# Executive summary

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# E1. Introduction

## E1.1 Project proponents

The Gladstone Area Water Board (GAWB) and SunWater Limited (SunWater) are joint proponents undertaking technical, environmental, social, cultural and economic investigations for the Lower Fitzroy River Infrastructure Project (Project).

The Project comprises the construction and operation of a raised Eden Bann Weir and construction and operation of a new weir at Rookwood (Rookwood Weir) on the Fitzroy River, Central Queensland.

The contact details for the Project are:

Lower Fitzroy River Infrastructure Project

Reply Paid 668, Brisbane, QLD, 4001

Telephone: 1800 423 213

Email: fitzroyweirs@ghd.com.au

GAWB is a Category 1 commercialised Water Authority under the *Water Act 2000* (Qld) (Water Act) and a registered service provider under the *Water Supply (Safety and Reliability) Act 2008* (Qld). GAWB owns and operates Awoonga Dam on the Boyne River along with a network of delivery pipelines, water treatment plants and other bulk water distribution infrastructure in the Gladstone Region in central Queensland. GAWB's corporate objective is to ensure that the long- and short-term water needs of current and future customers are met and environmental (ISO14001:2004), quality (ISO9001:2008), compliance and risk management systems are maintained.

The contact details for GAWB are:

Gladstone Area Water Board

147 Goondoon St, Gladstone, QLD, 4680

PO Box 466, Gladstone, QLD 4680

Telephone: (07) 4976 3000

Website: www.gawb.qld.gov.au

SunWater is a statutory Government Owned Corporation under the *Government Owned Corporations Act 1993* (Qld). SunWater owns and operates the Queensland Government's bulk water supply and distribution infrastructure located throughout regional Queensland, including the existing Eden Bann Weir. SunWater's Environmental Management System ensures that best practice environmental management and compliance is achieved across the business in accordance with ISO 14001:2004.

The contact details for SunWater are:

SunWater Limited

Level 10, 179 Turbot Street, Brisbane, QLD, 4002

PO Box 15536, City East, Brisbane QLD, 4002

Telephone: (07) 3120 0000

Website: www.sunwater.com.au

GAWB and SunWater have good environmental records and neither party has been found to be in contravention of environmental conditions imposed on their projects. GAWB and SunWater are committed to managing and operating their infrastructure in a safe and sustainable manner.

## E1.2 Project rationale

Planning, management and delivery of water to urban, industrial and agricultural communities is the role of State and local governments collaborating to implement water reforms to provide secure water entitlements to users while protecting the natural values and ecosystems of the region.

As subordinate legislation to the Water Act, the Water Resource (Fitzroy Basin) Plan 2011 (Fitzroy WRP) seeks to achieve general and specific outcomes for the sustainable management of water. The Fitzroy Basin Resource Operations Plan (Fitzroy ROP) implements the Fitzroy WRP and defines the rules for allocation and management of water.

The Fitzroy WRP reserves a nominal volume of water (76,000 ML) for strategic water infrastructure on the Fitzroy River as the strategic water infrastructure reserve. The Project is recognised as strategic water infrastructure to which water allocations may be granted.

The Fitzroy ROP specifies that submissions to make unallocated water available from the strategic water infrastructure reserve on the Fitzroy River may be made as follows:

- GAWB: up to 30,000 ML of the reserve for urban and industrial water supplies
- Local government authority: up to 4,000 ML of the reserve for urban water supplies for the Capricorn Coast.

The Fitzroy ROP does not specify the intended use of the remaining 42,000 ML and nominates that any person or entity may make a submission in this regard.

In December 2004 the Queensland Government, in partnership with local government, committed to developing the Central Queensland Regional Water Supply Strategy (CQRWSS) (DNRW 2006), a long term water supply strategy for the region to address the following key issues:

- Continued urban growth and industrial development, particularly in the Lower Fitzroy and Gladstone areas, and mining development in the Bowen and Surat coal basins
- Entitlements in some existing regional water supply systems are at or approaching full usage
- Some existing water supply schemes are performing below water user requirements
- Water demand projections indicate regional supply shortfalls exist to meet urban, industrial, coal mining and agricultural requirements through to 2020.

The CQRWSS identified the Lower Fitzroy System as the next main supply source for urban and industrial needs of the Rockhampton Regional Council (RRC) and Livingstone Shire Council (LSC) local government areas and for the needs of GAWB's supply area. The CQRWSS identified that further infrastructure on the lower Fitzroy River is required in order to provide the appropriate reliability of supply (mainly for high priority water). The Project was identified as appropriate infrastructure to satisfy short, medium and long term supply requirements.

Cumulatively, the CQRWSS predicted a total shortfall of high priority water for urban and industrial needs in the order of 41,000 ML/a by 2020. Future demand for water resources is predicted to be due primarily to the continued growth of industrial and urban expansion in the Lower Fitzroy and Gladstone areas and potentially some agricultural development within the Fitzroy Agricultural Corridor. In addition to direct increases in demand there is also a potential requirement to improve the level of reliability of the existing water supplies locally and regionally. Key potential water demand may arise from the following sources:

- GAWB: While not realised, water supply to Gladstone via GAWB's proposed Gladstone-Fitzroy Pipeline (GFP) of 30,000 ML/a is considered a likely first demand for the Project. The Project, together with the GFP, would provide a second water source supply solution for GAWB to improve reliability of supply risks. The GFP Project has received environmental approval from both the Queensland and Commonwealth governments
- RRC: The Fitzroy Barrage currently provides an allocation of 50,000 ML of high priority water to RRC (Fitzroy River Water), of which approximately half is used (DNRW 2006). Subject to the required level of service or the level of performance people can expect from their water supply (yet to be determined), demand for additional yield from the Project may be realised. RRC, together with the Department of Energy and Water Supply, is currently undertaking a regional water supply security assessment in this regard
- LSC: Water to the Capricorn Coast is supplied through the Rockhampton to Yeppoon pipeline, supplemented with supplies from Waterpark Creek (4,400 ML/a). Discussions with LSC indicate that given the improved reliability and supply is provided from the Fitzroy River, the LSC remains interested in further water resources being made available and/or supply reliability being improved as a result of the Project
- Industry and mining:
  - Whilst regional planning for the development of future infrastructure has been undertaken, notably in the form of the Gracemere-Stanwell Industrial Corridor, none of the expected projects have yet materialised, and demands are uncertain. Demand shortfalls in the order of 17,500 ML were predicted by 2020 (DNRW 2006). Nevertheless, RRC is currently promoting the need and desire for this development for economic growth in Rockhampton. Increased industrial demand within the Gladstone region is also expected, and these demands are catered for in the 30,000 ML being sought by GAWB
  - Similarly, while a number of mining and petroleum exploration projects are proposed for the Rockhampton region, projects have not materialised. While some demand for water can be expected in the long term, volumes required are difficult to predict.
- Agriculture
  - In terms of the demand for water from the agricultural sector, the CQRWSS reported that while the majority of demand could be satisfied by the take-up and trading of under-utilised entitlements, some demand from agriculture was predicted (DNRW 2006). With regard to the Project, tradable water allocations have been established for the lower Mackenzie and Fitzroy rivers from Tartrus Weir to the Fitzroy Barrage
  - Further to this the Fitzroy Industry and Infrastructure Study (DIP 2007) identified that the potential existed for animal production, fodder crops and some horticulture to be undertaken within the Lower Fitzroy Agricultural Corridor. The study was completed in 2007 but no further implementation plans were developed and no demand profiles were confirmed. More recently, through Regional Development Australia's Growing Central

Queensland initiative and RRC's promotion of agricultural development within the region (the Fitzroy Agricultural Corridor) it is possible that some future demand for high priority water will arise.

Consequently, future demands are difficult to predict with any degree of certainty. It is also noted that since the 2004-2007 drought that stimulated investigations into the Project, generally wetter than average weather and widespread flooding has been experienced in the region, until recently when drier conditions have again been prevalent. It is acknowledged that, as at June 2015, the demand for water that the full Project development can deliver is not yet realised. A staged approach to development will enable proponents to respond to potentially smaller demands in the short-term and progressively respond to increasing and/or larger demand requirements over time through intermediate infrastructure builds until full development is reached. The current Project concept/preliminary design is modular to facilitate staging in order to respond quickly and efficiently to deliver water to meet anticipated future demands.

### E1.3 Relationships to other projects

The Project will operate in concert with the existing Fitzroy Barrage with releases from Rookwood Weir to Eden Bann Weir (existing and raised) to the Fitzroy Barrage for abstraction (Chapter 2 Project description; Chapter 9 Surface water resources).

GAWB has identified the development of the GFP Project as its preferred delivery mechanism for a second water source. The GFP is designed to transfer 30,000 ML/a (and possibly more if required) from the Fitzroy system. Water supply is proposed to be from water secured through development of the Project.

### E1.4 Project alternatives

Project alternatives have been considered with respect to their ability to match immediate demand and then keep pace with emerging demand while ensuring capture of available yield in the system as follows:

- Fitzroy Barrage: Raising the gates of the existing Fitzroy Barrage was considered. This would achieve an additional 8,000 ML/a yield over the base case (existing Fitzroy Barrage and Eden Bann Weir and no Rookwood Weir). It is considered that raising the Fitzroy Barrage will not achieve Project objectives. In addition potentially adverse environmental, economic and social impacts are predicted
- GAWB's second water source options: GAWB's 2004 Strategic Water Plan identified 13 water source augmentations. Evaluation of these options against water quality, security, environmental, social and water pricing criteria resulted in nine options being selected for further assessment comprising weirs on the Fitzroy River, weirs on Baffle Creek, raising Awoonga Dam and/or Castle Hope Dam and a desalination plant (GAWB 2013). Given GAWB's requirement that a contingent supply needs to be chosen based on the lowest preparatory cost but able to deliver certainty of supply within a three year period, GAWB's Strategic Water Plan concludes that the GFP Project (with its link to the Project) is the preferred option
- Water storage infrastructure
  - Nathan Dam on the Dawson River (620 km upstream of the Fitzroy River estuary) is being proposed by SunWater. Water from the dam will be transported via a trunk pipeline to

primarily service coal mines and power stations in the Surat Basin, extending to Dalby. Water will also be released downstream to towns along the Dawson River, to new mining customers in the Southern Bowen Basin and to existing and potentially new irrigation customers in the Dawson Valley Water Supply Scheme (SKM, 2010). Nathan Dam has the potential to transfer water to the lower Fitzroy system to meet critical urban supply needs, potentially in response to drought triggers. Given the location of Nathan Dam and distance to the Project, together with anticipated demand from Nathan Dam within the Dawson-Callide and Upper Dawson sub-regions, it is unlikely that supply from Nathan Dam will achieve Project objectives and provide an economically viable solution to long-term water supply requirements in the lower Fitzroy system

  - Connors River Dam is proposed by SunWater on the Connors River (562 km upstream of the Fitzroy Barrage). Water from the dam will be transported via pipeline to Moranbah and will service coal mines and communities in the Bowen Coal Basin and surrounds. Downstream releases can be purchased and used by irrigators. Supply from Connors River Dam to the lower Fitzroy system to satisfy the projected demands is however not considered viable due to significant transfer losses downstream of the dam
  - Fitzroy Gap Dam: Construction of a dam at the Fitzroy Gap immediately upstream of, and within the impoundment of, the existing Eden Bann Weir has been previously considered. Supply from a dam at The Gap will not however achieve Project objectives in the short- to medium term as construction of a 'mega-dam' does not allow for incremental development in response to increasing demand. Environmental impacts on the aquatic ecosystems, terrestrial flora and fauna and loss of land associated with inundation will be considerably more severe than the Project due to impoundment outside of the river bed and banks. The nearness of the existing Eden Bann Weir to the proposed dam site adds further complications. It is likely that the existing impoundment would need to be drained to accommodate construction and this would have the potential to severely disrupt supply to Stanwell Power Station.

- Non-infrastructure options
  - Short-term water supplies may be achieved through demand management strategies such as pricing, education, rostering, recycling and water use efficiency, combined with research and development programmes that reduce consumption. Demand management alone is not considered sufficient to meet the longer-term needs of the Rockhampton, Livingstone and Gladstone regions water needs and that provision of new infrastructure on the Fitzroy River is required
  - Agricultural demand has the potential to be met through the take up of currently unutilised, or under-utilised, water allocations. Trading is allowed for in the Fitzroy River upstream of the Fitzroy Barrage to facilitate uptake of these allocations
  - Groundwater supply within the Rockhampton, Livingstone and Gladstone regions is limited to primarily stock and domestic purposes and supplies to small towns and is not considered to be a feasible alternative supply to the Project.
- No development option
  - Limited ability to respond to short- and long-term future demands for water resources will result if the Project is not progressed in preparedness for future demands from existing and new customers, drought and meeting the required service levels

- Inability to support the GFP Project increases GAWB's inherent existing risk of failure of supply from a single source (that is Awoonga Dam)
- The primary objective of the Project is to support industrial and urban growth. The 'no development' option has the potential to inhibit growth locally (Rockhampton and Livingstone local government areas) and regionally (Gladstone local government area). Limiting industrial growth in particular has the potential to adversely impact on the Queensland economy with large scale industrial development potentially seeking alternative locations interstate due to this water supply constraint.

## E1.5 Regulatory framework and environmental impact assessment process

The Project is being undertaken in accordance with the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act).

The EPBC Act is the Commonwealth's principle piece of environmental protection legislation. Under Part 3 of the EPBC Act, a person must not take an action that has or is likely to have a significant impact on a matter of national environmental significance (MNES) unless that person can rely on an exemption, or obtains an approval from the Commonwealth Minister. An action that has potential to significantly impact upon MNES is deemed to be a 'controlled action' and as such requires an approval. The Project is a 'controlled action' requiring assessment and approval under the EPBC Act (EPBC referral 2009/5173). In June 2010, the Commonwealth Department of the Environment (DoE) issued Guidelines for an EIS in relation to MNES. The relevant controlling provisions in relation to MNES are:

- World Heritage properties
- National Heritage places
- Listed threatened species and communities
- Listed migratory species.

The purpose of the SDPWO Act is to provide for '*State planning and development through a coordinated system of public works organisation, for environmental assessment, and for related purposes'* (Section 1 SDPWO Act). In May 2011, the Coordinator-General declared the Project to be a 'significant project' (now a 'coordinated project') for which an EIS is required pursuant to Section 26 (1) (a) of the SDPWO Act. Terms of reference (ToR) for the EIS were finalised by the Coordinator-General in April 2012.

As at 10 January 2014, the Project transitioned to assessment through the bilateral assessment process executed between State and Commonwealth governments. As a result, a single EIS addresses both State ToR and Commonwealth Guidelines. To facilitate this process, draft ToR addressing both State and Commonwealth requirements were re-issued and finalised in September 2014.

Table E-1 provides a summary of the structure of the draft EIS.

