

Table of contents

Executive summary	
E.1	Description of the action..... E-1
E.1.1	Project proponents and environmental record E-1
E.1.2	Project rationale E-1
E.1.3	Relationships to other projects..... E-4
E.1.4	Project alternatives E-4
E.1.5	Regulatory framework and environmental impact assessment process E-6
E.1.6	Consultation..... E-8
E.2	Project description..... E-10
E.3	Existing environment E-16
E.3.1	Local climate and seasonal conditions E-16
E.3.2	Land use and land tenure E-16
E.3.3	Air quality E-17
E.3.4	Surface water resources E-17
E.3.5	Water quality..... E-18
E.3.6	Threatened species and ecological communities E-18
E.3.7	Downstream threatened, migratory and marine species E-20
E.3.8	World Heritage and National Heritage places E-21
E.3.9	Socio-economic environment..... E-23
E.3.10	Cultural heritage E-24
E.4	Potential impacts, protection measures, safeguards and offsets E-24
E.4.1	General impacts E-24
E.4.2	World Heritage properties and National Heritage places E-29
E.4.3	Threatened species and ecological communities E-30
E.4.4	Downstream threatened, migratory and marine species..... E-31
E.4.5	Cumulative and consequential E-32
E.4.6	Environmental management..... E-33
E.5	Conclusions and recommendations..... E-34
1.	Description of the action
1.1	Overview 1-1
1.2	Project proponent..... 1-1
1.2.1	GAWB 1-1
1.2.2	SunWater..... 1-2
1.2.3	Environmental record..... 1-3
1.3	Project description..... 1-3
1.4	Project rationale..... 1-4
1.4.1	Strategic and economic justification..... 1-4

1.4.2	Technical feasibility and commercial drivers	1-7
1.5	Relationships to other projects	1-10
1.5.1	Existing Eden Bann Weir	1-10
1.5.2	Fitzroy Barrage.....	1-10
1.5.3	Gladstone-Fitzroy pipeline project	1-10
1.6	Environmental impact assessment process	1-11
1.6.1	Legislative basis of the EIS	1-11
1.6.2	Objectives of the draft EIS.....	1-18
1.6.3	Methodology of the EIS	1-19
1.6.4	Submissions	1-21
1.7	National Strategy for Ecologically Sustainable Development	1-22
2.	Project description	
2.1	Overview of the Project	2-1
2.2	Project location.....	2-4
2.2.1	Eden Bann Weir Project footprint	2-4
2.2.2	Rookwood Weir Project footprint	2-9
2.2.3	Downstream areas.....	2-15
2.3	Design of water resources infrastructure.....	2-15
2.3.1	Water storage infrastructure.....	2-15
2.3.1.1	Basis of design.....	2-15
2.3.1.2	Development of preliminary construction methodologies and cost estimates	2-15
2.3.1.3	Eden Bann Weir design	2-16
2.3.1.4	Rookwood Weir design.....	2-24
2.3.1.5	Aquatic fauna passage	2-29
2.3.2	Water distribution infrastructure	2-30
2.3.3	Other project specific infrastructure and services	2-30
2.3.3.1	Access roads	2-30
2.3.3.2	River crossings.....	2-31
2.3.3.3	Gauging stations and monitoring weirs.....	2-33
2.3.3.4	Site facilities.....	2-33
2.3.3.5	Power supply infrastructure	2-33
2.3.3.6	Telecommunications infrastructure	2-34
2.3.3.7	Resource extraction areas.....	2-34
2.4	Construction phase	2-38
2.4.1	Overview	2-38
2.4.1.1	Construction areas.....	2-38
2.4.1.2	Workforce and accommodation.....	2-43
2.4.2	Pre-construction activities	2-43
2.4.3	Construction	2-44
2.4.3.1	General activities	2-44

