



# Ella Bay Integrated Resort Proposal

## SEIS Submission Response

## Table of Contents



# Table of Contents

## Purpose and Structure of this Study

This report has been prepared response to submissions received from the members of the public; local, state and federal government agencies and other organisations received during the public submission period. This report should be read in conjunction with the EIS and SEIS.

The report has been collated into seven volumes:

Volume One	Report on Matters of National Environmental Significance (MNES) and List of changes from the EIS and SEIS that have occurred during this review;
Volume Two	Response to Public and Agency Comments post SEIS;
Volume Three	Environmental Management Plan and Sub-plans;
Volume Four	Ella Bay Road Design and Environmental Management Report;
Volume Five	Offset Package Proposal
Volume Six	Consultant and Ella Bay Reports
Volume Seven	Drawings – Masterplan Drawings Long Presentation Drawings Road Layout Drawings Road Detail Drawings

This Section contains the Table of Contents for all Volumes.

# Contents Volume One

<b>1. Introduction .....</b>	<b>1</b>
1.1 Proponent – Satori Resorts Ella Bay Pty Ltd .....	1
1.2 Environmental Record.....	1
<b>2. Project Description (The Action) .....</b>	<b>2</b>
2.1 Ella Bay Development.....	2
2.1.1 Sustainability.....	3
2.1.2 Masterplan Revisions .....	3
2.2 The Ella Bay Road Upgrade.....	7
2.2.1 Changes from previous reports .....	9
2.3 Construction.....	9
2.4 Project Rationale.....	14
2.4.1 Tourism Justification .....	14
2.4.2 Economic Justification .....	16
<b>3. Matters of National Environmental Significance .....</b>	<b>18</b>
3.1 Additional information Studies .....	18
3.2 Existing Environment.....	19
3.2.1 Tenures impacted by the proposed action .....	19
3.2.2 Ella Bay property .....	19
3.2.3 Ella Bay Road .....	22
3.3 Assessment of MNES Environmental Impacts of Existing Land Use .....	22
3.3.1.1 The ‘do nothing’ case .....	22
3.3.2 The Impacts of Existing Land .....	25
3.3.3 Conclusion .....	25
3.4 World Heritage Values .....	26
3.4.1.1 WTWHA.....	28
3.4.1.2 GBRWHA .....	28
3.4.2 Assessment of WHA Listing Criteria (vii) - Visual Amenity.....	29
3.4.2.1 Great Barrier Reef World Heritage Area and Wet Tropics World Heritage Area .....	29
3.4.2.2 Ella Bay Development Scenic Values .....	29
3.4.2.3 Ella Bay Road Scenic Values.....	31
3.4.2.4 Summary of Values and Impact WHA Listing Criteria (vii).....	34
3.4.3 Assessment of WHA Listing Criteria (viii) - Significant geomorphic or physiographic features.....	35
3.4.3.1 Nationally Important Wetland .....	35
3.4.3.2 Great Barrier Reef World Heritage Area .....	35
3.4.3.3 Ella Bay Development.....	36
3.4.3.4 Ella Bay Road.....	44
3.4.3.5 Summary of Values and Impact - WHA Listing Criteria (viii).....	44
3.4.4 Assessment of WHA Listing Criteria (ix) - Significant Ecological and Biological Processes.....	45
3.4.4.1 Ella Bay Site .....	46
3.4.4.2 Conservation Zones .....	48

3.4.4.3	Weeds, Pests and Disease .....	52
3.4.4.4	Summary of Values and Impact WHA Listing Criteria (ix) .....	52
3.4.5	Assessment of WHA Listing Criteria (x) Significant Biological Diversity/Threatened Species.....	53
3.4.5.1	Great Barrier Reef World Heritage Area.....	53
3.4.5.2	Summary of Values and Impact WHA Listing Criteria (x) .....	53
3.4.6	Assessment of Cultural and Historical Values.....	53
3.4.7	Upgrade of Ella Bay Road through WTWHA Environmental significance.....	54
3.4.7.1	Ella Bay Road.....	54
3.5	Conclusion .....	55
<b>4.</b>	<b>Listed Threatened Species and Ecological Communities .....</b>	<b>56</b>
4.1	Fauna and Flora Surveys and Assessment .....	56
4.1.1	Cassowary studies - Additional Information post SEIS .....	56
4.1.2	Fauna Studies - Additional Information post SEIS .....	57
4.1.2.1	Flora studies - Additional Information post SEIS .....	59
4.1.3	Environmental Management Plans.....	60
4.2	Southern Cassowary .....	62
4.2.1	Existing Status of Species and Habitat.....	62
4.2.1.1	Cassowary Abundance, Age Class Structure and Sex Ratio .....	62
4.2.1.2	Home Range and Sex Ratio.....	64
4.2.1.3	Summary of Cassowary Surveys .....	65
4.2.2	Cassowary Habitat Use Within Ella Bay Property and Access Road.....	66
4.2.2.1	Habitat within the Ella Bay property .....	66
4.2.2.2	Habitat Use along Ella Bay Road .....	67
4.2.3	Summary of Ella Bay Development Cassowary Mitigation Measures .....	69
4.2.3.1	Fauna Corridors and Cassowary Access.....	69
4.2.4	Summary of Ella Bay Road Fauna Mitigation Measures .....	73
4.2.4.1	Ella Bay Road Fencing.....	74
4.2.5	Mitigation during Preconstruction, Construction and Operations .....	78
4.2.5.1	Pre-construction/design phase.....	78
4.2.5.2	Construction phase .....	78
4.2.5.3	Operational phase .....	82
4.2.6	Summary of Actions.....	88
4.2.7	Cassowary Population Viability Analysis .....	89
4.2.8	Conclusion .....	90
4.3	Stream Dwelling Frogs .....	96
4.3.1.1	Ella Bay Site .....	96
4.3.1.2	Ella Bay Road.....	97
4.3.1.3	Assessment of Potential Impacts on Stream Dwelling Frogs .....	97
4.3.1.4	Chytrid Fungus .....	97
4.3.1.5	Conclusion.....	97
4.4	Spectacled Flying-fox .....	99
4.4.1.1	Assessment of Potential Impacts on Spectacled Flying-fox .....	99
4.4.1.2	Conclusion.....	99
4.5	Marine Turtles (As For GBRMPA above).....	100
4.5.1.1	2008 Turtle Surveys by Constable .....	100
4.5.1.2	Ella Bay Site .....	100
4.5.1.3	Assessment of Potential Impacts on Marine Turtles .....	100
4.5.1.4	Conclusion.....	100
4.6	Vegetation Communities and Flora Species.....	102

4.6.1.1	Threatened Vegetation Communities.....	102
4.6.1.2	Ella Bay Site .....	102
4.6.1.3	Ella Bay Road.....	103
4.6.1.4	Threatened Flora .....	103
4.6.1.5	Assessment of Potential Impacts Vegetation Communities and Flora Species .....	104
4.6.1.6	Conclusion.....	104
<b>5.</b>	<b>Offset Package .....</b>	<b>106</b>
5.1	Ella Bay Offset Package.....	106
5.2	Direct Impacts .....	107
5.3	Indirect Impacts to World Heritage Area .....	108
5.4	Offset Property Description .....	109
5.5	Eubenangee Offset Property .....	109
5.6	Offset Package Matrix.....	110
<b>6.</b>	<b>Review of the EIS and SEIS.....</b>	<b>112</b>
6.1	Public Consultation and Community Involvement.....	114
6.1.1	Scope of the Consultation.....	114
<b>7.</b>	<b>Study Team for Submission Response.....</b>	<b>117</b>
<b>8.</b>	<b>References.....</b>	<b>119</b>
<b>Appendix 1.</b>	<b>Changes to the Master Plan .....</b>	<b>121</b>
<b>Appendix 2.</b>	<b>List of Quantities .....</b>	<b>130</b>

## **List of Tables**

Table 2:1	Ella Bay Development Key quantities (From to Appendix 2 – List of Quantities).....	4
Table 2:2	Local Area Plan key constraints (refer to Volume 6.5a Local Area Plan).....	5
Table 2:3	Ella Bay Road Tenure (refer to Volume 4 Ella Bay Road Design and Environmental Management Report) .....	8
Table 3:1	Wet Tropics World Heritage Area and Great Barrier Reef World Heritage Area Criteria.....	26
Table 3:2	Clearing areas for Ella Bay Road Stage 1 & 2, plus clearing of Ella Bay Development site .....	46
Table 3:3	Isolation of habitat caused through fencing.....	47
Table 4:1	Comparison of population estimates between all Ella Bay Cassowary surveys. ....	63
Table 4:2	Habitat values as a function habitat quality and risk from Moore Working paper 3 (collated in 6.1L) .....	68
Table 4:3	Cassowary Habitat Clearing and Isolation areas for Ella Bay Road Stage 1 & 2, plus clearing of Ella Bay Development site.....	79
Table 5:1	Land based direct offsets .....	107
Table 5:2	Research based indirect offset package .....	107
Table 5:3	Cleared Areas and Resulting Regulatory Offsets.....	108
Table 5:4	Proposed Direct Residual offset - EPBC .....	108
Table 5:5	Wet Tropics World Heritage Area Criteria and Summary of Impacts.....	109
Table 5:6	Offset Package Matrix based on Offsets Matrix tool (DEWR 2007) .....	111

