

Volume 1: Project Information Table of Contents

۱.	Projec	roject Details			
	1.1.	Location and Background	1-1		
	1.2.	Brief Description of the Project	1-5		
	1.3.	Project Approvals History	1-7		
	1.3.	1 Minor Changes from Referral	1-		
	1.3.	2 Project Proponent	1-8		
	1.4.	Project Need	1-9		
	1.4.	1 Dredging Requirements	1-:		
	1.4.	The Need for Tourism Enabling Infrastructure	1-10		
	1.4.	North Stradbroke Island Economic Transition Strategy	1-1		
	1.4.	4 Project Related Employment	1-1:		
	1.5.	Project Alternatives	1-12		
	1.5.	1 Alternative Locations	1-1:		
	1.5.	2 Alternative Designs	1-1:		
	1.5.	Alternate Project: Capital Dredging, Disposal Offsite	1-13		
	1.5.	4 The 'Do Nothing' Option	1-2		
	1.5.	Advantages and Disadvantages of Alternate Options	1-2		
	1.6.	EIS Structure	1-23		
	1.6.	1 Document Structure	1-2:		
	1.6.	Project Team and Independent Advisory Panel	1-2		
2.	Detaile	ed Description of the Site and Action	2-1		
	2.1.	Site Conditions	2-		
	2.1.	1 Climate and Meteorology	2-		
	2.1.	2 Tides and Currents	2-:		
	2.1.	Topography and Bathymetry	2-:		
	2.1.	4 Geology and Sediments	2-:		
	2.1.	5 Surface Water and Groundwater	2-6		
	2.1.	6 Terrestrial Environment	2-6		
	2.1.	7 Marine Environment	2-6		
	2.2.	Site History and Existing Uses	2-12		
	2.2.	1 Review of Aerial History	2-1:		
	2.2.	2 Existing Toondah Harbour Ferry Terminal and Uses	2-1:		
	2.2.	3 Existing Situation - Fison Channel and Turning Basin	2-10		
	2.3.	Toondah Harbour Project Overview	2-18		
	2.3.	1 Project Footprint	2-1		
	2.3.	2 Project Design Principles	2-18		
	2.3.	Project Vision	2-2		
	2.3.	4 Project Land Uses	2-2		

		2.3.5	Urban Design	2-31
		2.3.6	Sustainability	2-38
		2.3.7	Opportunities for Indigenous Stewardship and Reconciliation.	2-39
		2.3.8	Future Management	2-39
		2.3.9	Project Sequencing	2-40
	2.4.	Di	redging and Reclamation Works	2-45
		2.4.1	Fison Channel and Turning Basin Dredging	2-45
		2.4.2	Reclamation Landforming	2-47
	2.5.	Ci	ivil Infrastructure and Services	2-56
		2.5.1	Electrical, Gas and Telecommunications	2-56
		2.5.2	Water Supply and Sewerage Infrastructure	2-56
		2.5.3	Bulk Earthworks	2-58
	2.6.	М	larine Infrastructure	2-58
		2.6.1	Marina and Private Vessel Berths	2-59
		2.6.2	Ferry Terminal	2-60
		2.6.3	Harbour Edge Treatments	2-62
		2.6.4	Boat Ramp for Non-Motorised Vessels	2-64
		2.6.5	Navigational Lighting	2-65
3.	Ор	eration	ns and Uses	3-1
	3.1.	М	larine Vessel Traffic	3-1
		3.1.1	Existing Marine Vessel Use in Moreton Bay	3-1
		3.1.2	Existing Marine Vessel Use in the Redland City Council LGA	3-2
		3.1.3	Existing Marine Vessel Use at Toondah Harbour	3-3
		3.1.4	Summary of Existing Marine Vessel Use	3-4
		3.1.5	Predicted Additional Vessel Generation from the Toondah Harbour Project	3-4
	3.2.	М	laintenance Dredging	3-9
	3.3.	Ve	ehicle Traffic	3-10
		3.3.1	Existing Traffic Volumes	3-10
		3.3.2	Construction Traffic Generation	3-12
		3.3.3	Development Traffic Generation	3-12
		3.3.4	External Network Impacts	3-14
		3.3.5	Fauna Crossing	3-14
	3.4.	Li	ghting Design	3-16
4.	Ass	sessme	ent Framework	4-1
	4.1.	Aı	ustralian Government Assessment Process	4-1
		4.1.1	EPBC Act Matters, Policies and Guidelines	4-1
	4.2.	ln	iternational Agreements and Conventions	4-3
	4.3.		ne Ramsar Convention	4-4
		4.3.1	Management of Ramsar Sites in Australia	4-6
		4.3.2	The Wise Use of Wetlands	4-8
	4.4.		tate Approval Framework	4-9
		4.4.1	Economic Development Act 2012	4-9
		4.4.2	Toondah Harbour PDA Development Scheme 2014	4-10

■ Draft Environmental Impact Statement

	4.4.3	Planning Act 2016	4-11
	4.4.4	Marine Parks Act 2004 and Marine Parks (Moreton Bay) Zoning Plan 2019	4-12
	4.4.5	Environmental Protection Act 1994	4-13
	4.4.6	Maritime Safety Queensland Act 2002	4-13
	4.4.7	Land Act 1994	4-14
	4.4.8	Aboriginal Cultural Heritage Act 2003 (Qld)	4-15
	4.5. State	Government Approvals Application Requirements	4-15
	4.5.1	Marine Parks Act Approvals Assessment and Approval Processes	4-15
	4.5.2	ED Act Assessment and Approvals Processes	4-16
	4.6. Moni	itoring, Enforcement and Approval Compliance	4-17
	4.7. Loca	l Government Assessment Not Required	4-18
5.	Stakeholde	r and Community Engagement	5-1
	5.1.1	Community and Stakeholder Contact and Sentiment	5-2
	5.1.2	Common Themes and Key Findings	5-4
	5.1.3	Draft EIS Community and Stakeholder Engagement Activities	5-5

Figures

Figure 1-1: Project Location	1-3
Figure 1-2: Toondah Harbour PDA and Key Features	1-4
Figure 1-3: Toondah Harbour Project Master Plan	1-6
Figure 1-4: SMBI Water Transport Alternate Route Strategy Mainland Sites	1-14
Figure 1-5: The Toondah Harbour PDA Development Scheme Structure PlanPlan	1-16
Figure 1-6: Alternative Dredge Material Disposal Options Conceptualisation	1-19
Figure 2-1: Redlands HRS 9 am (left) and 3 pm (right) Wind Roses (1953-2013)	2-1
Figure 2-2: Toondah Harbour Topography and Bathymetry	2-4
Figure 2-3: Toondah Harbour Regional Geology	2-5
Figure 2-4: Toondah Harbour Regional Soils	2-6
Figure 2-5: Toondah Harbour Acid Sulfate Soils	2-7
Figure 2-6: Toondah Harbour Catchment and Surface Drainage	2-9
Figure 2-7: Toondah Harbour Existing Terrestrial Features	2-10
Figure 2-8: Toondah Harbour Existing Marine Features	2-11
Figure 2-9: Historical Aerial Photography of Toondah Harbour	2-13
Figure 2-10: Toondah Harbour Land Tenure.	2-14
Figure 2-11: Project Footprint and Dredging and Reclamation Staging	2-20
Figure 2-12: Toondah Harbour Project Precinct Plan	2-22
Figure 2-13: Maximum Building Heights	2-32
Figure 2-14: Cassim Island Roost Site Buffers	2-33
Figure 2-15: Nandeebie Claypan Roost Site Buffers	2-34
Figure 2-16: Community Focal Points	2-35
Figure 2-17: Street and Movement Network	2-36
Figure 2-18: Open Space Network	2-37
Figure 2-19: Operational Management Plan	2-40
Figure 2-20: Project Sequencing Years 1 to 4	2-43
Figure 2-21: Project Sequencing Years 5 to 10.	2-44
Figure 2-22: Containment Bund Concept Drawing	2-5
Figure 2-23: Reclamation Perimeter Bund Final Edge Treatments	2-52
Figure 2-24: Schematic Diagram of Dredging and Reclamation Stage 1 Works	2-54
Figure 2-25: Schematic Diagram of Dredging and Reclamation Stage 2 Works	2-55
Figure 2-26: Proposed Water Supply Connections and External Infrastructure	2-57
Figure 2-27: Proposed Sewage Connections and External Infrastructure	2-57
Figure 2-28: Marina and Private Vessel Berths Layout	2-59
Figure 2-29: Marina and Private Vessel Berths Cross-section	2-60
Figure 2-30: New Harbour Layout	2-6
Figure 2-31: Section through Ro-Ro Ramp	2-6
Figure 2-32: Typical Harbour Rock Revetment	2-62
Figure 2-33: Anchored Steel Sheet Pile Wall	2-64
Figure 2-34: Boat Ramp	2-64
Figure 3-1: Existing Boat Use in Moreton Bay, Redland LGA and Toondah Harbour	3-5
Figure 3-2: Predicted Changes to Boat Traffic and Use at Toondah Harbour	3-8
Figure 3-3: Cleveland Road Hierarchy	
Figure 3-4: Fauna Crossing Location and Concept Design	3-15
Figure 4-1: Toondah Harbour Project Footprint within the Moreton Bay Ramsar Site and Marine Park	4-5