2.4.3.2	Construction inputs, handling and storage	2-45
2.4.3.3	Hazardous materials	2-47
2.4.3.4	Water supply.....	2-47
2.4.3.5	Restoration of temporary construction areas	2-48
2.4.4	Construction methodology and work sequence.....	2-48
2.4.4.1	Weirs	2-48
2.4.4.2	Diversion strategies.....	2-59
2.4.4.3	River crossings.....	2-60
2.4.5	Commissioning.....	2-61
2.5	Operation phase	2-61
2.5.1	Overview	2-61
2.5.2	Drawdown strategy and flow releases.....	2-61
2.5.3	Flap gate operation strategy.....	2-63
2.5.4	Fishway operation.....	2-64
2.5.5	Control systems	2-64
2.5.6	Maintenance.....	2-64
2.6	Decommissioning and rehabilitation.....	2-65
3.	Planning and approvals	
3.1	Overview	3-1
3.2	Overarching approvals	3-1
3.3	Water management legislation.....	3-2
3.4	International conventions and treaties	3-3
3.5	Water Quality Guidelines for the Great Barrier Reef Marine Park.....	3-3
3.6	National Water Quality Management Strategy	3-4
3.7	National Environmental Protection Measures.....	3-5
3.8	Offset policy.....	3-5
3.9	Other approvals.....	3-6
3.10	Summary of relevant Commonwealth and State legislation.....	3-6
3.11	Regional plans.....	3-10
3.11.1	Central Queensland Regional Water Supply Strategy	3-10
3.11.2	Central Queensland Regional Plan	3-11
3.12	Local planning schemes.....	3-11
3.12.1	Overview	3-11
3.12.2	Fitzroy Shire Planning Scheme 2005.....	3-12
3.12.3	Livingstone Shire Planning Scheme 2005.....	3-12
3.12.4	Duaringa Shire Planning Scheme 2007	3-13
3.12.5	Woorabinda Aboriginal Shire Planning Scheme 2014	3-13
3.13	Local laws.....	3-14
4.	Consultation	
4.1	Overview	4-1

4.2	Public consultation	4-1
4.2.1	Consultation approach.....	4-1
4.2.2	Aim and objectives.....	4-1
4.2.3	Integration of consultation program into Project EIS	4-2
4.3	Stakeholder identification and involvement	4-4
4.3.1	Project stakeholders.....	4-4
4.3.2	Consultation activities and communication tools	4-5
4.3.2.1	Overview	4-5
4.3.2.2	Landholder communications	4-5
4.3.2.3	Project newsletters and updates.....	4-6
4.3.2.4	Government agency briefing and meetings	4-6
4.3.2.5	Community information sessions.....	4-6
4.3.2.6	Project contacts.....	4-6
4.3.2.7	Project website.....	4-6
4.3.2.8	Advertising.....	4-6
4.3.2.9	Feedback form	4-9
4.3.2.10	Stakeholder database	4-9
4.4	Consultation outcomes.....	4-9
4.5	Future consultation with stakeholders.....	4-11
4.5.1	Consultation on the EIS	4-11
4.5.2	Consultation following completion of EIS	4-11
4.5.2.1	Stakeholder engagement plan	4-11
5.	Alternatives to the Project	
5.1	Overview	5-1
5.2	Fitzroy Barrage.....	5-1
5.3	GAWB second water source options	5-2
5.4	Water storage infrastructure.....	5-2
5.5	Non-infrastructure options	5-3
5.6	No development option.....	5-3
6.	Methodology for the assessment of impacts on matters of national environmental significance	
6.1	Overview	6-1
6.2	Migratory species, threatened species and ecological communities	6-1
6.2.1	Overview	6-1
6.2.2	Identification of relevant species and ecological communities	6-1
6.2.2.1	Overview	6-1
6.2.2.2	Desktop assessment.....	6-2
6.2.2.3	Nomenclature.....	6-4
6.2.3	Field surveys	6-4
6.2.3.1	Overview	6-4
6.2.3.2	Flora survey	6-5

6.2.3.3	Aquatic habitat and fauna surveys	6-8
6.2.3.4	Terrestrial habitat and fauna surveys	6-17
6.2.4	Future studies and surveys	6-28
6.2.5	Likelihood of occurrence determination	6-28
6.2.6	Impact assessment methodology	6-30
6.2.6.1	Significant impact guidelines.....	6-30
6.3	Surface water flows and water quality.....	6-31
6.3.1	Overview	6-31
6.3.2	Stream flow hydrology.....	6-32
6.3.3	Integrated Quantity Quality Model	6-33
6.3.4	Water quality data analysis.....	6-34
6.3.4.1	Desktop assessment.....	6-34
6.3.4.2	Data analysis	6-35
6.3.4.3	Potential nutrient loads	6-36
6.4	Social impact assessment.....	6-37
6.5	Cumulative and consequential impacts.....	6-38
7.	Existing environment	
7.1	Overview	7-1
7.2	Local climate and seasonal conditions.....	7-1
7.3	Extreme environmental events.....	7-4
7.3.1	Floods	7-4
7.3.2	Tropical cyclones.....	7-6
7.3.3	Severe storms.....	7-7
7.3.4	Drought.....	7-7
7.3.5	Extreme temperatures.....	7-8
7.3.6	Bushfires.....	7-8
7.3.7	Seismic activity.....	7-8
7.4	Air quality.....	7-10
7.5	Surface water.....	7-11
7.5.1	Catchment and sub-catchment characteristics	7-11
7.5.2	Historic and current flow regimes	7-14
7.5.3	Water quality.....	7-23
7.5.3.1	Overview	7-23
7.5.3.2	Fitzroy River at The Gap.....	7-24
7.5.3.3	Fitzroy River at Riverslea	7-28
7.5.3.4	Lower Dawson River	7-29
7.5.3.5	Lower Mackenzie River.....	7-31
7.6	Land use and planning.....	7-32
7.6.1	Planning schemes	7-32
7.6.2	Land use.....	7-34