## List of Figures

Figure 2:1	Project location (refer to Volume 7 Dwg 4) .....	5
Figure 2:2	Ella Bay Masterplan Conceptual Layout (refer to Volume 7 Dwg 15).....	6
Figure 2:3	Ella Bay Precinct Staging Plan (refer to Volume 7 Dwg 16).....	6
Figure 2:4	Proposed Precinct Staging .....	11
Figure 2:5	Precinct staging with construction starting in the Northern precincts.....	12
Figure 2:6	Ella Bay Road Stage 1 Refer to Dwg EBR1CE-PD03.....	13
Figure 2:7	Ella Bay Road Stage 2 Refer to Dwg EBR1CE-PD04.....	13
Figure 2:8	Breakdown of International Visitors to FNQ (Source Tourism Queensland Snapshots).....	15
Figure 2:9	Visitor Activity Participation Profile (Source: <i>Tourism Research Australia, International Visitor Survey and National Visitor Survey, 2009</i> ).....	15
Figure 3:1	Extract of 1898 survey of Ella Bay property. Ella Bay boundary added in red for clarity .....	21
Figure 3:2	Extract from army topographical map 1943 showing extent of clearing along riparian creeks. Ella boundary added in red.....	22
Figure 3:3	Pond Apple (red >70%, orange 35>70% & yellow <35%) and Hymenachne infestations (green) January 2010 (refer to Volume 6.2d <i>Weed mapping Ella Bay</i> ) .....	24
Figure 3:4	Comparison of surveyed Cassowary population .....	25
Figure 3:5	Wet Tropics World Heritage Area and Tenures. Note tenure of WHA only, NP only or WHA and NP along Ella Bay Road in insert. Extract from WTMA Map 16 Cooper Point and Insert from EBR1CE-DD70 Volume 7 .....	27
Figure 3:6	View of Heath Point Headland from the air highlighting the extent of the WHA.....	33
Figure 3:7	View of the existing access road from the sea highlighting its limited visibility. Vegetated retaining walls and other associated mitigation measures will minimise the visual impacts from the reef lagoon.....	33
Figure 3:8	Ella Bay Swamp Wetland - DSEWPAC's Protected Matters Search Tool .....	35
Figure 3:9	Ella Bay Development showing constructed wetlands and organic golf holes with proximity to Ella Bay Swamp Wetland and Offset areas.....	37
Figure 3:10	Low Flows Duration Curve for whole catchment to Northern Wetland .....	39
Figure 3:11	Low Flow Duration Curve for whole catchment to Northern Wetland .....	39
Figure 3:12	High Flow Duration Curve for whole catchment to Northern Wetland .....	40
Figure 3:13	Cross-section superimposed over groundwater drawdown showing impact of continuous drawdown assuming upper aquifer is connected and no inflow (worst case scenario) .....	42
Figure 3:14	Stormwater and Potable Water Cycle: Rainwater harvesting with groundwater backup. Constructed wetlands and Bioretention Filters filter runoff. Recycled water is stored during rain events.....	43
Figure 3:15	Recycled water cycle: supply to buildings, fire fighting, and irrigation of recycled water. ....	43
Figure 3:16	Areas of Clearing have been highlighted within red circles. Blue circles indicate clearing for wetland and BRF discharge structures .....	47
Figure 3:17	Revegetation Staging Plan .....	48
Figure 3:18	Ella Bay Conservation Zones .....	51
Figure 4:1	Comparison of Cassowary population estimates and arrow showing change from agriculture.....	63
Figure 4:2	Analysis Cassowary findings all surveys (Moore 2006, 2009, Buosi 2009b, 2010a,b) Note that in this figure each scat and footprint are recorded.....	65

Figure 4:3	Update of Cassowary habitat description (refer to 6.1m) with Moore area descriptors (EIS collated in 6.1L).....	67
Figure 4:4	Cassowary accessible areas (green shading) totalling 336ha out of a 470ha with movement corridors. The white outline is the edge of the conservation zoned areas. The markers are from all surveys.....	70
Figure 4:5	Cassowary access will be maintained through fauna underpasses shown in yellow and gated level crossings shown in red. ....	72
Figure 4:6	Cassowary one way Escape Gate during trials with captive cassowaries Refer to Volume 6.1i <i>Report on Cassowary Escape Gate Trials</i> .....	75
Figure 4:7	Installation of cassowary escape gate at road entrances with strategically placed vegetation. Refer to Volume 6.1k <i>Cassowary Fencing Strategy</i> .....	76
Figure 4:8	Typical escape gate location Stage 1 entrance. From Dwg. EBR1CE-DD01. For details of fence and escape gate locations Refer to Dwg. EBR1CE-DD(01-22) also Refer to Volume Seven drawing EBR1CE-PD10 .....	77
Figure 4:9	Cassowary Recovery Plan Matrix .....	95
Figure 4:10	Recordings of Litoria rheocola. From Figure 5.1 (BAAM, 2008) Volume 6.3a and (Alford 2009) Volume 6.3b .....	96
Figure 4:11	Map of EPBC status of critically endangered communities .....	105
Figure 5:1	Offset land showing the relationship between Eubenangee Swamp National Park and WTWHA .....	110



# Contents Volume Two

<b>1.</b>	<b>SEIS Review of Supplementary Environmental Impact Study .....</b>	<b>1</b>
1.1	Public Consultation .....	1
1.1.1	Submitter Reference.....	1
1.2	Submission Summary .....	3
<b>2.</b>	<b>Master Plan .....</b>	<b>12</b>
2.1	Submitter Issue: Infrastructure Management.....	12
2.1.1	Natural Hazard Planning and Management .....	12
2.1.2	Further Development.....	13
2.1.3	Erosion prone area .....	13
2.2	Submitter Issue: Visual Amenity.....	13
2.2.1	Visibility from World Heritage Areas .....	13
2.2.2	Design control to reduce impact to visual amenity .....	14
2.3	Submitter Issue: Beach Access .....	14
2.3.1	Beach Access Points and design .....	14
2.4	Submitter Issue: Buffers & Setbacks .....	15
2.4.1	Vegetation buffers, setbacks areas and conservation zones.....	15
2.5	Submitter Issue: Staging Plan .....	15
2.5.1	Development and construction Staging Plans.....	15
2.6	Submitter Issue: Resort Fencing .....	16
2.6.1	Precinct Fencing design and implementation.....	16
<b>3.</b>	<b>Water Resources.....</b>	<b>17</b>
3.1	Submitter Issue: Water Quality .....	17
3.1.1	Surface and groundwater monitoring programme.....	17
3.1.2	Golf Course Water Management Practices .....	17
3.2	Submitter Issue: Water Studies .....	18
3.2.1	Groundwater Abstraction Studies.....	18
3.2.2	Quantitative hydrologic assessment.....	18
3.3	Submitter Issue: Water Management .....	19
3.3.1	Water Runoff and Erosion Control Management practices .....	19
3.3.2	Ella Bay Access Road Bypass Drainage Design .....	19
3.3.3	Stormwater Treatment and Wetlands Management.....	20
3.3.4	Air-conditioning Geo Exchange Issues.....	20
3.4	Submitter Issue: Hydrological Connectivity of Wetlands .....	20
3.4.1	Hydrological Connectivity of Wetlands .....	20
<b>4.</b>	<b>Flora and Fauna .....</b>	<b>22</b>
4.1	Submitter Issue: Post SEIS Surveys & Studies .....	22
4.1.1	Post SEIS Flora and Fauna Surveys.....	22



4.1.2 Aquatic Vertebrate Surveys .....	23
4.2 Submitter Issue: Fauna Management.....	23
4.2.1 Management Procedures for Frog Species.....	23
4.2.2 Endangered Frogs and Ella Bay Road .....	24
4.2.3 Management of other Ella Bay Fauna .....	24
4.2.4 Domestic Pets.....	25
4.3 Submitter Issue: Flora and Revegetation Management .....	25
4.3.1 Weed and Feral Pests management .....	25
4.3.2 Revegetation Staging .....	26
4.4 Submitter Issue: Clearing Management .....	26
4.4.1 Clearing areas .....	26
<b>5. Cassowary .....</b>	<b>27</b>
5.1 Submitter Issue: Loss of Habitat & Mitigation .....	27
5.1.1 Cassowary and Human Interaction .....	27
5.1.2 Potential loss of access to coastal strip habitat, habitat for breeding.....	28
5.1.3 Impact on the cassowary population. ....	29
5.1.4 Loss of habitat from road clearing and fenced areas. ....	30
5.1.5 Net loss of habitat. ....	30
5.2 Submitter Issue: Habitat Connectivity .....	31
5.2.1 Cassowary movements restrictions .....	31
5.2.2 Cassowary home range impact .....	32
5.3 Submitter Issue: Cassowary Threat Analysis .....	33
5.3.1 Threats to the cassowary population.....	33
5.3.2 Introduced threats from the development.....	34
5.4 Submitter Issue: Cassowary Management .....	34
5.4.1 Cassowary management plan .....	34
<b>6. Road and Transport .....</b>	<b>35</b>
6.1 Submitter Issue: Ella Bay Road Design and Preferred Alignment.....	35
6.1.1 Preferred alignment and a multi criteria analysis .....	35
6.1.2 Alternate alignment selection .....	36
6.1.3 Cassowary impact and preferred alignment.....	37
6.1.4 Construction staging .....	38
6.1.5 Road design drawings and figures .....	38
6.1.6 Road design recommendations by the Uni SA.....	39
6.1.7 SEIS Trip generation .....	40
6.2 Submitter Issue: Road Safety .....	40
6.2.1 The Uni SA review of Road Safety .....	40
6.2.2 Uni SA review of Speed Limit .....	41
6.3 Submitter Issue: Cycleway .....	41
6.3.1 Cycleway design.....	41