Figure 5-1: Engagement Activities and Interactions with Community Members and Stakeholders	5-2
Figure 5-2: Topics Discussed as Part of the Community and Stakeholder Engagement Interactions	
Figure 5-3: Community and Stakeholder Sentiment	
Figure 5-4: Community and Stakeholder Sentiment per Engagement Activity	
Tables	
Table 1-1: Master Plan Minor Changes from Referral	1-8
Table 1-2: Summary of Short, Medium, and Long-Term Advantages and Disadvantages of Project Alternatives	1-22
Table 2-1: Climate Summary for Redlands (Redlands HRS 1953-2013)	2-1
Table 2-2: Tidal Planes at Toondah Harbour (2021)	2-2
Table 2-3: Details of Land Parcels within the Project Footprint	2-15
Table 2-4: Indicative Project Sequencing	2-41
Table 2-5: Approximate Dredging and Fill Volume Balance	2-49
Table 3-1: Registered Boat Use by LGA (2021 estimates).	3-1
Table 3-2: Predicted Size of Active Fleet on an Average Day (2021 estimates)	3-2
Table 3-3: Vehicle and Passenger Ferry Trips from the Redland Mainland (Weekend Day)	3-3
Table 3-4: Existing Traffic Volumes	
Table 3-5: Estimated Trip Generation Rates	3-13
Table 4-1: Australian Government Guidelines and Policies Relevant to the Project	
Table 4-2: International Conventions and Agreements Relevant to the Project	4-3
Plates	
Plate 2-1: Recreational Vessel Passing Ferry Outside of Safety Markers.	2-17
Plate 2-2: Turbidity Plume Generated by Vehicle Ferry	2-17
Plate 2-3: Conceptual Images of the Mixed-use Node	2-24
Plate 2-4: Conceptual Images of the Northern Residential Area and Foreshore Parklands	2-25
Plate 2-5: Conceptual Images of the Southern Residential Area.	2-26
Plate 2-6: Conceptual Image of the Residential Precinct (Middle and Wharf Street Intersection)	2-27
Plate 2-7: Existing Image of the Residential Precinct (Shore Street East).	
Plate 2-8: Conceptual Image of the Ferry Loading Area.	2-28
Plate 2-9: Conceptual Image of the Ferry Precinct	2-29
Plate 2-10: Conceptual Images of the Marina Precinct	
Plate 2-11: Image of a BHD Operating within a Floating Silt Curtain, Loading a Transport Barge	2-47
Plate 2-12: Examples of an excavator installing a steel sheet pile cut-off wall by vibration	
Plate 2-13: Reinforced Concrete L-shaped Wall (Shell Cove Boat Harbour, NSW)	2-63



Appendices

Appendix 1-A	Tender Documents Released by the State Government
Appendix 1-B	Final EIS Guidelines
Appendix 1-C	EIS Guideline Cross Reference Table
Appendix 1-D	Extracts from SMBIs Water Transport Alternate Route Strategy
Appendix 1-E	Alternate Options Assessment
Appendix 1-F	EIS Project Team
Appendix 1-G	IAP Final Recommendations Letter
Appendix 1-H	Construction and Project Sequencing Drawings
Appendix 1-l	Dredging and Reclamation Options Assessment and Design Report
Appendix 1-J	Geotechnical Report
Appendix 1-K	Concept Bulk Earthworks and Civil Infrastructure Report
Appendix 1-L	Marine Infrastructure Design Report
Appendix 1-M	RCC Boat Ramp Data
Appendix 1-N	Traffic Generation Report
Appendix 1-O	Summary of Relevant Legislation
Appendix 1-P	Community and Stakeholder Engagement Report



Volume 2: Existing Environment and **Potenti**al Impacts Table of Contents

6.	The li	The Impact Assessment Process		
	6.1.	Impact Assessment Structure	6	5-2
	6.	.1 Identification of Activities that	May Result in Impacts	5-2
	6.	.2 Description of the Existing Valu	res 6	5-3
	6.	.3 Quantification of Potential Imp	acts	5-3
	6.	.4 Adaptive Management and Mo	nitoring Measures 6	5-3
	6.	.5 Residual Impact Risk Assessme	nt e	5-5
	6.2.	Project Referencing	6	5-6
7.	Soils,	Sediments, and Contaminated I	and 7-	-1
	7.1.	Introduction	7	'-1
	7.	.1 Scope of Study	7	7-1
	7.	.2 Activities that May Result in Im	pacts 7	7-2
	7.2.	Assessment Methodology	7	'-2
	7.	2.1 Sediment Analysis	7	7-2
	7.	2.2 Terrestrial Contaminated Land	7	7-8
	7.3.	Existing Values	7-	12
	7.	3.1 Sediment Analysis Results	7-	12
	7.	3.2 Terrestrial Contaminated Land	7-	15
	7.4.	Potential Impacts	7-:	21
	7.	Contaminants in Marine Sedim	ents 7-	21
	7.	Acid Sulfate Soils	7-	21
	7.	Contaminated Land	7-	22
	7.	Fuel and Chemical Spills	7-	22
	7.5.	Adaptive Management and Monitorin	g Measures 7-	23
	7.	Detailed Site Investigations	7-	25
	7.6.	Residual Risk of Impact	7	27
8.	Coast	al Processes and Dredge Plume	8-	-1
	8.1.	8	3-1	
	8.	.1 Scope of Study	8	3-1
	8.	.2 Activities that May Result in Im	pacts 8	3-2
	8.2.	Assessment Methodology	8	3-2
	8.	2.1 Model Component Description	s and Calibration	3-2
	8.	2.2 Scenarios Assessed	3	3-6
	8.	2.3 Assessment Processes	۶	3-7

	8.3.		Existing Values	8-10
		8.3.1	Tidal Currents and Circulation	8-10
		8.3.2	Waves	8-12
		8.3.3	Shoreline Processes	8-14
	8.4.		Potential Impacts	8-17
		8.4.1	Tidal Hydrodynamics	8-17
		8.4.2	Wave Climate	8-30
		8.4.3	Shoreline Processes	8-35
		8.4.4	Sediment Dynamics and Siltation	8-38
		8.4.5	Extreme Event Simulation with Climate Change	8-41
		8.4.6	Modelling of Dredging Activities	8-47
	8.5.		Adaptive Management and Monitoring Measures	8-63
	8.6.		Residual Risk of Impact	8-63
9.	Sur	face	Water Quality	9-1
	9.1.		Introduction	9-1
		9.1.1	Scope of Study	9-1
		9.1.2	Water Quality Objectives	9-1
		9.1.3	Activities that May Result in Impacts	9-4
	9.2.		Assessment Methodology	9-4
		9.2.1	Desktop Methods	9-4
		9.2.2	Field Methods	9-8
		9.2.3	Surface Water Quality Modelling	9-10
	9.3.		Existing Values	9-11
		9.3.1	General Description of Moreton Bay Water Quality	9-11
		9.3.2	Assessment of EHMP Data	9-12
		9.3.3	Assessment of Data from the Dredge Campaign in 2019	9-17
		9.3.4	Assessment of Turbidity Logger Data	9-19
		9.3.5	Key Assessment Outcomes	9-22
	9.4.		Potential Impacts	9-23
		9.4.1	Changes to Turbidity Associated with Dredging and Reclamation	9-23
		9.4.2	Changes to Flushing Rates Associated with Reclamation	9-26
		9.4.3	Changes in Water Quality Due to Stormwater	9-29
		9.4.4	Release of Contaminants from the Disturbance of Sediment	9-32
		9.4.5	Release of Contaminants from the Disturbance of Soil and Groundwater	9-33
		9.4.6	Tailwater Release into Moreton Bay	9-33
	9.5.		Adaptive Management and Monitoring Measures	9-34
		9.5.1	Draft Water Quality Monitoring Plan	9-36
	9.6.		Residual Risk of Impact	9-42
10.	Gro	ound	water	10-1
	10.1		Introduction	10-1
		10.1.	Scope of Study	10-1
		10.1.	Activities that May Result in Impacts	10-1
	10.2		Assessment Methodology	10-2

	10.2.	Desktop Methods	10-2
	10.2.	2 Field Methods	10-2
	10.2.	Excavation Dewatering Investigation	10-3
1	0.3.	Existing Values – Conceptual Groundwater Model	10-5
	10.3.	Geology	10-5
	10.3.	2 Hydrostratigraphic Units	10-5
	10.3.	Groundwater Levels and Flow Directions	10-6
	10.3.	4 Groundwater Quality	10-13
	10.3.	Groundwater Surface Water Seawater Interaction	10-17
	10.3.	Groundwater Users	10-18
	10.3.	7 Summary of Conceptual Model	10-22
1	0.4.	Potential Impacts	10-24
	10.4.	Dredging	10-24
	10.4.	2 Reclamation	10-25
	10.4.	Perimeter Containment Wall and Dewatering for Excavation	10-25
	10.4.	Clearing of Mangroves	10-30
1	0.5.	Adaptive Management and Monitoring Measures	10-31
	10.5.	Draft Groundwater Monitoring Plan	10-32
1	0.6.	Residual Risk of Impact	10-34
11. <i>A</i>	Air Qua	lity	11-1
1	1.1.	Introduction	11-1
	11.1.		11-1
	11.1.		11-1
	11.1.		11-3
1	1.2.	Assessment Methodology	11-3
	11.2.		11-3
	11.2.		11-4
	11.2.	-	11-5
	11.2.		11-8
1	1.3.	Existing Values	11-9
	11.3.		11-9
	11.3.	·	11-9
	11.3.		11-11
	11.3.		11-12
1	1.4.	Potential Impacts	11-13
	11.4.	·	11-13
	11.4.		11-15
	11.4.		11-16
	11.4.		11-16
	11.4.		11-17
1	1.5.	Adaptive Management and Monitoring Measures	11-17
'	11.5.	•	11-19
1	1.6.	Residual Risk of Impact	11-21
12 7	F=	ial an al I lo al america o Niais a la cal Nila cati a ca	40.4
12.	erresti	ial and Underwater Noise and Vibration	12-1

	12.1.	Introduction	12-1
	12.	1.1 Scope of Study	12-1
	12.	1.2 Acoustic Quality Objectives	12-1
	12.	1.3 Activities that May Result in Impacts	12-4
	12.2.	Assessment Methodology	12-5
	12.2	2.1 Background Noise Level Measurements	12-5
	12.2	2.2 Noise Modelling	12-7
	12.2	2.3 Construction Vibration	12-9
	12.3.	Existing Values	12-10
	12.3	3.1 Background Terrestrial Noise	12-10
	12.3	3.2 Background Underwater Noise	12-13
	12.4.	Potential Impacts	12-15
	12.4	4.1 Noise Impacts on Sensitive Receptors	12-15
	12.4	4.2 Predicted Underwater Noise Levels	12-23
	12.4	4.3 Operational Noise Levels	12-26
	12.5.	Adaptive Management and Monitoring Measures	12-26
	12.6.	Residual Risk of Impact	12-29
13.	Lightir	ng Assessment and Strategy	13-1
	13.1.	Introduction	13-1
	13.	1.1 Lighting Criteria and Objectives	13-1
	13.	1.2 Activities that May Result in Impacts	13-2
	13.2.	Assessment Methodology	13-2
	13.2	2.1 Existing Light levels	13-2
	13.2	2.2 Conceptual Lighting Model	13-2
	13.3.	Construction and Operational Phase Lighting Design	13-5
	13.3	Conceptual Lighting Discussion and Design Intent	13-6
	13.3	3.2 Luminaires Selections	13-6
	13.4.	Existing Values	13-8
	13.5.	Potential Impacts – Conceptual Lighting Model	13-11
	13.5	5.1 Illumination Levels	13-11
	13.5	5.2 Rendered Views	13-11
	13.6.	Adaptive Management and Monitoring Measures	13-21
	13.7.	Residual Risk of Impact	13-22
14.	Waste	Management	14-1
	14.1.	Introduction	14-1
	14.	1.1 Scope of Study	14-1
	14.	1.2 Activities that May Generate Waste	14-1
	14.2.	Assessment Framework	14-2
	14.2	2.1 Project Waste Management Principles	14-2
	14.3.	Waste Generation	14-4
	14.3	3.1 Construction	14-5
	14.3	3.2 Operations	14-6
	14.4.	Adaptive Management and Monitoring Measures	14-8

