation measures or environmental safeguards put in place during the activity to eliminate or minimise the risk to the environment.

5. Hold Point

Defined point in construction usually with a checklist or specification in which hold on construction activities is initiated until the inspection is passed.

6. Review

When controls are in place, the review process checks to ensure they are working effectively and if any modifications are required.

Procedure

A project risk assessment workshop will be held during the planning stage of the project. The Project manager will involve the key project delivery team. A documented risk assessment will be undertaken to identify the steps in the activity, the environmental hazards and associated risk levels (initial risk). The risk management procedure in **Section 13.10 BSCPM** sets out the process for identification and control of risks.

Environmental assessments carried out by BSC Environmental Officer will identify specific environmental risks and opportunities associated with construction and maintenance activities. Utilising the risk management procedure, environmental safeguards or control measures can be identified and implemented to reduce or eliminate the severity and likelihood of BSC activities impacting the environment.

14.9.2 Environmental Assessments

Introduction

Land use and development in the Bellingen Shire LGA is regulated by State and Federal legislation. This legislation sets different levels of environmental assessment for different activities. The following procedure has been developed to ensure council is in accordance with the legal requirements.

Procedure

The environmental assessment for RMCC project works will be carried out prior to Council's engagement on the project. As part of due diligence, the environmental representative should review this documentation. This procedure will be applicable to RMCC Routine Maintenance activities.

For local works, Council will undertake an environmental assessment in accordance with table 2 below. identify environmental aspects for consideration and any legislative triggers which may require approvals/permits or licences. Environmental aspects for consideration in construction and maintenance activities can be found in Table 2: Section 14.9 of this document.

A review of environmental factors will consist of the following components:

- Define the study area
- Define the scope of works
- Identify approval pathway
- Review of existing data through a desktop review
- Due Diligence Indigenous Heritage Assessment
- Non-indigenous heritage assessment
- Biodiversity Searches
- Initial environmental assessment
- Threatened species assessment
- Assess the direct and indirect environmental impacts of the proposed works
- Identify environmental aspects which will require environmental controls
- Include control measures in reports, documentation and recommendations.
- Assess opportunities to improve environmental outcomes

Table 14-2 – Level of Environmental Impact Assessment

Description	Level of documentation	Legislation	Responsibility
Minor works including routine maintenance activities. Works are considered to be within an already disturbed area and to have no or minimal effect on the environment.	E422 Form Environmental Safeguards	Exempt Development SEPP Infrastructure 2007 SEPP Exempt and Complying Development Codes 2008	Environmental Representative
Minor to moderate works within an already disturbed area not considered to have an impact on threatened species, populations, communities or habitats.	REF Aboriginal Heritage Information Management System (AHIMS) Search Environmental Safeguards	Development permitted without consent SEPP Infrastructure 2007	Environmental Representative
Major works or works with the potential to cause harm to: - A threatened species, population, community or habitat. - An indigenous heritage item - A non-indigenous heritage item	REF Test of significance AHIMS Search Statement of Heritage Impact (if required) Aboriginal Heritage Impact Permit (If required) Approval or permits from relevant Authority	Development permitted with consent State Environmental Planning Policy (Infrastructure) 2007	Environmental Representative

A significant change to the scope of works will require an updated environmental assessment. This may be completed as an addendum to the original assessment.

The process for selecting the appropriate assessment pathway is detailed in Figure 14-2 – Mapped Environmental Procedure.