7.7	Reserves, protected and sensitive environmental areas	7-37
7.8	Terrestrial ecology.....	7-39
7.8.1	Regional context.....	7-39
7.8.2	Flora values.....	7-39
7.8.3	Terrestrial habitats.....	7-52
7.8.4	Terrestrial fauna.....	7-56
7.8.5	Biodiversity and connectivity.....	7-56
7.9	Aquatic ecology	7-68
7.9.1	Aquatic habitats.....	7-68
7.9.2	Aquatic fauna.....	7-72
7.10	Downstream environment.....	7-73
7.10.1	Overview	7-73
7.10.2	Freshwater habitat	7-73
7.10.3	Estuarine and marine habitat	7-74
7.10.4	Great Barrier Reef World Heritage Area.....	7-76
7.10.4.1	Overview.....	7-76
7.10.4.2	Water quality	7-77
7.11	Socio-economics.....	7-79
7.11.1	Local community profile.....	7-79
7.11.2	Social infrastructure, services and facilities	7-79
7.11.2.1	Local study area.....	7-79
7.11.2.2	Regional study area.....	7-80
7.12	Cultural heritage	7-80
7.12.1	Indigenous cultural heritage.....	7-80
7.12.2	Non-Indigenous cultural heritage.....	7-81
8.	General impacts	
8.1	Overview	8-1
8.2	River morphology and stream flow hydrology.....	8-1
8.2.1	Disruption and diversion of flows during construction.....	8-1
8.2.2	Altered stream flow patterns.....	8-2
8.2.3	Altered flood flow regimes.....	8-5
8.2.4	Changes to river morphology (fluvial processes).....	8-5
8.3	Water quality	8-9
8.3.1	Construction phase.....	8-9
8.3.2	Operations phase.....	8-10
8.3.2.1	Initial filling phase	8-10
8.3.2.2	Normal operations phase.....	8-14
8.4	Terrestrial ecology.....	8-16
8.4.1	Impacts on terrestrial flora.....	8-16
8.4.2	Impacts on terrestrial fauna.....	8-18

8.4.2.1	Overview	8-18
8.4.2.2	Individual fauna injury and mortality	8-19
8.4.2.3	Disruption to behaviour of localised wildlife assemblages.....	8-20
8.4.2.4	Loss of terrestrial habitat due to clearing.....	8-20
8.4.2.5	Loss of terrestrial habitats due to impoundment.....	8-21
8.4.2.6	Fragmentation of riparian habitat.....	8-23
8.4.2.7	Degradation of habitat	8-24
8.4.2.8	Encroachment of feral species	8-25
8.5	Aquatic ecology	8-25
8.5.1	Loss of aquatic habitat.....	8-25
8.5.2	Alteration of aquatic habitats	8-26
8.5.3	Inundation of turtle nesting habitat.....	8-28
8.5.4	Habitat degradation.....	8-29
8.5.5	Changes to downstream flow regime.....	8-31
8.5.6	Fauna injury and mortality.....	8-33
8.5.7	Restriction of movement	8-34
8.6	Marine ecology	8-36
8.7	Extreme environmental events	8-36
8.7.1	Flooding.....	8-36
8.7.2	Tropical cyclones.....	8-37
8.7.3	Severe storms.....	8-37
8.7.4	Extreme temperatures.....	8-37
8.7.5	Bushfires.....	8-37
8.7.6	Earthquakes and landslides	8-38
8.8	Hazardous substances.....	8-38
8.9	Weed and pest species.....	8-41
8.10	Socio-economics.....	8-43
8.11	Decommissioning.....	8-45
9.	World Heritage properties and National Heritage places	
9.1	Overview	9-1
9.2	World Heritage properties.....	9-1
9.2.1	Description of the Great Barrier Reef World Heritage Area.....	9-1
9.2.2	Potential indirect impacts	9-4
9.2.2.1	Surface water flows.....	9-4
9.2.2.2	Water quality.....	9-4
9.2.2.3	Aquatic ecosystems	9-6
9.2.3	Assessment of significance.....	9-6
9.3	National Heritage places	9-9
9.3.1	Description of the National Heritage listing.....	9-9
9.3.2	Potential indirect impacts	9-10