	14.5.	Residual	Risk of Impact	14-11
15.	Terres	trial Ecol	logy	15-1
	15.1.	Introduc	tion	15-1
	15.	1.1	Scope of Study	15-1
	15.	1.2	Relevant Legislation, Policy, and Planning Instruments	15-2
	15.	1.3	Activities that May Result in Impacts	15-2
	15.2.	Assessm	ent Methodology	15-3
	15.	2.1	Desktop Methods	15-3
	15.	2.2	Field Methods	15-4
	15.3.	Existing '	Values	15-8
	15.	3.1	Threatened Flora and Ecological Communities	15-8
	15.	3.2	Threatened Fauna Species Likelihood of Occurrence	15-13
	15.	3.3	Koala (Phascolarctos cinereus)	15-17
	15.	3.4	Grey-headed Flying-fox (Pteropus poliocephalus)	15-30
	15.	3.5	Water Mouse (Xeromys myoides)	15-35
	15.	3.6	White-throated Needletail (Hirundapus caudacutus)	15-37
	15.	3.7	Terrestrial Migratory Bird Species	15-38
	15.4.	Potentia	l Impacts	15-42
	15.	4.1	Project Staging	15-42
	15.	4.2	Potential Impacts on Koalas	15-43
	15.	4.3	Potential Impacts on Grey-headed Flying-fox	15-54
	15.	4.4	Potential Impacts on Water Mouse	15-56
	15.	4.5	Potential Impacts on White-throated Needletail	15-56
	15.	4.6	Potential Impacts on Terrestrial Migratory Bird Species	15-56
	15.	4.7	Invasive Species	15-57
	15.5.	Adaptive	e Management and Monitoring Measures	15-58
	15.	5.1	Draft Terrestrial Fauna Monitoring Program	15-62
	15.6.	Residual	Risk of Impact	15-63
16.	Marine	e Ecolog	у	16-1
	16.1.	Introduc	ction	16-1
	16.	1.1	Scope of the Study	16-1
	16.	1.2	Relevant Legislation, Policy, and Planning Instruments	16-2
	16.	1.3	Activities that May Result in Impacts	16-3
	16.2.	Assessm	ent Methodology	16-4
	16.	2.1	Desktop Methods	16-4
	16.	2.2	Field Methods	16-5
	16.3.	Existing '	Values – Marine Habitat Types	16-11
	16.	3.1	Mudflats and Sandbanks	16-15
	16.	3.2	Mangroves	16-17
	16.	3.3	Saltmarsh	16-19
	16.	3.4	Seagrass Meadows	16-20
	16.	3.5	Coral Communities	16-27
	16.4.	Existina '	Values – Marine Fauna	16-29

	16.4	1.1	Southern Right Whale	16-31
	16.4	1.2	Marine Turtles	16-31
	16.4	1.3	White's Seahorse	16-37
	16.4	1.4	Australian Humpback Dolphin	16-37
	16.4	1.5	Dugong	16-37
	16.5.	Potentia	l Impacts	16-40
	16.5	5.1	Dredging, Reclamation and Marine Works	16-40
	16.5	5.2	Civil Works	16-52
	16.5	5.3	Ongoing Use and Operations	16-53
	16.6.	Adaptive	e Management and Monitoring Measures	16-58
	16.6	5.1	Management Measures	16-58
	16.6	5.2	Loss of Habitat	16-61
	16.6	5.3	Draft Marine Ecology Monitoring Plan	16-62
	16.7.	Residual	Risk of Impact	16-65
17.	Migrat	ory Sho	rebirds	17-1
	17.1.	Introduc	tion	17-1
	17.1	.1	Scope of Study	17-1
	17.1	.2	Relevant Legislation, Policy, and Planning Instruments	17-2
	17.1	.3	Activities that May Result in Impacts	17-5
	17.2.	Assessm	ent Methodology	17-5
	17.2	2.1	Desktop Methods	17-5
	17.2	2.2	Field Methods	17-6
	17.2	2.3	Analysis of Methodological Approach	17-11
	17.2	2.4	Assessment of Migratory Shorebird Habitat Importance	17-11
	17.3.	Existing '	Values	17-12
	17.3	3.1	Migratory Shorebird Ecology	17-12
	17.3	3.2	Database Search Results	17-14
	17.3	3.3	Shorebirds Roosting at High Tide Sites at Toondah Harbour	17-19
	17.3	3.4	Shorebirds Foraging at Low Tide at Toondah Harbour	17-26
	17.3	3.5	Migratory Shorebird Habitat Importance within and adjacent to the Project footprint	17-29
	17.3	3.6	Threats and Trends in Shorebird Habitat Condition	17-31
	17.3	3.7	Key Assessment Outcomes	17-32
	17.4.	Potentia	l Impacts	17-33
	17.4	1.1	Dredging, Reclamation and Civil Works	17-35
	17.4	1.2	Ongoing Use and Operations	17-36
	17.4	1.3	Review of Key Impacts on Shorebirds	17-36
	17.5.	Adaptive	e Management and Monitoring Measures	17-45
	17.5	5.1	National Guidelines	17-45
	17.5	5.2	Management through Design	17-46
	17.5	5.3	Project Specific Management Measures	17-47
	17.5	5.4	Summary of Management Measures	17-49
	17.5	5.5	Draft Shorebird Monitoring Plan	17-50
	17.6.	Residual	Risk of Impact	17-51
18.	Comm	ercial ar	nd Recreational Fisheries	18-1

TOONDAH HARBOUR

	18.1.	Introduc	tion	18-1
	18.1	1.1	Scope of Study	18-1
	18.1	1.2	Activities that May Result in Impacts	18-1
	18.2.	Assessm	ent Methodology	18-2
	18.2	2.1	Desktop Methods	18-2
	18.2	2.2	Consultation	18-2
	18.2	2.3	Logbook Analysis	18-2
	18.3.	Existing \	Values	18-3
	18.3	3.1	Current Fishing Activities	18-3
	18.3	3.2	Commercial Fisheries	18-4
	18.3	3.3	Recreational Fishing	18-7
	18.3	3.4	Indigenous Fisheries	18-7
	18.3	3.5	Biology of Key Fish Species	18-8
	18.3	3.6	Existing Marine Habitats in Relation to Key Fish Species	18-11
	18.3	3.7	Commercial Fishing Data Analysis	18-14
	18.3	3.8	Recreational Fisheries	18-15
	18.3	3.9	Key Assessment Outcomes	18-15
	18.4.	Potential	l Impacts	18-16
	18.4	4.1	Construction Impacts	18-16
	18.4	1.2	Fishing Access	18-16
	18.4	4.3	Habitat Loss	18-16
	18.5.	Adaptive	e Management and Monitoring Measures	18-17
	18.5	5.1	Management Measures	18-17
	18.5	5.2	Recreational Fisheries	18-18
	18.5	5.3	Fisheries Habitat Construction	18-19
	18.5	5.4	Draft Fisheries Monitoring Plan	18-20
	18.6.	Residual	Risk of Impact	18-20
	18.6	5.1	Recreational Fishing Access	18-20
	18.6	5.2	Commercial Fishing Access	18-20
	18.6	5.3	Fisheries Habitat	18-20
19.	Cultura	al Herita	ge	19-1
	19.1.	Aborigin	nal Cultural Heritage	19-1
	19.1	1.1	Introduction	19-1
	19.1	1.2	General Methodology	19-1
	19.1	1.3	Desktop Review of the Archaeology of Moreton Bay	19-2
	19.1	1.4	Site Inspection	19-3
	19.1	1.5	Summary of Survey Results	19-3
	19.1	1.6	Archaeological Testing Results	19-5
	19.1	1.7	Study Area Cultural Heritage Archaeological Significance	19-7
	19.1	1.8	Potential Impacts and Management Measures	19-8
	19.2.	Non-Indi	igenous Cultural Heritage	19-8
	19.2	2.1	Introduction	19-8
	19.2	2.2	Assessment Methodology	19-8
	19.2	2.3	Existing Values	19-9
	19.2	2.4	History of Toondah Harbour	19-12

	19.2.5	Australian Historical Themes Assessment	19-13
	19.2.6	Survey Results	19-15
	19.2.7	Potential Impacts	19-17
	19.2.8	Consultation with the National Trust of Australia Queensland Redlands Branch	19-19
	19.2.9	Management Measures	19-20
20.	Social Envir	ronment	20-1
	20.1. Intro	oduction	20-1
	20.1.1	Scope of Study	20-1
	20.1.2	Local Strategies and Planning	20-1
	20.2. Asse	essment Methodology	20-3
	20.2.1	Assessment Approach	20-4
	20.3. Exist	ting Values	20-5
	20.3.1	Existing Community Profile	20-5
	20.3.2	Future Community Profile	20-6
	20.3.3	Surrounding Social Infrastructure	20-6
	20.4. Com	nmunity and Stakeholder Engagement	20-9
	20.4.1	Stakeholder Engagement	20-9
	20.4.2	SIA Specific Consultation	20-10
	20.5. Pote	ential Impacts	20-12
	20.5.1	Impacted Communities	20-12
	20.5.2	Impact Scoping	20-12
	20.6. Asse	essment of Significant Impacts	20-14
21.	Economic E	Environment	21-1
	21.1. Intro	oduction	21-1
	21.1.1	Scope of Study	21-1
	21.2. Cost	-Benefit Analysis	21-1
		ional Economic Impact Analysis	21-6
	21.3.1	Construction Impacts	21-6
	21.3.2	Operational Impacts	21-7
22.	Sustainabili	ity	22-1
		oduction	22-1
	22.1.1	Scope of Study	22-2
	22.1.2	PDA Development Scheme	22-2
		ainability Responses Provided in the Toondah Harbour EIS	22-3
		essment Methodology	22-4
	22.3.1	Urban Development Institute of Australia - EnviroDevelopment	22-5
	22.3.1	Green Building Council Australia - Green Star Rating	22-5
	22.3.3	NABERS	22-5
	22.3.4	Regulatory Approvals	22-5
		eline Sustainability	22-5
		ainability of the PDA	22-6
	22.5.1	Sustainability in Design	22-6
	22.3.1	Sastamasinty in Design	22-0