6.4	Submitter Issue: Visual Impact .....	42
6.4.1	Visual impact of Ella Bay Road upgrade .....	42
6.5	Submitter Issue: Fauna Impact and Mitigation.....	42
6.5.1	Graham Seymour southern cassowary population .....	42
6.5.2	Cassowary Exclusion Fence.....	44
6.5.3	Road alignment construction methodologies, mitigation and monitoring strategies .....	44
6.5.4	Cassowary Underpass.....	45
6.5.5	Little Cove habitat loss and fragmentation .....	45
6.6	Submitter Issue: Road Edge Effects.....	46
6.6.1	Edge Effects Impact.....	46
6.6.2	Vehicle noise impact.....	46
6.7	Submitter Issue: Local Community Impact .....	47
6.7.1	Town traffic impact during construction .....	47
6.7.2	Ruby St Issues.....	48
6.7.3	Impact to Coconuts Community. ....	48
6.8	Submitter Issue: Transport .....	49
6.8.1	Traffic Impact Study: Innisfail to Ella Bay .....	49
6.8.2	Ella Bay Transport Strategy.....	49
6.8.3	Public Carparking strategy.....	49
<b>7.</b>	<b>Energy, Water Supply, Sewerage and Waste Management.....</b>	<b>50</b>
7.1	Submitter Issue: Water Supply .....	50
7.1.1	CCRC water supply .....	50
7.2	Submitter Issue: Sewerage .....	50
7.2.1	Sewerage Management Infrastructure .....	50
7.3	Submitter Issue: Power Supply .....	51
7.3.1	Power Supply Infrastructure .....	51
<b>8.</b>	<b>Socio-economic Issues .....</b>	<b>52</b>
8.1	Submitter Issue: Council Maintenance of Ella Bay Rd .....	52
8.1.1	Responsibility, and maintenance of Ella Bay Road .....	52
8.2	Submitter Issue: Indigenous Employment .....	53
8.2.1	Indigenous Employment and communities relations .....	53
8.3	Submitter Issue: Local Real Estate.....	53
8.3.1	Housing Impacts .....	53
8.4	Submitter Issue: Town and Regional Planning Issues .....	54
8.4.1	Security/Environmental Bond .....	54
8.4.2	Community Land tenure .....	54
8.5	Submitter Issue: Public Consultation .....	54
8.5.1	Public consultation.....	54
<b>9.</b>	<b>Additional Issues .....</b>	<b>56</b>



9.1	Submitter Issue: Acid Sulphate Soil.....	56
9.1.1	Potential Acid Sulphate Soil. ....	56
9.2	Submitter Issue: Emergency Management.....	57
9.2.1	Emergency Disaster Management .....	57
9.3	FNQ Regional Plan .....	58
9.3.1	FNQ Regional Plan.....	58
9.4	OFFSETS .....	58
9.4.1	Land handover to National Parks. ....	58
9.4.2	Seymour Range Corridor Offset .....	58



# Contents Volume Three

<b>3.1 Environmental Management Plan.....</b>	<b>1</b>
1.    Introduction .....	5
Project Location .....	5
Project Description.....	7
History.....	8
Background.....	9
EMP Purpose.....	9
EMP Objectives .....	9
EMP Performance Targets .....	9
Ella Bay Environmental Policy.....	10
Environmental Management Plan and Sub-Plans.....	11
Relevant Legislation, Agreements, Policies and Guidelines .....	13
Conditions of Approval.....	14
2.    Environmental Management Implementation and Operation .....	15
Environmental Management Team .....	15
Environmental Experts and Consultants .....	16
Environmental Management Team Responsibilities .....	16
Environmental Management Procedure .....	19
Communications Management System Register .....	19
Ecological Risk Assessment.....	20
Work Method Statements .....	22
Environment in Procurement .....	22
Training and Awareness .....	23
Environmental Communication and Consultation .....	24
Emergency Preparedness and Response.....	24
3.    Monitoring and Compliance.....	26
Environmental Monitoring .....	26
Compliance with Performance Criteria .....	26
Environmental Auditing.....	27
Corrective Action .....	28
4.    EMP Review .....	29
5.    Reporting .....	30
6.    Environmental Management Sub-plans.....	31
7.    Standard Systems .....	33
<b>3.2 Southern Cassowary Management Sub-Plan .....</b>	<b>45</b>
1.    Introduction .....	49
Document Structure.....	49
Document Management .....	49

2.	Background .....	50
3.	Objectives of the Cassowary Management Sub-plan .....	51
	Objectives .....	51
4.	Responsibilities and Authorities.....	52
5.	Reporting and Sub-plan Reviews .....	54
	Reporting .....	54
	Sub-plan Reviews.....	54
6.	Planning Phase .....	55
	Potential Impacts on Cassowaries during the Planning Phase .....	55
	Objectives .....	55
	Performance Criteria.....	55
	Mitigation Measures, Monitoring and Compliance .....	55
7.	Construction Phase .....	59
	Potential impacts on cassowaries during construction phase .....	59
	Objectives .....	59
	Performance Criteria (as a result of EBD activities) .....	59
	Mitigation Measures, Monitoring and Compliance .....	59
8.	Operation Phase .....	68
	Potential Impacts on Cassowaries during Operational Phase .....	68
	Objectives .....	68
	Performance Criteria.....	68
	Mitigation Measures, Monitoring and Compliance .....	68
9.	Auditing and Reporting.....	77
10.	References and Information Sources .....	78
	Websites .....	78
	Legislation.....	78
	References .....	78
	Appendix A: : Cassowary Specialist Contacts .....	80
	Appendix B: Cassowary Emergency Management Procedure .....	81
<b>3.3</b>	<b>Stream Dwelling Rainforest Frog Species Management Sub-Plan.....</b>	<b>82</b>
1.	Introduction .....	87
	Document Structure.....	87
	Document Management .....	87
2.	Background .....	88
3.	Objectives of the Stream Dwelling Rainforest Frog Environmental Management Sub-Plan.....	89
4.	Stream Dwelling Rainforest Frog Profile.....	90
	Site Distribution.....	90
	Common Mist Frog ( <i>Litoria rheocola</i> ).....	90
	Australian Laclelid ( <i>Nyctimystes dayi</i> ).....	91

	Torrent Treefrog ( <i>Litoria nannotis</i> ).....	91
5.	<b>Responsibilities and Authorities.....</b>	<b>92</b>
	Amphibian Advisor (AA).....	92
6.	<b>Reporting and Sub-plan Reviews .....</b>	<b>94</b>
	Reporting .....	94
	Sub-plan Reviews.....	94
7.	<b>Planning Phase .....</b>	<b>95</b>
	Potential Impacts during the Planning Phase.....	95
	Objectives .....	95
	Performance Criteria.....	95
	Mitigation Measures, Monitoring and Compliance .....	95
8.	<b>Construction Phase .....</b>	<b>98</b>
	Potential Impacts during the Construction Phase .....	98
	Objectives .....	98
	Performance Criteria.....	98
	Mitigation Measures, Monitoring and Compliance .....	98
9.	<b>Operation Phase .....</b>	<b>106</b>
	Potential Impacts during the Operation Phase .....	106
	Objectives .....	106
	Performance Criteria.....	106
	Mitigation Measures, Monitoring and Compliance .....	106
10.	<b>Auditing and Reporting.....</b>	<b>112</b>
11.	<b>References and Information Sources .....</b>	<b>113</b>
	Appendix A: Site Distribution.....	114
	Appendix B: Emergency Incident Procedures .....	115
	Appendix C: Hygiene Protocol .....	116
	Appendix D: Stream Dwelling Rainforest Frog Species Monitoring Program .....	120
	Appendix E: Frog Specialist Contacts .....	126
<b>3.4</b>	<b>Spectacled Flying Fox Management Sub-Plan .....</b>	<b>127</b>
1.	<b>Introduction .....</b>	<b>131</b>
	Document Structure.....	131
	Document Management .....	131
2.	<b>Background .....</b>	<b>132</b>
3.	<b>Objectives of the Spectacled Flying-fox Environmental Management Sub-Plan .....</b>	<b>133</b>
4.	<b>Spectacled Flying-fox (<i>Pteropus conspicillatus</i>) Profile.....</b>	<b>134</b>
	Site Distribution.....	134
	Spectacled Flying-fox .....	134
5.	<b>Responsibilities and Authorities.....</b>	<b>136</b>
	Fauna Advisor (FA).....	136