**Table E-1 Draft EIS structure**

| Volume 1 Part B of the ToR (focussing on State matters) | | Volume 2 – Part C of the ToR (focussing on MNES) | | Volume 3 – Appendices (supporting material) | |
|---|---|---|---|---|---|
| E | Executive summary | E | Executive summary | A | Final terms of reference |
| 1 | Introduction | 1 | Description of the action | B | Terms of reference cross-reference |
| 2 | Project description | 2 | Project description | C | Glossary and abbreviations |
| 3 | Legislation and project approvals | 3 | Planning and approvals | D | Study team |
| 4 | Climate, natural hazards and climate change | 4 | Consultation | E | Proponents' environmental policies |
| 5 | Land | 5 | Alternatives to the Project | F | Consultation report |
| 6 | Flora | 6 | Methodology | G | Land - detailed mapping |
| 7 | Aquatic ecology | 7 | Existing environment | H | An assessment of the potential implications on native vegetation and terrestrial ecosystems (Nangura 2007) |
| 8 | Terrestrial fauna | 8 | General impacts | I | Flora - detailed mapping |
| 9 | Surface water resources | 9 | World Heritage properties and National Heritage places | J | Eden Bann Weir baseline aquatic ecology report |
| 10 | Groundwater resources | 10 | Threatened species and ecological communities | K | Rookwood Weir baseline aquatic ecology report |
| 11 | Water quality | 11 | Migratory and marine species | L | Fitzroy River turtle (*Rheodytes leukops*) technical report |
| 12 | Air quality | 12 | Cumulative and consequential impacts | M | Fitzroy River turtle (*Rheodytes leukops*) species management program |
| 13 | Greenhouse gas emissions | 13 | Environmental Management System | N | Eden Bann Weir baseline terrestrial fauna report |
| 14 | Noise and vibration | 14 | Offsets | O | Rookwood Weir baseline terrestrial fauna report |
| 15 | Waste | 15 | Conclusion | P | Surface water resources supporting material |
| 16 | Transport | 16 | Information sources and reference list | Q | Traffic and transport supporting material |
| 17 | Cultural heritage | | | R | Social impact assessment report |
| 18 | Social impact | | | S | Economic assessment report (Commercial in confidence) |

| Volume 1 Part B of the ToR (focussing on State matters) | | Volume 2 – Part C of the ToR (focussing on MNES) | Volume 3 – Appendices (supporting material) | |
|---|---|---|---|---|
| 19 | Economics | | T | Counter-terrorism and critical infrastructure protection reports (Commercial in confidence) |
| 20 | Hazard and risk | | U | EPBC Protected Matters Search Tool Results |
| 21 | Cumulative impacts | | V | IQQM yield assessment (Commercial in confidence) |
| 22 | Offsets | | W | Project commitments |
| 23 | Environmental Management Plan | | X | Fish passage technical report |
| 24 | Conclusions and recommendations | | Y | Consolidated mitigation measures for impacts on matters of national environment significance |
| 25 | References | | | |

Planning approval pathways for the Project comprise a Community Infrastructure Designation (CID) or a Material Change of Use (MCU). A decision on which pathway is most appropriate for the Project is yet to be made. The Project is considered to meet the definition of 'Other Community Infrastructure' under Part 2 of Schedule 2 of the Sustainable Planning Regulation 2009 (SP Regulation) as subordinate legislation to the *Sustainable Planning Act 2009* (Qld) (SP Act) and as such is afforded a number of exemptions. The SP Act also establishes the Integrated Development Assessment System (IDAS), a framework for assessment of development applications. IDAS integrates the requirements for development assessment under the following acts relevant to the Project: *Environmental Protection Act 1994* (Qld) (EP Act), *Fisheries Act 1994* (Qld) (Fisheries Act), *Land Protection (Pest and Stock Route Management) Act 2002* (Qld), *Land Act 1994* (Qld) (Land Act), *Local Government Act 2009* (Qld) (LG Act), *Queensland Heritage Act 1992* (Qld), *Transport Infrastructure Act 1994* (Qld) (TI Act), *Vegetation Management Act 1999 (Qld)* (VM Act) and the Water Act.

On 1 July 2014, a new environmental offsets framework was introduced in Queensland. State offset requirements of the Project have been assessed with reference to this new framework which includes the *Environmental Offsets Act 2014* (Qld) (EO Act), Environmental Offsets Regulation 2014 (EO Regulation) and the Queensland Environmental Offsets Policy Version 1.0. (EO Policy) (DEHP 2014).

The State Assessment and Referral Agency (SARA) forms part of the Queensland Government's planning reforms and provides a coordinated whole-of government approach to state assessment by creating a central point for development applications, resulting in one application and one response. Development approvals sought for the Project will be lodged with and coordinated by SARA. Further the State Development Assessment Provisions (SDAP) are prescribed in the SP Regulation and is a statutory instrument made under the SP Act.

Table E-2 provides a summary of the approvals and SDAP modules that may be triggered by the Project.

## Table E-2 Approvals summary

| Approval | Why it applies | When/how it applies | Relevant legislation | Approving authority | Conditions sought in Coordinator-General's report |
|---|---|---|---|---|---|
| **Commonwealth** | | | | | |
| Approval of controlled action | The Project is a controlled action. | Prior to development | EPBC Act | DoE | Not applicable |
| **State Integrated Development Assessment System (IDAS)** | | | | | |
| MCU | If a CID is not sought or granted a MCU Development Approval can be applied for. The proposed Eden Bann Weir triggers a MCU. The proposed Rookwood Weir is exempt development. | Post EIS (during detailed design) | Livingstone Shire Planning Scheme 2005<br>SDAP module 12<br>SDAP module 18<br>SDAP module 19 | RRC / LSC | Recommended |
| MCU for an environmentally relevant activity (ERA) | The Project includes activities defined as prescribed ERAs. These are to be determined prior to lodgement. | Subject to separate environmental assessment and approval (prior to construction) | EP Act<br>SP Act<br>SP Regulation<br>SDAP module 4 | Department of Environment and Heritage Protection (DEHP) / SARA | Not applicable |
| Operational works for clearing of native vegetation | The clearing of native vegetation for the Project is exempt development and will not require approval. | Exempt | VM Act<br>SP Act | Department of Natural Resources and Mines (DNRM) / SARA | Not applicable |
| Operational works for a referrable dam | The Eden Bann Weir is classed as a referrable dam. | Post EIS (during detailed design) | Water Act<br>SP Regulation<br>SDAP module 16 | Department of Energy and Water Supply (DEWS) / SARA | Recommended |

| Approval | Why it applies | When/how it applies | Relevant legislation | Approving authority | Conditions sought in Coordinator-General's report |
|---|---|---|---|---|---|
| Operational works for constructing or raising waterway barrier works | A development permit for waterway barrier works is required for weir construction, bridges at Glenroy, Riverslea and Foleyvale crossings, Hanrahan Crossing upgrade and Thirsty Creek Road upgrade. | Post EIS (during detailed design) | Fisheries Act<br>SP Act<br>SP Regulation<br>SDAP module 5 | Department of Agriculture and Fisheries (DAF) / SARA | Recommended |
| Development permit for the removal of quarry material (dredging) in a watercourse | A development permit is required for the removal of quarry material from a watercourse if an allocation notice is required under the Water Act. | Subject to separate environmental assessment and approval (prior to construction) | Water Act<br>SP Act<br>SP Regulation | DNRM / SARA | Not applicable |
| Operational works for taking or interfering with water from a watercourse, lake or spring | A development permit is required for weir and bridge construction. | Post EIS (prior to operation) | Water Act<br>SP Regulation<br>SDAP module 7 | DNRM / SARA | Stated |
| Reconfiguration of a lot | A development permit is required for obtaining new tenure over or reconfiguring parcels of land. | Post EIS (prior to operation) | Land Act<br>SP Act<br>SP Regulation | Regional Council | Not applicable |
| Building works | Development application for building works requiring assessment against the *Building Act 1975* and assessable against a planning scheme. | Post EIS (prior to construction) | *Building Act 1975*<br>SP Act<br>SP Regulation | Regional Council | Not applicable |
| **State Non IDAS** | | | | | |
| Coordinated Project Declaration | The Project has been declared a 'coordinated project' under the SDPWO Act, requiring an EIS. | Prior to issue of any and all state approvals | SDPWO Act | DSD | Yes |

| Approval | Why it applies | When/how it applies | Relevant legislation | Approving authority | Conditions sought in Coordinator-General's report |
|---|---|---|---|---|---|
| Cultural heritage management plans (CHMPs) | The Project has the potential to disturb items of Aboriginal cultural heritage significance. CHMPs for the Project have been approved. | Parallel to EIS | *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act) | Department of Aboriginal and Torres Strait Islander and Multicultural Affairs | Not applicable |
| CID | Land may be designated for community infrastructure under a planning scheme, in which case the works will be exempt development under the relevant planning schemes. | Post EIS (during detailed design) and prior to any other State approvals | SP Act 2009 and SP Regulation | DSDIP | Not applicable |
| Private infrastructure facility | If a private entity was designated to deliver the Project. | Post EIS | SDPWO Act | DSD | Not applicable |
| Evidence of a resource entitlement | There are number of State Resources applicable to the Project. | Post-EIS | SP Act<br>Land Act<br>Water Act<br>TI Act | Applicable government department | Not applicable |
| Water permit | Water will be taken on a temporary basis during the construction of the Project. | Post EIS (during detailed design | Water Act, Fitzroy ROP | DNRM / SARA | Recommended |
| Water licence | A water licence will be required to take water through the operation of the Project. | Post EIS (prior to operation) | Water Act, Fitzroy ROP | DNRM / SARA | Recommended |
| Riverine protection permit | A permit is required to excavate, place fill or destroy vegetation in a watercourse, unless such works are otherwise authorised or exempt. | Post EIS (prior to construction) | Water Act | DNRM / SARA | Recommended |
| Permit to clear native plants | A licence, permit or authority, or an exemption is required to 'take' protected plants. | Post-EIS | Nature Conservation Act 1992 (NC Act) | DEHP | Recommended |

| Approval | Why it applies | When/how it applies | Relevant legislation | Approving authority | Conditions sought in Coordinator-General's report |
|---|---|---|---|---|---|
| Damage mitigation permit | In the event that the Project tampers with a confirmed breeding place of a native animal (that is endangered, vulnerable, near threatened or least concern wildlife). | Post EIS | Nature Conservation (Wildlife Management) Regulation 2006 | DEHP | Not applicable |
| Species management program | For large impacts, particularly where potential breeding places of endangered, vulnerable, near threatened or least concern species, or essential habitat for these species, is involved, a Species Management Program will be required. | Post EIS | Nature Conservation (Wildlife Management) Regulation 2006 | DEHP | Imposed |
| Sales permit for quarry material and/or timber | A sales permit may be required for use of forest products or quarry material. | Post EIS | *Forestry Act 1959* (Qld) | DAF | Not applicable |
| Quarry material allocation notice | An allocation notice is required for the removal of quarry material in a watercourse or other State land. | Post EIS | Water Act<br>SP Act<br>SP Regulation<br>SDAP module 7 | DNRM | Not applicable |
| Failure impact assessment | A Failure Impact Assessment must be undertaken prior to submission of the operational works application for a referrable dam. | Post EIS | *Water Supply (Safety and Reliability) Act 2008* (Qld) | DEWS | Not applicable |
| Disposal permit to remove and treat or dispose of contaminated soil from land on the Environmental Management Register or Contaminated Land Register | A disposal permit will be required if contaminated soil is to be removed from site. | Post EIS | EP Act | DEHP | Not applicable |

| Approval | Why it applies | When/how it applies | Relevant legislation | Approving authority | Conditions sought in Coordinator-General's report |
|---|---|---|---|---|---|
| Road corridor permit | A road corridor permit to construct, maintain, operate or conduct ancillary works and encroachments on a state controlled road is required for the Project. | Post EIS | TI Act | DTMR / SARA | Recommended |
| Oversized load permit | For heavy machinery and oversized loads to be transported on the road network. | Ad hoc during construction | TI Act | Queensland Police Service | Not applicable |
| Approval for carrying out works on a road or interfering with a road or its operation | Road upgrade works to local government controlled roads for road upgrades and improvements. | Post EIS | LG Act<br>Local Law No. 1 (Administration) 2011 | Regional councils | Recommended |
| Flammable and combustible liquids licence | Storage of flammable and combustible liquids on site. | Post EIS | *Work Health and Safety Act 2011* (Qld (WHS Act) | Department of Justice and Attorney-General | Not applicable |
| Notification of hazardous chemicals in excess of manifest quantities or Major Hazard Facility | Storage of hazardous substances may exceed thresholds. | Post EIS | WHS Act | Department of Justice and Attorney-General | Not applicable |
| Amendment to Fitzroy ROP | An amendment is required to include the operation of the weirs. | Post EIS | Water Act | DNRM | Recommended |
| Resource operations licence (ROL) | A ROL is required to authorise the interference with water necessary to operate the infrastructure.<br>An interim ROL may be required prior to the Fitzroy ROP amendment. | Post EIS | Water Act | DNRM | Recommended |
| Building works | Development application for building works. | Post EIS | *Building Act 1975* | Private certifier | Not applicable |

## E1.6 Consultation

Guided by the core values and principles of the International Association of Public Participation, a public consultation program is being implemented as part of the Project EIS to enable a structured process to facilitate open, meaningful and accountable public consultation and engagement with relevant stakeholders during the preparation of the draft EIS for the Project.

A variety of communication tools were developed to facilitate two-way flow of information between the Project team and stakeholders and assisted in capturing stakeholder feedback throughout the EIS process, as depicted in Figure E-1. An indicative list of the stakeholders is provided in Table E-3. Table E-4 shows the sequencing of consultation phases.

**Figure E-1 EIS consultation activities and communication tools**

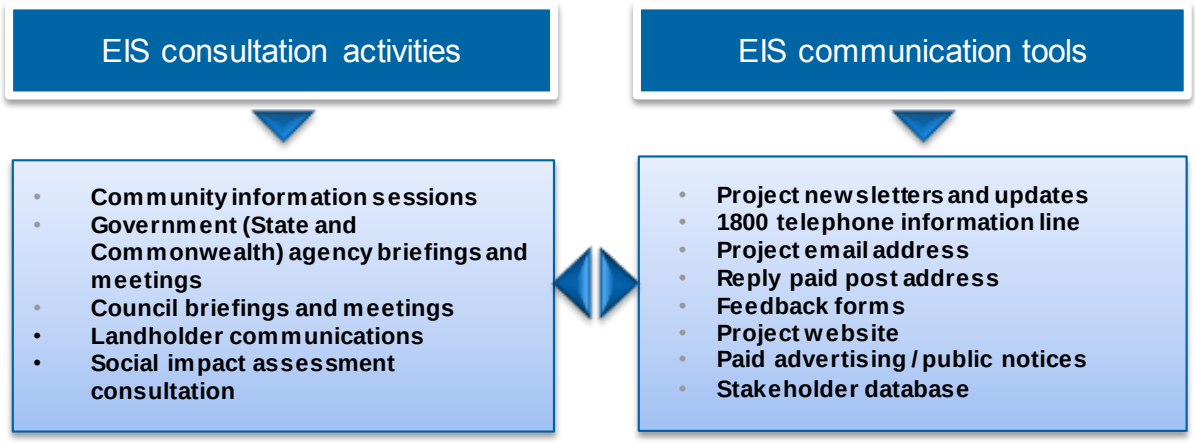



**Table E-3 Project stakeholders**

| Stakeholder category | Member list (non-exhaustive) |
|---|---|
| **Internal stakeholders** | |
| **Project partners** | SunWater and GAWB Boards, Executive Management Teams, Project Control Groups, Project Technical Teams |
| **GHD and sub-consultants** | Project Manager, assessment teams, consultation team, sub-consultants |
| **External stakeholders** | |
| **Commonwealth Government** | Departmental ministers, elected representatives, Government departments and authorities |
| **Queensland Government** | Premier and departmental ministers, elected representatives, State departments and authorities |
| **Local government** | RRC, LSC, Central Highlands Regional Council (CHRC), Woorabinda Aboriginal Shire Council (WASC), Gladstone Regional Council |
| **Community and business** | Directly affected landholders, local residential areas, environmental groups, local business, industry/peak bodies, community/interest groups, cultural heritage representatives, health and educational institutions, recreational groups, media, utility service providers |

**Table E-4 Consultation phases**

| Period | October 2008 – August 2009 | August 2009 – June 2015 | Q3 2015 | Q3-Q4 2015 |
|---|---|---|---|---|
| Phase | Phase 1<br>Scoping and planning | Phase 2<br>Draft EIS development | Phase 3<br>Public exhibition | Phase 4<br>Evaluation and EIS finalisation |
| Summary of Activities | • Identification of stakeholders and establishment of stakeholder database<br>• Issue/risk assessment<br>• Preparation of information materials (including website, 1800 number and reply paid post facilities)<br>• Consultation plan preparation and approval (internal)<br>• Preparation of land access protocols, media protocols etc. | • Production and distribution of Project newsletters and updates<br>• Maintain website, 1800 number and reply paid post facilities and stakeholder database<br>• Stakeholder briefings<br>• Landholder meetings<br>• Community information sessions<br>• Management of enquiries and media relations | • Production and distribution of Project newsletters and updates<br>• Maintain website, 1800 number and reply paid post facilities and stakeholder database<br>• Community and agency information sessions<br>• Management of enquiries and media relations | • Close out activities<br>• Production and distribution of Project newsletters and updates<br>• Maintain website, 1800 number and reply paid post facilities and stakeholder database<br>• Consultation evaluation<br>• Public notification of EIS assessment outcomes |
| Regulatory consultation requirements | Consultation plan | Prepare consultation report for the draft EIS | Public display of draft EIS<br>Community information sessions and regulatory agency briefings | Prepare response to draft EIS submissions as directed by Coordinator-General requirements |

To date (scoping (Phase 1) and EIS development (Phase 2)), approximately 8,800 newsletters have been distributed, workshops and briefings have been held, including 250 telephone discussions and 52 face-to-face meetings, and three community information sessions hosted where people could 'drop in' and talk to the Project team. Feedback forms have also been used and all stakeholder feedback, both positive and negative, was recorded in the Project stakeholder database.