Figures

Figure 6-1: Adaptive Management Process (source: CSIRO)	6-4
Figure 6-2: Toondah Harbour Project Reference Areas.	6-7
Figure 7-1: Sediment Sampling Locations	7-4
Figure 7-2: Contaminated Land Assessment Locations.	7-11
Figure 8-1: Coastal Processes Model Boundary and Mesh	8-3
Figure 8-2: Toondah Harbour Model Mesh and Bathymetry	8-4
Figure 8-3: SWAN Model Grids	8-5
Figure 8-4: Modelled Development Phases	8-8
Figure 8-5: Hydrodynamic and Wave Reporting Locations	8-9
Figure 8-6: Toondah Harbour Locality Peak Flood Tide Current Patterns.	8-11
Figure 8-7: Toondah Harbour Locality Peak Ebb Tide Current Patterns.	8-11
Figure 8-8: Wave Roses Showing Recorded Significant Wave Height (Left) and Peak Wave Period (Right) at A	DCP North
(06/03/2020 – 04/06/2020)	8-12
Figure 8-9: Modelled Wave Height in Toondah Harbour Locality. Example Northerly Wind Conditions	8-13
Figure 8-10: Modelled Wave Height in Toondah Harbour Locality. Example South-Easterly Wind Conditions	8-13
Figure 8-11: 2017 Aerial Photo of the Shoreline to the North of the Project Site (Google Earth)	8-15
Figure 8-12: 2017 Aerial Photo of the Shoreline to the South of the Project Site (Google Earth)	8-16
Figure 8-13: Water Level at the Peak Flood and Peak Ebb Instantaneous Velocity Impact Analysis Times	8-17
Figure 8-14: Stage 1 Complete Peak Flooding Tide Instantaneous Velocity impacts.	8-19
Figure 8-15: Stage 1 Complete Peak Ebbing Tide Instantaneous Velocity Impacts	8-20
Figure 8-16: Stage 1 Complete Water Level (top), Depth Averaged Velocity (middle) and Current Direction (k	ottom) for
Point 4 (North of Cassim Island)	8-21
Figure 8-17: Stage 1 Complete Water Level (top), Depth Averaged Velocity (middle) and Current Direction (k	ottom) for
Point 6 (Mangrove Islets East of the Development).	8-22
Figure 8-18: Stage 1 Complete Water Level (top), Depth Averaged Velocity (middle) and Current Direction (k	ottom) fo
Point 8 (South of Mangrove Islets Located East of the Development)	8-23
Figure 8-19: Stage 2 Complete Peak Flooding Tide Instantaneous Velocity Impacts	8-25
Figure 8-20: Stage 2 Complete Peak Ebbing Tide Instantaneous Velocity Impacts	8-26
Figure 8-21: Stage 2 Complete Water Level (top), Depth Averaged Velocity (middle) and Current Direction (k	ottom) fo
Point 4 (North of Cassim Island)	8-27
Figure 8-22: Stage 2 Complete Water Level (top), Depth Averaged Velocity (middle) and Current Direction (k	ottom) for
Point 6 (Mangrove Islets East of the Development).	8-28
Figure 8-23: Stage 2 Complete Water Level (top), Depth Averaged Velocity (middle) and Current Direction (k	
Point 8 (South of Mangrove Islets Located East of the Development)	8-29
Figure 8-24: 50 th Percentile Significant Wave Height. Existing Condition (top), Developed Scenario (middle) a	•
(bottom) Stage 1 Complete	
Figure 8-25: 95th Percentile Significant Wave Height. Existing Condition (top), Developed Scenario (middle)	and Impact
(bottom) Stage 1 Complete	
Figure 8-26: 50 th Percentile Significant Wave Height. Existing Condition (top), Developed Scenario (middle) a	•
(bottom) Stage 2 Complete	
Figure 8-27: 95 th Percentile Significant Wave Height. Existing Condition (top), Developed Scenario (middle) a	and Impact
(bottom) Stage 2 Complete	8-34

Figure 8-28: Shoreline in the Toondah Harbour Area, 1955 (Left) and 2017 (Right)	8-36
Figure 8-29: Shoreline at the Manly Boat Harbour Area, 1945 (Top) and 2017 (Bottom)	8-37
Figure 8-30: Stage 1 Phase 1 Annualised Scour /Sedimentation Rate	8-39
Figure 8-31: Stage 2 Complete Annualised Scour / Sedimentation RateRate	8-40
Figure 8-32: Wind, Water Level and Significant Wave Height Conditions Stage 2 Complete 0.4 m Sea Level	Rise8-42
Figure 8-33: Wind, Water Level and Significant Wave Height Conditions Stage 2 Complete 1.5 m Sea Level	Rise8-42
Figure 8-34: Water Level Impacts Stage 2 Complete Ex-Tropical Cyclone Oswald Simulation 0.4 m Sea Leve	el Rise8-43
Figure 8-35: Maximum Significant Wave Height Impacts Stage 2 Complete Ex-Tropical Cyclone Oswald Sir	nulation 0.4 m
Sea Level Rise	8-44
Figure 8-36: Water Level Impacts Stage 2 Complete Ex-Tropical Cyclone Oswald Hindcast Simulation 1.5 m	
Figure 8-37: Maximum Significant Wave Height Impacts Stage 2 Complete Ex-Tropical Cyclone Os	
Simulation 1.5 m Sea Level Rise	8-46
Figure 8-38: Toondah Harbour Development Fison Channel Dredge Stage Scenarios	8-47
Figure 8-39: Snapshot of Stage 1 Dredging Depth-Averaged Turbidity – Depicting Eastward Advection of	_
Figure 8-40: Snapshot of Stage 1 Dredging Depth-Averaged Turbidity – Depicting Northward Advect Plume	ion of Dredge
Figure 8-41: Snapshot of Stage 2 Dredging Depth-Averaged Turbidity – Depicting Eastward Advection of	
	8-51
Figure 8-42: Snapshot of Stage 2 Dredging Depth-Averaged Turbidity – Depicting Northward Advect	ion of Dredge
Plume	8-51
Figure 8-43: 50th Percentile of the Depth-Averaged Turbidity Dredging Campaign 1	8-53
Figure 8-44: 95th Percentile of the Depth-Averaged Turbidity Dredging Campaign 1	8-54
Figure 8-45: 50th Percentile of the Depth-Averaged Turbidity. Dredging Campaign 2	8-55
Figure 8-46: 95th Percentile of the Depth-Averaged Turbidity Dredging Campaign 2	8-56
Figure 8-47: 50 th Percentile Deposition Rate Dredging Campaign 1	8-58
Figure 8-48: 95th Percentile Deposition Rate. Dredging Campaign 1	8-59
Figure 8-49: 50th Percentile Deposition Rate. Dredging Campaign 2	8-60
Figure 8-50: 95th Percentile Deposition Rate Dredging Campaign 2	8-61
Figure 8-51: Modelled Ultimate Dredged Sediment Deposition Thickness. Dredging Campaign 1	8-62
Figure 8-52: Modelled Ultimate Dredged Sediment Deposition Thickness. Dredging Campaign 2	8-62
Figure 9-1: EPP Water and Wetlands Status and EHMP Water Quality Sites.	9-3
Figure 9-2: Water Quality Monitoring 2019 Maintenance Dredging Campaign	9-7
Figure 9-3: Deployment of Turbidity Logger	9-8
Figure 9-4: Project Specific Turbidity Logging Locations	9-9
Figure 9-5: Turbidity at Sites C1 and HEVa1284 (in HEV waters) and the 50th Percentile WQO	
Figure 9-6: Turbidity at Sites in Area C2 (in Moderately Disturbed Marine Water) and the WQO	
Figure 9-7: Turbidity at L6 from 11 July to 2 August 2019 during Maintenance Dredging	
Figure 9-8: Turbidity at L6 from 21 July to 28 July 2019 during Maintenance Dredging	
Figure 9-9: Turbidity and Tide Height at Site L5, 21 June 2018 to 29 June 20182018	9-20
Figure 9-10: Rolling Two-week Average Turbidity at L1: 10 July 2015 to 11 November 2017	
Figure 9-11: Rolling Two-week Average Turbidity at L2: 22 September 2015 to 1 September 2017	
Figure 9-12: Rolling Two-week Average Turbidity at L3: 22 September 2015 to 25 July 2019	
Figure 9-13: Rolling Two-week Average Turbidity at L5: 2 February 2018 to 28 August 2019	
Figure 9-14: Rolling Two-week Average Turbidity at L6: 5 February to 20 August 2019	
Figure 9-15: Snapshot of Stage 1 Dredging Depth-Averaged Turbidity – Depicting Eastern and Northern	
Dredge Plume	9-24