6.	<b>Reporting and Sub-plan Reviews .....</b>	138
	Reporting .....	138
	Sub-plan Reviews.....	138
7.	<b>Planning Phase .....</b>	139
	Potential Impacts during the Planning Phase.....	139
	Objectives .....	139
	Performance Criteria.....	139
	Reporting .....	139
	Mitigation Measures, Monitoring and Compliance .....	139
8.	<b>Construction Phase .....</b>	142
	Potential Impacts during the Construction Phase .....	142
	Objectives .....	142
	Performance Criteria.....	142
	Mitigation Measures, Monitoring and Compliance .....	142
9.	<b>Operation Phase .....</b>	146
	Potential Impacts during the Operation Phase .....	146
	Objectives .....	146
	Performance Criteria.....	146
	Mitigation Measures, Monitoring and Compliance .....	146
10.	<b>Auditing and Reporting.....</b>	149
11.	<b>Emergency Incident Procedure .....</b>	150
	References .....	150
	<b>Appendix A: Site Distribution.....</b>	151
	<b>Appendix B: The Australian Bat <i>Lyssavirus</i> Health Warning .....</b>	152
	Recommendations .....	152
	References .....	153
	<b>Appendix C: Spectacled Flying-fox Monitoring Program.....</b>	154
	<b>Appendix D: Spectacled Flying-fox Specialist Contacts.....</b>	160
<b>3.5</b>	<b>Marine Turtle Species Management Sub-Plan.....</b>	<b>161</b>
1.	<b>Introduction .....</b>	166
	Document Structure .....	166
	Document Management .....	166
2.	<b>Background .....</b>	167
3.	<b>Objectives of the Marine Turtle Environmental Management Plan .....</b>	168
4.	<b>Marine Turtle Profile .....</b>	169
	Site Distribution.....	169
	Green Turtle ( <i>Chelonia mydas</i> ) .....	169
	Flatback Turtle ( <i>Natator depressus</i> ) .....	170
	Loggerhead Turtle ( <i>Caretta caretta</i> ).....	171
	Hawksbill Turtle ( <i>Eretmochelys imbricata</i> ) .....	172



Olive Ridley Turtle ( <i>Lepidochelys olivacea</i> ).....	172
Leatherback Turtle ( <i>Dermochelys coriacea</i> ).....	173
<b>5. Responsibilities and Authorities.....</b>	<b>175</b>
Marine Turtle Advisor (MTA) .....	175
<b>6. Reporting and Sub-plan Reviews .....</b>	<b>177</b>
Reporting .....	177
Sub-plan Reviews.....	177
<b>7. Planning Phase.....</b>	<b>178</b>
Potential Impacts during the Planning Phase.....	178
Objectives .....	178
Performance Criteria.....	178
Mitigation Measures, Monitoring and Compliance .....	178
<b>8. Construction Phase.....</b>	<b>181</b>
Potential Impacts during the Construction Phase .....	181
Objectives .....	181
Performance Criteria.....	181
Mitigation Measures, Monitoring and Compliance .....	181
<b>9. Operation Phase .....</b>	<b>185</b>
Potential Impacts during the Operation Phase.....	185
Objectives .....	185
Performance Criteria.....	185
Mitigation Measures, Monitoring and Compliance .....	185
<b>10. Auditing and Reporting.....</b>	<b>189</b>
<b>11. References.....</b>	<b>190</b>
Literature Cited .....	190
<b>Appendix A: Emergency Incident Procedure .....</b>	<b>192</b>
<b>Appendix B: Marine Turtle Species Monitoring Program .....</b>	<b>193</b>
<b>Appendix C: Marine Turtle Specialist Contacts.....</b>	<b>197</b>
<b>3.6 Significant Flora Management Sub-Plan.....</b>	<b>198</b>
<b>1. Introduction .....</b>	<b>203</b>
Document Structure .....	203
Document Management .....	203
<b>2. Background .....</b>	<b>204</b>
<b>3. Objectives of the Flora Management Plan.....</b>	<b>205</b>
<b>4. Local Priority Actions.....</b>	<b>206</b>
<b>5. Site Distribution.....</b>	<b>207</b>
<b>6. Conservation Significant Flora under the Environment Protection and Biodiversity Conservation Act 1999 .....</b>	<b>208</b>
Carronia pedicellata.....	208
Australian Arenga Palm ( <i>Arenga australasica</i> ) .....	208

Aponogeton proliferus.....	209
Canarium acutifolium var. acutifolium.....	210
Layered Tassel-fern ( <i>Huperzia phlegmarioides</i> ) .....	211
Swamp Orchid ( <i>Phaius tancarvilleae</i> ) .....	212
<b>7. Conservation Significant Vegetation Communities under the Environment Protection and Biodiversity Conservation Act 1999 .....</b>	<b>213</b>
Littoral rainforest and coastal vine thicket .....	213
<b>8. Conservation Significant Flora under Queensland's <i>Nature Conservation Act 1992</i>.....</b>	<b>215</b>
Macaranga polyadenia. ....	215
Ball Fruited Walnut ( <i>Endiandra globosa</i> ).....	215
Ichnanthus pallens. var majus .....	216
Water Vine (Rourea brachyandra).....	216
<b>9. Responsibilities and Authorities.....</b>	<b>217</b>
Vegetation Advisor (VA) .....	217
<b>10. Reporting and Sub-plan Reviews .....</b>	<b>219</b>
Reporting .....	219
Sub-plan Reviews.....	219
<b>11. Planning Phase .....</b>	<b>220</b>
Potential Impacts during the Planning Phase.....	220
Objectives .....	220
Performance Criteria.....	220
Mitigation Measures, Monitoring and Compliance .....	220
<b>12. Construction Phase .....</b>	<b>224</b>
Potential Impacts during the Construction Phase .....	224
Objectives .....	224
Performance Criteria.....	224
Mitigation Measures, Monitoring and Compliance .....	224
<b>13. Operation Phase .....</b>	<b>229</b>
Potential Impacts during the Operation Phase .....	229
Objectives .....	229
Performance Criteria.....	229
Mitigation Measures, Monitoring and Compliance .....	229
<b>14. Auditing and Reporting.....</b>	<b>233</b>
<b>15. Emergency Incident Procedure .....</b>	<b>234</b>
<b>16. References:.....</b>	<b>235</b>
<b>Appendix A: Vegetation Management Act 1999 Conservation Status of Regional Ecosystems.....</b>	<b>236</b>
<b>Appendix B: Environment Protection and Biodiversity Conservation Act 1999 Conservation Status .....</b>	<b>238</b>
<b>Appendix C: Potential Conservation Significant Flora Species .....</b>	<b>240</b>

Appendix D: Locations of the Permanent Monitoring Points .....	241
Appendix E: Endangered, Vulnerable and/or Rare (EVR) species under Queensland's <i>Nature Conservation Act 1992</i> .....	242
Appendix F: Conservation Significant Flora Monitoring Program .....	244
Appendix G: Conservation Significant Flora Specialist Contacts .....	247
<b>3.7 Cultural Heritage Management Sub-Plan .....</b>	<b>248</b>
PART ONE - Introduction .....	253
1. Introduction .....	254
Document Structure .....	254
Document Management .....	254
2. Background .....	255
Aims .....	255
Rationale .....	255
Location of the subject area .....	255
3. Principles .....	257
Legislative context .....	257
4. Definitions .....	258
PART TWO – Cultural Heritage Values .....	259
5. Aboriginal Consultation .....	260
6. Literature Review .....	261
7. Field Work and Assessment .....	262
PART THREE – Cultural Heritage Management .....	264
8. Roles and Responsibilities .....	265
Traditional Owner Stakeholders .....	265
Cultural Heritage Monitors .....	265
Ella Bay Pty Ltd or Subsequent Development Bodies or individuals .....	266
Site Supervisor .....	266
9. Management Procedures .....	267
Participants in the Management of Cultural Heritage .....	267
Number of Cultural Heritage Monitors .....	267
10. Management of Contingencies .....	268
Monitoring Procedures for Cultural Heritage Monitors .....	268
Discovery of Find Procedure for Cultural Heritage Monitors .....	268
Discovery of a Potentially Significant Find by Monitors .....	269
Discovery of Skeletal Material by Monitors .....	270
Artefact Collection Procedures for Monitors .....	270
Monitoring by Contractors .....	271
Discovery of a Find by Contractors .....	272
Discovery of Skeletal Material by Contractors .....	272
11. Reporting Requirements .....	274