At the conclusion of the public exhibition period (Phase 3), stakeholder and community feedback will be reviewed and addressed as necessary, including the provision of additional information as required. Following completion of the EIS, consultation will focus on maintaining the relationships established during the draft EIS consultation, through the 'holding period' until such time as a Project development trigger is realised. At this time, consultation will mainly focus on construction related matters before moving into an operation planning phase.

Any submissions regarding this draft EIS should be addressed to:

The Coordinator-General

EIS Project Manager – Lower Fitzroy River Infrastructure Project

Coordinated Project Delivery

Office of the Coordinator-General Box 15517

City East QLD 4002

Tel: (07) 3452 7458 Fax: (07) 3452 7486

Email: LowerFitzroy.InfrastructureProject@coordinatorgeneral.qld.gov.au

Website: www.statedevelopment.qld.gov.au/lower-fitzroy

## E2. Project description

Key Project components include the following:

- Eden Bann Weir
  - Eden Bann Weir Stage 2 (EB2) – a raise of the existing Eden Bann Weir (herein termed as Stage 1 with an existing full supply level (FSL) of 14.5 m Australian Height Datum (AHD)) (EB1) to a new FSL of 18.2 m AHD and associated impoundment of the Fitzroy River
  - Eden Bann Weir Stage 3 (EB3) – the addition of 2 m high flap gates to Stage 2 to FSL 20.2 m AHD and associated impoundment of the Fitzroy River.
- Rookwood Weir
  - Rookwood Weir Stage 1 (RW1) – a new build to FSL 45.5 m AHD, saddle dams and associated impoundment of the Fitzroy, Mackenzie and Dawson rivers
  - Rookwood Weir Stage 2 (RW2) – the addition of 3.5 m high flap gates to Stage 1 achieve FSL 49.0 m AHD and associated impoundment of the Fitzroy, Mackenzie and Dawson rivers.
- Fish passage infrastructure and turtle passage infrastructure, namely fish locks and a turtle bypass, respectively, at each weir.

The Project is expected to be staged, with sequencing and timing dependant on a number of demand triggers including existing and new consumers, drought conditions and security of supply requirements.

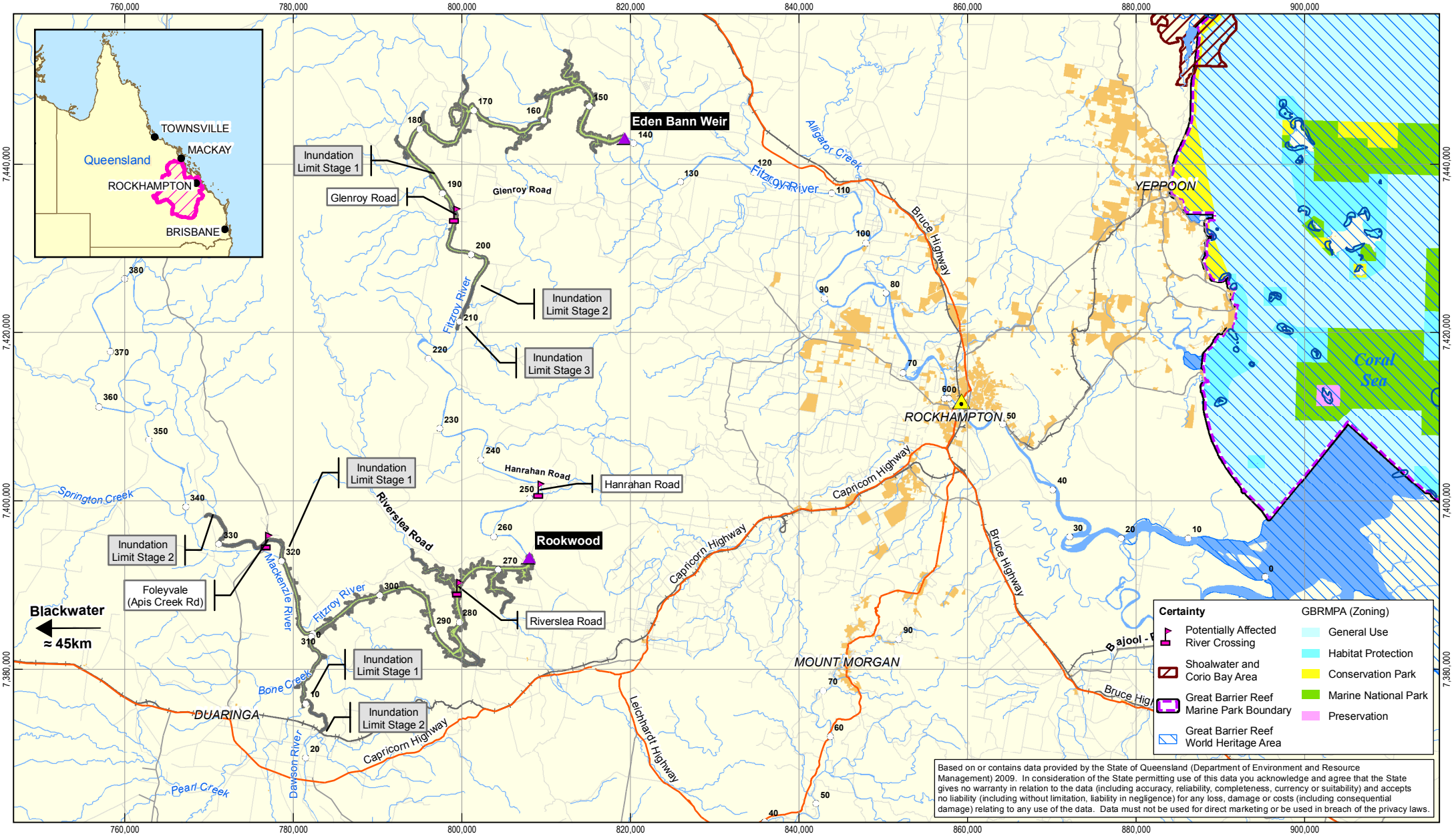
Other infrastructure components associated with the Project include:

- Upgrades to and construction of access roads (public and private) to and from the weir sites and upgrades to intersections for construction and operation
- Construction of bridges in areas upstream of weir infrastructure impacted by the impoundments, specifically at Glenroy, Riverslea and Foleyvale crossings
- Installation of culverts at Hanrahan Crossing downstream of Rookwood Weir to facilitate access during operational releases
- Relocation of existing and/or installation of new gauging stations on the Fitzroy, Mackenzie and Dawson rivers
- Removal and decommissioning of existing low level causeways and culverts at river crossings described above
- Water supply for construction will be sourced directly from the Fitzroy River and the Mackenzie River and will not require the construction of additional water supply infrastructure. Operational water for services/facilities at the weir sites will be provided through rainwater harvesting systems. Drinking water will be delivered to the site during construction and operation.

For the purposes of assessment, the Project is divided into the following areas:

- Project footprint
  - Weir infrastructure - permanent weir wall and abutments, spillway, fish and turtle passage infrastructure, control room and amenities, immediate downstream protection areas and saddle dams, as applicable
  - Weir construction area incorporating the weir infrastructure area in addition to other in stream works such as coffer dams and excavations and areas adjacent to the river for the establishment of site facilities, as applicable to Eden Bann Weir and Rookwood Weir
  - Weir impoundment comprising the area within the riverbed and banks inundated at FSL and adjacent riparian areas that will be the subject of a water storage easement
  - Weir access roads (public and private, including intersection treatments)
  - River crossings comprising Glenroy, Riverslea, Foleyvale and Hanrahan crossings inclusive of road approaches.
- Downstream riverine areas comprising river sections downstream of Rookwood and Eden Bann weirs to the Fitzroy Barrage, excluding existing impoundments
- Downstream estuarine/marine areas comprising areas downstream of the Fitzroy Barrage to the Great Barrier Reef Marine Park.

Figure E-2 shows the location of Project and its key components. Figure E-3 and Figure E-4 show the Project construction areas relative to Eden Bann Weir and the proposed Rookwood Weir, respectively. Eden Bann Weir's existing development areas of impact and Eden Bann Weir proposed development levels and areas of impact are summarised in Table E-5. The proposed Rookwood Weir development levels and areas of impact are summarised in Table E-6.

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1:600,000 (at A4)

0 5 10 15 20

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA94)
Grid: Map Grid of Australia 1994, Zone 55

N

**LEGEND**

- AMTD (km)
- Weir Location
- Fitzroy Barrage
- Highway
- Major Road
- Streets (Local)
- Fitzroy Basin
- Urbanised Area
- Rookwood Inundation Stage 1
- Rookwood Inundation Stage 2
- Eden Bann Inundation Stage 2
- Eden Bann Inundation Stage 3

Gladstone Area Water Board, SunWater
Lower Fitzroy River Infrastructure Project

Job Number 41-20736
Revision G
Date 31 Oct 2014

# Project Location

# Figure E-2

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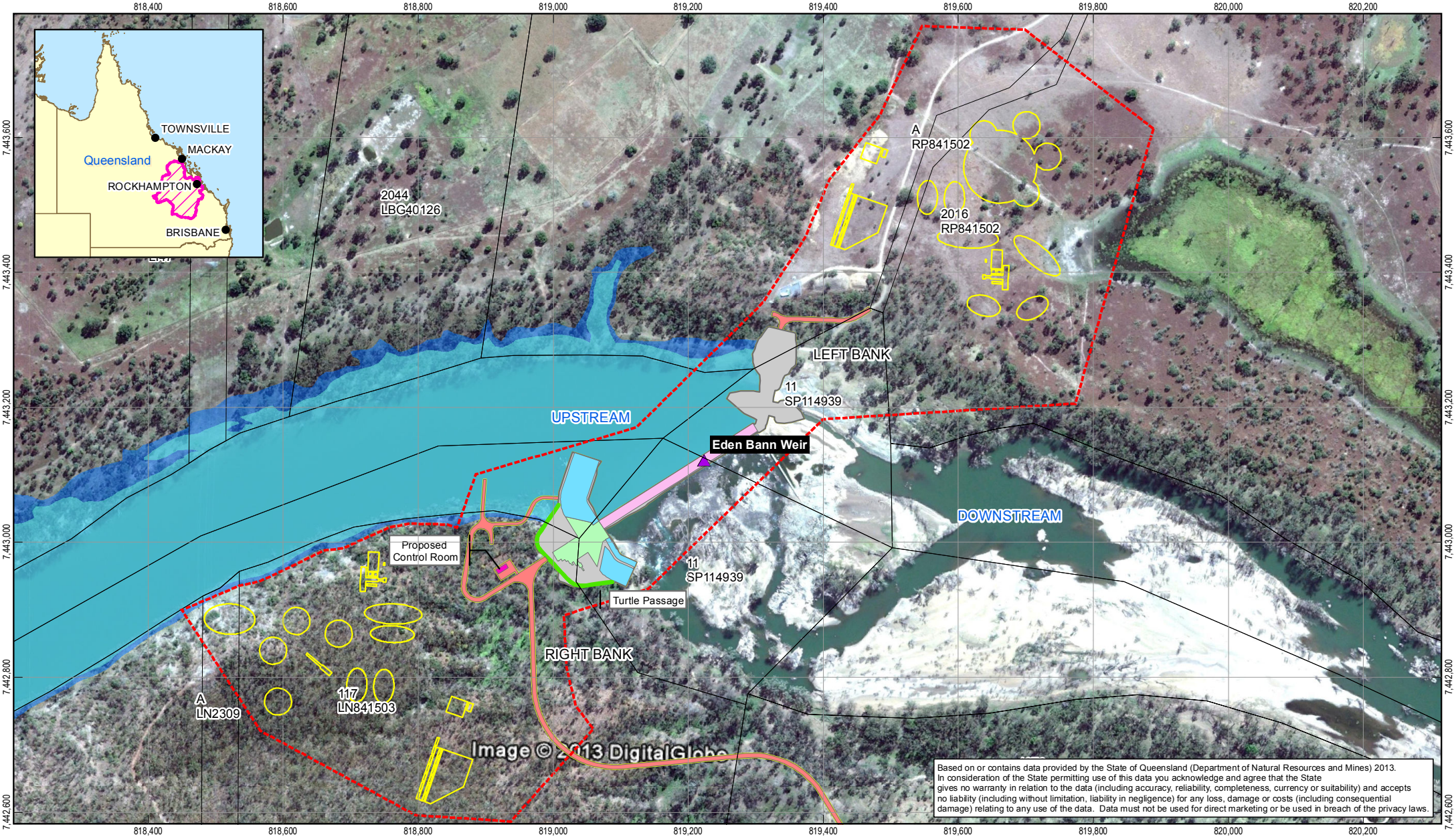
Level 9, 145 Ann Street Brisbane QLD 4000 Australia T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data Source: © Copyright Commonwealth of Australia (Geoscience Australia): Places, Waterways (2007); Sunwater: Waterways, Weir Locations - 2008; DERM: Railways, Roads, RAMSAR Wetlands, World Heritage Area - 2010; © Copyright Commonwealth of Australia (GBRMPA) Zoning, Boundary - 2011. Created by: MG *See Appendix for disclaimers and copyrights.