Figure 9-16: Dredge campaign 1: median increase in turbidity due to dredging	9-24
Figure 9-17: Snapshot of Stage 2 Dredging Depth-Averaged Turbidity – Depicting Eastern and Northern Adv	ection o
Dredge Plume	9-25
Figure 9-18: Dredge campaign 2: median increase in turbidity due to dredging	9-25
Figure 9-19: Connections Between Internal Waterways and Moreton BayBay	9-27
Figure 9-20: Flushing Times for Neap Tide Conditions for Stage 1 Phase 3 (top), Stage 1 Complete (middle) and	d Stage 2
Complete (bottom), without (left) and with (right) Internal Culverts	9-28
Figure 9-21: Toondah Harbour Conceptual Stormwater Management PlanPlan	9-30
Figure 10-1: Groundwater Monitoring Bore Locations	
Figure 10-2: Groundwater Conceptual Model Cross Section Locations	10-7
Figure 10-3: Groundwater Conceptual Northwest – Southeast Hydrogeological Cross-section A-A	
Figure 10-4: Groundwater Conceptual Southwest – Northeast Hydrogeological Cross-section B-B	
Figure 10-5: Groundwater Level Contours in the Petrie Formation	
Figure 10-6: Petrie Formation Water Level Data.	
Figure 10-7: Groundwater Conceptual Northwest – Southeast Hydrogeological Cross-section A-A with Halocline	
Figure 10-8: Groundwater Conceptual Southwest – Northeast Hydrogeological Cross-section B-B with Halocline	
Figure 10-9: Major Ion Composition of Groundwater in Hydrostratigraphic UnitsUnits	
Figure 10-10: Registered Groundwater Bores Locations	
Figure 10-11: Groundwater Dependent Ecosystems Near Toondah Harbour	
Figure 10-12: Summary Conceptual Model - Southeast Hydrogeological Cross-section B – B'	
Figure 10-13: Modelled prediction of groundwater levels – Temporary Sheet Piling Installed	
Figure 10-14: Modelled prediction of groundwater levels – Temporary Sheet Piling Removed	
Figure 11-1: Baseline Air Quality Sample Locations	
Figure 11-2: Air Quality Modelling Methodology Graphical Representation	
Figure 11-3: Modelled Air Quality Receptors	
Figure 11-4: Air Quality Background Monitoring Location AQ1 – March to October 2020	
Figure 11-5: Air Quality Background Monitoring Location AQ2 – March to October 2020	
Figure 11-6: Proposed Air Quality Monitoring Locations.	
Figure 12-1: Attended Noise Monitoring Locations	
Figure 12-2: Measured L _{Aeq}	
Figure 12-3: Measured L _{A10}	
Figure 12-4: Measured L _{A90} - Background Noise Level	
Figure 12-5: Representative components of ambient noise in Australian waters (Source: Cato 1997)	
Figure 12-6: Noise from Perimeter Sheet Piling and Rock Revetment – Works on Northern Reclamation Eastern F	
Figure 12-7: Noise from Perimeter Sheet Piling and Rock Revetment – Works on Southern Reclamation Eastern F	
Ingule 12-7. Noise from Fermieter Sheet Filing and Nock Nevertherit – Works on Southern Neclamation Lastern F	
Figure 12-8: Noise from Internal Earthworks and Revetments – Northern Reclamation Earthworks and Marina	
Figure 12-9: Noise from Internal Earthworks and Revetments – Northern Reclamation Earthworks and Internal C	
Figure 12-10: Noise from Dredging and Reclamation Landforming – Stage 1 Dredging and Northern Reclamatic	
Figure 12-11: Noise from Dredging and Reclamation Landforming – Stage 2 Dredging and Southern Reclamatic	
Figure 12-12: Noise from Dredging Alone including Workboat and Unloading Barge	
Figure 12-13: Underwater Noise from Northern Reclamation Vibratory Piling (When in Water)	
Figure 12-14: Underwater Noise from Southern Reclamation Vibratory Piling (When in Water)	
Figure 12-15: Underwater Noise from Impact Piling in the Harbour AreaArea	
Figure 13-1: Luminaire Locations	
Figure 13-2. Simplified Lighting Types and their Ability to Control Environmentally Obtrusive Light (ASA282:201	.uı 17₋′

Figure 13-3: Luminaire Design and their Ability to Control Environmentally Obtrusive Light (AS4282:2019)	13-5
Figure 13-4: Luminaire Design to Avoid Skyward Illumination and Control Environmentally Obtrusive	Ligh
(AS4282:2019)	
Figure 13-5: Example Luminaire Selections	
Figure 13-6: Toondah harbour and Surrounds – Measurements in Lx on a Horizontal Plane	
Figure 13-7: Roads North of Toondah Harbour – Measurements in Lx on a Horizontal PlanePlane	
Figure 13-8: Predicted Lighting Levels for The Entire Site (Lx)	
Figure 13-9: Aerial Render View of the Toondah Harbour Project	
Figure 13-10: Lighting Render Viewpoints	
Figure 13-11: NE Location, 400 m Site 30° Field of View	
Figure 13-12: NE Location, 400 m from Site 15° Field of View	
Figure 13-13: NE Location, 400 m from Site 5° Field of View	
Figure 13-14: 100 m South of Cassim Island Site 30° Field of View	13-16
Figure 13-15: 100 m South of Cassim Island Site 15° Field of View	13-16
Figure 13-16: 100 m South of Cassim Island Site 5° Field of View (Showing Navigation Beacon)	13-16
Figure 13-17: Nandeebie Claypan (Excludes Screening Effect of Mangroves) Site 30° Field of View	13-17
Figure 13-18: Nandeebie Claypan (Excludes Screening Effect of Mangroves) Site 15° Field of View	
Figure 13-19: Nandeebie Claypan (Excludes Screening Effect of Mangroves) Site 5° Field of View	13-17
Figure 13-20: Marina Navigation Channel Entrance Site 30° Field of View	
Figure 13-21: Cassim Island Looking North 30° Field of View	
Figure 13-22: Cassim Island Looking Southwest 30° Field of View	
Figure 13-23: Oyster Point Looking North 30° Field of View	
Figure 13-24: Sandbank 1.5 km from Site Looking West 30° Field of View	
Figure 13-25: NE of site (150 m) Looking SW 30° Field of View	
Figure 15-1: Project footprint Terrestrial Environments	
Figure 15-2: Toondah Harbour Vegetation Communities and Koala Resources	
Figure 15-3: Wildlife Online Koala Records 2010-2018	
Figure 15-4: DES Koala Incident Reports for Cleveland January 2015 - June 20212021	
Figure 15-5: Koala Data for the Project footprint and Surrounds	
Figure 15-6: Critical Koala Habitat	
Figure 15-7: Grey-headed Flying-fox Camp Locations within 25 km of the Project footprint	
Figure 15-8: Foraging Resources for Grey-headed Flying-fox within the PDA.	
Figure 15-9: Water Mouse (<i>Xeromys myoides</i>) ALA Records	
Figure 15-10: Toondah Harbour Koala Resources Impact	
Figure 15-10: Toolidan Flanbour Roala Resources Impact	
Figure 15-12: Koala Underpass Concept Design	
Figure 15-12: Roald Orluer pass Concept Design	
Figure 15-14: Proposed Koala Safe Neighbourhood Area	
Figure 16-1: Sub tidal and Intertidal Sampling Locations within the MIA	
Figure 16-2: Benthic Infauna Survey Locations.	
Figure 16-3: Marine and Aquatic Habitat Distribution within Moreton Bay (Source: EPA 2008)	
Figure 16-4: Marine and Aquatic Habitat Distribution within the Project Footprint and MIA	
Figure 16-5: Seagrass Distribution in the Project Footprint and the MIA.	
Figure 16-6: Marine Fauna Sightings in the Project Footprint and the MIA	
Figure 16-7: Marine Turtle Distribution in Moreton Bay (source: Sobtzick et al. 2017)	
Figure 16-8: Marine Turtle Biologically Important Areas (National Conservation Values Atlas)	
Figure 16-9: Dugong Distribution in Moreton Bay (source: Sobtzick et al. 2017)	
Figure 16-10: Marine and Aquatic Habitat within the Project Footprint	16-4

Figure 16-11: Draft Marine Habitat Monitoring Sites.	16-64
Figure 17-1: Shorebird Survey Areas	17-9
Figure 17-2: Shorebird Low Tide Survey Areas – Southern-western Moreton BayBay	17-10
Figure 17-3: Process for Identifying Important Habitat for Migratory Shorebirds (excluding Latham's Snip	oe) under the
EPBC Act (from Commonwealth of Australia 2015b).	17-11
Figure 17-4: Shorebird Feeding Habitat and Roost Sites, Toondah Harbour	17-20
Figure 17-5: Average Migratory Shorebird Summer Foraging Densities	17-30
Figure 17-6: Project Development Footprint in Relation to Shorebird Feeding Habitat and Roost Sites, Toor	ıdah Harbour
	17-34
Figure 17-7: Schematic Illustrating the Operation of Density Dependence in Regulating Population Size after	
Figure 18-1: Map of the Commercial Fishing Logbook Grids	
Figure 19-1: Indigenous Cultural Heritage Survey Tracks Walked in the Study Area	
Figure 19-2: Toondah Harbour Indigenous Heritage Test Pit Locations	
Figure 19-3: The Archaeological Significance Continuum Applied in the Study	
Figure 19-4: State Heritage Register Listings in Proximity to Project footprint.	
Figure 20-1: SIA Risk Assessment Methodology.	
Figure 20-2: Social Infrastructure Map (Source: Urbis)	20-9
Tables	
Tables	
Table 6-1: Scale of Impact	6-5
Table 6-2: Duration/Irreversibility of Impact	
Table 6-3: Impact Category	
Table 6-4: Likelihood of Impact and Risk	
Table 7-1: Sediment Quality Parameters for Analysis and Practical Quantitation Limits (Excluding PASS)	
Table 7-2: EMR / CLR Search Results	
Table 7-3: Sediment and Contaminated Land Management Measures	7-23
Table 7-4: Preliminary Soil and Groundwater Investigation Sampling Analytes	
Table 7-4: Sediment, ASS and Contaminated Land Risk Assessment of Key Activities	
Table 8-1: Dredging Model Input Summary (BHD).	
Table 8-2: Coastal Processes Management Measures	
Table 8-3: Coastal Processes Risk Assessment of Key Activities	
Table 9-1: State Planning Policy Stormwater Management Design Objectives	9-2
Table 9-2: EHMP Sites and Relevant Water Area WQO.	
Table 9-3: Median Water Quality Data and the 50th Percentile WQO for Sites within HEV Areas	9-14
Table 9-4: Median Water Quality Data Compared to the WQO for Sites within Moderately Disturbed Coasta	
Table 9-5: State Planning Policy Operational Performance Criteria and Modelled Outcomes	
Table 9-6: Increases in the Concentration of the 50 th Percentile of TN and TP in the Central Marina	
Background and WQOs	
Table 9-7: Increases in the Concentration of the 80 th Percentile of TN and TP in the Central Marina	
Background and WQOs	•
Table 9-8: Surface Water Management Measures	
Table 9-9: Indicative Triggers for Investigation within the Marina	
Table 9-10: Seagrass Light Thresholds for Species in the MIA	
Table 9-11: Surface Water Quality Risk Assessment of Key Activities	
Table 10-1: Groundwater Monitoring Bore Details	10-3