12.	Inductions.....	275
	Cultural Awareness Induction .....	275
	Workplace Health and Safety Induction .....	275
13.	Dispute Resolution .....	276
14.	Personnel and Administrative Arrangements.....	277
	Cultural Heritage Consultant .....	277
	Employment of Monitors .....	277
15.	Review Procedures and Variations to the CHMP .....	278
16.	Signatories .....	279
	Attachment 1 – Contact Details .....	281
	Attachment 2 – Monitoring Flow Sheet.....	282
	Attachment 3 – Daily Form .....	283
	Attachment 4 – Procedures for a Find for Indigenous Monitors .....	284
	Attachment 5 - Indigenous Monitors are Present .....	285
	Attachment 6 – Collection Record .....	286
	Attachment 7 – Stop Work Form .....	287
	Attachment 8 – Procedures in Relation to Skeletal Material .....	289
	Attachment 9 – Indigenous Monitors Not Present.....	291
	Appendix A: Report on a Cultural Heritage Assessment .....	292
	Appendix B: Cultural Heritage Issues - 1995.....	336
<b>3.8</b>	<b>Weed Management Sub-Plan .....</b>	<b>352</b>
1.	Introduction .....	357
	Document Structure .....	357
	Document Management .....	357
2.	Background .....	358
3.	Objectives of the Weed Management Sub-Plan .....	359
4.	Weeds present in EBD and EBR areas .....	360
5.	Weed Control Methods.....	361
6.	Risk Assessment Associated with Weed Control.....	363
7.	Responsibilities and Authorities.....	365
	Vegetation Advisor (VA) .....	365
8.	Reporting and Sub-plan Reviews .....	366
	Reporting .....	366
	Sub-plan Reviews.....	366
9.	Planning Phase .....	367
	Potential Impacts during the Planning Phase .....	367
	Objectives .....	367
	Performance Criteria.....	367
	Mitigation Measures, Monitoring and Compliance .....	367

10. Construction Phase .....	371
Potential Impacts during the Construction Phase .....	371
Objectives .....	371
Performance Criteria.....	371
Mitigation Measures, Monitoring and Compliance .....	371
11. Operations Phase .....	378
12. Auditing and Reporting.....	382
13. Emergency Incident Procedure .....	383
14. References and Information Sources .....	384
Chemical Storage .....	384
Weed Management in Queensland .....	384
Legislation.....	384
Weed Identification .....	384
Weed Plans/Strategies .....	385
Water Quality .....	385
Appendix A: Declared weeds on the Ella Bay Development.....	386
Note - Summary of controls (in order of status under the Land Protection Act). .....	386
Appendix B: Environmental Weeds (not declared) on the Ella Bay Development.....	387
Note: Summary of controls (in alphabetical order) .....	387
Appendix C: Weed Species Recorded during the 3D Vegetation Survey for Ella Bay not listed as an Environmental Weed. ....	388
Appendix D: Noxious Plants with Potential to Infest Ella Bay .....	389
Class 1 .....	389
Class 2 .....	389
Class 3 .....	389
Appendix E: Serious Environmental Weeds – Identification and Treatment Calendars.....	390
Pond Apple ( <i>Annona glabra</i> ) .....	390
Sicklepod ( <i>Senna obtusifolia</i> ) .....	392
Rat's Tail Grasses ( <i>Sporobolus</i> species) .....	393
Hymenachne ( <i>Hymenachne amplexicaulis</i> ) .....	394
Appendix F: Herbicides Prohibited from use on Ella Bay .....	395
Background.....	395
Herbicide Reference List for Ella Bay Development as at 17 August 2010. ....	396
Appendix G: Operational Procedures for Weed Control on the Ella Bay Development and Ella Bay Road.....	398
Prerequisites .....	398
Weather .....	398
Record keeping.....	398



Storage and transport of herbicides on the EBD site .....	399
Mixing of herbicides and storage of mixed herbicides.....	399
Disposal of surplus herbicide, rinsate and containers .....	400
Herbicide and Chemical Safety .....	401
Safe Work Method Statement (WMS) for Tractor and Quad Spray Herbicide Application.....	402
Emergency procedure - Herbicide spills.....	405
Weed Control - Procedures by Zones .....	407
<b>Appendix H: Weed Hygiene Protocol .....</b>	<b>412</b>

# Contents Volume Four

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
<b>2</b>	<b>Structure and Purpose of this Report .....</b>	<b>2</b>
	Control of the Road Development and Maintenance .....	2
	Relationship to Previous Reports and Studies.....	2
	Guides and Manuals .....	2
	Research.....	3
	Best Practice .....	3
	Design and Drawings .....	3
<b>3</b>	<b>Road Concept and Staging .....</b>	<b>4</b>
	Road Tenure .....	8
<b>4</b>	<b>Environmental Significance and Potential Impact to WHA .....</b>	<b>10</b>
	WHA Environmental significance.....	10
	Summary of Values and Impact.....	11
	WHA Visual & Aesthetic Values .....	11
	Flying Fish Point Bypass.....	13
	Cultural Heritage .....	15
	Historic and Non Indigenous Heritage .....	16
	Weeds, Pathogens and Feral Animals.....	17
	Assessment of Impact.....	18
	Proposed Mitigation Methods .....	19
	Assessment of Impact to WHA post Mitigation.....	19
	Qualitative Assessment of Impacts on WHA Integrity .....	20
	Environmental Risk Assessment .....	21
	Wet Tropics Permit Conditions Assessment against World Heritage Management Plan (as amended 2009).....	25
<b>5</b>	<b>Road Design and Design Criteria .....</b>	<b>29</b>
	Physical Environment and Climate Constraints .....	29
	Route Selection and Alternative options .....	29
	Traffic Volumes and Development Traffic Generation .....	29
	Transport Efficiency and Level of Service Types of Vehicles.....	30
	Road Concept Design .....	30
	Roadwidth .....	31
	Crossfall and Superelevation.....	33
	Design Speed.....	33
	Traffic Calming .....	34
	Road Geometry.....	35
	Sight Distances .....	36

Clear Zone Widths.....	36
Barrier Fencing.....	36
Vista Points .....	36
Heath Point Park.....	36
Heath Point Headland Vista Point. ....	37
Intersections.....	37
Noise.....	37
Pavement, Linemarking and signage .....	38
Services .....	38
Geotechnical .....	38
Cut and Fill.....	39
Embankment Details .....	39
Lighting .....	41
Road Safety Audit .....	42
Design for construction.....	42
<b>6 Hydrology, Catchment Integrity and Water Quality .....</b>	<b>43</b>
Current catchment hydrology .....	43
Existing Erosion Potential .....	43
Receiving Waters.....	43
Western drainage .....	47
CH 0000 to CH 1700 Flying Fish Point to Heath Point Park .....	47
CH 1700 to 2600 Heath Point Park to North of WHA. ....	47
CH 2600 to 4000 North of WHA to Ella Bay .....	48
Culverts .....	49
Gross Pollutant Traps.....	50
Bridges.....	51
Bridge 1 CH 0425 - 0450 - (EBR1CE-DD03).....	51
Bridge 2 CH2981- 3011 - (EBR1CE-DD16).....	51
Bridge 3 CH3227- 3257 - (EBR1CE-DD18).....	51
Vegetated Swale.....	51
Eastern Drainage .....	52
CH 0000 to CH 1700 Flying Fish Point to Heath Point Park .....	52
CH 1700 to 2600 Heath Point Park to North of WHA. ....	53
CH 2600 to 4000 North of WHA to Ella Bay .....	53
Hydrocarbon Spill Basins .....	53
Water Quality Baseline and Site Specific data.....	54
<b>7 Visual Values.....</b>	<b>57</b>
Visual Analysis .....	57
Change to Visual Character .....	57

Landscape Integration Strategy .....	58
<b>8 Fauna Sensitive Road Design .....</b>	<b>59</b>
Monitoring - Cassowary Interaction with Ella Bay Road.....	59
CH 0000 to 1700 Flying Fish Point to Heath Point Park.....	59
CH 1700 to 2600 Heath Point Park to North of WHA .....	60
CH 2600 to 4000 North of WHA to Ella Bay .....	60
Stage 2.....	60
Planning Mitigation - Cassowaries.....	60
Mitigation Design - Cassowary Underpasses .....	62
Mitigation Design - Cassowary Fence, Barriers and Escape Gate.....	64
Cassowary Fence Trials .....	65
Cassowary One Way Escape Gate Design .....	67
Other Barriers.....	68
Mitigation Design – Fauna Overpass.....	69
Monitoring - Other Fauna .....	69
Planning Mitigation – Other Fauna .....	70
Mitigation Design – Small Fauna Culverts .....	71
Frog-Exclusion Fencing .....	73
Location of Fauna Sensitive Road Design Elements .....	74
Road Noise .....	79
Noise Impact on the World Heritage Area .....	80
Road Light Impact .....	81
<b>9 Flora Sensitive Road Design.....</b>	<b>82</b>
Edge Effects.....	82
Clearing Design.....	83
CH 0000 to 1700 Flying Fish Point to Heath Point Park.....	83
CH 1700 to 2600 Heath Point Park to North of WHA .....	84
CH 2600 to 4000 North of WHA to Ella Bay .....	84
TOTAL CLEARING CH 0000 to CH 4000 .....	84
Stage 2 CH 0000 to 0940 Flying Fish Point Bypass.....	85
Canopy Connectivity and Mature Tree Retention .....	88
Stage 2 Canopy Connectivity.....	96
Revegetation .....	96
Revegetation Plant Selection.....	97
Fauna Underpasses.....	99
Weeds and Weed Control .....	103
Fire.....	103
<b>10 Construction Methodology.....</b>	<b>104</b>
Environmental Code of Conduct .....	104