9.3.3	Assessment of significance	9-10
9.4	Summary	9-10
10.	Threatened species and ecological communities	
10.1	Overview	10-1
10.2	Approach and methodology	10-2
10.3	Threatened ecological communities	10-2
10.3.1	Ecological communities predicted to occur	10-2
10.3.2	Likelihood of occurrence.....	10-3
10.3.3	Potential impacts.....	10-16
10.4	Critically endangered and endangered species.....	10-18
10.4.1	Species predicted to occur.....	10-18
10.4.2	Likelihood of occurrence.....	10-18
10.4.3	Potential impacts.....	10-22
10.5	Vulnerable species.....	10-22
10.5.1	Species predicted to occur.....	10-22
10.5.2	Likelihood of occurrence.....	10-23
10.5.3	Potential impacts.....	10-37
10.5.3.1	Squatter pigeon (southern)	10-37
10.5.3.2	Black ironbox.....	10-39
10.5.3.3	Fitzroy River turtle	10-41
10.6	Downstream threatened species.....	10-47
10.6.1	Species predicted to occur.....	10-47
10.6.2	Potential downstream impacts.....	10-49
10.6.2.1	General.....	10-49
10.6.2.2	Yellow chat (Dawson)	10-50
10.6.2.3	Fitzroy River turtle	10-53
10.7	Summary	10-53
11.	Migratory and marine species	
11.1	Overview	11-1
11.2	Approach and methodology	11-1
11.3	Listed migratory species within the Project footprint.....	11-2
11.3.1	Species predicted to occur.....	11-2
11.3.2	Likelihood of occurrence.....	11-3
11.3.3	Potential impacts on listed migratory species within the Project footprint.....	11-6
11.3.3.1	Overview.....	11-6
11.3.3.2	Migratory birds.....	11-6
11.3.3.3	Migratory marine species.....	11-7
11.4	Downstream migratory species	11-7
11.4.1	Species predicted to occur.....	11-7
11.4.2	Potential impacts on downstream migratory species.....	11-10

11.5	Marine species	11-16
11.5.1	Species predicted to occur.....	11-16
11.5.2	Potential impacts on marine species	11-18
11.6	Summary.....	11-19
12.	Cumulative and consequential impacts	
12.1	Introduction.....	12-1
12.1.1	Overview	12-1
12.1.2	Objective	12-1
12.2	Existing pressures.....	12-1
12.2.1	Catchment pressures.....	12-1
12.2.2	Bio-subregion pressures.....	12-5
12.3	Cumulative impacts	12-5
12.3.1	Overview	12-5
12.3.2	Proposed developments within the Fitzroy Basin catchment	12-5
12.3.3	Potential cumulative impacts on MNES.....	12-10
12.3.3.1	World Heritage properties and National Heritage places	12-10
12.3.3.2	Listed threatened, migratory and marine species and ecological communities ..	12-13
12.4	Consequential impacts.....	12-18
12.4.1	Overview	12-18
12.4.2	Potential consequential developments within the region.....	12-19
12.4.2.1	Industrial development	12-19
12.4.2.2	Residential development	12-20
12.4.2.3	Agricultural development	12-20
12.4.3	Potential consequential impacts on MNES.....	12-21
12.4.3.1	World Heritage Properties and National Heritage Places	12-22
12.4.3.2	Listed threatened, migratory and marine species and ecological communities ..	12-28
12.5	Summary.....	12-32
13.	Environmental management system	
13.1	Environmental management approach	13-1
13.2	Environmental management framework.....	13-1
13.2.1	Environment and sustainability policies.....	13-1
13.2.2	Legislation and compliance.....	13-2
13.2.3	Training, competence and induction.....	13-2
13.2.3.1	Overview.....	13-2
13.2.3.2	Awareness inductions	13-2
13.2.3.3	Tool box talks.....	13-3
13.2.3.4	Training needs assessment.....	13-3
13.2.4	Consultation.....	13-3
13.2.5	Documentation, document control and records	13-5
13.2.6	Environmental reporting.....	13-5