Table 10-2: Average Vertical Head Gradient across Nested Groundwater Monitoring SitesSites Sites	10-12
Table 10-3: Dredging Impacts to Groundwater	10-24
Table 10-4: Reclamation Impacts to Groundwater	10-25
Table 10-5: Sheet Piling Containment Wall Impacts to Groundwater	10-29
Table 10-6: Dewatering Impacts to Groundwater	
Table 10-7: Groundwater Management Measures	10-31
Table 10-8: Analysis Strategy for Project Groundwater Monitoring	10-33
Table 10-9: Groundwater Analysis Suite Description	10-34
Table 10-10: Groundwater Risk Assessment of Key Activities	10-35
Table 11-1: Summary of State and Federal Air Quality Criteria	
Table 11-2: DES Ambient Air Monitoring Data	11-11
Table 11-3: Stage 1 Predicted Air Quality Concentrations – Cumulative	11-14
Table 11-4: Stage 2 Predicted Concentrations	11-15
Table 11-5: Air Quality Management Measures	11-17
Table 11-6: Air Quality Risk Assessment of Key Activities	11-22
Table 12-1: EPP (Noise) 2019 Acoustic Quality Objectives for Dwellings	12-2
Table 12-2: Noise Level Goals L _{Aeq,adj,T} [dB(A)]	
Table 12-3: Proposed Vibration Limits - Human Comfort	12-4
Table 12-4: Attended Noise Measurements Dates and Times	12-5
Table 12-5: Typical Construction Plant Sound Power Levels (LAeq) in dB(A) and Numbers of Plant per Phase	12-9
Table 12-6: Sound Pressure Levels from Pile Driving	
Table 12-7: Rating Background Noise Level [dB(A)]	12-13
Table 12-8: Attended Noise Levels at Cassim Island	12-13
Table 12-9: Attended Noise Levels at Cassim Island	12-13
Table 12-10: Comparison of Predicted Noise Levels at Noise Sensitive Receptors	
Table 12-11: Ambient and Underwater Noise Management Measures	
Table 12-12: Ambient and Underwater Noise and Vibration Risk Assessment of Key Activities	
Table 13-1: AS 4282 Lighting Design Goals	13-1
Table 13-2: Lighting Management Measures	
Table 13-3: Lighting Risk Assessment of Key Activities	
Table 14-1: National Waste Report Categories and Types	
Table 14-2: Estimated Residential Precincts Waste Generation per Annum	14-6
Table 14-3: Waste Management Measures	14-8
Table 14-4: Waste Risk Assessment for Key Activities	
Table 15-1: Koala Survey Details	
Table 15-2: Terrestrial Vegetation Community Descriptions	
Table 15-3: Threatened and Migratory Terrestrial Species Likelihood of Occurrence – Known and Likely Species.	
Table 15-4: Summary of Koala Incident Reports (DES database) for Cleveland January 2015-June 2021	
Table 15-5: Primary and Secondary Koala Food Trees Recorded within the Project footprint	15-26
Table 15-6: Known Flying-fox Camps where Grey-headed Flying-fox has been Recorded within 25 km of the	e Project
footprint	
Table 15-7: Cleveland Population Growth and Dwelling Types	
Table 15-8: Grey-Headed Flying-Fox Resources that Would be Cleared from within the Project Footprint	
Table 15-9: Terrestrial Ecology Management Measures	
Table 15-10: Terrestrial Ecology Risk Assessment of Key Activities	
Table 16-1: Area of Habitat in Moreton Bay, the MIA and in the Project footprint	
Table 16-2: Marine Threatened and Migratory MNES Likelihood of Occurrence	16-32

Fable 16-3: Frequencies Produced and Received, and Impact Thresholds for MNES Listed Marine Mammals F	Potentially
Occurring in the Study Area ¹	16-48
Fable 16-4: Hearing Capabilities, and Impact Thresholds for MNES Listed Marine Turtles Potentially Occurring in	the Study
Area ¹	16-48
Table 16-5: Frequencies Produced and Received, and Impact Thresholds for Fish ¹	16-49
Fable 16-6: Marine Ecology Management Measures	16-58
Table 16-7: Marine Ecology Risk Assessment of Key Activities	16-66
Table 17-1: Threatened and Migratory Shorebird Species Identified in the Protected Matters Search Tool (PM) ar	nd Wildlife
Online (WO) Desktop Searches and Assessed as Known, Likely or to Have Potential to Occur in the Project foo	tprint and
mmediate Surrounds, their Status under the EPBC Act (EPBC) and NC Act (NC), and their Preferred Habitat Requ	uirements
	17-15
Table 17-2: Average (and Maximum) Counts of Migratory Shorebird Species Roosting at Cassim Island	17-19
Table 17-3: Average (and Maximum) Counts of Shorebird Species (when Present) Roosting at Nandeebie Clay	oan. 17-22
Table 17-4: Average (and maximum) Counts of Shorebird Species (when Present) Roosting at Oyster Point	17-24
Table 17-5: Average (and maximum) Counts of Shorebird Species (when present) Roosting on the Offshore	
	17-26
Table 17-6: Summary of the Average (and Maximum) Number of Shorebirds Recorded Feeding at Toondah Har	bour Each
Summer Season	
Table 17-7: Assessment of the Importance of Migratory Shorebird Habitats in their Own Right	
Table 17-8: Flight Initiation Distance (FID) of a Variety of Migratory Shorebird Species in Response to Disturban	_
Table 17-9: Comparison of Migratory Shorebirds Feeding at Low Tide between 1990 (Thompson 1990) and Z	
this study)	
Fable 17-10: Migratory and Threatened Shorebirds Management Measures	
Table 17-11: Migratory and Threatened Shorebirds Risk Assessment of Key Activities.	
Table 18-1: Likely Presence at Various Life History Stages in the Habitats at Toondah Harbour	
Fable 18-2: Summary of Commercial Fishing Catch and Effort in Logbook Grids W37 (northern Moreton Bay)	
southern Moreton Bay) between 2010 and 2018	
Γable 18-3: Impacts and Mitigation Summary Γable 18-4: Summary of risk for recreational and commercial fishing access, and fisheries habitat	
Table 19-1: State Heritage Listed Places in Proximity to the Project footprint	
Fable 19-2: Historical Themes for the Cleveland Area.	
Table 19-3: State Heritage Listings Criteria in Proximity to Project footprint	
Fable 20-1: Social Infrastructure Review.	
Fable 20-2: Impact Scoping	
Fable 21-1: Summary of Economic Benefits under the Project Case.	
Fable 21-2: Summary of Economic Costs under the Project Case	
Fable 21-3: Results from Cost-Benefit Analysis (\$'000 2020 \$s).	
Fable 21-4: Construction period – Queensland Economic Impacts	
Fable 21-5: Operational Period – Minjerribah Economic Impacts	
Fable 21-6: Operating Period – Redland LGA Economic Impacts	
Fable 22-1: ESD Summary and Cross-reference for EIS Aspects	
Plates	
Plate 9-1: The 'Faucon' During Maintenance Dredging on an Incoming Tide at Toondah Harbour	Ω_17
Plate 13-1: Toondah Harbour from Fison Channel South of Cassim IslandIsland	



Plate 13-2: Toondah Harbour from Fison Channel South of Cassim Island with Comments	13-10
Plate 15-1: Koalas home ranges around the Toondah Harbour precinct (source: de Villiers et. al. (2019)	15-18
Plate 15-2: Koala food trees in the Trade College grounds	
Plate 15-3: Koala food trees in GJ Walter Park	15-24
Plate 15-4: Carpark plantings	15-24
Plate 15-5: Condition of Casuarina glauca stand	15-24
Plate 15-6: Section of Middle Street between the trade college grounds and GJ Walter Park	15-27
Plate 15-7: Typical interface between marine and terrestrial habitats	
Plate 16-1: Mudflats within the Project Footprint	16-16
Plate 16-2: Avicennia marina Closed Open Shrubland with Sparse Rhizophora stylosastylosa	16-17
Plate 16-3: Seagrass community dominated by Zostera muelleri (left) in the reclamation area and Halophila sp	
(right) in the Fison channel	
Plate 17-1: Mangrove Tree Roost at Cassim Island	17-21
Plate 17-2: Whimbrel Roosting in Mangrove Tree	17-21
Plate 17-3: Saltmarsh Roost Site at Nandeebie Claypan	17-22
Plate 17-4: Public Footpath and Cycleway on the Western Boundary of the Nandeebie Claypan Roost	17-22
Plate 17-5: View over the Oyster Point roost showing proximity to public recreational park infrastructure	17-24
Plate 17-6: Roosting shorebirds pushed towards the edge of the park at Oyster Point by rising spring tide	17-24
Plate 17-7: Flock of Eastern Curlew Roosting at Oyster Point Roost	17-25
Plate 17-8: Roosting Eastern Curlew flushed by person approaching to the edge of the shoreline at Oyster Poi	nt, 70m
from the birds	17-25
Plate 17-9: Bar-tailed Godwit	17-27
Plate 17-10: Eastern Curlew	17-27
Plate 19-1: Front View of Grand View Hotel, from North Street	19-15
Plate 19-2: Front View of Fernleigh Homestead, from Shore Street E	19-16
Plate 19-3: View of St Paul's Church from Cross Street	19-16
Plate 19-4: South View of Park	19-17
Plate 19-5: Moreton Bay Fig Tree	19-17

Appendices

Appendix 2-A

Sediment Sampling and Analysis Technical Report

Appendix 2-B

Sediment Sampling and Analysis Report – Contaminated Land Comparison

Appendix 2-C

Toondah Harbour Contaminated Land Preliminary Site Investigation

Appendix 2-D

Toondah Harbour Historical Contaminated Land Reports

Appendix 2-E



Coastal Processes, Stormwater and Dredge Plume Modelling

Appendix 2-F

Coastal Processes Peer Review Summary

Appendix 2-G

Water Quality Technical Report

Appendix 2-H

Groundwater Technical Report

Appendix 2-I

Air Quality Technical Report

Appendix 2-J

Terrestrial and Underwater Noise and Vibration Technical Report

Appendix 2-K

Lighting Technical Report

Appendix 2-L

Terrestrial Ecology Technical Report

Appendix 2-M

Marine Ecology Technical Report

Appendix 2-N

Migratory and Threatened Shorebirds Technical Report

Appendix 2-0

Commercial and Recreational Fisheries Marine Zoning Data Commercial Fishing Catch and Effort Data