Site Establishment & Environmental Management.....	104
Environmental Completion.....	106
Stage 1 Phase 1 – FFP Road Upgrade .....	106
Stage 1 Phase 2 – Road Construction Flying Fish Point to Heath Point Headland .....	106
Stage 1 Phase 3 – Heath Point to Ella Bay .....	107
Stage 2 Phase 1 – Flying Fish Point Bypass and Tunnel.....	109
Construction Environmental Management.....	109
Clearing Inspection (Pre, during and post clearing).....	109
Fauna Mortality Avoidance .....	110
Imported Materials - Weeds, Pathogens and Feral Animals .....	110
Erosion and Sediment Control .....	111
Ella Bay Road Environmental Reporting and Auditing .....	112
Management of Construction Infrastructure.....	120
Storm Water Treatment .....	121
Equipment Parkup and Maintenance.....	121
Clearing and Dead Tree Management .....	121
Weed Management.....	122
Wash-down Facilities .....	122
Material and Stockpile Store .....	122
Chemicals Store.....	122
Gabion Prefabrication .....	123
Acid Sulphate Soils: .....	123
Asphalt batch plant: .....	123
Material Reuse and Recycling .....	123
Cleared Vegetation .....	123
Internally Sourced Fill Material.....	123
Topsoil.....	124
Imported Fill Material .....	124
Concrete.....	124
Waste Reuse and Recycling .....	124
<b>11 Traffic Management Plans.....</b>	<b>126</b>
Local Area Traffic Management Plan .....	126
Construction Traffic Management through Flying Fish Point.....	126
Workforce Vehicular Movements .....	128
Ella Bay Road Traffic.....	128
Local Traffic.....	129
Construction Traffic .....	129
Construction Traffic Management.....	129
Communication Strategy .....	130
Construction Evacuation and Emergency Response .....	131

<b>12 Operational Management and Monitoring.....</b>	<b>132</b>
Road Asset Maintenance.....	132
Corridor Management Plan.....	132
Fauna, Flora and Aquatic Monitoring.....	132
Operational Environmental Principles.....	132
Road Asset Maintenance .....	133
Corridor Management Plan .....	133
Cassowary Fencing and Escape Gates.....	133
Frog Fencing .....	134
Fauna Underpass & Culverts.....	134
Flora Management.....	134
Waterways .....	135
Fauna, Flora and Aquatic Monitoring.....	135
Cassowary Monitoring .....	135
Fauna Monitoring .....	136
Frog Species of Conservation Significance .....	136
Flora and Edge Effects monitoring.....	137
Monitoring Aquatic Ecosystems.....	137
<b>13 References.....</b>	<b>140</b>
<b>14 APPENDICES.....</b>	<b>145</b>
<b>Appendix 1. Visual Landscape Assessment Ella Bay Road .....</b>	<b>146</b>
<b>Appendix 2. Revision to Multi Criteria Analysis of Ella Bay Road Options..</b>	<b>188</b>
<b>Appendix 3. Revision to Road Usage Demographics for Ella Bay Road.....</b>	<b>241</b>
<b>Appendix 4. Road Safety Audit of Ella Bay Road .....</b>	<b>268</b>
<b>Appendix 5. Revegetation Planting List .....</b>	<b>279</b>
<b>Appendix 6. Noise Report.....</b>	<b>289</b>

## List of Tables

Table 4.1	Qualitative Assessment of Impacts on WHA Integrity .....	21
Table 4.2	Environmental Risk Assessment .....	24
Table 4.3	Wet Tropics Management Permit Conditions.....	27
Table 4.4	S60(a)(ii) Impact on Current Users of Ella Bay Road.....	28
Table 4.5	Summary of Compliance with Guideline 3 .....	28
Table 4.6	Summary of Compliance with Guideline 6. ....	28
Table 5.1	Single Carriageway Road Widths (Austroads, 2003a). ....	31
Table 6.1	Drainage structures located at Ella Bay Road. ....	50
Table 6.2	Freshwater Values for physicochemical indicators assessed along Ella Bay Road. ....	55
Table 6.3	Middle estuary values for physicochemical indicators assessed along Ella Bay Road.....	56
Table 8.1	Fauna reported along Ella Bay Road.....	69
Table 8.2	Stage 1: All fauna mitigation by chainage.....	76
Table 8.3	Stage 2: All fauna mitigation by chainage.....	76

Table 8.4	Road traffic parameters used in noise model (ASK Consulting Engineers, 2004).....	80
Table 9.1	Reduction in edge effect adapted from (Gooseem M. , 2007).....	83
Table 9.2	Clearing Areas CH 0000 to 1700.....	83
Table 9.3	Clearing Areas CH 1700 to 2600.....	84
Table 9.4	Clearing Areas CH 2600 to 4000.....	84
Table 9.5	Stage 1 Total Clearing CH 0000 to 4000.....	84
Table 9.6	Net revegetation totals CH0000 to 4000.....	85
Table 9.7	Stage 2 Total Clearing CH 0000 to CH 940 (Option D1).....	85
Table 9.8	Stage 2 Total Clearing CH 0000 to CH 940 (Option D2).....	85
Table 9.9	Net revegetation totals CH 0000 to CH 0940.....	85
Table 9.10	Mature trees to be protected stage 1 – list is indicative, subject to Arborist inspection.....	93
Table 9.11	Regional Ecosystem Communities Influencing Road Side Revegetation Localities.....	97
Table 9.12	Revegetation Criteria for Western drains and Batters.....	99
Table 9.13	Revegetation Criteria for Bioretention Swales.....	99
Table 9.14	Revegetation criteria for edge closure.....	99
Table 9.15	Revegetation Criteria for Fauna Underpasses.....	100
Table 9.16	Revegetation criteria for gabion and stabilised cut embankment .....	101
Table 9.17	Most common and potentially invasive weeds (3D, 2009b).....	103
Table 10.1	Construction Management Compounds.....	121
Table 11.1	Road Construction traffic movements Year 2.....	128
Table 12.1	Summary of monitoring required (may vary depending upon results) species/mitigation measure.....	139

## List of Figures

Figure 3:1	Ella Bay Road Alignment Dwg. EBR1CE-PD01 (part 1).....	6
Figure 3:2	Ella Bay Road Alignment Dwg. EBR1CE-PD01 (part 2).....	7
Figure 3:3	Tenure of Ella Bay Road.....	9
Figure 4:1	View from the access road highlighting the scenic values of the World Heritage Area.....	11
Figure 4:2	Photograph of the existing Ella Bay dirt road around Heath Point.....	12
Figure 4:3	View of the existing access road from highlighting its limited visibility. Vegetated retaining walls and other associated mitigation measures will minimise the visual impacts from the reef lagoon.....	13
Figure 4:4	The existing Ella Bay dirt road with weed infested verges.....	14
Figure 4:5	View from Ella Bay looking back towards the World Heritage Area.....	14
Figure 4:6	Photograph indicating the approximate location of the 'cut and cover' tunnel.....	15
Figure 4:7	View of 'cut and cover' portal from reef lagoon.....	15
Figure 4:8	Surveyor Generals Office Brisbane 1883 (NG1 Sheet 6) with approximate location of Ella Bay Road Upgrade shown in red.....	17
Figure 5:1	Estimated Hourly Trip Generation Profile. EIS Vol A6.5.....	29
Figure 5:2	Estimated Monthly Trip Generation Profile. EIS Vol A6.5.....	30
Figure 5:3	Figure from (Gooseem 2007) illustrates an integrated mitigation method adopted on Ella Bay Road.....	31
Figure 5:4	Traffic Lane width (from DMR RPDM 2009).....	33
Figure 5:5	Bar markings at known Cassowary Crossings Tully – Mission Beach Road.....	35
Figure 5:6	Extensive road side clearing and speed limits introduced at known Cassowary Crossings.....	35
Figure 5:7	Typical Batter slopes near Prawn Farm.....	40
Figure 5:8	Vegetated Gabion embankment at Heath point .....	41