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1:7,500 (at A4)

0 50 100 150 200

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA94)
Grid: Map Grid of Australia 1994, Zone 55

N

**LEGEND**

- Weir Location
- Fitzroy Basin
- Access Roads
- Channel
- Outlet works and fishway
- Proposed Control Room
- Proposed Spillway
- Turtle Passage
- Eden Bann Weir Proposed Structure
- Construction Footprints
- Construction Area
- Eden Bann Weir Stage 2 impoundment
- Eden Bann Weir Stage 3 impoundment

GHD CLIENTS|PEOPLE|PERFORMANCE

Gladstone Area Water Board

SunWater Making Water Work

Gladstone Area Water Board, SunWater
Lower Fitzroy River Infrastructure Project

Job Number 41-20736
Revision B
Date 30 Oct 2014

# Eden Bann Weir construction area

Figure E-3

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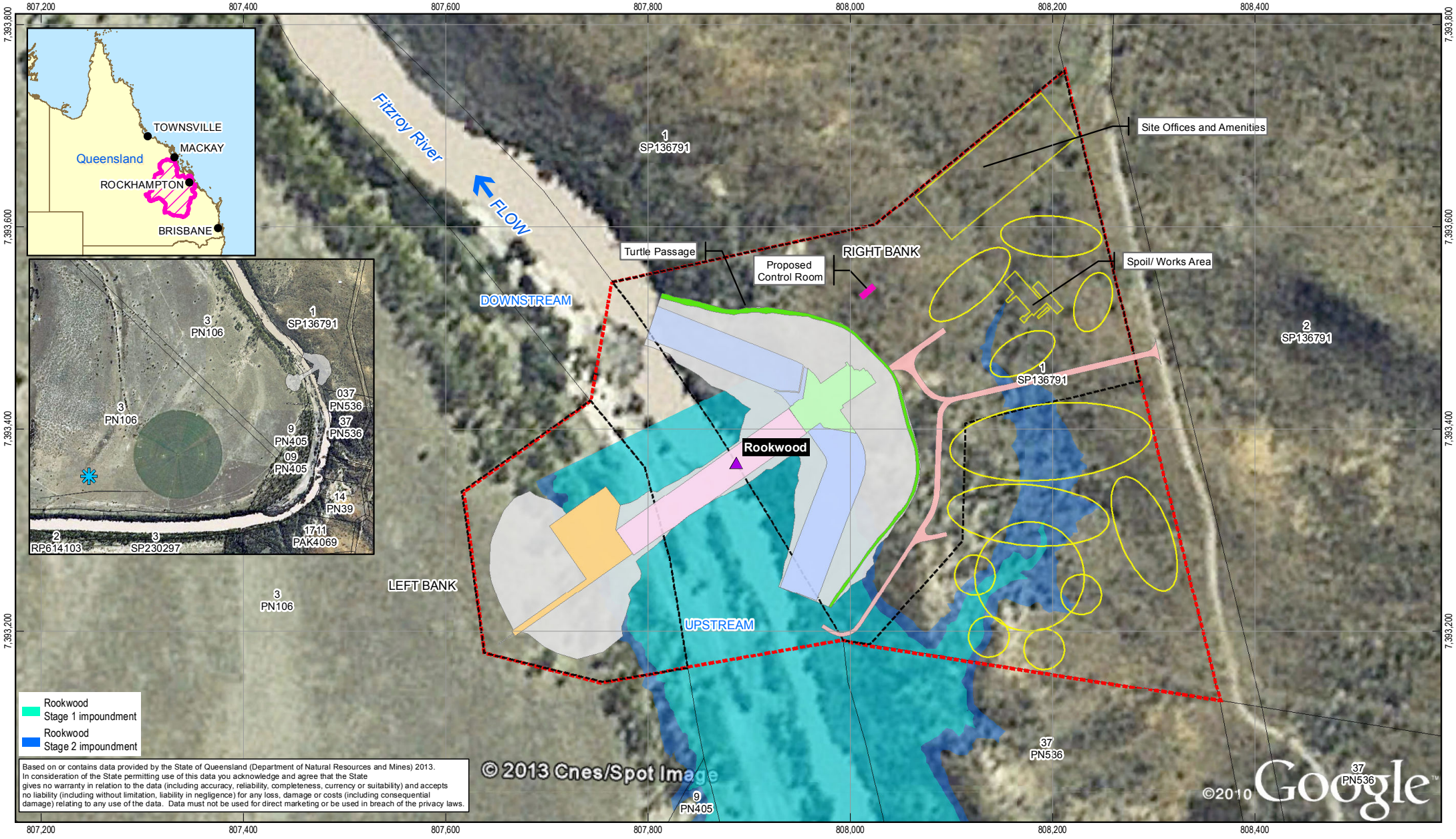
Data Source: © Copyright Commonwealth of Australia (Geoscience Australia): Waterways (2007); Sunwater: Waterways, Weir Locations - 2008, Google: Google Imagery Extraction 19/02/2013; GHD: Proposed Weir, Construction Area, Facilities/2013. Created by: MS *See Appendix for disclaimers and copyrights.




1:5,000 (at A4)

0 50 100 150 200

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA94)
Grid: Map Grid of Australia 1994, Zone 55

N

**LEGEND**

- Weir Location
- Fitzroy Basin
- Construction Area
- Proposed Property Acquisition Boundary
- Rookwood Weir proposed structure
- Construction Site Facilities
- Abutement, Wide Rock filled mattress
- Access Roads
- Channel
- Outlet works and fishway
- Proposed Control Room
- Spillway
- Turtle Passage
- Saddle Dam

Gladstone Area Water Board, SunWater
Lower Fitzroy River Infrastructure Project

Job Number 41-20736
Revision D
Date 30 Oct 2014

# Rookwood Weir construction area

Figure E-4

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Level 9, 145 Ann Street Brisbane QLD 4000 Australia T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

## Table E-5 Eden Bann Weir existing and proposed development levels

| Criteria | Stage 1 (existing) | Stage 2 | Stage 3 |
|---|---|---|---|
| **Weir infrastructure** | | | |
| **Weir type** | Conventional concrete weir with fixed crest and earth embankment at left abutment). | Conventional concrete weir raise with an un-gated concrete gravity ogee crest spillway section and earth abutment on left bank. | Addition of 18 flap gates (2 m high) with reinforced concrete piers such that development comprises a conventional concrete weir with 2 m high gated gravity spillway section and earth abutment on left bank. |
| **Purpose** | Water supply | | |
| **Catchment area** | 135,000 $km^2$ | | |
| **FSL** | RL 14.5 m AHD | RL 18.2 m AHD | RL 20.2 m AHD |
| **Storage at FSL** | 35,980 ML | 67,690 ML | 91,450 ML |
| **Yield (per stage) at FSL** | Not applicable | 35,000 ML/a | 50,000 ML/a |
| **Dead storage level** | 7.25 m | | |
| **Dead storage volume** | 9,650 ML | | |
| **Impoundment area at FSL** | 670 ha | 1,170 ha | 1,690 ha |
| **Impoundment extent at FSL** | 184 km AMTD | 205 km AMTD | 211 km AMTD |
| **Impoundment length (main channel) at FSL (approximate)** | 43 km | 64 km | 70 km |
| **Total weir length** | 427 m | 461.70 m | 461.70 m |
| **Fauna passage** | Fish lock (left bank)<br>The existing weir incorporates a fish lock on the left bank adjacent to the outlet works and a 1.5 m diameter outlet conduit. A diversion channel cut through a rock bar services the outlet works and fish lock | Fish lock (left bank)<br>Fish lock (right bank)<br>Turtle ramp (right bank) | Fish lock left bank)<br>Fish lock (right bank)<br>Turtle ramp (right bank) |
| **Spillway section** | | | |
| **Type** | Split level concrete un-gated spillway with a low section over 92 m (at 14.5 m AHD) adjacent to the left abutment and a high level section over the remaining 180 m (at 14.8 m AHD) | Spillway: un-gated concrete ogee spillway | 2 m high flap gates with concrete ogee spillway) |

| Criteria | Stage 1 (existing) | Stage 2 | Stage 3 |
|---|---|---|---|
| **Crest level** | RL 14.5 m | RL 18.2 m | RL 18.2 m |
| **Crest length** | The left abutment is perpendicular to the left bank for about 92 m and then the axis for the spillway and right abutment skews across the river perpendicular to the right bank | Primary spillway: 270 m | |
| **Downstream slope** | 0.8 H : 1.0 V | | |
| **Energy dissipation method** | Not required as foundation rock is non-erodible and consists of large boulders and irregular rock outcrops which assists with energy dissipation | Not required given satisfactory performance of existing structure | |
| **Design headwater level (bank full level)** | Not applicable | RL 30 m | RL 30 m |
| **Control description** | Not applicable | Not applicable | 2 m high crest gates with hydraulic controls |
| **Height above riverbed** | Approximately 5 m | Approximately 13 m | Approximately 15 m |
| **Other** | | A crane/pedestrian access bridge over the crest of the weir for maintenance purposes | |
| **Left abutment** | | | |
| **Crest level** | RL 18.5 m | RL 26.2 m | |
| **Crest width (non-spillway)** | Varies | 6 m | |
| **Section type** | Earthfill | Zoned earthfill | |
| **Embankment downstream slope** | 2.5 H : 1.0 V | | |
| **Embankment slope protection** | Rockfill / rip rap | Reinforced concrete and rip rap | |
| **Right abutment** | | | |
| **Crest level** | RL 18.5 m | RL 26.2 m | |
| **Crest width (non-spillway)** | 4 m | 6 m | |
| **Section type** | Mass concrete | Conventional concrete | |
| **Embankment downstream slope** | 0.8 H : 1.0 V | 0.8 H : 1.0 V | |
| **Embankment slope protection** | Not required | Not required | |

| Criteria | Stage 1 (existing) | Stage 2 | Stage 3 |
|---|---|---|---|
| **Outlet works** | | | |
| **Provision for selective withdrawal** | Manual selection of baulks | Outlet control gates with selective withdrawal capability and trash screens | |
| **Low level outlet conduit** | Inlet structure 1200 mm x 1200 mm | 1,800 mm diameter inlet to a 1,400 mm outlet | |
| **Low level outlet valve** | Sluice gate to 1500 mm x 1500 mm box culvert | Vertical discharge regulating valve | |
| **Low level outlet capacity** | Adjacent to fish lock (left bank) | Discharge rate: 15 $m^3/s$ (or a volume of 1,300 ML/day) | |
| **Siting** | Approximately 12 m in length | Adjacent to fish locks | |
| **Environmental flow outlet size** | Outlet capacity 5.5 $m^3/s$ (maximum volume 500 ML/d) | 3 bays of culverts (1.9 m x 2 m) with gated sluice | |
| **Environmental flow outlet length** | Concrete overflow stilling basin | Approximately 12 m | |
| **Environmental flow outlet capacity** | | Discharge rate: 58 $m^3/s$ (or a volume of 5,000 ML/day) | |
| **Environmental flow outlet stilling basin type** | | USBR impact type basin | |
| **Construction footprint** | Not applicable | 45.8 ha | |
| **Saddle dam** | Not applicable | Not required | |
| **Other project specific infrastructure and services** | | | |
| **Access roads** | Left bank access | Retain existing left bank access.<br>New right bank access (9.6 ha). | |
| **River crossings** | Glenroy Crossing causeway | Upgraded Glenroy Crossing (3.5 ha) | |
| **Gauging stations** | The Gap | Relocated and/or recalibrated | |

## Table E-6 Rookwood Weir proposed development levels

| Criteria | Stage 1 | Stage 2 |
|---|---|---|
| **Weir infrastructure** | | |
| **Weir type** | An uncontrolled gravity ogee weir constructed using roller compacted concrete and conventional concrete and earth embankment on the left abutment. | Addition of 14 flap gates (3.5 m high). |
| **Purpose** | Water supply | |
| **Catchment area** | 135,000 $km^2$ | |
| **FSL** | RL 45.5 m AHD | RL 49.0 m AHD |
| **Storage at FSL** | 65,400 ML | 117,290 ML |
| **Yield at FSL** | 54,000 ML/a | 86,000 ML/a |
| **Dead storage level** | RL 31.0 m | |
| **Dead storage volume** | 2,640 ML | |
| **Impoundment area at FSL** | 1,430 ha | 1,930 ha |
| **Impoundment extent at FSL** | Mackenzie River: 322 km AMTD<br>Dawson River: 10 km AMTD | Mackenzie River: 335 km AMTD<br>Dawson River: 15 km AMTD |
| **Impoundment length (main channel) at FSL (approximate)** | 61 km | 84 km |
| **Total weir length** | 460 m | |
| **Fauna passage** | Fish locks (right bank)<br>Turtle ramp (right bank) | |
| **Spillway section** | | |
| **Type** | Un-gated concrete ogee crest spillway | 3.5 m high crest gates with concrete ogee crest spillway |
| **Crest level** | RL 45.5 m | RL 49.0 m |
| **Crest length** | 209 m | |
| **Downstream slope** | 0.8 H: 1.0 V | |
| **Energy dissipation method** | Type 1 stilling basin | |
| **Design headwater level (bank full level)** | RL 56.7 m | |
| **Control description** | Not applicable | 3.5 m high gates hydraulic controls |
| **Height above riverbed** | Approximately 14 m | Approximately 17.5 m |
| **Other** | A crane/pedestrian access bridge over the crest of the weir for maintenance purposes only | |
| **Left abutment** | | |
| **Crest level** | RL 52.5 m | |
| **Crest width (non-spillway)** | 6 m | |
| **Section type** | Roller compacted concrete | |

| Criteria | Stage 1 | Stage 2 |
|---|---|---|
| **Embankment downstream slope** | 0.8 H: 1.0 V | |
| **Embankment slope protection** | Wrap around embankment with roller compacted concrete face protection and rock filled mattresses downstream | |
| **Right abutment** | | |
| **Crest level** | RL 52.5 m | |
| **Crest width (non-spillway)** | 6 m | |
| **Section type** | Conventional concrete | |
| **Embankment downstream slope** | 0.8 H : 1.0 V | |
| **Embankment slope protection** | Not required | |
| **Outlet works** | | |
| **Provision for selective withdrawal** | Outlet control gates with selective withdrawal capability and trash screens | |
| **Low level outlet conduit** | 1800 mm diameter inlet to a 1400 mm outlet | |
| **Low level outlet valve** | Vertical discharge regulating valve | |
| **Low level outlet capacity** | Discharge rate: 14.5 $m^3/s$ (or a volume of 1250 ML/day) | |
| **Siting** | Adjacent to fish locks (right bank) | |
| **Environmental flow outlet size** | 3 bays of culverts (1.5 m x 2 m) | |
| **Environmental flow outlet length** | Approximately 12 m | |
| **Environmental flow outlet capacity** | Discharge rate 58 $m^3/s$ (or a maximum volume of 5,000 ML/d) | |
| **Environmental flow outlet stilling basin type** | USBR impact type basin | |
| **Construction footprint** | 19.1 ha | |
| **Saddle dam** | Earth embankment/reno mattress (6 m wide by 230 mm thick) | |
| **Other project specific infrastructure and services** | | |
| **Access roads** | Existing | |
| **River crossings** | Riverslea Crossing (2.2 ha)<br>Hanrahan Crossing (1.2 ha) | Foleyvale Crossing (2.6 ha) |
| **Gauging stations** | Relocate and/or recalibrate at Riverslea Crossing | |

Operationally, the Project comprises the maintenance and management of the weir infrastructure, private access roads and impoundments, inclusive of a flood buffer. Water releases will be made through 'run of river' methods and no water distribution infrastructure is required as part of the Project. Water releases will be made to satisfy environmental flow objectives (EFOs) and water allocation security objectives (WASOs) in accordance with the Fitzroy WRP. Operating regimes will be developed and implemented through the Fitzroy ROP.

The development of weir infrastructure (and associated works), the resultant storage of water (inundation of the river bed and banks) and the transfer of water between storages through 'run of river' methods on the Fitzroy River comprise the scope of the Project. Abstraction, transmission and distribution to end users are not considered as part of the proposed Project and are subject to their own environmental investigations and approvals where applicable. This includes the GFP Project described earlier.

Power supply, telecommunications and resource extraction areas have been considered for the Project and will be assessed under separate approvals processes.

Environmental design features of the Project include:

- Modification of an existing fishlock and provision of new fishways to facilitate fish passage over a range of impoundment levels (high and low) at Eden Bann Weir and Rookwood Weir, as applicable
- Outlets that facilitate a range of release volumes, for example low or base flow discharge for water releases to meet downstream water allocations and base level environmental flow requirements and high flow releases to meet the high capacity post-winter environmental flow requirements
- Outlets with selective offtakes to manage the quality of water released
- Screens, surface treatments, stilling basins and operation of the outlets to allow controlled incremental release of water volumes to avoid and minimise injury and mortality of aquatic fauna
- Turtle passage infrastructure to facilitate movement of turtles around the weirs
- Construction programme and staging to avoid or minimise impacts on fish passage
- Bridges to provide improved access to the road network and improved immunity of river crossings during floods.

Construction (per stage) is programmed to occur over at least two dry seasons. A contract start time for EIS reporting purposes has been set so that site activities, particularly those related to the riverbed activities can commence at the end of the wet season due to the unpredictability and magnitude of the flows during the wet season.