Appendix 2-P

Non-Indigenous Cultural Heritage Technical Report

Appendix 2-Q

Social Matters Technical Report

Appendix 2-R

Economic Matters Technical Report

Volume 3: MNES Significant Impact Assessment

Table of Contents

23.	Summary	of Direct and Indirect Impact Assessment	23-1
	23.1. M	NES Significant Impact Assessment Process	23-1
	23.2. Su	ımmary of Key Impacts to Environmental Values	23-2
	23.2.1	Overview of Potential Impacts on the Marine Environment	23-2
	23.2.2	Overview of Potential Impacts on the Terrestrial Environment	23-4
	23.2.3	Overview of Potential Impacts on Threatened and Migratory Shorebirds	23-5
	23.2.4	Summary of Direct and Indirect Impacts from the Toondah Harbour Project	23-5
24.	Threatened Species Significant Impact Assessment		
	24.1. In	troduction	24-1
	24.2. Th	rreatened Terrestrial Species	24-2
	24.2.1	Koala Threatened Species Significant Impact Assessment	24-2
	24.2.2	Grey-Headed Flying-fox Threatened Species Significant Impact Assessment	24-6
	24.2.3	Water Mouse Threatened Species Significant Impact Assessment	24-9
	24.2.4	White-throated Needletail Threatened Species Significant Impact Assessment	24-12
	24.3. Th	reatened Shorebird Species	24-13
	24.3.1	Eastern Curlew Threatened Species Significant Impact Assessment	24-13
	24.3.2	Great Knot Threatened Species Significant Impact Assessment	24-16
	24.3.3	Curlew Sandpiper Threatened Species Significant Impact Assessment	24-19
	24.3.4	Red Knot Threatened Species Significant Impact Assessment	24-21
	24.3.5	Lesser Sand Plover Threatened Species Significant Impact Assessment	24-24
	24.3.6	Bar-tailed Godwit Threatened Species Significant Impact Assessment	24-27
	24.3.7	Greater Sand Plover Threatened Species Significant Impact Assessment	24-30
	24.4. Th	reatened Marine Species	24-32
	24.4.1	Southern Right Whale Threatened Species Significant Impact Assessment	24-32
	24.4.2	Loggerhead Turtle Threatened Species Significant Impact Assessment	24-34
	24.4.3	White's Seahorse Threatened Species Significant Impact Assessment	24-36
	24.4.4	Green Turtle Threatened Species Significant Impact Assessment	24-39
	24.4.5	Hawksbill Turtle Threatened Species Significant Impact Assessment	24-41
	24.5. Su	ımmary of Significant Residual Impacts to Threatened Species	24-44
25.	Migratory	Species Significant Impact Assessment	25-1
	25.1. In	troduction	25-1
	25.2. Te	errestrial Migratory (Non-Shorebird) Species Significant Impact Assessment	25-2
	25.2.1	Eastern Osprey Migratory Species Significant Impact Assessment	25-2
	25.2.2	Gull-billed Tern Migratory Species Significant Impact Assessment	25-3

25	2.3 Caspian Tern Migratory Species Significant Impact Assessment	25-4
25	2.4 Little Tern Migratory Species Significant Impact Assessment	25-5
25	2.5 Crested Tern Migratory Species Significant Impact Assessment	25-7
25	2.6 White-winged Black Tern Migratory Species Significant Impact Assessment	25-8
25	2.7 Common Tern Migratory Species Significant Impact Assessment	25-9
25	2.8 Oriental Cuckoo Migratory Species Significant Impact Assessment	25-10
25	2.9 Rufous Fantail Migratory Species Significant Impact Assessment	25-12
25.3.	Migratory (Non-threatened) Shorebirds Significant Impact Assessment	25-13
25	3.1 Grey-tailed Tattler Migratory Species Significant Impact Assessment	25-13
25	3.2 Whimbrel Migratory Species Significant Impact Assessment	25-15
25	3.3 Terek Sandpiper Migratory Species Significant Impact Assessment	25-16
25	3.4 Pacific Golden Plover Migratory Species Significant Impact Assessment	25-18
25	3.5 Red-necked Stint Migratory Species Significant Impact Assessment	25-19
25	3.6 Common Greenshank Migratory Species Significant Impact Assessment	25-20
25	3.7 Ruddy Turnstone Migratory Species Significant Impact Assessment	25-22
25	3.8 Grey Plover Migratory Species Significant Impact Assessment	25-23
25	3.9 Sharp-tailed Sandpiper Migratory Species Significant Impact Assessment	25-24
25	3.10 Double-banded Plover Migratory Species Significant Impact Assessment	25-25
25	3.11 Black-tailed Godwit Migratory Species Significant Impact Assessment	25-26
25	3.12 Little Curlew Migratory Species Significant Impact Assessment	25-27
25.4.	Marine Migratory Species Significant Impact Assessment	25-28
25	4.1 Humpback Whale Migratory Species Significant Impact Assessment	25-28
25	4.2 Australian Humpback Dolphin Migratory Species Significant Impact Assessment	25-30
25	4.3 Dugong Migratory Species Significant Impact Assessment	25-31
25.5.	Summary of Significant Residual Impacts to Migratory Species	25-32
26. Cumu	lative and Consequential Impacts	26-1
26.1.	Definition and Scope	26-1
26.2.	Cumulative and Consequential Impact Assessment Method	26-2
	2.1 Key Issues to be Addressed by the CIA	26-2
	2.2 Identifying Environmental Values	26-2
26	2.3 Definition of Spatial and Temporal Boundaries	26-3
26	2.4 Identifying Types and Sources of Cumulative and Consequential Impacts	26-3
26	2.5 Risk and Significant Impact Assessment Process	26-4
26.3.	Cumulative and Consequential Impact Assessment	26-5
	3.1 Key Issues to be Addressed	26-5
	3.2 Environmental Values that may be Impacted	26-11
26	3.3 Spatial and Temporal Boundaries for the CIA	26-16
26	3.4 Actions that may Result in Cumulative and Consequential Impacts	26-16
26	3.5 Cumulative Impact Assessment	26-23
26.4.	Other Consequential Impacts	26-37
	4.1 Increased Boat and Recreational Vessel Usage	26-37
	4.2 Climate Change	26-38
26.5.	Summary	26-40
20.3.		20 40
27. Moret	on Bay Ramsar Site Impact Assessment	27-1



	27.1.	Defin	ition and Scope	27-1		
	27.	1.1	Ramsar Convention on Wetlands	27-2		
	27.	1.2	Assessment Requirements	27-3		
	27.2.	The M	Noreton Bay Ramsar Site	27-4		
	27.3.	Chan	ge to Ecological Character Assessment Method	27-7		
	27.	3.1	Reliability of Information	27-8		
	27.	3.2	Critical Components, Processes and Services of the MBRS	27-8		
	27.	3.3	Identifying Critical Components, Processes and Services at the Project Site Level	27-9		
	27.	3.4	Assessment of Significance of Potential Impacts	27-12		
	27.4.	MBRS	and Site Level Ecological Character	27-14		
	27.	4.1	Critical Components, Processes and Services of the MBRS	27-14		
	27.	4.2	Critical Components, Processes and Services Represented at the Project Site	27-17		
	27.5.	Asses	sment of Potential Impacts to the MBRS	27-25		
	27.	5.1	Impacts to Critical Physical and Biogeochemical Processes	27-27		
	27.	5.2	Impacts to Critical Components	27-29		
	27.	5.3	Impacts to Critical Biological Processes and Services	27-32		
	27.	5.4	Summary of Potential Impacts	27-35		
	27.6.	Poten	itial for Change in Ecological Character or Significant Impact to the Ramsar MNES	27-37		
28.	Environmental Management Framework 28-					
	28.1. Introd		duction	28-1		
	28.	1.1	Purpose of the Environmental Management Framework	28-1		
	10.	1.1	Objectives	28-1		
	10.	1.2	Application	28-1		
	10.	1.3	Relevance to the EPBC Act	28-2		
	28.	1.2	Other Relevant Legislation	28-3		
	28.	1.3	Proponent's Environmental Record	28-5		
	28.2.	Draft	EM Framework Structure	28-5		
	28.	2.1	Draft EM Framework Procedures	28-7		
	28.	2.2	MNES Management Plans	28-7		
	28.	2.3	Activity Management Plans	28-8		
	28.	2.4	Operational Handover Procedure	28-9		
	28.	2.5	Review and Technical Advisory Panel	28-10		
	28.3. Outline of Draft EM Framework Procedures			28-10		
	28.	3.1	Working Hours	28-10		
	28.	3.2	Roles and Responsibilities	28-11		
	28.	3.3	Complaints Procedure	28-13		
	28.	3.4	Incident and Emergency Procedures	28-14		
	28.	3.5	Spill Response Procedure	28-15		
	28.	3.6	EM Compliance and Auditing Procedure	28-17		
	28.	3.7	Reporting Procedure	28-18		
	28.	3.8	Adaptive Management	28-19		
	28.4.	Draft	MNES Management Plans	28-19		
29.	Enviro	nmen	tal Offsets Strategy	29-1		



