

Reef Trust Offsets Plan and Calculator

Draft 13 January 2017

1. Background

'Biodiversity offsetting' is a mechanism whereby the permitted environmental impacts of development projects are compensated through conservation activities that yield a gain at least equivalent to the impact. This project is an extension of a project that was funded by the National Environmental Science Programme's (NESP) Tropical Water Quality Hub ("Phase 1"). The purpose of the Phase 1 project was to design a scientifically robust calculation approach to determine the amount of money that a proponent would pay when voluntarily using the Reef Trust as an offset provider (Maron et al 2016). The current project is being funded by the Department of the Environment and Energy (Department) to address the gaps in the prototype calculator and develop a Reef Trust Offsets Plan. Background and methods are detailed in Appendix 1.

2. Purpose

The purpose of the Reef Trust Offsets Plan (Plan) is to provide guidance to the Department on determination of offset costs, actions, and locations for Great Barrier Reef (Reef) offsets delivered through the Reef Trust on behalf of approval holders under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

3. Structure

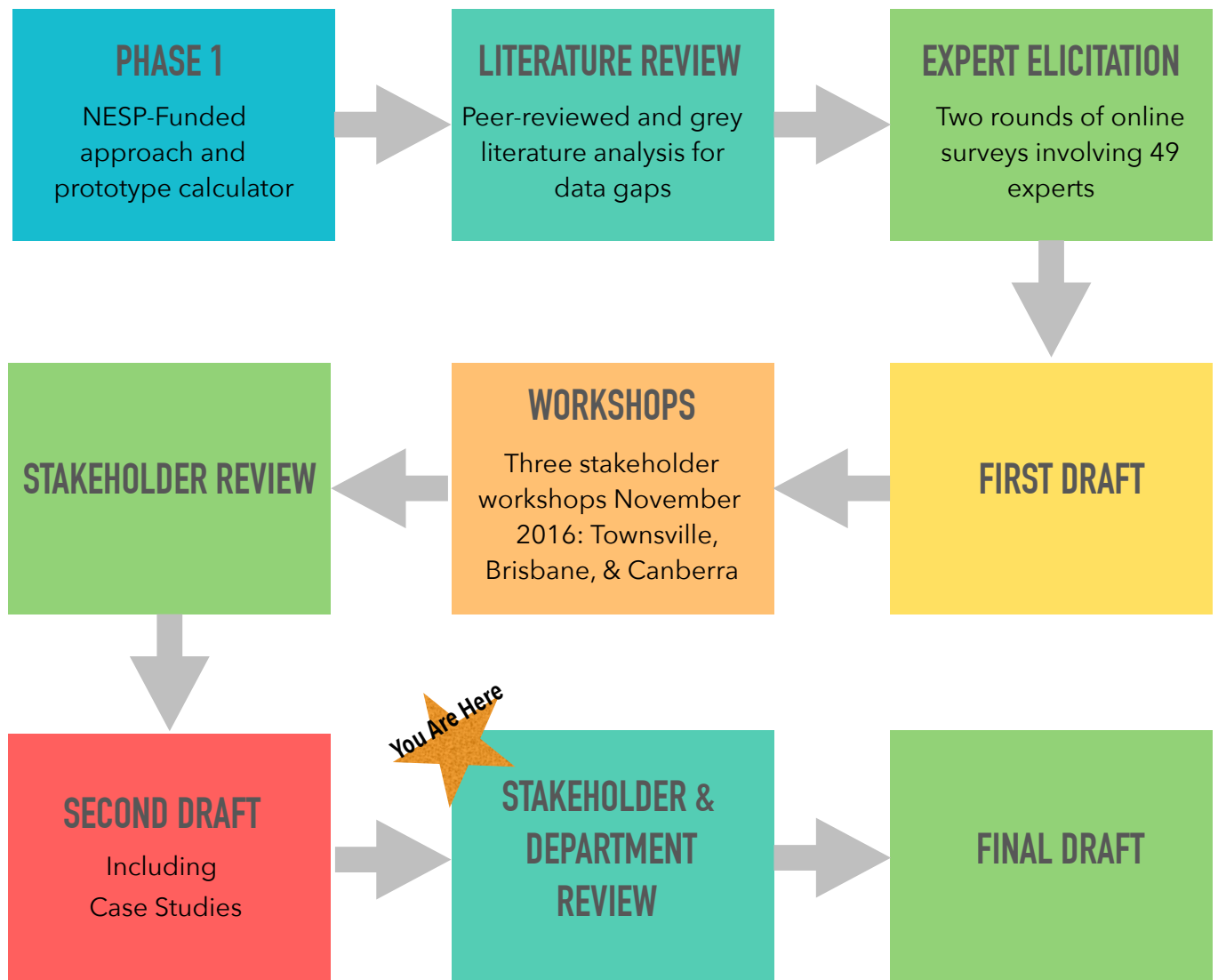
To facilitate review, the draft includes a summarised PDF (this document) and five appendices with more detailed information:

- Appendix 1. Background and Methods
- Appendix 2. Offset Approach for Surrogates
- Appendix 3. Summary of Literature Review and Expert Elicitation
- Appendix 4. Case Studies
- Appendix 5. References

4. Comments

Please email comments to melissa@marineconservationfinance.com by 3 February 2017.