13.2.6.1	Internal	13-5
13.2.6.2	External	13-6
13.2.6.3	Document control.....	13-6
13.2.7	Environmental auditing.....	13-6
13.2.8	Review and continuous improvement	13-7
13.2.9	Emergency contingency plans.....	13-7
13.3	Environmental management plan.....	13-8
13.3.1	Construction management plans	13-11
13.3.1.1	Soil Management Programme.....	13-11
13.3.1.2	Contaminated Land Management Programme	13-14
13.3.1.3	Nature Conservation Management Programme.....	13-14
13.3.1.4	Water Management Programme.....	13-19
13.3.1.5	Air Management Programme	13-21
13.3.1.6	Greenhouse Gas Emissions Management Programme	13-23
13.3.1.7	Noise and Vibration Management Programme	13-24
13.3.1.8	Waste Management Programme	13-27
13.3.1.9	Road use and Traffic Management Programme.....	13-29
13.3.1.10	Cultural Heritage Management Programme	13-30
13.3.1.11	Community Management Programme	13-31
13.3.1.12	Hazardous Material Management Programme	13-32
13.3.1.13	Emergency Management Programme.....	13-35
13.3.2	Operation management plans	13-36
13.3.2.1	Nature Conservation Management Programme.....	13-36
13.3.2.2	Water Management Programme.....	13-39
13.3.2.3	Community Management Programme	13-41
13.3.2.4	Emergency Management Programme.....	13-42
14.	Offsets	
14.1	Introduction.....	14-1
14.1.1	Overview	14-1
14.1.2	Regulatory framework.....	14-1
14.1.3	Approach and methodology	14-2
14.2	Project offset requirements	14-2
14.2.1	Overview	14-2
14.2.2	Brigalow threatened ecological community.....	14-3
14.2.3	Fitzroy River turtle.....	14-3
14.2.4	Black ironbox.....	14-4
14.3	Offset proposal.....	14-5
14.3.1	Overview	14-5
14.3.2	Brigalow threatened ecological community.....	14-5
14.3.2.1	Offset requirements	14-5

14.3.2.2	Offset availability	14-6
14.3.2.3	Further ecological surveys	14-6
14.3.2.4	Offset staging	14-6
14.3.3	Fitzroy River turtle	14-7
14.3.3.1	Overview	14-7
14.3.3.2	Impact calculator	14-7
14.3.3.3	Offset calculator	14-9
14.3.3.4	Potential offset areas	14-12
14.3.3.5	Offset management plan	14-13
14.3.3.6	Offset staging	14-15
14.3.4	Black ironbox	14-15
14.3.4.1	Impact calculator	14-15
14.3.4.2	Offset calculator	14-15
14.3.4.3	Offset management plan	14-17
14.3.4.4	Offset staging	14-17
14.4	Summary	14-17
15.	Conclusion	
15.1	Overview	15-1
15.2	Conclusions	15-1
16.	Information sources and reference list	
16.1	Description of the action	16-1
16.2	Project description	16-1
16.3	Planning and approvals	16-1
16.4	Consultation	16-2
16.5	Alternatives to the Project	16-2
16.6	Methodology	16-2
16.7	Existing environment	16-7
16.8	General impacts	16-10
16.9	World Heritage properties and National Heritage places	16-12
16.10	Listed threatened species and ecological communities	16-13
16.11	Listed migratory species	16-16
16.12	Cumulative and consequential impacts	16-18
16.13	Environmental Management System	16-20
16.14	Offsets	16-20
16.15	Conclusion	16-21

Table index

Table E-1	Draft EIS structure.....	E-6
Table E-2	Project stakeholders	E-8
Table E-3	Consultation phases	E-9
Table E-4	Brigalow TEC impacted.....	E-30
Table 1-1	Approvals Summary	1-13
Table 1-2	EIS structure	1-20
Table 1-3	Comparative analysis of the NSED core objectives.....	1-23
Table 2-1	Eden Bann Weir existing and proposed development levels.....	2-17
Table 2-2	Rookwood Weir proposed development levels.....	2-24
Table 2-3	River crossing access.....	2-31
Table 2-4	Provisional quantities of construction materials	2-35
Table 2-5	Project construction areas	2-38
Table 2-6	Construction activities.....	2-44
Table 2-7	Eden Bann Weir construction methodology and work sequence	2-49
Table 2-8	Rookwood construction methodology and work sequence	2-50
Table 2-9	Cofferdam levels and associated flood flows – Eden Bann Weir.....	2-59
Table 2-10	Gate operation opening sequence	2-63
Table 3-1	Relevant State and Commonwealth legislation	3-6
Table 3-2	Level of assessment – Fitzroy Shire.....	3-12
Table 3-3	Level of assessment – Livingstone Shire	3-13
Table 3-4	Level of assessment – Duaringa Shire.....	3-13
Table 3-5	Level of assessment – Woorabinda Aboriginal Shire Council Planning Scheme 2014	3-14
Table 4-1	EIS consultation stages and timeframes	4-3
Table 4-2	Project stakeholders	4-5
Table 4-3	Summary of newsletters and updates.....	4-7
Table 4-4	Summary of paid advertisements and public notices.....	4-9
Table 4-5	Summary of key issues raised by stakeholders.....	4-10
Table 6-1	Summary of survey effort	6-8
Table 6-2	Summary of literature reviewed and field survey effort for aquatic fauna and macrophytes	6-14
Table 6-3	Survey effort, techniques and locations – Eden Bann Weir Project footprint.....	6-20