Figure 6:1	Existing Western drain opposite Seahaven Prawn Farm. Gully erosion is indicative along the whole alignment. ....	44
Figure 6:2	Existing culverts at Heath Point. Indicative of approximately one-third of the original RCPs. ....	44
Figure 6:3	Unsealed road runoff above and below an existing culvert (headwall visible on left). ....	44
Figure 6:4	Sedimentation 20-30mm at Culvert 16. is 30m east of GBRWHA. ....	44
Figure 6:5	Stormwater Management Plan Drawing EBR1CE-PD06 (part 1 of 2)....	45
Figure 6:6	Stormwater Management Plan Drawing EBR1CE-PD06 (part 2 of 2)....	46
Figure 6:7	Typical western drain cross section Flying Fish Point to Heath Point Park. ....	47
Figure 6:8	Typical western drain for gabion structures at Heath Point. (this section of road is superelevated for safety).....	48
Figure 6:9	Inadequate drainage causes unnecessary erosion along the current alignment. ....	49
Figure 6:10	Cross section of Bioretention swale, the distance from the road varies.....	52
Figure 6:11	Plan of Bioretention Swale runoff and drainage collection pipes. ....	53
Figure 8:1	Cassowary crossing points along Ella Bay Road. (after Moore).....	61
Figure 8:2	Wongaling Creek Bridge Nov 2008. ....	63
Figure 8:3	Cassowary Underpass Bridge 1. ....	63
Figure 8:4	Cassowary fence details from Dwg. EBR1CE-DD42.....	65
Figure 8:5	Trial Cassowary Fence at Ella Bay Revegetation Site. The Ella Bay fence will be dark grey. ....	65
Figure 8:6	Cassowary shear clip assembly.....	66
Figure 8:7	Cassowary one way Escape Gate. ....	67
Figure 8:8	Wallaby using the Escape Gate. ....	68
Figure 8:9	Proposed installation of cassowary escape gate at road entrance. Vegetation would be strategically placed to camouflage the fence. ....	68
Figure 8:10	Fauna Overpass Flying Fish Point Bypass. ....	69
Figure 8:11	Location of Fauna reported along Ella Bay Road. ....	70
Figure 8:12	Cross section showing two fauna ledges. ....	71
Figure 8:13	Dry ledge ramp of Besser block. ....	71
Figure 8:14	CH 0635 Fauna culvert long section showing location of ledges, ramps and rock protection .....	71
Figure 8:15	CH 2170 Fauna Culvert long section showing rocks to retard stream velocity.....	72
Figure 8:16	CH 2400 Fauna culvert long section showing location of ledges and rocks to retard stream velocity. ....	72
Figure 8:17	CH 2400 Fauna culvert cross section showing scree and fauna ledges.....	73
Figure 8:18	Frog fence design. Source: (DTMR, 2010a). ....	74
Figure 8:19	Fauna Mitigation Design Ella Bay Road Alignment Dwg. EBR1CE-PD08 (part 1). ....	77
Figure 8:20	Fauna Mitigation Design Ella Bay Road Alignment Dwg. EBR1CE-PD08 (part 2). ....	78
Figure 9:1	Clearing Vegetation EVR status (part 1). ....	86
Figure 9:2	Clearing Vegetation EVR status (part 2). ....	87
Figure 9:3	Heath Point park at CH1600. The new carpark will finish in front of the Mexican Rain Tree ( <i>Samanea saman</i> ) on the right and the White Apple ( <i>Syzygium forte</i> ) on the left. ....	88
Figure 9:4	Damage to mature trees and canopy connectivity from Cyclone Larry. ....	89

Figure 9:5	Damage to mature trees and canopy connectivity from Cyclone Yasi 2011 .....	89
Figure 9:6	Protected tree, CH0680, Native Olive ( <i>Chionanthus ramiflora</i> ) (centre left) .....	94
Figure 9:7	Protected Tree CH1192, Milky Pine ( <i>Alstonia scholaris</i> ) (centre) and post Cyclone Yasi. Note the broken crown on the western side tree .....	95
Figure 9:8	FourTrees CH2600-2612, two Brown Kurrajongs ( <i>Commersonia bartramia</i> ) and two Swamp Mahoganies ( <i>Lophostemon suaveolens</i> ) .....	96
Figure 9:9	Existing bank stability at Heath Point. There are currently no mitigation measures to prevent landslides .....	100
Figure 9:10	Schematic of gabion revegetation using long stem planting concept.....	102
Figure 9:11	Installation of lifting pipes in gabions.....	102
Figure 9:12	Section of unlined gabion showing establishment of ferns (Photos courtesy of Macaferri). ....	102
Figure 10:1	Schedule of Stage 1 Road Construction - Flying Fish Point to Ella Bay.....	105
Figure 10:2	Schedule of Stage 2 Road Construction - Flying Fish Point Bypass and Shared Pathway .....	108
Figure 10:3	Catelan Road Construction Management Area concept layout.....	120
Figure 11:1	Local Area Traffic Management in Flying Fish Point .....	127
Figure 11:2	Local Area Traffic Road Furniture.....	127

# Contents Volume Five

<b>1. Introduction .....</b>	<b>3</b>
1.1 Project Background.....	3
1.2 Matters of National Environmental.....	3
1.3 Purpose of Report .....	4
1.4 Formal Offset Requirements .....	4
1.4.1 Offsets required under the Vegetation Management Act (VMA) and Nature Conservation Act (NCA) .....	5
1.4.2 Offsets required under the Environmental Protection and Biodiversity Conservation Act .....	5
1.5 Offset Objectives.....	6
<b>2. Quantifiable Impacts under the Queensland Vegetation Management Act (VMA) and Nature Conservation Act (NCA).....</b>	<b>7</b>
2.1.1 Ella Bay Road .....	7
2.1.2 Ella Bay Development .....	7
2.1.3 State based Offset Proposal.....	7
<b>3. Residual Significant Direct Impacts under EPBC .....</b>	<b>9</b>
3.1 Residual Direct Impacts .....	9
3.1.1 Ella Bay Road .....	10
3.1.2 Ella Bay Development .....	12
3.1.3 Commonwealth Direct Offset Proposal .....	14
<b>4. Indirect Impacts to World Heritage Area .....</b>	<b>16</b>
4.1 WHA Listing Criteria (vii) - Visual Amenity.....	16
4.1.1 Great Barrier Reef World Heritage Area and Wet Tropics World Heritage Area .....	16
4.1.2 Visual Amenity Impact .....	18
4.2 WHA Listing Criteria (viii) - Significant geomorphic or physiographic features .....	18
4.2.1 Nationally Important Wetland .....	19
4.2.2 Great Barrier Reef World Heritage Area.....	20
4.2.3 Groundwater and Surface Water Impact on World Heritage Values.....	21
4.3 WHA Listing Criteria (ix) - Significant Ecological and Biological Processes .....	21
4.3.1 Impact to Ecological and Biological Processes .....	22
4.4 WHA Listing Criteria (x) Significant Biological Diversity/Threatened Species .....	22
4.4.1 Cassowary Population Viability Analysis and Present Indirect Impacts .....	22
4.4.2 Residual Indirect Impacts .....	23
4.4.3 Great Barrier Reef World Heritage Area.....	26
4.5 National Heritage Values - Cultural and Historical Impacts.....	27
4.6 Commonwealth Indirect Offset Proposal .....	27



<b>5. Ella Bay Offset Package .....</b>	<b>29</b>
5.1 Queensland VMA & NCA and EPBC Direct Impact Offset.....	30
5.2 EPBC Indirect Impacts Offset - Eubenangee Offset Property .....	32
5.2.1 Background: Cassowary habitat connectivity in the sub-region .....	32
5.2.2 Site Location and Description.....	36
5.3 Management Strategy for Eubenangee Offset Property .....	40
5.4 EPBC Indirect Impacts Offset -Research Package.....	43
5.5 Offset Package Matrix.....	44
<b>6. Long Term Conservation Result.....</b>	<b>45</b>
<b>7. References.....</b>	<b>52</b>
<b>Appendix 1. Terrain NRM Offset Corridors Report.....</b>	<b>54</b>
<b>Appendix 2. Revegetation Strategy for Ella Bay Offset Property – Ella Bay.....</b>	<b>105</b>
<b>Executive Summary .....</b>	<b>108</b>
1. Introduction .....	109
2. Site Description.....	112
3. Planning Phase .....	113
4. Project Implementation .....	115
5. References.....	120
<b>Appendix A – Potential Selection of Cassowary ‘Attractant’ Species .....</b>	<b>121</b>
<b>Appendix B - Eubenangee Swamp National Park’s Natural Recruitment Species in 10 years .....</b>	<b>124</b>
<b>Appendix C - Offset Property Photos .....</b>	<b>126</b>
<b>Appendix 3. Research Proposals.....</b>	<b>128</b>
<b>Cassowary Tracking – UQ .....</b>	<b>129</b>
<b>Determining Cassowary Diet and Energetics through Remote Sensing UQ....</b>	<b>131</b>
<b>Cassowary Fencing &amp; Escape Gate Research Project Ella Bay.....</b>	<b>134</b>
<b>Impact of Ella Bay Development on Cassowaries, Fauna and Flora - JCU .....</b>	<b>136</b>
<b>Appendix 4. Regional Ecosystem Mapping for Offset Property.....</b>	<b>142</b>