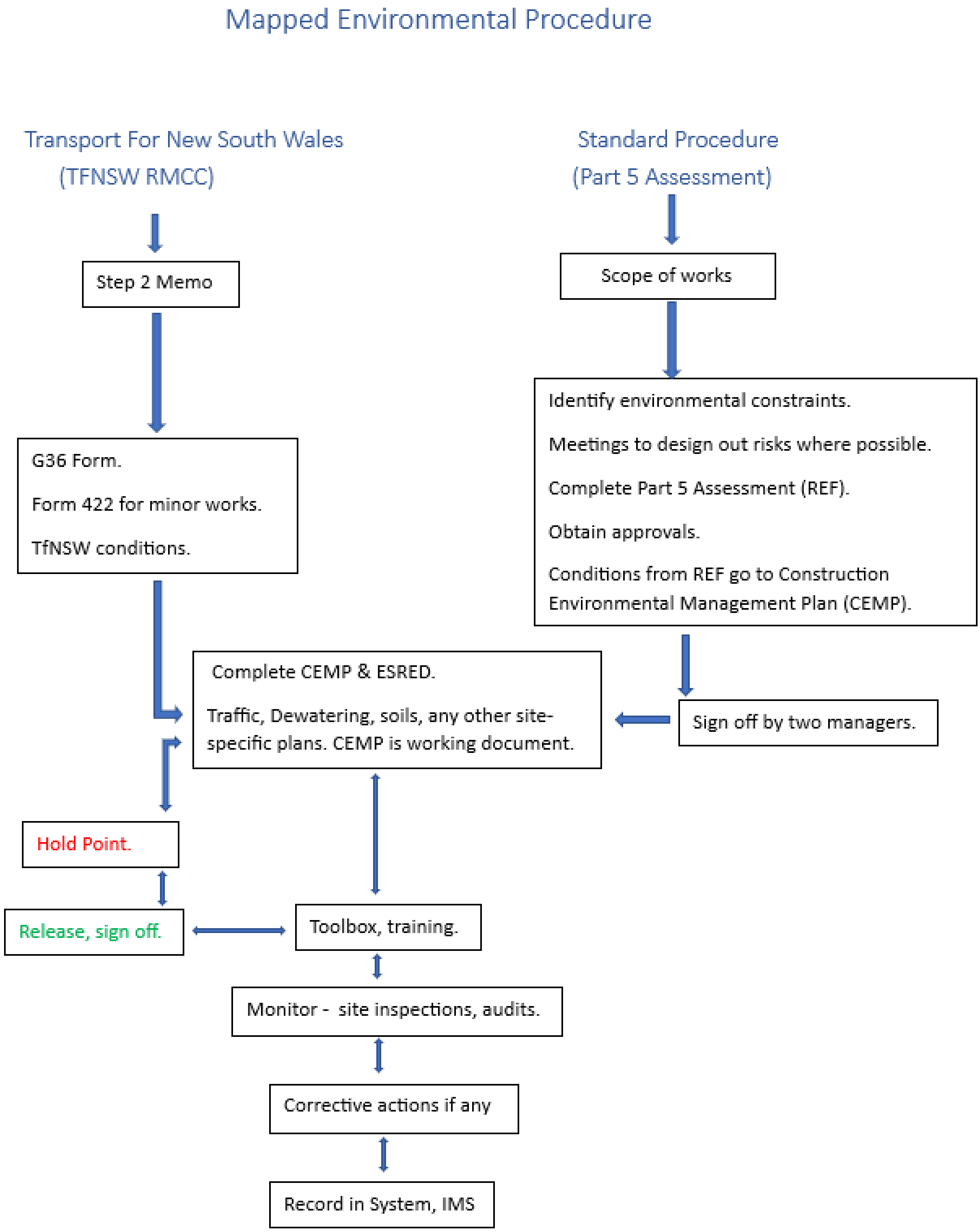

Figure 14-2 – Mapped Environmental Procedure

14.9.2.1 Documentation of Environmental Assessments

Documentation of environmental assessments will be in accordance with table 2 above. Under Part 5 Division 5.1 of the Environmental Planning and Assessment Act 1979, Planning Authorities have a duty to consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity. Table 2 states the levels of documentation required relevant to the legislation. This documentation forms the legislative approval for activities carried out by Council. It is essential this documentation is stored within the project folders as evidence of environmental assessment.

When assessed as required a Review of Environmental Factors (REF) will be completed by qualified staff and kept within project folder, documentation and findings will be communicated to staff and contractors through an EMP and/or environmental safeguards.

The REF is required to be reviewed by an appropriately qualified Environmental Officer and approved by the Manager Works prior to the start of construction.

A REF is valid for 1 year from the date of approval. If a project is expected to be carried out for more than 12 months, the EMP will include assessments of environmental conditions which monitor seasonal changes during the course of the building, construction or maintenance activity.

14.10 Environmental Management Procedure (ISO 14001 cl. 4.3.1 - 4.3.3)

Introduction

The aim of this procedure is to outline the requirements of environmental management in Councils Operations department; throughout all project levels, including maintenance activities and set out the criteria to be included within an Environmental Management Plan (EMP).