The milestones and timeframes for the Project are as follows, noting that an actual start date will be determined by a demand trigger coinciding with seasonal factors as explained above:

- Preparatory and early works (15 to 18 months prior to Quarter (Q)1 Year 1)
- Contract award (Q1 Year 1)
- Commencement of construction (start-Q1 Year 1)
- Spillway concrete complete (start-Q4 Year 2)
- Commencement of impounding (mid-Q4 Year 2)

- Weir practically complete (end-Q4 Year 2).

Impoundment is expected to occur within a single wet season during which commissioning will take place (Chapter 9 Surface water resources).

While the design life of the Project is 100 years, it is anticipated that the weir infrastructure will be maintained and operational after this period. As such, prescriptive planning for decommissioning and rehabilitation cannot be undertaken at present as best practice standards and legislative requirements are likely to change over the life of the Project. Management obligations for the infrastructure continue in accordance with approval requirements until such time as the infrastructure is decommissioned and rehabilitated. These responsibilities remain with the owner of the infrastructure.

## E3. Environmental values, potential impacts and mitigation

### E3.1 Climate, natural hazards and climate change

The Rockhampton region experiences hot summer months from November to April followed by a cooler, usually dry period from May to October. Seasonal irregularity is a defining feature of the study area, with long dry spells often followed by intense wet season rainfalls. The Fitzroy River has a long and well-documented history of flooding. Major floods can result from either the Dawson or the Mackenzie rivers although significant flooding in the Rockhampton area can also occur from heavy rain in the local area below Riverslea Crossing.

The Project area is located within the Australia Eastern Region for cyclone activity and the cyclone season occurs each year from November through to April. The region also experiences severe storms which occur on average at least twice per year during spring and summer months. Like much of Queensland, the Project area frequently experiences drought conditions, notably during the period between 2000 and 2007.

Predicted increased temperatures, increased evaporation and reduced rainfall as a result of climate change may impact catchment yields. Staging the development will allow the Project to respond to actual demand over time taking into account climate variation, economic considerations and Government policy, planning instruments and guidelines based on circumstances at the time. Water storages are likely to become more important for the purpose of water supply, mitigating drought and for maintaining environment flows.

### E3.2 Land

#### Scenic amenity and lighting

The Project is located in a rural area, with beef cattle grazing the predominant land use.

Large rural properties border the weir sites and impoundments, with limited public access. Public viewpoints within the Project area are limited to river crossings at Glenroy, Riverslea and Foleyvale with relatively low usage. Viewpoints at the existing Eden Bann Weir and proposed Rookwood Weir sites are restricted through private access. There are no houses with views of the weir sites or crossings.

The nature of the Project will result in changes to the visual landscape and amenity of the area but these changes will be viewed by a limited number of residents, farm workers and road users with short term viewing periods. The impact of lighting during construction and operation will be

managed by restricting construction activities to daylight hours as far as possible and making use of directional sensor activated lighting to reduce sky glow.

### Topography, geology and soils

The Fitzroy River has a strong meandering habit and passes through undulating to relatively level country that is largely cleared. Class A agricultural land and strategic cropping land are mapped in areas along the Fitzroy, Mackenzie and Dawson rivers.

The channel of the Fitzroy River at the Eden Bann Weir and proposed Rookwood Weir site is interpreted to be controlled by a major regional geological structure. Eden Bann Weir has good founding conditions suitable for raising the weir. Construction of a weir at the proposed Rookwood Weir site is supported by the outcomes of geotechnical investigations.

The Project's impact on agricultural land and strategic cropping land will be negligible, as there is a limited development footprint outside of the river bed and banks. Inundation during operations will be confined to within the river bed and banks and will not impact on the productive capacity of the surrounding land.

### Contaminated land

Existing land use in the Project area is predominantly cattle grazing, with existing potential contamination resulting from the storage and use of hydrocarbons, herbicides, pesticides and livestock dips. One potential contamination site is located within the Eden Bann Weir impoundment and one potential contamination site comprises the existing Eden Bann Weir. Two potential contamination sites are located within the Rookwood Weir construction footprint. Four subject lots are listed on the Environmental Management Register for containing a livestock dip or spray race. No sites are recorded on the Contaminated Land Register.

Initial site investigations will be undertaken for identified contamination sites prior to construction to prevent the release of existing contaminants to the environment and protect the quality of water in the reservoirs. It is unlikely that activities will require notification to the Contaminated Land Register. Remediation and validation would be completed if required before construction proceeds, where the site is likely to be impacted. An incident response plan and appropriate preventative measures would be implemented to minimise the risk of accidental spills and leaks of environmentally hazardous substances during construction and operation of the Project.

### Land use and tenure

Eden Bann Weir is located on the Fitzroy River bounded by the RRC local government area (LGA) and the LSC LGA. The Rookwood Weir site is located on the Fitzroy River within the RRC LGA. The impoundment associated with development of a weir at Rookwood borders two parcels of WASC land and sections of CHRC land.

The main activity occurring on properties affected by the Project is cattle grazing, breeding and fattening. There is some crop cultivation for grains near the weir sites and a small number of properties with irrigation licences. The most common use of the river is for stock watering with cattle generally accessing the water directly or via pump/trough systems. The large rural properties common to the Project areas are generally served by unsealed roads, often single lane, branching from the major arteries of the Bruce and Capricorn Highways.

The Project is unlikely to impact significantly on the existing uses of land for rural purposes. The Project footprint will cause only a minor loss of land used for rural production, based on land as mapped within the banks of the Fitzroy, Dawson and Mackenzie rivers. The Project has the

potential to affect the ability of landholders to graze livestock over the area between the high and low bank outside their legal riparian boundary, to ingress and egress the river, to invite other people and remove trespassers, and to access water for livestock. Further loss of access to land and loss of access within properties and between properties may impact the ability of landholders to productively manage their operations. The extent of these impacts would be determined through consultation with landholders and would be taken into consideration when determining appropriate landholder compensation.

SunWater own and operate the existing Eden Bann Weir under perpetual lease tenure. This tenure is appropriate for the expanded Eden Bann Weir Project area. The location of the proposed southern bank access road will traverse three freehold lots. It is proposed that an easement will be negotiated with the landholders. Similar to Eden Bann Weir, a long-term lease will be acquired over Rookwood Weir and the associated infrastructure. Access to the proposed Rookwood Weir site is largely via existing designated roads. The Project is not expected to impact on the potential for future road upgrades.

The Fitzroy, Mackenzie and Dawson rivers are designated unallocated State land. Land adjacent to the watercourses within the Project's extent comprises largely freehold land. A water storage easement (or similar) (including a flood buffer zone) will be negotiated for riparian land within the impoundment but outside of the watercourse.

Reserves (primarily for the purposes of camping, water, roads and stock) will be locally impacted by the Project. In the order of 4 ha of the Aricia State Forest will be impacted as a result of Eden Bann Weir impoundment.

Construction and operation of the Project will not adversely impact mining and petroleum tenures, key resource areas, stock routes or existing or proposed rail, power, gas water and telecommunications infrastructure.

The Project area currently has limited access and recreational use opportunities. It is not intended to facilitate recreational use of the impoundments as a result of the Project. Access to the impoundments would be restricted as there are few public access points and recreational use of the impoundments would not be encouraged. The weir infrastructure areas will be fenced.

### E3.3 Flora

Desktop assessments, vegetation mapping, field surveys and bio-condition assessments were undertaken to determine existing flora values and potential impacts on flora values as a result of the Project. The following sensitive environmental areas relating to flora values occur in the Project footprint and impacts are detailed in Table E-7:

- One endangered threatened ecological community (TEC) known is to occur (Brigalow (*Acacia harpophylla* dominant and co-dominant))
- Endangered, of concern and least concern regional ecosystems (REs) located within or adjacent to the riparian zone.

**Table E-7 Remnant vegetation within the Project footprint and surrounding region**

| TECs and REs | Eden Bann Weir Project footprint* | Rookwood Weir Project footprint* | Within 2 km of the Project footprint | | Within the Fitzroy Basin catchment* | | Within Brigalow Belt bioregion | |
|---|---|---|---|---|---|---|---|---|
| | | | ha | % impacted | ha | % impacted | ha | % impacted |
| **Threatened ecological communities** | | | | | | | | |
| Brigalow TEC | 0.7 | 19.4 | 1358 | 1.5 | 35,153 | 0.06 | 80,610 | 0.03 |
| **Endangered regional ecosystems** | | | | | | | | |
| 11.3.1 | 0.7 | 19.4 | 1358 | 1.5 | 35,153 | 0.06 | 80,610 | 0.03 |
| 11.3.38 | 6.3 | 0 | 246 | 2.6 | 8,064 | 0.08 | 9,577 | 0.07 |
| **Of concern regional ecosystems** | | | | | | | | |
| 11.3.2 | 2.0 | 4.3 | 129 | 4.9 | 211,145 | 0.00 | 517,452 | 0.00 |
| 11.3.3 | 13.5 | 188.1 | 4,932 | 4.1 | 49,567 | 0.41 | 281,071 | 0.07 |
| 11.3.4 | 27.0 | 4.2 | 380 | 8.2 | 109,013 | 0.03 | 183,695 | 0.02 |
| 11.11.10 | 0.5 | 0.0 | 137 | 0.4 | 43,941 | 0.00 | 87,063 | 0.00 |
| **Least concern regional ecosystems** | | | | | | | | |
| 11.3.9 | 0.6 | 0.0 | 4 | 15.0 | 6,477 | 0.01 | 64,225 | 0.00 |
| 11.3.25 | 543.4 | 1053.9 | 4,703 | 34.0 | 109,576 | 1.46 | 513,711 | 0.31 |
| 11.3.27 | 39.9 | 0.0 | 271 | 14.7 | 12,768 | 0.31 | 49,086 | 0.08 |
| 11.11.1 | 0.0 | 0.7 | 1,003 | 0.1 | 108,848 | 0.00 | 160,931 | 0.00 |
| 11.11.7 | 25.4 | 0.0 | 4,179 | 0.6 | 47,821 | 0.05 | 50,909 | 0.05 |
| 11.12.1 | 1.6 | 0.0 | 955 | 0.2 | 205,365 | 0.00 | 847,961 | 0.00 |
| 11.12.2 | 0.1 | 15.1 | 345 | 4.4 | 5,301 | 0.3 | 190,352 | 0.01 |

* Based on Eden Bann Weir Stage 3 and Rookwood Weir Stage 2, inclusive of other Project specific infrastructure.

Regional ecosystems are typically fragmented across the landscape as a result of historic clearing including parts of the riparian zone of the lower Dawson, lower Mackenzie and Fitzroy rivers.

Brigalow TEC is well represented in the surrounding landscape and a relatively small proportion will be impacted across the Project footprint. Prior to the commencement of Project activities, further ecological surveys will be undertaken to verify the area of Brigalow TEC present and impacted as a result of the Project. Conservatively, approximately 20 ha of Brigalow TEC will be impacted as a result of the Project in stages as per Table E-8.

**Table E-8 Brigalow TEC impacts**

| Stage | Area of Brigalow TEC |
|---|---|
| Eden Bann Weir Stage 2 (FSL 18.2 m) | Construction activities: nil<br>Impoundment: up to 0.3 ha |
| Eden Bann Weir Stage 3 (FSL 20.2 m) | Construction activities: nil<br>Impoundment: up to 0.4 ha |
| Rookwood Weir Stage 1 (FSL 45.5 m) | Construction activities: up to 1.4 ha<br>Impoundment: up to 2.3 ha |
| Rookwood Weir Stage 2 (FSL 49 m) | Construction activities: up to 0.2 ha<br>Impoundment: up to 15.5 ha |

In addition, 185.9 ha of high value regrowth will be lost within the Eden Bann Weir Project footprint and 372.3 ha of high value regrowth within the Rookwood Weir Project footprint. Approximately 40 ha of essential habitat are mapped within the Eden Bann Weir Project footprint and 11 ha of within the Rookwood Weir Project footprint.

In accordance with the SP Act, the Project is deemed to be 'other community infrastructure', specifically 'water cycle management infrastructure' and is considered not assessable development. The clearing of native vegetation (including regrowth vegetation and essential habitat) is exempt development and will not require approval or assessment against the Brigalow Belt and New England Tablelands state code within Module 8 of the SDAP in conjunction with the SP Act. Offsets are not proposed in terms of Queensland legislation for remnant vegetation. Offsets are proposed for impacts on Commonwealth listed species, namely, Brigalow TEC and black ironbox (*Eucalyptus raveretiana*) in accordance with the EPBC Act Environmental Offsets Policy.

Introduced plants and weeds are ubiquitous across the Study area. Eight weeds listed under Queensland legislation, five of which are Weeds of National Significance were recorded during field studies. A Weed Management Plan would be prepared and implemented to prevent the introduction of new weed species into the area and minimise the spread of weeds within the site.

## E3.4 Aquatic ecology

Aquatic habitats in the Fitzroy, Mackenzie and Dawson rivers are highly dynamic. The temporal distribution and spatial extent of the aquatic habitat types are related to fluctuating water levels driven by factors such as seasonal rainfall, water storage management, water extraction, evaporation and ground seepage. Climate, hydrological regime and past and present land use practices have all influenced the diversity and abundance of aquatic species within the Project footprints.

The impoundment created as a result of the existing Eden Bann Weir is the dominant aquatic habitat type within the Eden Bann Weir Project footprint. Upstream of the existing impoundment, the Fitzroy River (as well as the Dawson and Mackenzie rivers) exists as a series of pool-riffle-run sequences. A number of creeks and off-stream water bodies provide further aquatic habitat beyond the main channel of the rivers.

To document the known aquatic ecology values within the Project footprint, a desktop and field assessment was undertaken. Survey timing and design considered seasonal variation and the

ecology of targeted threatened species. Aquatic fauna values within the study area are summarised as follows:

- No NC Act or EPBC Act listed fish species of conservation significance have been previously recorded or are predicted to occur
- Three fish species, southern saratoga (*Scleropages leichardti*); leathery grunter (*Scortum hillii*); and Fitzroy River golden perch (*Macquaria ambigua oriens*), identified as known or likely to be present, are considered to have a local conservation value due to their restricted geographic range
- Six turtle species have been identified as known or likely to be present: the Fitzroy River turtle (*Rheodytes leukops*), white-throated snapping turtle (*Elseya albagula*); saw-shelled turtle (*Elseya latisternum*); Krefft's river turtle (*Emydura macquarii krefftii*); broad-shelled river turtle (*Chelodina expansa*) and eastern snake-necked turtle (*Chelodina longicollis*). The Fitzroy River turtle is listed as vulnerable under the EPBC Act and NC Act. The white-throated snapping turtle, saw-shelled turtle, Kreft's river turtle, broad-shelled river turtle and eastern snake-necked turtle are native species listed as least concern under the NC Act
- Estuarine crocodile (*Crocodylus porosus*), listed as vulnerable under the NC Act, is confirmed present within the Eden Bann Weir Project footprint. Although crocodiles are occasionally observed upstream of the proposed Rookwood Weir site they are uncommon beyond Glenroy Crossing
- Platypus, listed as special least concern under the NC Act, is known to occur in the Fitzroy Basin catchment. Nonetheless it is considered likely to be limited in abundance with a low potential to occur or are absent within Project areas as burrowing habitat is not prevalent
- Studies of macroinvertebrate diversity recorded a total of 4,270 individuals from 59 families of macroinvertebrates during the wet season and 233 individuals from 28 families during the dry season. A total of one hundred and five species of macrophytes have been previously recorded in the Fitzroy Basin catchment, however, macrophytes abundance and diversity was relatively low within the Project footprints at the time of survey
- Macrophytes were uncommon in riverine (in-channel) habitats within the Eden Bann Weir Project footprint and generally in low abundance at sites assessed within the proposed Rookwood Weir footprint. Aquatic weeds recorded within the catchment include salvinia (*Salvinia molesta*) and *Hymenachne amplexicaulis*
- Potentially toxic blue-green algae blooms are known to occur throughout the Fitzroy Basin catchment in response to high pH, high nutrients and low flows (Noble et al. 1997). Within the Rookwood Weir Project footprint, filamentous algae were particularly prevalent in riffle and run habitats where clear, shallow water occurred. Only low levels of blue-green algae have been recorded from the existing Eden Bann Weir impoundment (frc environmental 2008).