	29.1.	EPBC Act Environmental Offsets				
	29.	.1.1 EPBC Act Environmental Offsets Policy Requirements	29-2			
	29.2.	Summary of Residual Significant Impacts	29-3			
	29.3.	Offset Delivery Framework	29-7			
	29.	.3.1 Offset Delivery Approach	29-7			
	29.	.3.2 Offset Delivery Method	29-8			
	29.	.3.3 OFM Framework	29-9			
	29.4.	Potential Toondah Harbour Offset Projects	29-12			
	29.	.4.1 Approach for Threatened and Migratory Shorebird Offset Projects	29-12			
	29.	.4.2 Approach for Marine Wetland Habitat in Moreton Bay	29-14			
	29.5.	Offset Suitability	29-15			
30.	Concl	usion	30-1			
	30.1.	Background and Description	30-1			
	30.2.	Potential Impacts	30-3			
		.2.1 Marine Impacts	30-3			
		.2.2 Terrestrial Impacts	30-3			
		.2.3 Migratory Shorebirds	30-4			
	30.3.	Significant Impacts to MNES	30-5			
		.3.1 Listed Threatened Species	30-5			
		.3.2 Listed Migratory Species	30-5			
		.3.3 Moreton Bay Ramsar Site	30-6			
	30.4.	Environmental Offsets Strategy	30-7			
	30.5.	EPBC Act Objectives	30-8			
F	iau	ires				
	_	: Conceptual Model of Environmental Values at Toondah Harbour (Existing)	23-6			
_		Decreasing Certainty of Project Forecasting (taken from Kaveney, Kerswell and Buick 2015).				
-		CIA Spatial Boundary and Actions that may Contribute to Cumulative Impacts				
_		Toondah Harbour Mudflat Extent (MLWS) under Predicted Sea Level Rise				
_		The Moreton Bay Ramsar Site				
Figure 27-2: Toondah Harbour MBRS Zone of Influence						
Figure 27-3: Toondah Harbour Conceptual Ecosystem Interactions						
Figu	ıre 27-4:	Toondah Harbour Zone of Influence Conceptual Ecosystem Interactions	27-23			
Figu	ıre 27-5: l	Marine Wetland Habitats Within the MBRS and Project Footprint	27-24			
Figu	ıre 27-6: (Conceptual Flowchart of Impact Pathways to MBRS Components, Processes and Services	27-26			
Figu	ıre 27-7:	Toondah Harbour Project Conceptual Ecosystem Interactions ImpactsProject Conceptual Ecosystem Interactions	27-36			
_		Draft Environmental Framework Conceptual Diagram				
_		Construction Roles and Responsibilities				
_		Complaints Procedure				
_		Adaptive Management Process (source: CSIRO)				
-		Toondah Harbour Project MNES Significant Residual Impacts				
Fiat	ıre 29-2: ⁻	Toondah Harbour Offset Fund General Steps and Operation	29-11			

Tables

Table 24-2: Assessment of Grey-headed Flying-fox Against the Vulnerable Threatened Species Significant Impact Criteria
Table 24-3: Assessment of Water Mouse Against the Vulnerable Threatened Species Significant Impact Criteria
Table 24-4: Assessment of White-throated Needletail Against the Vulnerable Threatened Species Significant Impact Criteria
Criteria
Criteria
Table 24-6: Assessment of Great Knot Against the Critically Endangered Threatened Species Significant Impact Criteria
Table 24-7: Assessment of Curlew Sandpiper Against the Critically Endangered Threatened Species Significant Impact Criteria
Criteria
Table 24-9: Assessment of Lesser Sand Plover Against the Endangered Threatened Species Significant Impact Criteria. 24-25 Table 24-10: Assessment of Bar-tailed Godwit Against the Vulnerable Threatened Species Significant Impact Criteria. 24-28 Table 24-11: Assessment of Greater Sand Plover Against the Vulnerable Threatened Species Significant Impact Criteria. 24-31 Table 24-12: Assessment of Southern Right Whale Against the Endangered Threatened Species Significant Impact Criteria. 24-34 Table 24-13: Assessment of Loggerhead Turtle Against the Endangered Threatened Species Significant Impact Criteria. 24-35 Table 24-14: Assessment of White's Seahorse Against the Endangered Threatened Species Significant Impact Criteria. 24-38 Table 24-15: Assessment of Green Turtle Against the Vulnerable Threatened Species Significant Impact Criteria. 24-38
Table 24-9: Assessment of Lesser Sand Plover Against the Endangered Threatened Species Significant Impact Criteria. 24-25 Table 24-10: Assessment of Bar-tailed Godwit Against the Vulnerable Threatened Species Significant Impact Criteria. 24-28 Table 24-11: Assessment of Greater Sand Plover Against the Vulnerable Threatened Species Significant Impact Criteria. 24-31 Table 24-12: Assessment of Southern Right Whale Against the Endangered Threatened Species Significant Impact Criteria. 24-34 Table 24-13: Assessment of Loggerhead Turtle Against the Endangered Threatened Species Significant Impact Criteria. 24-35 Table 24-14: Assessment of White's Seahorse Against the Endangered Threatened Species Significant Impact Criteria. 24-38 Table 24-15: Assessment of Green Turtle Against the Vulnerable Threatened Species Significant Impact Criteria. 24-38
Table 24-10: Assessment of Bar-tailed Godwit Against the Vulnerable Threatened Species Significant Impact Criteria. 24-28 Table 24-11: Assessment of Greater Sand Plover Against the Vulnerable Threatened Species Significant Impact Criteria
Table 24-11: Assessment of Greater Sand Plover Against the Vulnerable Threatened Species Significant Impact Criteria
Table 24-12: Assessment of Southern Right Whale Against the Endangered Threatened Species Significant Impact Criteria
Table 24-13: Assessment of Loggerhead Turtle Against the Endangered Threatened Species Significant Impact Criteria
Table 24-14: Assessment of White's Seahorse Against the Endangered Threatened Species Significant Impact Criteria24-38 Table 24-15: Assessment of Green Turtle Against the Vulnerable Threatened Species Significant Impact Criteria 24-40
Table 24-15: Assessment of Green Turtle Against the Vulnerable Threatened Species Significant Impact Criteria 24-40
Table 24-16: Assessment of Hawksbill Turtle Against the Vulnerable Threatened Species Significant Impact Criteria 24-
42
Table 25-1:Assessment of the Eastern Osprey Against the Migratory Species Significant Impact Criteria25-2
Table 25-2: Assessment of the Gull Billed Tern Against the Migratory Species Significant Impact Criteria25-4
Table 25-3: Assessment of the Caspian Tern Against the Migratory Species Significant Impact Criteria25-5
Table 25-4: Assessment of the Little Tern Against the Migratory Species Significant Impact Criteria25-6
Table 25-5: Assessment of the Crested Tern Against the Migratory Species Significant Impact Criteria25-8
Table 25-6: Assessment of the White-winged Black Tern Against the Migratory Species Significant Impact Criteria25-9
Table 25-7: Assessment of the Common Tern Against the Migratory Species Significant Impact Criteria25-10
Table 25-8: Assessment of the Oriental Cuckoo Against the Migratory Species Significant Impact Criteria
Table 25-9: Assessment of the Rufous Fantail Against the Migratory Species Significant Impact Criteria
Table 25-10: Assessment of the Grey-tailed Tattler Against the Migratory Species Significant Impact Criteria25-14
Table 25-11: Assessment of the Whimbrel Against the Migratory Species Significant Impact Criteria25-16
Table 25-12: Assessment of the Terek Sandpiper Against the Migratory Species Significant Impact Criteria 25-17
Table 25-13: Assessment of the Pacific Golden Plover Against the Migratory Species Significant Impact Criteria 25-19
Table 25-14: Assessment of the Red-necked Stint Against the Migratory Species Significant Impact Criteria
Table 25-15: Assessment of the Common Greenshank Against the Migratory Species Significant Impact Criteria 25-21
Table 25-16: Assessment of the Ruddy Turnstone Against the Migratory Species Significant Impact Criteria

■ Draft Environmental Impact Statement

Table 25-17: Assessment of the Grey Plover Against the Migratory Species Significant Impact Criteria	25-24
Table 25-18: Assessment of the Sharp-tailed Sandpiper Against the Migratory Species Significant Impact Crite	eria 25-25
Table 25-19: Assessment of the Double-banded Plover Against the Migratory Species Significant Impact Crite	ria 25-26
Table 25-20: Assessment of the Black-tailed Godwit Against the Migratory Species Significant Impact Criteria.	25-27
Table 25-21: Assessment of the Little Curlew Against the Migratory Species Significant Impact Criteria	25-28
Table 25-22: Assessment of the Humpback Whale Against the Migratory Species Significant Impact Criteria	25-29
Table 25-23: Assessment of the Humpback Dolphin Against the Migratory Species Significant Impact Criteria	25-30
Table 25-24: Assessment of the Dugong Against the Migratory Species Significant Impact Criteria	25-31
Table 26-1: Scoring of Residual Risk	26-5
Table 26-2: Key Issues to be Addressed by the CIA	26-6
Table 26-3: Environmental Values Considered in the CIA.	26-12
Table 26-4: Actions with Potential for Cumulative and Consequential Impacts	26-17
Table 26-5: Potential Sources for Impact Utilised for the CIA.	26-22
Table 26-6: Water Quality Cumulative Risk Scores from Other Projects.	26-26
Table 26-7: Koala Cumulative Risk Scores from Other Projects	26-28
Table 26-8: Koala Cumulative Significant Impact Assessment	26-28
Table 26-9: Migratory and Threatened Shorebirds Cumulative Risk Scores from Other Projects	26-32
Table 26-10: Threatened and Migratory Shorebird Species Cumulative Significant Impact Assessment	26-32
Table 26-11: Marine Threatened Species and Habitats Cumulative Risk Scores from Other Projects	26-36
Table 27-1: Summary of Moreton Bay Characteristics against Ramsar Listing Criteria	27-6
Table 27-2: Categories of Wetland Components, Processes and Services	27-9
Table 27-3: Potential for Impacts on the Ecological Character of the MBRS	27-13
Table 27-4: MBRS Critical Services Identified by the Draft ECD	27-14
Table 27-5: Local Representation of MBRS Critical Services.	27-18
Table 27-6: Critical Services of the MBRS Present in the Project Footprint and Zone of Influence	27-25
Table 27-7: Potential for Project Impacts to Result in a Change in Ecological Character of the MBRS or Signific	ant Impact
on MNES	27-39
Table 28-1: Activity MPs and Endorsement Agencies	28-8
Table 28-2: Activity Management Plan Implementation During Construction Periods	
Table 29-1: Summary of Significant Residual Impacts to MNES from the Toondah Harbour Project	29-4
Table 29-2: EPBC Act Environmental Offsets Policy Requirements, OFM Project Draft Criteria and Application	to Toondah
Harbour	20.16



Appendices

Appendix 3-A

Migratory Species Significant Impact Assessment Tables

Appendix 3-B

Moreton Bar Ramsar Site Assessment

Appendix 3-C

Draft MNES MP Sub-plans

Appendix 3-D

Offset Calculator Outputs