# Contents Volume Six

## Part A

<b>6.1 Cassowary Reports.....</b>	<b>6</b>
6.1 a Review of EIS and SEIS Cassowary Reports P Buosi .....	7
6.1 b Cassowary Survey Feb. 2009 L. Moore .....	17
6.1 c Cassowary Survey Nov. 2009 P. Buosi .....	51
6.1 d Cassowary Survey Apr. 2010 P. Buosi .....	75
6.1 e Cassowary Survey Nov. 2010 P. Buosi .....	105
6.1 f Cassowary Identification Drawings .....	121
6.1 g Cassowary Water Survey October 2009 Ella Bay .....	135
6.1 h Cassowary Underpass Survey 2008, 2009 Ella Bay .....	155
6.1 i Cassowary Gate Trial 2009 Ella Bay .....	167
6.1 j Cassowary Fence Trial 2010 Ella Bay .....	187
6.1 k Cassowary Fencing Strategy Ella Bay .....	211
6.1 l EIS and SEIS Cassowary reports Vol I, II, III & WP 3 L Moore.....	225
6.1 m Update of Habitat Assessment of Ella Bay for the Southern Cassowary .....	429

## Part B

<b>6.2 Flora Reports.....</b>	<b>500</b>
6.2 a Vegetation Survey Report 3D .....	501
6.2 b Baseline Vegetation Monitoring of Edge Effect 3D.....	625
6.2 c Revegetation and Weed Management Issues Discussion Paper J Webber.....	677
6.2 d Weed Mapping Survey Jan 2010 Ella Bay .....	687
6.2 e Vegetation management plan for the littoral rainforest and coastal vine thicket J Webber .....	693
6.2 f Cassowary Specific Revegetation -A Cyclone Tolerant Orchard Ella Bay....	703
6.2 g Pond Apple Assessment on Littoral Rainforest 3D.....	735

<b>6.3 Fauna Reports .....</b>	<b>744</b>
--------------------------------	------------

6.3 a Fauna Survey Report Nov 2008 BAAM .....	745
6.3 b Chytrid Fungus Aug 2009 R Alford .....	861
6.3 c Marine Turtle Review Mar 2009 J. Thorogood .....	879
6.3 d Feral Pig trapping and Baiting Report.....	909

## Part C

<b>6.4 Water Reports.....</b>	<b>948</b>
-------------------------------	------------



6.4 a	Coastal Inundation Study WBM .....	949
6.4 b	Integrated Water Management Plan Bligh Tanner .....	987
6.4 c	WSUD Stormwater Objectives DesignFlow .....	1051
6.4 d	Northern Precinct Stormwater Management Plan DesignFlow.....	1095
6.4 e	Groundwater Resource Evaluation Supplemental Report Golders.....	1161
6.4 f	Groundwater Resource Evaluation Golders .....	1175
6.4 g	Water Monitoring Results Golders .....	1315
<b>6.5</b>	<b>Masterplan Reports.....</b>	<b>1364</b>
6.5 a	Local Area Plan Ella Bay .....	1365
6.5 b	Visual Assessment and Mitigation .....	1403
6.5 c	Architectural Inundation Report DBI.....	1409
6.5 d	Beach Access Survey Report Ella Bay .....	1421
6.5 e	Walking Track Design Report Ella Bay .....	1451
6.5 f	Conservation Zones at Ella Bay Ella Bay.....	1463



# Contents Volume Seven

## Drawings

<b>7.a Masterplan Drawings.....</b>	
Location .....	4
Context .....	5
Ella Bay Panorama.....	6
Ella Bay's History .....	8
Ella Bay Setbacks .....	9
Conservation Status of Vegetation Communities and Clearing.....	10
Conservation Zones .....	11
Revegetation And Rehabilitation Plan .....	12
Revegetation Staging Plan .....	13
Cassowary Accessability Through Ella Bay .....	14
Masterplan Conceptual Layout.....	15
Precinct Staging Plan.....	16
Local Area Plan.....	17
Stormwater Quality Management Strategy .....	18
World Heritage Area Visual Amenity From Heath Point.....	19
World Heritage Area Visual Amenity From Shore.....	20
Offset Property Revegetation Plan .....	21
Regional Cassowary Habitat Corridor.....	22
Ella Bay Essential Cassowary Habitat.....	23
<b>7.b Ella Bay Road Drawings .....</b>	
LONG PRESENTATION DRAWINGS.....	
EBR1CE-PD01 Ella Bay Road Alignment Aerial Photo.....	
EBR1CE-PD02 Overall Layout .....	
EBR1CE-PD03 Road Design Stage 1 .....	
EBR1CE-PD04 Road Design Stage 2 .....	
EBR1CE-PD05 Longitudinal Plan.....	
EBR1CE-PD06 Stormwater Management Plan .....	
EBR1CE-PD07 Stormwater Management Longitudinal Plan .....	
EBR1CE-PD08 Fauna Fencing Management.....	
EBR1CE-PD09 Clearing Vegetation Management .....	
EBR1CE-PD10 Ella Bay Road Design (General Overview) .....	



## ROAD LAYOUT DRAWINGS .....

- EBR1CE-DD00 Ella Bay Road Cover Sheet.....
- EBR1CE-DD01 Stage 1 - Road Layout (Sheet 1 of 22) .....
- EBR1CE-DD02 Stage 1 - Road Layout (Sheet 2 of 22) .....
- EBR1CE-DD03 Stage 1 - Road Layout (Sheet 3 of 22) .....
- EBR1CE-DD04 Stage 1 - Road Layout (Sheet 4 of 22) .....
- EBR1CE-DD05 Stage 1 - Road Layout (Sheet 5 of 22) .....
- EBR1CE-DD06 Stage 1 - Road Layout (Sheet 6 of 22) .....
- EBR1CE-DD07 Stage 1 - Road Layout (Sheet 7 of 22) .....
- EBR1CE-DD08 Stage 1 - Road Layout (Sheet 8 of 22) .....
- EBR1CE-DD09 Stage 1 - Road Layout (Sheet 9 of 22) .....
- EBR1CE-DD10 Stage 1 - Road Layout (Sheet 10 of 22) .....
- EBR1CE-DD11 Stage 1 - Road Layout (Sheet 11 of 22) .....
- EBR1CE-DD12 Stage 1 - Road Layout (Sheet 12 of 22) .....
- EBR1CE-DD13 Stage 1 - Road Layout (Sheet 13 of 22) .....
- EBR1CE-DD14 Stage 1 - Road Layout (Sheet 14 of 22) .....
- EBR1CE-DD15 Stage 1 - Road Layout (Sheet 15 of 22) .....
- EBR1CE-DD16 Stage 1 - Road Layout (Sheet 16 of 22) .....
- EBR1CE-DD17 Stage 1 - Road Layout (Sheet 17 of 22) .....
- EBR1CE-DD18 Stage 1 - Road Layout (Sheet 18 of 22) .....
- EBR1CE-DD19 Stage 1 - Road Layout (Sheet 19 of 22) .....
- EBR1CE-DD20 Stage 1 - Road Layout (Sheet 20 of 22) .....
- EBR1CE-DD21 Stage 1 - Road Layout (Sheet 21 of 22) .....
- EBR1CE-DD22 Stage 1 - Road Layout (Sheet 22 of 22) .....
- EBR2CE-DD01 Stage 2 - Bay Road Layout (Sheet 1 of 8).....
- EBR2CE-DD02 Stage 2 - Alice Street (Sheet 2 of 8).....
- EBR2CE-DD03 Stage 2 - Roundabout (Sheet 3 of 8).....
- EBR2CE-DD04 Stage 2 - Road Layout (Sheet 4 of 8) .....
- EBR2CE-DD05 Stage 2 - Road Layout (Sheet 5 of 8) .....
- EBR2CE-DD06 Stage 2 - Road Layout (Sheet 6 of 8) .....
- EBR2CE-DD07 Stage 2 - Road Layout (Sheet 7 of 8) .....
- EBR2CE-DD08 Stage 2 - Road Layout (Sheet 8 of 8) .....

## ROAD DETAIL DRAWINGS .....

- EBR1CE-DD30 Fauna Culvert 3 Design .....
- EBR1CE-DD31 Fauna Culvert 15 Design .....
- EBR1CE-DD32 Fauna Culvert 16 Design .....
- EBR1CE-DD33 Fauna Culvert 20 Design .....



EBR1CE-DD35 Drain and Bioretention Swale Detail .....
EBR1CE-DD36 Typical R.C.B.C. & Headwall Crossing .....
EBR1CE-DD40 Cassowary Fence Exit Design 1 and 2 .....
EBR1CE-DD41 Cassowary Fence Exit Design 3 and 4 .....
EBR1CE-DD42 Cassowary Fence Exit Details .....
EBR1CE-DD55 Ella Bay MCA Road Options .....
EBR1CE-DD56 Traffic Management Plan .....
EBR1CE-DD60 Revegetation Design Bridge 1 .....
EBR1CE-DD61 Revegetation Design Bridge 2 .....
EBR1CE-DD62 Revegetation Design Bridge 3 .....
EBR1CE-DD70 Ella Bay Road Property Tenure .....