Direct impacts associated with the Project's construction include the permanent loss of 1.4 ha of aquatic habitat within the construction footprints. The area of habitat to be impacted is relatively small in size in relation to that available within the immediate area and, as such, the loss of habitat is not considered significant. Additional impacts to aquatic ecological values that may occur as a result of Project construction activities include: the degradation of habitat, increased injury and mortality, and the restriction of fauna movement. These impacts will be localised and restricted to the duration of the construction period and mitigated through consideration of

appropriate construction methodologies and the implementation of measures described in the environmental management plan (EMP) and a more detailed construction EMP to be developed.

The Project's operation will result in the inundation of an additional 114.5 km of natural riverine habitat, increasing the area of impacted habitat within the Fitzroy, Dawson and Mackenzie sub-catchments by 10 per cent. In regard to each weir:

- Raising of Eden Bann Weir (to Stage 3) is expected to inundate an additional 27.5 km of natural river habitat, comprising approximately 14.5 km of natural pool habitat, 8.5 km of run habitat and 4.5 km of riffle habitat. This equates to approximately 282 ha of aquatic habitat
- Approximately 87 km of river habitat will be inundated as a result of the proposed Rookwood Weir Stage 2, comprising approximately 46.4 km of pool habitat, 29.1 km of run habitat and 21.2 km of riffle habitat. This equates to approximately 660 ha of aquatic habitat.

Alteration of natural riverine habitats within the Project footprints will reduce the heterogeneity of the river system and therefore the diversity of habitats available to aquatic fauna. Aquatic species are expected to persist, particularly within the shallow littoral habitats along the perimeter of the inundated areas and within the upper reaches. An increase in deep water habitat and linear shoreline is likely to benefit the population of estuarine crocodile within the existing Eden Bann Weir.

The Project will result in the inundation of known and potential Fitzroy River turtle nesting habitat. The loss of nesting habitat within the Project footprints has the potential to disrupt the breeding cycle of these species by restricting nesting in the area adjacent to the impoundment to sub-optimal habitats and reducing reproductive success. Suitable nesting habitat for the Fitzroy River turtle is expected to persist in the upper reaches of the impoundments with potential nesting habitat remaining above the FSL within the Rookwood Weir site. Suitable nesting habitat is also expected to be naturally created in flood deposition areas over time. Nevertheless, due to the specific nesting requirements of the species and the current extremely high nest predation rates (reportedly close to 100 per cent and caused mainly by feral species (Limpus et al 2011a, 2011b) throughout the catchment, the loss of Fitzroy River turtle nesting habitat within the Project footprint is considered significant in accordance with the Commonwealth's Matters of National Environmental Significance - Significant impact guidelines 1.1 (DoE 2013). Offsets are proposed in relation to the residual Project impacts on the turtle consistent with the EPBC Act Environmental Offset Policy. The protection and management of nesting habitat to be implemented as part of the Project will target Project specific impacts as well as address the key processes currently threatening the survival of the species. These actions will reduce nest predation, improve birth rate thereby increasing population recruitment and promote the recovery of the species. The management actions proposed for the Project are included in the Fitzroy River turtle SMP.

In addition, in the order of 950 ha of aquatic habitat is proposed to be offset through a financial contribution in accordance with the Queensland Government's financial settlement offset calculator.

During operation, the new weir infrastructure and to a lesser extent river crossings have the potential to be an impediment to the movement of aquatic fauna. Maintaining upstream and downstream fauna movement and minimising the potential risk of fauna injury and mortality associated with the in-stream infrastructure have been key management objectives through the Project design phase. Fish passage infrastructure has been designed to preliminary design stage.

Eden Bann Weir fish passage infrastructure comprises an upgraded fish lock on the left bank and a new fish lock located on the right bank for high and low reservoir levels to cater for flows from zero to 2,700 $m^3/s$. This provides for normal operating conditions as well as low spillway flow conditions at the weir. The proposed Rookwood Weir fish passage infrastructure comprises a right bank fish lock to cover low and high reservoir levels to cater for flows from a minimum operating level up to 500 $m^3/s$. The lock arrangements proposed are considered suitable for the purpose of fish passage as:

- The lock is in a configuration known to work (although physical model studies are required to assist with refinement of entry / exit conditions and sedimentation management)
- The addition of a right bank fish lock at Eden Bann Weir will improve on current passage efficiency above spilling flows.
- The lock operates on flows up to 2,700 $m^3/s$ for Eden Bann Weir and flows up to 500 $m^3/s$ for Rookwood Weir. This allows for operation of the fish lock for between 98 per cent and 95 per cent of flows prior to drownout at Eden Bann Weir and Rookwood Weir, respectively
- It reduces average wait days per occurrence from 11 to seven at Eden Bann Weir. At Rookwood Weir the average number of waiting days per event is estimated at ten
- The lock arrangement is capable of providing continuous attraction flows when the fishway is operating and allows for variable attraction flows between phases of the cycle. Attraction flow velocities can be varied between: 0.15 m/s and 1.8 m/s
- It caters for small and large-bodied fish
- It provides upstream and downstream passage
- It can be shut down in large floods to maximize operation following flood.

A Fish Monitoring Program will be designed and implemented to monitor the effectiveness of fish passage infrastructure during both the construction and operation phases of the weirs.

A consultative design process has been undertaken for the Project to minimise risk of fish and turtle injury and mortality at Eden Bann Weir and Rookwood Weir. The key design features responsible for high levels of fauna injury and mortality (such as stepped spillway, dissipater teeth, high turbulence, insufficient pool length and depth, high velocity trash screens) have been avoided in Project design thereby substantially reducing the risk of injury and mortality to fish and turtles.

Minor works associated with road upgrades and the installation of culvert crossings will be undertaken in accordance with Fisheries Queensland's self-assessable codes as applicable and in consideration of fish passage. The upgrade to Hanrahan Road will comprise the installation of large culverts that will facilitate fish passage. Preliminary design for the bridges at Glenroy, Riverslea and Foleyvale crossings was undertaken in accordance with the Australian Standard for Bridge Design (AS 5100). During the early works phase waterway crossings will be detailed designed to meet the requirements of the *Fisheries Act 1994* (Qld) and in consultation with DAF.

A specifically designed turtle passage facility (turtle ramp) will also be constructed at Eden Bann Weir and Rookwood Weir to mitigate the potential impacts of the Project on turtle movement. In addition the Fitzroy River turtle SMP provides for the implementation of a Fitzroy River turtle movement study that will be implemented on commencement of a Project trigger to improve current knowledge of Fitzroy River turtle movement patterns, home range and seasonal variations through monitoring and tracking. The study would be implemented through a university research

program (or similar approach with qualified specialists in the field) in collaboration with DEHP. The study would further inform the requirements of Fitzroy River turtle passage and will facilitate quantifiable performance criteria to measure the effectiveness of the passage once operational.

Construction and operation of the Project have the potential to exacerbate existing threatening processes on the aquatic ecology of the Project area, including water quality issues and weed and pest species. The Project EMP (and more specifically a construction EMP and operations EMP) documents various management measures that will be implemented to improve the quality of aquatic and riparian habitat remaining within the Project footprints. Engagement with landholders, community groups and local councils will promote more holistic control of feral animals and weeds to better manage existing impacts on aquatic ecological values including turtle nesting habitat.

The operation of weirs is predicted to result in a change to the downstream flow regime. Water flows are predicted to increase during the dry season resulting in a decrease in the frequency and duration of no flow periods. The operation of the weirs is also likely to result in a temporary reduction in the frequency and magnitude of small to medium downstream flood flows. Flood flows entering the impoundment are likely to be captured and stored until the weir reaches its full supply level. This will result in the reduction of flows downstream (or at least a lag in the flow downstream) and is most likely to occur at the start of summer when the storage is predicted to be at a minimum in most years. It is noted that this lag is expected to be of short duration; in the order of a week to a month.

The increase in flows during the dry season associated with weir operational releases has the potential to improve the quality of aquatic habitat downstream by reducing the duration and severity of pool isolation and prolonging the presence of flowing riffles zones and runs. An alteration in the magnitude and timing of downstream flows does, however, in the absence of suitable management strategies have the potential to impact fish movement and turtle nesting. Flow analysis indicates that flows downstream of the Fitzroy Barrage will not be significantly impacted by the Project. Impacts to these downstream sensitive environmental areas and conservation significant species are therefore expected to be minimal.

### E3.5 Terrestrial fauna

Terrestrial fauna habitats within the Project area (that is riparian habitat within the riverbed and banks and areas within the construction footprints) are largely seasonal, responding to changes in rainfall and river flow. Ephemeral off-stream water bodies and creeks represent sensitive terrestrial fauna habitats within the Project footprint. Such habitats provide resources for a wide array of animals, including amphibians (breeding and foraging), reptiles (foraging), ground-dwelling mammals (foraging), microchiropteran bats (foraging) and birds (foraging and nesting amongst dense riparian vegetation).

Ecological resources and habitats critical to the long-term viability of conservation significant terrestrial species are unlikely to occur within the Project footprint. Nonetheless, fragmented habitats that occur within and adjacent to the Fitzroy River are likely to provide resources for small localised populations of listed threatened species, as well as a wide diversity of common, generalist species that are tolerant of a modified landscape matrix. Since much of the lowland landscape has been cleared for agricultural development, riparian habitat corridors perform a valuable role, maintaining connectivity between habitat remnants.

The Project area provides foraging, shelter and breeding resources for at least 158 species within the Eden Bann Weir Project footprint and at least 208 species within the Rookwood Weir Project footprint (as identified during wet and dry season field surveys).

Listed threatened terrestrial fauna species recorded during field surveys within the Project footprint included:

- Squatter pigeon (southern) (*Geophaps scripta scripta*), listed as vulnerable under the EPBC Act and the NC Act
- Black-necked stork (*Ephippiorhynchus australis*), black-chinned honeyeater (*Melithreptus albogularis*), cotton pygmy-goose (*Nettapus coromandelianus*) and little pied bat (*Chalinolobus picatus*), all listed as near threatened under the NC Act.

Two NC Act listed special least concern species (echidna (*Tachyglossus aculeatus*) and koala (*Phascolarctos cinereus*)) were also recorded or evidenced during the field surveys.

Listed threatened terrestrial fauna species assessed as having a high potential to occur but not detected during field surveys within the Project footprint included:

- Powerful owl (*Ninox strenua*), listed as vulnerable under the NC Act
- Square-tailed kite (*Lophoictinia isura*), listed as near threatened under the NC Act.

Potential impacts to terrestrial fauna during construction and operation of the Project include: injury and mortality; disruption to behaviour of localised wildlife assemblages; loss of terrestrial habitat; fragmentation of riparian habitat; loss of movement corridors and connectivity; increased predation and competition; and degradation of habitats.

To address these impacts, mitigation measures have been developed and documented in the Project EMP, including undertaking pre-clearing surveys (within construction footprints) and development of a Project SMP, weed and pest control measures, revegetation activities, and the preparation of dust, weed and other relevant management plans. With these mitigation and management measures in place, significant adverse impacts on conservation significant species are not anticipated as a result of the Project.

### E3.6 Surface water resources

The Fitzroy Basin is the largest catchment on the eastern seaboard of Australia, and is second only to the Murray-Darling Basin as Australia's largest catchment. It extends over an area of approximately 142,000 km$^2$ of central and eastern Queensland about the Tropic of Capricorn. It consists of six major subcatchments, namely: Isaac Connors; Nogoa; Comet; Mackenzie; Dawson; and Fitzroy.

Strongly seasonal climatic factors heavily influence flows within the Fitzroy Basin, with the sub-tropical climate fostering the majority of rainfall during the wet season (approximately November to April). The warm, wet season is generally interspersed with long, dry periods from approximately May to October. Mean annual rainfall is generally higher in the eastern parts of the Fitzroy Basin (800 – 1000 mm), and slightly lower inland to the west (600 mm) (Johnston et al., 2008). Severe flooding occurs within the Fitzroy Basin as a result of intensive rainfall events associated with severe storms, cyclones and tropical low pressure systems. Prolonged dry conditions and drought are also characteristic features of the highly variable and unpredictable nature of the climate that the Fitzroy Basin is exposed to.

Flows in the Mackenzie River (and subsequently the Fitzroy River) are erratic and largely driven by cyclonic action, severe storms and tropical low pressure systems characteristic of the north of the Fitzroy Basin. Historically total annual flows range from almost zero to 22,500,000 ML. Peak flows generally coincide with extreme weather events, in particular flood events. Extended periods of low flows reflect prolonged droughts as experienced during the period 2001 to 2007. While the Dawson River also exhibits variable flows, the order of magnitude is much reduced (between zero and 5,000,000 ML annually).

The Fitzroy River at Rockhampton has a long and well-documented history of flooding with flood records dating back to 1859. The highest recorded flood occurred in February 1918 and reached 10.11 m on the Rockhampton gauge. Within the Project area in general the flood extents for the 1 in 2 year annual exceedance probability (AEP) event under existing conditions are largely contained within the main river channel. Anabranch flows (streams that divert from the main channel and re-join the river downstream) develop during the 1 in 5 year AEP event. Flooding starts becoming quite extensive across the river floodplains and anabranches start to run full during a 1 in 20 year AEP event, and become flooded during a 1 in 50 year AEP event.

Flood flows in the Fitzroy River contain a high level of suspended sediment. When flow is captured (at a weir) or passes through areas where flow velocity reduces, the sediment drops out as silt and sand. As a consequence of the high velocity flows in the Fitzroy River during flood events, deposited silt is remobilised in subsequent floods (Keane 2004).

The Fitzroy Basin is a highly regulated system with a number of existing water storages. Regulation is facilitated through the Water Act's subordinate legislation; the Fitzroy WRP. The Fitzroy WRP seeks to achieve general and specific outcomes for the sustainable management of water. Specifically the outcomes relate to providing:

- Security for water users and licence holders through the establishment of water allocation security objectives (WASOs). WASOs define the performance that water users can expect from their allocations. The Fitzroy WRP defines WASO performance indicators for supplemented and unsupplemented water allocations within water supply schemes and water management areas, respectively
- Environmental water for aquatic ecosystems through the establishment of environmental flow objectives (EFOs). EFOs are the flows considered necessary to sustain a healthy environment. The Fitzroy WRP defines EFOs that specifically relate to flow-based performance indicators.

In the Project area, supplemented water is supplied from Eden Bann Weir (owned and operated by SunWater) through the Lower Fitzroy Water Supply Scheme (25,520 ML/a) and the Fitzroy Barrage (owned and operated by RRC) through the Fitzroy Barrage Water Supply Scheme (50,000 ML/a). Unsupplemented water in the Project area is managed within the Fitzroy Water Management Area.

The WASO performance indicators for supplemented water in the Lower Fitzroy Water Supply Scheme and Fitzroy Barrage Water Supply Scheme for water allocation in the high priority group are:

- The annual supplemented water sharing index is to be at least 94 per cent
- The monthly supplemented water sharing index is to be at least 98 per cent.

For water allocations in the medium priority group, the performance indicator is based on the monthly supplemented water sharing index that must be at least 82 per cent. WASOs are also defined for unsupplemented water allocations per water allocation group in the Fitzroy Water Management Area.

The performance indicators for the EFOs are:

- For assessing periods of low flow (the seasonal base flow)
- For assessing periods of medium to high flow
- For assessing the first post-winter flows.