Table 6-4	Survey effort, techniques and locations – Rookwood Weir Project footprint.....	6-21
Table 6-5	Summary of nest survey effort.....	6-22
Table 6-6	Terrestrial fauna survey sites within the Eden Bann Weir Project footprint.....	6-24
Table 6-7	Terrestrial fauna survey sites within the Rookwood Weir Project footprint.....	6-25
Table 6-8	Key to likelihood of occurrence – flora.....	6-29
Table 6-9	Key to likelihood of occurrence – fauna.....	6-30
Table 6-10	Summary of water quality datasets.....	6-34
Table 7-1	Temperature summary.....	7-3
Table 7-2	Evaporation summary.....	7-4
Table 7-3	Earthquakes resulting in MMI 3 and above.....	7-10
Table 7-4	Median values and water quality objectives for The Gap/Eden Bann Weir.....	7-25
Table 7-5	Blue green algae guideline hazard levels.....	7-28
Table 7-6	Median values and water quality objectives at Riverslea.....	7-29
Table 7-7	Median values and water quality objectives for aquatic ecosystems at Beckers.....	7-30
Table 7-8	Median values and water quality objectives for aquatic ecosystems at Coolmaringa.....	7-31
Table 7-9	Regional ecosystems within the Project footprint.....	7-40
Table 7-10	Significant weeds identified during field surveys.....	7-41
Table 7-11	Terrestrial habitat types, characteristics and values.....	7-53
Table 7-12	Terrestrial fauna species predicted to occur or recorded during field surveys.....	7-57
Table 7-13	Aquatic habitat types.....	7-69
Table 7-14	Aquatic fauna species predicted to occur or recorded during field surveys.....	7-72
Table 8-1	Flow analysis data locations.....	8-2
Table 8-2	Rates of decay for total nitrogen and total phosphorous.....	8-11
Table 8-3	Current level of impoundment in rivers relative to the Project.....	8-27
Table 8-4	Indicative list of environmentally hazardous substances.....	8-38
Table 8-5	Likely quantities, storage and transport of environmentally hazardous substances.....	8-39
Table 9-1	World Heritage values potentially indirectly impacted by the Project.....	9-7
Table 10-1	Key to likelihood of occurrence.....	10-2
Table 10-2	Threatened ecological communities predicted to occur.....	10-3
Table 10-3	Listed threatened ecological communities – likelihood of occurrence.....	10-4
Table 10-4	Significance of impact on Brigalow TEC.....	10-17
Table 10-5	Listed endangered species potentially present within or near to the Project footprint.....	10-19