The EMP aims to ensure environmental protection measures are communicated, implemented and maintained throughout BSC Operations department activities and through all levels of staffing.

The EMP is prepared following the completion of the environmental assessment and contains environmental conditions, safeguards, monitoring requirements and control measures identified during the planning and assessment stages of the project. The EMP acts as a record of due diligence on behalf of the staff throughout all levels of Council.

Procedure

The Group Leader Infrastructure Services will review the contract documents to identify the customer's requirements for environmental management and determine what to include in the EMP. The Group Leader Infrastructure Services will also review any environmental assessment documentation that is applicable under the contract, to identify project-specific environmental issues raised in the environmental impact assessment process. If Council is required to carry out a further environmental assessment, approvals, licences or permits, this will be arranged by the Project Manager.

The Environmental Officer will prepare the EMP prior to commencement of works and communicate the requirements to Works Coordinators/ Project Managers/ Site Supervisors for inclusion in project planning. The level of environmental management and documentation will be relevant the size and impacts of the project. These levels are detailed below.

LEVEL 1: Project greater than $250,000 or a project.

LEVEL 2: Project between $250,000 and $50,000 and/or the works are likely to impact threatened species, indigenous heritage or non-indigenous heritage.

LEVEL 3: Project less than $50,000 and/or an area identified as containing a threatened species, community, population or their habitats which is regularly maintained by council during routine maintenance works.

Minor Works/Maintenance: Routine maintenance activities and minor works and/or exempt development under EPA Act 1979.

14.10.1 Environmental Management Procedure: Level 1.

This procedure describes the environmental management processes developed for BSC construction and maintenance projects with an estimated budget of above $250,000.

This level of planning incorporates all aspects of the Integrated Management System (IMS) system and is in accordance with TfNSW Specification G36.

Environmental Management Plan

Bellingen Shire Council's Integrated Management System Plan (BSC-IMSP) is the base document for this level of environmental management. The EMP consists of Appendix 7 and 8 of the Project Specific Plan- Construction (PSP-C). Legislative requirements will be documented in Appendix 7 and the EMP documenting compliance with the Environmental Assessment and relevant TfNSW standards is Appendix 8 of the PSP-C. This documentation is to be kept onsite at all times.

The environmental management plan will include a brief description of the project, main construction activities and existing environmental conditions in sections 1.1 to 1.12 of Appendix 8. Appendix 7 contains a list of the environmental legislation relevant to construction works. This is set up as a planning checklist for approvals, licences or permits required for the project.

Procedure

The procedure for environmental management will generally follow the below steps:

Pre-Works

- Preparation of a project risk management plan.
- Prepare legislation checklist (appendix 7).
- Identify and acquire approvals, licences and/or permits.
- Identify environmental objectives/ targets for the project.
- Identify project environmental hold points.
- Review environmental safeguards/ standards for the site from the environmental assessment.
- Identify any additional safeguards/ standards.
- Prepare information for Site Emergency Plan, if required.
- Prepare additional management plans such as: Erosion and sediment control, noise and vibration, threatened species management plan, as required.
- Environmental monitoring, inspection and auditing requirements will be identified prior to start of construction PSP-C Appendix 5.
- Summarise information within PSP-C and EMP (Appendix 8 of PSP-C).

During Works

- Environmental inductions and regular toolbox talks for all site personnel.

- Daily, weekly and monthly inspections and auditing of the works are carried out to ensure standards and safeguards are within council policies.
- A 6-month review of the whole project to be carried out including all key persons for the project.
- Keep legible records of all environmental inspections, issues and activities.
- Non-conformities and deficiencies will be reviewed, and the effectiveness of corrective and preventative actions verified. Areas of opportunity for improvement and any procedural changes required will be identified.
- Incidents will be classified, managed and reported as per the requirements of BSC policies and procedures.

Post Works

- On completion of the works, all areas disturbed by construction activities (including the site compound, materials storage, and access and haul roads) must be reinstated and restored to conditions similar to the original condition.
- Close out workshop.