The Fitzroy ROP implements the Fitzroy WRP and defines the rules for allocation and management of water in order to achieve WASOs and EFOs.

Unallocated water within the Fitzroy WRP plan area is divided into a strategic reserve, strategic water infrastructure reserve and a general reserve. For the Project, unallocated water (a nominal volume of 76,000 ML) held as the strategic water infrastructure reserve may be granted for water infrastructure on the Fitzroy River. Further, the Fitzroy ROP specifies reserves of unallocated water for urban and industrial supplies in the Gladstone area (nominal volume of 30,000 ML) and urban supplies in the Capricorn Coast area (nominal volume of 4,000 ML). The Fitzroy ROP does not specify the intended end use of the remaining 42,000 ML (nominal volume) available from the strategic water infrastructure reserve. However, the Fitzroy WRP requires that decisions made about the allocation and management of water in the plan area must be consistent with the WASOs and the EFOs.

Potential impacts on surface water resources arising from construction of the Project may include:

- Disruption to or diversion of downstream flows
- Localised drawdown within natural ponded areas (Rookwood Weir).

Downstream flows (and operational releases as applicable to the existing Eden Bann Weir) will be maintained throughout the construction period and it is not expected that flows will be adversely impacted as a result of the Project's construction.

In-stream diversion strategies (including coffer dams) will be implemented to temporarily divert flows away from the Project activities but retain them within the river channel. Scheduling of construction activities at Eden Bann Weir will be undertaken in consultation with the asset owner/operator, namely SunWater, to ensure that operational releases are maintained through the existing infrastructure or new infrastructure components as necessary.

During operations, the weirs capture and retain river flows during the wet season allowing for slow, regulated releases through the dry season, and allowing for environmental releases as necessary and in accordance with regulations.

Potential impacts on surface water resources during operation of the Project include:

- Inundation of river and creek bed and banks and infrastructure upstream within the impoundment
- Altered stream flow patterns potentially affecting current flow regimes and availability of water supplies to the environment and water users (supplemented and unsupplemented entitlements)
- Altered flood flows

- Changes to river morphology (fluvial processes)
- Uncontrolled releases of water due to system failure.

Inundation associated with a raised Eden Bann Weir and construction of Rookwood Weir will be retained within the river bed and banks. Weirs are in-river structures that are designed to be overtopped. Unlike a dam, the whole of the structure will be located within the bed and banks of the watercourse. Subsequently, inundation associated with weirs is designed to bank full, that is the elevation where water will 'break out' of the river banks.

It is expected that the raised Eden Bann Weir and new Rookwood Weir will be operational within the first wet season post-construction and will fill in a relatively short period (in the order of one to two months). Operationally it is intended that weir storages remain impounded for approximately eight months of the year with draw down occurring in the drier period. At ultimate development, Rookwood Weir storage would be drawn down with releases passing to the Fitzroy Barrage for use and abstraction. Once Rookwood Weir reaches its minimum operating level (and the storage is depleted), releases would be made from Eden Bann Weir to the Fitzroy Barrage for use and abstraction.

The operational regime will be developed further once a Project trigger is initiated and a specific development scenario (and associated infrastructure) is defined. It is acknowledged that the operational regime will be subject to the provisions of the Fitzroy WRP and amendment of the Fitzroy ROP will be required.

Analysis of flood flows pre- and post-development indicate marginal to no significant changes to flow regimes upstream, within and downstream of Eden Bann Weir and the proposed Rookwood Weir. Statistical analysis shows that for the majority of years analysed, releases from the Project at its upper limits of development (that is Eden Bann Weir Stage 3 and Rookwood Weir Stage 2), do not significantly influence flows at the end of the system. This indicates that under the upper limit development scenario, minimal impacts on flow are expected to occur during years of high flow.

The alteration of surface flows and changes in inundation downstream during releases will potentially impact on public and private infrastructure, such as roads (tracks) and river crossings (low level bridges and causeways) and other installations (stream gauges) that may require upgrades to accommodate raised water levels, including at: Glenroy Crossing; Riverslea Crossing, Foleyvale Crossing and Hanrahan Crossing. Upgrades to these crossings will be implemented to address these impacts.

Using the State's Integrated Quantity Quality Model (IQQM) (surface water balance modelling), theoretical Project yields were quantified (Table E-9) for each development scenario.

**Table E-9 Theoretical Project yields**

| Infrastructure scenario | Theoretical Project yield (ML/a) |
|---|---|
| Eden Bann Stage 1 (existing) | 0 |
| Eden Bann Stage 2 | 35,000 |
| Eden Bann Stage 3 | 50,000 |
| Rookwood Stage 1 | 54,000 |
| Rookwood Stage 1 + Eden Bann Stage 2 | 77,000 |

| Infrastructure scenario | Theoretical Project yield (ML/a) |
|---|---|
| Rookwood Stage 1 + Eden Bann Stage 3 | 87,000 |
| Rookwood Stage 2 | 86,000 |
| Rookwood Stage 2 + Eden Bann Stage 2 | 105,000 |
| Rookwood Stage 2 + Eden Bann Stage 3 | 110,000 |

The theoretical yields are the potential maximum yield achieved for the development scenario. It is acknowledged that some development scenarios achieve yields in excess of the nominated strategic water infrastructure reserve. Analysis of yield capped at the strategic water infrastructure reserve (nominal volume of 76,000 ML) was also undertaken.

Post-processing of the high priority yields was completed to assess compliance with the requirements of the Fitzroy WRP (WASOs and EFOs) or at least such that there is no worsening of the existing situation (existing case).

All theoretical yields comply with high and medium priority user group supplemented WASOs in the Lower Fitzroy Water Supply Scheme and the Fitzroy Barrage Water Supply Scheme. For the infrastructure scenarios that achieve at least 76,000 ML/a and where the yield is capped at 76,000 ML/a (capped yield), WASOs are achieved and water sharing indices for high and medium priority user groups are improved.

Unsupplemented WASOs are achieved for flow classes 5B, 6C and 7D for all infrastructure scenarios at theoretical yields and capped yields. Unsupplemented WASOs are achieved for flow Class 5A under infrastructure scenario Eden Bann Weir Stage 2. For the remaining infrastructure scenarios, the system average annual volume probabilities fall between one and five per cent below the specified objective. Further modelling will be undertaken once development of a specific infrastructure scenario is triggered to assess yields against the performance of supplies delivered by the existing infrastructure. The Project is committed to maintaining existing supply reliability for current water allocation licensees.

It is considered that existing water harvesting entitlements (that is water take under high flow conditions) can co-exist with supplemented entitlements arising as a result of the Project, as they currently do elsewhere in the Fitzroy Basin.

Low flow or no flow (waterholes) entitlements have the potential to be impacted as a result of the Project, both upstream and downstream of the weirs. It is likely that changes to stream flow regimes will alter the ability of these users to extract water under the existing licence conditions. This impact on affected landholders will be addressed in the amended Fitzroy ROP.

Once demands for the Project are realised and development of a specific infrastructure scenario is triggered, detailed design and further modelling will be required to ensure compliance with the underlying Fitzroy WRP requirements. Since changes to existing operational rules are also likely to be required, a ROP amendment will be sought, again requiring compliance with Fitzroy WRP objectives.

Seasonal base flow EFOs will be met for all theoretical and capped yields during the January to April water flow season. During the May to August and September to December water flow seasons, the existing system does not meet the Fitzroy WRP seasonal base flow objectives. All proposed infrastructure staging scenarios comply with medium to high flow EFOs except the upper limit development scenario which failed (slightly) against the 20 year daily flow volume

objective. It is noted that the upper limit development scenario yield may be restricted by the Fitzroy WRP requirement to achieve the 20 year daily flow volume. Alternatively operating rules may be modified. First post-winter flow event EFOs are achieved for all Project infrastructure scenarios.

A raised Eden Bann Weir (Stage 2) has a small influence on water levels upstream during smaller magnitude floods (1 in 2 and 1 in 5 year AEP events). Negligible increases in water level are associated with higher magnitude floods up to the weir being drowned by these floods.

Rookwood Weir influences water levels upstream of the site during smaller magnitude floods (1 in 2 and 1 in 5 AEP events). The impact of the weir during larger magnitude events is small to negligible as the weir is drowned by these flood flows.

Sediment management on the Fitzroy River is currently achieved by transmission of the sediment over or through the weirs. Both the raised Eden Bann Weir and the proposed Rookwood Weir will allow sediment to be swept over the weir. Aside from local areas of lower velocity around weir structures where local deposition at the upstream face can be expected, the weirs are expected to provide unimpeded transfer of sediment down the river, assisted by the provision of outlets to assist in sediment flushing.

In relation to erosion and bank slumping, measures to be implemented during detailed design once a development site is triggered will include undertaking a detailed geomorphic site assessment to identify key indicators for long term monitoring. During operations rehabilitation and restoration of impacts as a result of scouring, erosion or bank slumping will be undertaken.

### E3.7 Groundwater resources

The construction and operation of the Project is expected to have a negligible impact on groundwater in the area adjacent to the Project footprint.

Construction activities with the potential to impact on groundwater resources or uses include dewatering of excavations; extraction of surface water, in-stream diversion of surface water and contamination.

Dewatering of excavations will take place during drier periods in accordance with the construction phases. Groundwater extracted as part of this dewatering will be stored temporarily in a sediment basin and released to the existing channel of the Fitzroy River once it is demonstrated that the water quality is suitable for release. It is considered that recharge is likely due to the proximity of the point of release and the point of groundwater extraction. It is not expected that drawdown as a result of dewatering will be significant.

Water supply for the Project will be achieved through surface water extraction immediately upstream of the construction site in accordance with a permit acquired under the Water Act and will therefore be consistent with the EFOs of the Fitzroy WRP. Groundwater extraction is not proposed for the purpose of water supply. It is considered that drawdown as a result of the extraction of surface water will not be significant.

The construction of the Project will involve diversion of surface water within existing channels and will not require the impoundment of water within a watercourse. As surface water will be diverted within the existing channel, this activity is not expected to affect groundwater recharge.

Groundwater quality has the potential to be impacted by unsuitable storage and spillage of chemicals, fuels and waste products during construction. The potential for groundwater

contamination is negligible as mitigation measures will be implemented as per the Project EMP and construction EMP.

Construction of the Project will not directly impact groundwater infrastructure as there are no registered bores within the construction areas. There is low potential for groundwater drawdown as a result of construction the Project. As such, no indirect impacts on groundwater infrastructure (reduced availability) are expected.

The construction phase is anticipated to have very little effect on groundwater dependant ecosystems (GDEs) within the area, due to the established low potential for drawdown associated with construction of the Project.

Groundwater impacts during operations can be broadly divided into two categories:

- Upstream impacts caused by inundation of river bed and bank areas upstream of the proposed weirs:
  - While it is not expected that groundwater salinisation will occur during operations, the inundation area and immediate surrounds will be monitored to detect any instances of erosion, salinity, or other landscape instability so that any necessary remedial work can be implemented
  - No existing groundwater bores will be directly impacted as a result of raising Eden Bann Weir. A single bore will be inundated at Rookwood Weir Stage 1 and Stage 2. Consultation with the landholder will be undertaken in this regard
  - Groundwater levels are anticipated to rise locally at Eden Bann Weir and Rookwood Weir, but will remain below the river bank elevations
  - Potential GDEs dependent on the subsurface presence of groundwater include riparian vegetation dominated by *Eucalyptus camaldulensis*, *E. tereticornis* and *E. coolabah*, consistent with RE 11.3.25, RE 11.3.4 and RE 11.3.3 known from the Project area. Riparian vegetation and GDEs inundated within the bed and banks of the Fitzroy, Mackenzie and Dawson rivers will be subject to dieback. The increase in inundation and localised rise in the groundwater table in the immediate vicinity of the river channel may lead to waterlogging of the root zone of the riparian area outside of the inundated zone resulting in dieback.
- Downstream impacts caused by altered river flow regimes:
  - Flow in the river is the predominant mechanism for the recharge of groundwater and for the maintenance of groundwater levels and flows in the immediate vicinity of the Fitzroy River. Given that no significant differences between pre and post-development modelled flows are predicted downstream of Eden Bann Weir and Rookwood Weir, no significant reduction in the existing groundwater levels or in the existing recharge to groundwater provided by the Fitzroy River channel downstream of the structures is anticipated
  - The potential for a reduction in groundwater levels at existing registered bores located downstream of the weirs as a result of the Project is considered negligible
  - It is demonstrated that environmental flows will be maintained and no significant reduction in the existing groundwater levels or in the existing recharge to groundwater provided by the Fitzroy River channel downstream of Eden Bann Weir or Rookwood Weir is anticipated. No significant impacts to potential GDEs downstream of either structure are therefore anticipated.

## E3.8 Water quality

Desktop assessments were undertaken to determine general surface water quality characteristics and potential impacts on surface water quality as a result of the Project. As the largest catchment flowing to the eastern coast of Australia, the Fitzroy Basin has a large agricultural production base, accounting for almost 90 per cent of land use in the Basin area. These activities, combined with point source inputs from mining operations, reduced or altered flows from weirs and the natural climatic variability of the region, have the potential to affect water quality in the lower Fitzroy, Dawson and Mackenzie rivers.

Construction activities may create short-term, localised impacts on water quality, such as erosion, run-off and sedimentation and have the potential to introduce pollutants (hydrocarbons) through inadvertent spillage. However, the quantum of this impact on areas downstream of the Project is expected to be minimal. Potential impacts will be minimised by undertaking in-stream works during drier periods and sequencing works to account for periods of high flows and rainfall events. Management and mitigation measures are described in the Project EMP and will be developed further in the construction EMP.

In terms of operational impacts, it is evident from existing conditions that water quality in the Project area is heavily influenced by anthropogenic factors in the catchment area and these existing impacts on water quality will persist. Existing turbidity levels within the Fitzroy, Dawson and Mackenzie rivers are greater than water quality objectives as a result of sediment entering the waterways from runoff and erosion. The Project operation is not expected to alter the sediment load within the system, and apart from local areas of lower velocity around weir structures such as intakes, the weirs are expected to provide unimpeded transfer of sediment downstream.

Prior to the first fill, it is not intended to clear vegetation from within the watercourse. Consequently that vegetation will decay over time releasing methane, carbon dioxide and nutrients and reducing dissolved oxygen (DO) levels in the water column. While localised short-term increases in nutrient levels, as well as increased turbidity and reduced DO are expected to occur, wet season in-flows, overtopping of the spillway, operational releases and releases through fishways and outlet works will dilute and flush nutrients and materials within and from the impoundment. Maintaining vegetation in the impoundment areas of the weirs will limit subsequent bank erosion and sediment transfer downstream in the short-term. As a consequence, effects on downstream water quality are expected to be minor in the initial operational phase and it is not expected that elevated levels will persist for extended durations.

Stratification of the impounded water bodies will be impeded by the continued drawdown of water over a period of approximately eight months every year, thus reducing time at depth. Differential (multi-level) offtakes will facilitate selective water release through outlet works, improving the DO (together with mediating temperature) to achieve water quality objectives. Existing storages in the Fitzroy Basin exhibit minimal stratification and this outcome is expected to be the case for the Project. The potential for blue green algae blooms to occur within the impoundments is considered to be low. A water quality monitoring program including pre, during and post construction will be implemented and monitoring of blue green algae will be conducted.

### E3.9 Air quality

The Project areas are remote and rural in nature with land use dominated by broad scale clearing to support cattle grazing. Community receptors potentially sensitive to elevated dust levels during construction have been identified at Eden Bann Weir, Glenroy Crossing, Riverslea Crossing and Gogango. During construction, localised dust impacts are anticipated in proximity to each weir site, river crossings and along access roads. Management and mitigation measures are proposed and incorporated into the Project EMP (and subsequent construction EMP) to minimise these impacts and achieve air quality objectives. Potential operational impacts associated with the Project are likely to be negligible.