Table 10-6	Listed critically endangered and endangered species - likelihood of occurrence within the Project footprint	10-20
Table 10-7	Listed vulnerable species potentially present with the Project footprint.....	10-22
Table 10-8	Listed vulnerable species - likelihood of occurrence within the Project footprint.....	10-24
Table 10-9	Significance of impact on the squatter pigeon (southern).....	10-38
Table 10-10	Significance of impact on black ironbox	10-40
Table 10-11	Potential impacts on the Fitzroy River turtle.....	10-42
Table 10-12	Significance of impact on the Fitzroy River turtle	10-43
Table 10-13	Listed threatened species predicted to occur downstream of the Project footprint.....	10-47
Table 10-14	Yellow chat (Dawson) characteristics	10-50
Table 11-1	Key to likelihood of occurrence.....	11-1
Table 11-2	Listed migratory species potentially present within or near to the Project footprint	11-2
Table 11-3	Commonwealth listed migratory species predicted to occur within and surrounding the Project footprint – likelihood of occurrence.....	11-4
Table 11-4	Listed migratory species downstream of the Project footprint	11-8
Table 11-5	Commonwealth listed migratory marine species downstream of the Project footprint – potential indirect impacts	11-11
Table 11-6	Listed marine species predicted to occur	11-16
Table 12-1	Current level of impoundment (Fitzroy, Dawson and Mackenzie rivers).....	12-4
Table 12-2	Extent of regional ecosystems within the bio-subregion study area	12-5
Table 12-3	Proposed projects	12-6
Table 12-4	Cumulative impacts on the Great Barrier Reef	12-11
Table 12-5	Project’s contribution to cumulative impacts on threatened, migratory and marine species.....	12-14
Table 12-6	Potential consequential impacts on the Great Barrier Reef	12-25
Table 12-7	Potential consequential impacts on threatened, migratory and marine species and ecological communities	12-29
Table 13-1	Project construction activities and impacts	13-9
Table 13-2	Project operation activities and potential impacts	13-10
Table 14-1	Brigalow TEC offset staging.....	14-7
Table 14-2	Impact calculator for Fitzroy River turtle.....	14-10
Table 14-3	Fitzroy River turtle offset calculator	14-10
Table 14-4	Historical, confirmed and high potential nesting sites within the Eden Bann Weir impoundment	14-13

Table 14-5 Historical, confirmed and high potential nesting sites within the Rookwood Weir impoundment 14-13

Table 14-6 Fitzroy River turtle nest habitat offset management plan..... 14-13

Table 14-7 Black ironbox impact calculator 14-16

Table 14-8 Black ironbox offset calculator 14-16

Figure index

Figure E-1 EIS consultation activities and communication tools..... E-8

Figure E-2 Project location..... E-12

Figure E-3 Eden Bann Weir construction area..... E-13

Figure E-4 Rookwood Weir construction area E-14

Figure E-5 Reserves, protected areas and sensitive environmental areas E-22

Figure 1-1 Project location..... 1-5

Figure 2-1 Existing Eden Bann Weir views 2-5

Figure 2-2 Eden Bann Weir infrastructure and impoundment locations 2-6

Figure 2-3 Eden Bann Weir construction area..... 2-7

Figure 2-4 Eden Bann Weir access 2-8

Figure 2-5 Rookwood Weir site views.....2-10

Figure 2-6 Rookwood Weir infrastructure and impoundment location.....2-11

Figure 2-7 Rookwood Weir construction area2-12

Figure 2-8 Rookwood Weir access.....2-13

Figure 2-9 Flap gate (example).....2-20

Figure 2-10 Eden Bann Weir Stage 2 ogee spillway section.....2-20

Figure 2-11 Eden Bann Weir Stage 3 ogee (high level) spillway section with flap gates.....2-21

Figure 2-12 Eden Bann Weir spillway longitudinal section including founding levels2-22

Figure 2-13 Eden Bann Weir right bank outlets and fish lock design.....2-23

Figure 2-14 Section through Eden Bann Weir environmental flow outlets.....2-23

Figure 2-15 Rookwood Weir Stage 1 ogee spillway section2-26

Figure 2-16 Rookwood Weir Stage 2 ogee spillway section2-26

Figure 2-17 Rookwood Weir spillway longitudinal section including founding levels2-27