14.10.2 Environmental Management Procedure: Level 2

This procedure describes the environmental management process developed for BSC construction and maintenance projects with an estimated budget between $50,000 - $250,000. It also relates to projects which are likely to impact threatened species, communities, populations and habitats or items of indigenous or non-indigenous heritage which require specific management practices incorporated within construction plans. The legislative requirements will be recorded using the Environmental Legislation Checklist and EMP as described below.

Environmental Management Plan

The EMP for a project of this description requires the following sections to be completed and kept onsite:

Introduction: Brief Description of the project, main construction activities and existing environmental conditions.

Legislative Requirements: Environmental Legislation Checklist.

Environmentally Sensitive Areas: Summary and maps of any sensitive receivers including heritage and protection measures.

Environmental Impacts: Summary of expected environmental impacts associated with the project

Environmental Controls: Environmental safeguards as point form.

Record of specified management plans: Reference any management plans specific to the project.

Emergency Instructions:

Monitoring Schedule: Refer BSCPM Section 14.11

Approvals, permits and licences must be attached.

Procedure

The procedure for environmental management will generally follow the below steps:

Pre-Works

- Preparation of a project risk management plan.
- Legislation checklist.
- Acquire all approvals, licences or permits.
- Identify project environmental hold points.
- Review environmental impact assessment safeguards and identify additional safeguards.
- Prepare additional management plans such as: Erosion and sediment control, noise and vibration or threatened species management plan, as required.
- Identify environmental monitoring, inspection and auditing requirements.
- Summarise information within EMP.

During Works

- Environmental inductions and regular toolbox talks for all site personnel.
- Daily, weekly and monthly inspections of the works to ensure standards and safeguards are within council standards/policies.
- Keep legible records of all environmental inspections, issues and activities
- Non-conformities and deficiencies will be reviewed, and the effectiveness of corrective and preventative actions verified. Areas of opportunity for improvement and any procedural changes required will be identified.
- Incidents will be classified, managed and reported as per the requirements of BSC policies and procedures.

Post Works

- On completion of the works, all areas disturbed by construction activities (including the site compound, materials storage, and access and haul roads) must be reinstated and restored to conditions similar to the original condition.
- Close out workshop

14.10.3 Environmental Management Procedure: Level 3

This procedure describes the environmental management process for projects less than $50,000 and/or an area identified as containing a threatened species, community, population or their habitats, which is regularly maintained by council during routine maintenance works.

Environmental Management Plan

The EMP for a project of this description requires the following information to be documented and kept onsite:

Legislative Requirements

Environmentally Sensitive Areas: Summary and maps of any sensitive receivers including heritage, including protection measures.

Environmental Impacts: Summary of expected environmental impacts associated with the project.

Environmental Controls: Environmental safeguards as point form.

Record of specified management plans: Reference any management plans specific to the project.

Monitoring Schedule: Refer BSCPM Section 14.11

Approvals, permits and licences must be attached

Pre-Works

- Preparation of a project risk management plan If required ecological assessment.
- Legislation checklist.
- Acquire all approvals, licences or permits.
- Identify project environmental hold points.
- Develop environmental safeguards/ standards for the site.
- Prepare additional management plans such as : Erosion and sediment control and/or Noise and vibration.
- Identify environmental monitoring, inspection and auditing requirements.
- Summarise information within EMP.

During Works

- Environmental inductions and regular toolbox talks for all site personnel.
- One prestart, one during works and a close out inspection are required as a minimum and dependant on the duration of the project.
- Auditing of the works to ensure standards and safeguards are within council policies.
- Keep legible records of all environmental inspections, issues and activities.
- Non-conformities and deficiencies will be reviewed, and the effectiveness of corrective and preventative actions verified. Areas of opportunity for improvement and any procedural changes required will be identified.
- Incidents will be classified, managed and reported as per the requirements of BSC policies and procedures.

Post Works

- On completion of the works, all areas disturbed by construction activities (including the site compound, materials storage, and access and haul roads) must be reinstated and restored to conditions similar to the original condition.
- Close out inspection and workshop.

14.10.4 Minor Works/ Maintenance Environmental Management Procedure

This procedure provides the environmental management requirements for routine maintenance activities and/or projects categorised as exempt development under the EPA Act 1979.

Environmental Management Plan.