### E3.10 Greenhouse gas emissions

A greenhouse gas assessment was undertaken to calculate the predicted emissions of greenhouse gases associated with the design, construction and operational stages of the Project, and to propose strategies for reducing emissions.

Based on the predicted emissions during construction and operation (largely as a result of fuel and electricity usage), it is not expected that the Project will trigger national greenhouse gas reporting thresholds.

### E3.11 Noise and vibration

Community receptors potentially affected by elevated noise and vibration have been identified in proximity to the weir construction areas, river crossings, the Eden Bann Weir access road and at Gogango.

It is likely that construction work noise levels will be audible at times at sensitive receptors but not cause significant nuisance. Noise from piling activities associated with bridge construction will be intermittent and occur over short durations and will be restricted to daytime hours. The Project construction is not expected to generate low frequency noise emissions. Identified sensitive receptors are not expected to be adversely impacted as a result of the vibration levels from construction activities. Minor blasting activity may be required at the proposed Rookwood Weir construction site. Blasting is not expected to take place at Eden Bann Weir. The nearest sensitive receptor is approximately 3 km west. Estimated air blast over pressure and ground vibration at this location will be within the adopted guideline levels.

It is unlikely that adverse noise and vibration impacts on native fauna and livestock will arise as a result of the Project. Construction noise and vibration impacts will be localised, intermittent and/or of short duration, and as far as practicable will be confined to daylight hours.

### E3.12 Waste

Waste will be generated during the construction and operation of the Project. The waste management hierarchy for the Project follows a framework for prioritising waste management practices to achieve the best environmental outcomes possible. The management of waste streams associated with the Project would be undertaken in accordance with the Waste Management Plan. It is expected that the Project generated waste would be able to be managed at a suitably located off-site waste disposal and recycling facility managed by the Rockhampton Regional Council, or by a licensed waste contractor as appropriate depending on the waste type. Based on the management measures proposed for the Project, it is unlikely that the waste

generated during the construction and operational phases of the Project will have a significant impact.

### E3.13 Transport

The existing roads in the Project area comprise largely local (council) roads with some private access tracks. State-controlled highways border the Project area to the north/north-east (Bruce Highway (Rd 10F)) and south/south-west (Capricorn Highway (Rd 16A)). The state-controlled road, namely the Duaringa-Apis Creek Road (Rd 5101) borders the western extent of the Project area.

Local roads comprise a combination of bitumen sealed and unsealed gravel roads. In general few existing local roads would meet the 80 km/h design speed limit and are more suited to a 60 km/h speed limit. The flood immunity of the roads is generally poor and culverts and bridges are subject to frequent flooding.

Access from the Bruce Highway and Capricorn Highway to Eden Bann Weir and the proposed Rookwood Weir site, respectively, will be via the following local roads:

- Eden Bann Weir (existing access): Atkinson Road, Mona Vale Road and Eden Bann Road
- Rookwood Weir site: Third Street (at Gogango), Riverslea Road and Thirsty Creek Road. Two electrified tracks of the Aurizon Blackwater rail system traverse Third Street/Riverslea Road at Gogango.

A new 12 km access route is proposed to the southern bank of Eden Bann Weir. This route leads out of Rockhampton via the state-controlled Rockhampton-Ridgelands Road (Rd 511) for the first 29 km and then onto Ridgelands Road (a local RRC road). The new access is required to intersect with the local Ridgelands Road section to access the weir site.

The location and layout of the Gogango rail crossing is not anticipated to impact on Project construction activities and nor are Project construction activities expected to impact on operation of the rail system. Discussions will be held with Aurizon and the Department of Transport and Main Roads (DTMR) to inform the development of appropriate management plans (as applicable) for use of the crossing, including provision of dilapidation surveys and repair, maintenance and reinstatement requirements.

Construction generated traffic will overlap with school transport services on state-controlled roads but, given the current capacity of these roads, are not expected to impact on the operations of these services. A road use management plan (and where necessary site specific management plans, for example at Gogango) will be developed in consultation with DTMR, the Queensland Police Service and bus operators and appropriate notifications provided.

New bridges will be constructed as part of the Project at Glenroy Crossing, Riverslea Crossing and Foleyvale Crossing. Flood immunity will be improved and the road network maintained. A bank of culverts and a causeway will be installed at Hanrahan Crossing to facilitate access during water releases from Rookwood Weir. Upgrading of Thirsty Creek Road will be undertaken to facilitate construction access and maintain operational access to Rookwood Weir.

The traffic impact assessment undertaken for the state-controlled Atkinson Road / Bruce Highway and Third Street / Capricorn Highway intersections concluded the following in regard to the potential impact of the Project construction phase:

- Traffic operation on the Bruce Highway and Capricorn Highway approaches will not be significantly impacted by the Project (less than five per cent of Annual Average Daily Traffic (AADT)
- The impact of heavy vehicle movement on traffic operation of the Bruce and Capricorn highway approaches will be minimal (less than five per cent of Equivalent Standard Axle (ESA)) and pavement impact assessments are not required
- Traffic operations on the Atkinson Road and Third Street approaches will be impacted (more than five per cent of AADT), with the impact of heavy vehicle movement on traffic operations considered significant (more than five per cent of ESA). Pavement impact assessments will be undertaken, along with road safety audits during detailed design. Traffic management measures will be implemented
- Dilapidation surveys will be undertaken at the Atkinson Road/Bruce Highway and Third Street/Capricorn Highway intersections prior to construction and provided to DTMR, RRC and LSC. The intersections will be restored to original condition post-construction
- Intersection upgrades are required to adequately accommodate Project traffic during the construction phase at the Bruce Highway/Atkinson Road and Capricorn Highway/Third Street intersections.

Traffic generated as a result of construction of Eden Bann Weir will increase the use of the existing access route to the left bank (northern bank) of Eden Bann Weir intermittently and for short periods. A new access road will be constructed to the right bank (southern bank) off Ridgelands Road. Given the current low usage it is not expected that construction activities will impact on the operation of these roads.

Access to Rookwood Weir will be maintained via Thirsty Creek, Riverslea Road and Third Street (at Gogango) off the Capricorn Highway. Thirsty Creek Road will require upgrading at low areas (primarily watercourse crossings).

The impact of traffic generated during the operation phase of the Project is expected to be minimal and comprises largely traffic movements consisting of operations personnel in utility vehicles associated with maintenance activities.

During detailed design, refinement of the Project activities will be facilitated through updating traffic counts, undertaking pavement impact assessments and road safety audits and developing site specific traffic management plans. A road use management plan will be developed in consultation with DTMR, RRC and LSC governing upgrades, use, maintenance and restoration (as applicable) of these roads, along with identification of transport targets, updated traffic generation and road-use data and road-use management strategies.

## E3.14 Cultural heritage

### E3.14.1. Indigenous cultural heritage

Desktop database searches and preliminary field surveys were undertaken to identify the presence of areas and objects that may be impacted by the Project, in consultation with Aboriginal parties. Desktop searches have identified 28 places (largely stone artefacts) within the buffered area for Eden Bann Weir listed on the Queensland cultural heritage database and register. Field survey results have identified locations that possess a range of cultural places and values that constitute Aboriginal cultural heritage as defined in the ACH Act. These areas and

objects include stone artefact scatters, shell middens, and scarred trees as well as places of traditional significance.

Activities associated with the proposed Project have the potential to disturb identified Aboriginal cultural heritage that lies within the areas where infrastructure is to be constructed or that will be inundated. GAWB and SunWater are committed to ensuring all practical measures are taken to avoid impacts on Indigenous cultural heritage.

CHMPs have been prepared in consultation with Aboriginal endorsed parties and approved by State Government, providing management and mitigation measures to protect Indigenous cultural heritage values. GAWB and SunWater are committed to the implementation of these CHMPs and protection of Indigenous cultural heritage values.

### E3.14.2. Non-Indigenous cultural heritage

Desktop searches revealed no places of non-Indigenous cultural heritage significance in close proximity to the Project footprint.

As the Fitzroy River is subject to regular flooding, there are few structures of non-Indigenous cultural heritage located on or near the lower Fitzroy River. Searches and surveys did not identify any items of non-Indigenous cultural heritage that would be impacted by the Project. Management and mitigation measures in the event of an unexpected find of cultural heritage value during the construction program are provided in the Project EMP.

## E3.15 Social impact

Settlement in the area in proximity to the Project is sparse and scattered. Landholdings comprise a mix of owner-occupied homesteads and non-resident landholders residing elsewhere in the region (e.g. Rockhampton and Yeppoon) yet travel regularly to their properties. There is a mix of household types throughout the local study area, varying from single to family households.

Apart from basic infrastructure and services such as utilities, roads and crossings, and police services and primary schools further afield, there are no community services or facilities available in the local study area. The roads and crossings over the Fitzroy, Mackenzie and Dawson rivers are particularly important to the local community, as they provide the only direct access to Rockhampton for many residents. Residents in the local study area regularly travel to Rockhampton to access services.

The Project will result in both positive and negative social impacts. These impacts will be largely similar for both sites. The most significant potential benefit of the Project will be the increase in availability and reliability of water for regional users. The Project will facilitate and enable development in the region, thus benefitting the regional, state and national economies. Locally, the Project will increase business and employment opportunities.

Consultation with landholders and local community members has revealed widespread expectations of benefits from the proposed Project to flow to the local community. These include aspirations for additional water entitlements and expectations that river crossings will be improved. While these aspirations in themselves do not constitute an impact, the way in which they are addressed by the Project will potentially affect the local community's perception about the Project and its proponents, either positively or negatively depending on whether the Project meets their expectations or not.

During construction, there will be some local amenity issues due to increases to traffic volumes near the weir sites, at river crossings and along construction access roads, particularly during mobilisation and demobilisation. Increased traffic volumes may also increase the risk of accidents involving single vehicles, other road users or livestock. Effective implementation of the Project EMP and construction EMP will ensure management of these issues.

In addition the Project will develop a stakeholder engagement plan, a land acquisition strategy and compensation strategy, a land access protocol, a construction management plan (including workforce requirements, a strategy for participation by Indigenous and minority groups and a recruitment plan) and a procurement plan (including policy specifying the preference for local businesses to service the Project).

### E3.16 Economics

The economic assessment identified that the primary benefit of the Project is an increase in the availability of high priority (high reliability) water. Other benefits include the reduced need for water management and contingency strategies due to periods of supply shortfall and an increase in employment and use of local suppliers during construction. The benefit cost analysis found that all the Project development stages that were considered provide a net gain to society. The benefit cost analysis includes costs associated with management, mitigation and offsetting environmental impacts associated with the Project.

An analysis against the core objectives and principles of ecologically sustainable development (ESD) demonstrates that the Proponents have incorporated sustainability considerations throughout planning and design phases and are committed to incorporating sustainability considerations in construction, operation and decommissioning of the Project. An iterative planning approach has been taken to the design and development of the Project, integrating both environmental and social considerations into decision making for the Project and supporting the objectives of ESD.

### E3.17 Hazard and risk

A preliminary risk assessment has been carried out for all components of the Project in accordance with the *AS/NZS ISO 31000: 2009 Risk management – Principles and guidelines* and with a number of legislations, standards and guidelines applicable to the Project. Hazard identification has focused on non-routine events that may result in impacts on people, property or the environment.

Based on the failure impact assessment studies for the weirs, a raised Eden Bann Weir is considered to be a referrable dam and will be separately assessed in accordance with the provisions under the *Water Supply (Safety and Reliability) Act 2008* (Qld) during the detailed design phase. Although the proposed Rookwood Weir has not been designated as a referrable dam, it will be designed to the same safety standards as the Eden Bann Weir.

Risk mitigation measures have been incorporated into Project design through the Safety in Design process. The Proponent will establish health and safety management systems which will be implemented for the Project. Preventative measures will also be implemented through workplace procedures and training.

## E3.18 Cumulative impacts

A cumulative impact assessment has been undertaken to identify the potential cumulative impacts upon existing environmental values as a result of constructing and operating the Project in conjunction with construction and/or operation of other proposed projects within relevant study areas. Current pressures on the Fitzroy Basin catchment include land degradation, habitat disturbance and alteration, and impacts to water quality resulting primarily from agricultural and mining activities.

The assessment of the Project's contribution to cumulative impacts takes into consideration the relative size, scale, proximity and nature of the Project in relation to other existing and potential development activities. Due to the localised and short term nature of the Project's construction impacts and the absence of other proposed projects within the vicinity of the Project footprint, the Project's contribution to cumulative impacts will mostly occur during the operational phase or as a result of impoundment. Through the assessment, it was determined that there is the potential for the Project to contribute to the cumulative impacts as follows:

- Cumulative loss of remnant vegetation within the bio-subregion study
- Cumulative loss/alteration of aquatic habitat within the catchment study area including the loss of turtle nesting habitat and the conversion of riffle-run habitat to impounded habitat
- Cumulative risk of injury and mortality to aquatic fauna from the operation of water infrastructure within the catchment. The cumulative impact is considered insignificant with mitigation and management measures in place
- Cumulative impact on aquatic fauna movement in the catchment. Inclusion of fish locks as mitigation will minimise this overall impact
- Cumulative impacts on the Fitzroy River turtle based on the proportion of impact and having regard to proposed turtle passage infrastructure and offsets actions.

In order to minimise its contribution to cumulative impacts, the Project has sought to avoid, mitigate, manage and where necessary offset impacts associated with Project activities. With the implementation of mitigation and management measures, the Project will not result in cumulative impacts on landholders and rural land use practices, the local community including Gogango as well as aquatic and terrestrial ecology. Potential cumulative Project impacts will be avoided, mitigated and managed through the measures implemented for individual impacts.

The Project would also contribute to cumulative economic benefits through the provision of water infrastructure that will support primarily community and industry growth, along with some agricultural development, and improve the security of water supply for existing water resource users.

### E3.19 Offsets

Based on the requirements of the *Environmental Offsets Act 2014* (Qld) (EO Act) and consistent with the Commonwealth Matters of National Environmental Significance: Significant Impact Guidelines 1.1(DoE 2013) a significant residual impact has been identified for the Fitzroy River turtle as a prescribed environmental matter for which offsets have been proposed.

The proposed offsets for Fitzroy River turtle nesting habitat have been developed to meet the offset requirements of the EPBC Act on the basis that a condition for an offset imposed under that authority will satisfy the requirements for offsets under the EO Act. A financial settlement offset is proposed for the Project's residual impacts to Fitzroy River turtle aquatic habitat under the EO Act.

Whilst impact to a second matter, namely regulated vegetation under the *Vegetation Management Act 1999* (Qld), will occur, the prescribed activity is exempt and an authority is not required. As such a condition requiring an offset cannot be applied under the EO Act in this regard.

## E4. Environmental management

An EMP has been developed for the Project, addressing the environmental management commitments for the construction and operational phase of the Project.

The EMP has been developed to:

- Build on the commitments to environmental performance made in the Project EIS
- Provide a framework to protect the environmental values potentially affected by the Project
- Set out environmental management obligations for environmental authorities and permits to assist the authorities when developing project approvals.

The EMP will be developed in more detail and as a standalone document as the Project progresses into detailed design, construction and operation. A construction EMP and operation EMP will be developed and implemented based on this EMP.

## E5. Conclusion and recommendations

The outcomes of specialist studies, community consultation and stakeholder engagement, along with regulatory requirements, codes and guidelines all form the framework for development of the Project commitments made by GAWB and SunWater. These commitments range from broad social, cultural and economic commitments, through to measures required to protect environmental values specific to the Project area. They include further investigations, field work and monitoring required at various stages of the Project. These documented commitments are a part of an ongoing strategy to meet EIS obligations.

The EMP presents a range of management and mitigation measures to be implemented during construction and operation of the Project.

Based on the findings of the EIS and given implementation of the EMP and offsets strategy, it is considered that the Project can be undertaken without unacceptable social, environmental or cultural impacts. The Project also presents a range of opportunities and positive benefits to regional, State and national economies.