Figure 2-18 Rookwood Weir right bank proposed outlets and fish lock design2-28

Figure 2-19 Section through Rookwood Weir environmental flow outlets.....2-28

Figure 2-20 Typical fish lock arrangement.....2-29

Figure 2-21	Eden Bann Weir potential construction material resource areas.....	2-36
Figure 2-22	Rookwood potential construction material resource areas.....	2-37
Figure 2-23	Glenroy Crossing layout.....	2-39
Figure 2-24	Riverslea Crossing layout.....	2-40
Figure 2-25	Foleyvale Crossing layout.....	2-41
Figure 2-26	Hanrahan Crossing layout.....	2-42
Figure 2-27	Typical mobile concrete batching plant.....	2-46
Figure 2-28	Typical mobile continuous concrete mixing plant.....	2-47
Figure 2-29	Eden Bann Weir construction sequencing.....	2-51
Figure 2-30	Rookwood Weir construction sequencing.....	2-55
Figure 4-1	EIS consultation activities and communication tools.....	4-2
Figure 4-2	Integration of EIS and SIA consultation processes.....	4-4
Figure 6-1	EPBC Act Protected Matters Search Tool search extent.....	6-3
Figure 6-2	Eden Bann Weir flora field survey sites.....	6-6
Figure 6-3	Rookwood Weir flora field survey sites.....	6-7
Figure 6-4	Eden Bann Weir aquatic fauna survey sites.....	6-11
Figure 6-5	Rookwood Weir aquatic fauna survey sites.....	6-12
Figure 6-6	Eden Bann Weir terrestrial fauna survey sites.....	6-18
Figure 6-7	Rookwood Weir terrestrial fauna survey sites.....	6-19
Figure 6-8	Catchment study area.....	6-40
Figure 6-9	Bio-subregion study area.....	6-41
Figure 7-1	Climate statistics.....	7-2
Figure 7-2	Average annual rainfall (Rockhampton).....	7-3
Figure 7-3	Annual wind rose 09:00 am (left) and 03:00 pm (right).....	7-4
Figure 7-4	Significant flood peaks – Fitzroy River, Rockhampton.....	7-5
Figure 7-5	Average annual number of tropical cyclones (1969/70 – 2005/06).....	7-6
Figure 7-6	Recorded tropical cyclones within 100 km of Rockhampton (1906-2006).....	7-7
Figure 7-7	Earthquakes recorded in Queensland from 1960 to 2013.....	7-9
Figure 7-8	Fitzroy Basin and sub-catchments.....	7-12
Figure 7-9	Hydrographs for the historic period (1974 – 2009).....	7-15
Figure 7-10	Hydrographs for the current period (1999 – 2009).....	7-17
Figure 7-11	Flow duration curves for the historic and current periods.....	7-19
Figure 7-12	Total average monthly flows for the historic and current periods.....	7-21

Figure 7-13 Temperature within the Eden Bann Weir impoundment.....7-26

Figure 7-14 Dissolved oxygen concentration within the Eden Bann Weir impoundment.....7-27

Figure 7-15 Local government areas.....7-33

Figure 7-16 Eden Bann Weir land use.....7-35

Figure 7-17 Rookwood land use.....7-36

Figure 7-18 Reserves, protected areas and sensitive environmental areas7-38

Figure 7-19 Eden Bann Weir regional ecosystem mapping.....7-42

Figure 7-20 Rookwood Weir regional ecosystem mapping.....7-47

Figure 7-21 Eden Bann Weir Biodiversity Planning Assessment mapping.....7-58

Figure 7-22 Rookwood Biodiversity Planning Assessment mapping.....7-63

Figure 7-23 Spatial distribution of in-channel aquatic habitats within the Eden Bann Weir
Project footprint7-70

Figure 7-24 Spatial distribution of in-channel aquatic habitats within the Rookwood Weir
Project footprint7-71

Figure 7-25 Fitzroy region inshore water quality trends7-75

Figure 7-26 Native title claim area.....7-82

Figure 8-1 Gauging stations and flow assessment locations within and near to Project areas 8-3

Figure 8-2 Critical velocity (cm/s) for erosion, transportation and deposition of sediment 8-6

Figure 8-3 Sand deposition at Eden Bann Weir..... 8-7

Figure 8-4 Project (Eden Bann Weir) TN and TP contribution to existing annual loads8-12

Figure 8-5 Project (Rookwood Weir) TN and TP contribution to existing annual loads8-13

Figure 8-6 Project (Eden Bann Weir and Rookwood Weir) TN and TP contribution to existing
annual loads.....8-14

Figure 9-1 Great Barrier Reef World Heritage Area..... 9-2

Figure 9-2 Project location in relation to the GBRWHA..... 9-3

Figure 10-1 Brigalow woodland.....10-5

Figure 10-2 Brigalow TEC within the Eden Bann Weir Project footprint.....10-6

Figure 10-3 Brigalow TEC within the Rookwood Weir Project footprint..... 10-11

Figure 10-4 Squatter pigeon (southern) recorded locations and potential habitat..... 10-31

Figure 10-5 Black ironbox..... 10-33

Figure 10-6 Black ironbox (Rookwood Weir Project footprint)..... 10-34

Figure 10-7 Essential habitat mapping for serpentine endemics on hills and colluvials (Eden
Bann Weir)..... 10-35

Figure 10-8 Fitzroy River turtle important habitat areas 10-36

Figure 10-9 Fitzroy River turtle nesting habitat impacted 10-46

Figure 10-10 Yellow chat (Dawson) distribution and habitat..... 10-52

Figure 12-1 Land use in the Fitzroy Basin catchment..... 12-2

Figure 12-2 Existing activities..... 12-3

Figure 12-3 Proposed developments..... 12-9

Figure 14-1 Location of historical, confirmed and high potential nesting habitat within the
Project footprints..... 14-8