Works of this description require a E22 Routine and Minor works Assessment form to be completed, documenting justification for the exemption, potential environmental impacts associated with the activity, environmental safeguards, monitoring requirements and any hold points required during the works.

Prior, during and post works

- Environmental aspects identified/ assessed if required and recorded.
- Environmental safeguards identified and established throughout the works period.
- If large areas of high conservation value need maintaining preparation of a management plan is required.
- Daily toolbox talks.

14.11 Monitoring Controls (ISO 14001 4.3.3, 4.5.1)

Introduction

Monitoring is required to check whether operational controls remain adequate and effective.

The procedure, including roles and responsibilities of environmental monitoring, are stated in Project environmental performance: BSC-IMSP Section 4.13.

Procedure

A survey of the works area will be initiated prior to commencement of works to determine the baseline environmental status of relevant environmental aspects.

Inspections can be categorised into daily, weekly, monthly, 3 monthly and 6 monthly intervals. The Monitoring Schedule is added to the EMP or held within the project folder.

Where additional plans or instructions are needed to explain to site personnel how, when and where to perform monitoring tasks, these will be referenced in the Monitoring Control column and included in the EMP together with inspection report forms. A copy of all reports of audits, inspections and reviews will be kept on the project file and onsite in the project folder.

14.11.1 Workplace Inspections

Workplace inspections are recognised as an important part of the environmental control strategy and are implemented throughout BSC-IMS.

They are conducted to:

- Verify environmental compliance.
- Ensure environmental controls are effective.
- Identify areas which require further training, awareness and competence.
- Ensure all council building/maintenance and construction projects are maintained to council standards.

Frequency of workplace inspections will be undertaken as stated in the Monitoring Schedule, and as part of the EMP.

Environmental workplace inspections will be carried out in accordance with BSCPM Section 6 & 13.10.

Inspection and test plans (ITP's) may be required to ensure conformance of environmental,

WHS or traffic management requirements. Where additional plans are required, they must be referenced in the EMP and kept onsite.

14.11.2 Non-conformance, Corrective and Preventive Action (ISO 14001 4.5.3)

Environmental non-conformances will be recorded and rectified in accordance with BSCPM Section 12.

Corrective or preventive action to eliminate the causes of actual or potential environmental non-conformances will be initiated in accordance with BSCPM Section 31.

14.12 Records (ISO 14001 cl. 7.5)

Environmental records are be filed as part of the construction records (refer BSCPM Section 5).

14.13 Emergency Preparedness (ISO 14001 cl. 4.4.7)

Emergency planning and response refer BSC-IMSP Section 4.5.

Identify any potential accident or emergency situations that could result in significant adverse environmental impacts and (if needed) document emergency procedures in the EMP.

The emergency procedures will include communication protocol, containment measures plus assessment and mitigation of any significant environmental impacts that could result from the emergency situation.

Arrange for appropriate containment equipment to be held at the site and instruct site staff periodically on how to carry out the emergency procedures.

Periodically test the planned response actions where applicable to a project and after the occurrence of emergency situation. Review and revise process and planned actions and ensure staff are trained in processes developed or revised.

14.14 Resources (ISO 14001 cl. 4.4.1)

Review the level of staffing and physical resources identified during the environmental planning process against those allocated in the construction budget. If additional resources are needed to fulfil environmental obligations under the contract, allocate adequate resources.

14.15 Tender Review (ISO 14001 cl. 4.3.1)

Environmental requirements to be addressed during construction are considered during our tender assessment (refer BSCPM Section 3).

14.16 Subcontractors and Suppliers (ISO 14001 cl. 4.3.2. & 4.4.2)

When purchasing materials or subcontracting work (see BSCPM Section 11), it is important to address any environmental requirements for which the supplier or subcontractor has to be responsible. This involves five main steps:

1. When setting out the technical criteria for purchase orders or subcontracts, include details of the environmental requirements which the supplier or subcontractor has to meet. This may include:
   a. "Environmentally friendly" characteristics for materials,
   b. Recommendation for storage and use of materials to avoid damage to the environment (e.g. SDS),
   c. Recommendations for remediation if accidents occur in storing or using materials,
   d. Environmental controls for which subcontractor is responsible.
2. When selecting a supplier or subcontractor, assess their capability to meet these environmental requirements.
3. Obtain relevant information from supplier or subcontractor to include in the Environmental Management Plan.
4. Fill in the table in EMP Section 1.7 for each subcontractor (as applicable) to outline their environmental responsibilities and those responsibilities Council will retain for the subcontractor's work site, plus the extent of surveillance to be performed by Council Staff on the subcontractor's environmental control measures.
5. Carry out surveillance while subcontract is in progress to confirm that subcontractor is maintaining appropriate environmental controls and records. Obtain copies of subcontractor's environmental records, where nominated by the customer.

14.17 Training, Awareness and Competence (ISO 14001 cl. 4.4.2)

Personnel qualifications/skills related to environmental management activities will be ascertained, training needs will be identified, and training undertaken and recorded in accordance with BSCPM Section 32. The environmental policy will be placed in works area and IMSP to highlight council commitment to the protection of the environment.

14.17.1 Site induction

An environmental induction is to be presented to on ground staff and contractors prior to commencement of works, relaying legislative requirements, environmental impacts and environmental protection measures identified within the EMP according to BSCPM Section 4.4. In addition, Project Manager will issue staff/ contractors with a copy of BSC Environmental Policies explaining how the EMS operates within the organisation. Site inductions will be recorded within the Council's Pre-Start "Toolbox" Risk Assessment form and/or Site Induction Register.

14.18 EMS Audits (ISO 14001 cl. 4.5.5)

The Group Leader Infrastructure Services will include environmental management as part of the Council's internal management system audits (refer BSCPM Sections 35 and 36).

14.19 Evaluation of Compliance (ISO 14001 cl. 4.5.2)

The Group Leader Infrastructure Services will evaluate compliance against applicable environmental legislation for each construction project by reviewing performance outcomes against the Applicable Legislation Checklist prepared for the project (see EMP).

The Group Leader Infrastructure Services also includes evaluation of compliance against environmental legislation in EMS audits (Clause 14.18) and as part of the annual review of the environmental management system (Clause 14.20).

The Environmental Officer will conduct and report on regular inspections/ audits as stated in Section 4.11 of this document.

14.20 Review of Environmental Performance (ISO 14001 cl.4.5.5)

The Group Leader Infrastructure Services will review the effectiveness of the Environmental Management Plan and the implemented control measures as part of the monthly project review (refer BSCPM Section 4).This will include consideration of any recent environmental communications. The Group Leader Infrastructure Services / Project Manager will record review conclusions and agreed actions.

The Group Leader Infrastructure Services will carry out an annual management review to evaluate the continuing suitability adequacy and effectiveness of the environmental management system as part of the integrated management system review (refer BSCPM Section 37).

Appendix N

Bellingen Shire Council Integrated Management System Environmental Protection – Statement of Intent

ENVIRONMENTAL PROTECTION - STATEMENT OF INTENT

Bellingen Shire Council strives for excellence in environmental protection and awareness to achieve local government best practice in our operations.

To deliver best practice Bellingen Shire Council shall:

Establish	and implement an Environmental Management System, in accordance with ISO14001, which shall be an integral part of the IMS Environmental Management Systems
Communicate	the IMS Environmental Statement of Intent and procedures to all employees and other workers as appropriate, to ensure they are aware of their obligations related to BSC operations
Comply	with all relevant government legislation and regulations having taken into account Client requirements and industry guidelines
Apply	waste minimisation principals taking all practicable steps to prevent pollution and other adverse effects from our operations
Consult	with all affected property holders and comply with all reasonable requests wherever practicable
Educate	and train our employees and other workers to continually improve awareness, skills and knowledge of environmental practices and issues
Minimise	disturbance to known sites of indigenous, archaeological or historical significance
Minimise	disturbance to soil, vegetation and wildlife habitats by limiting vehicular travel to cleared work sites, designated access tracks and roads
Set	measureable targets and objectives to ensure continual improvement our environmental performance and communicate results
Review	and revise our Environmental Protection Statement of Intent and procedures to maintain their relevance and effectiveness

The well-being of the Environment is of primary importance. It is the responsibility of all individuals to achieve a responsible approach to the protection of the environment.

APPROVED COMPANY
ISO 14001
Environmental Management Systems

QMS Certification Services

Ashley Greenwood

Deputy General Manager Operations

02/03/2024