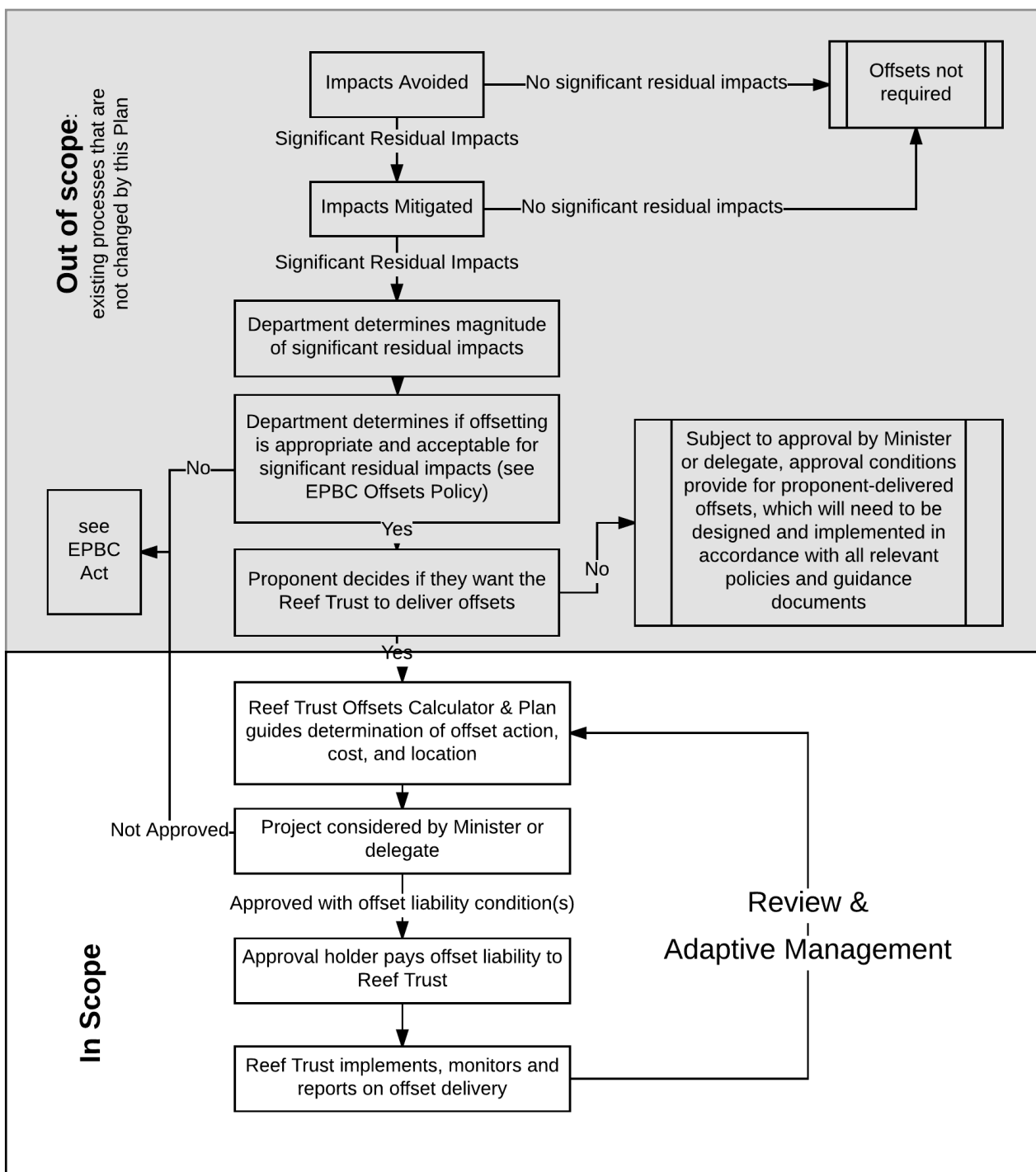
5. Project Flow



6. Context

Offsets will be implemented by the Reef Trust only 1) after impacts have been avoided and mitigated according to the mitigation hierarchy, 2) in accordance with the EPBC Act Environmental Offsets Policy and other relevant policies and guidelines, and 3) through voluntary arrangements with proponents. The Plan and Calculator are appropriate for biodiversity values, but are not designed to be used for cultural, social, heritage, and other non-biodiversity values.

Figure 1. Scope and Context of Plan



7. Surrogates

This Plan uses twenty-two surrogates as proxies for Matters of National Environmental Significance (MNES). Impacts to surrogates are considered through a three-tier system - water quality, habitats, and species. The tiered surrogate system was developed in Phase 1 (see [Appendix 1](#)). The surrogates are listed in Table 1 below and defined in Appendix 2.

For each surrogate, the Plan provides guidance on the offset action, cost and location according to the best available data for that surrogate (see Table 1). Each column of Table 1 is explained in more detail in following sections, with supporting information in Appendices 2 and 3.

The adequacy of cost and efficacy data for offsets is inconsistent across the surrogates. Since offsets need to be implemented before comprehensive, GBR-specific information about every surrogate is available, the Department will use the best available data and adopt a review and adaptation cycle (see Section 13) which will enable the calculator to be used for more surrogates as data becomes available. The colours in Table 1 represent the relative offset data availability for each surrogate (green indicates GBR-specific restoration cost data available, yellow indicates global restoration cost data available, red indicates low availability of offset cost data).

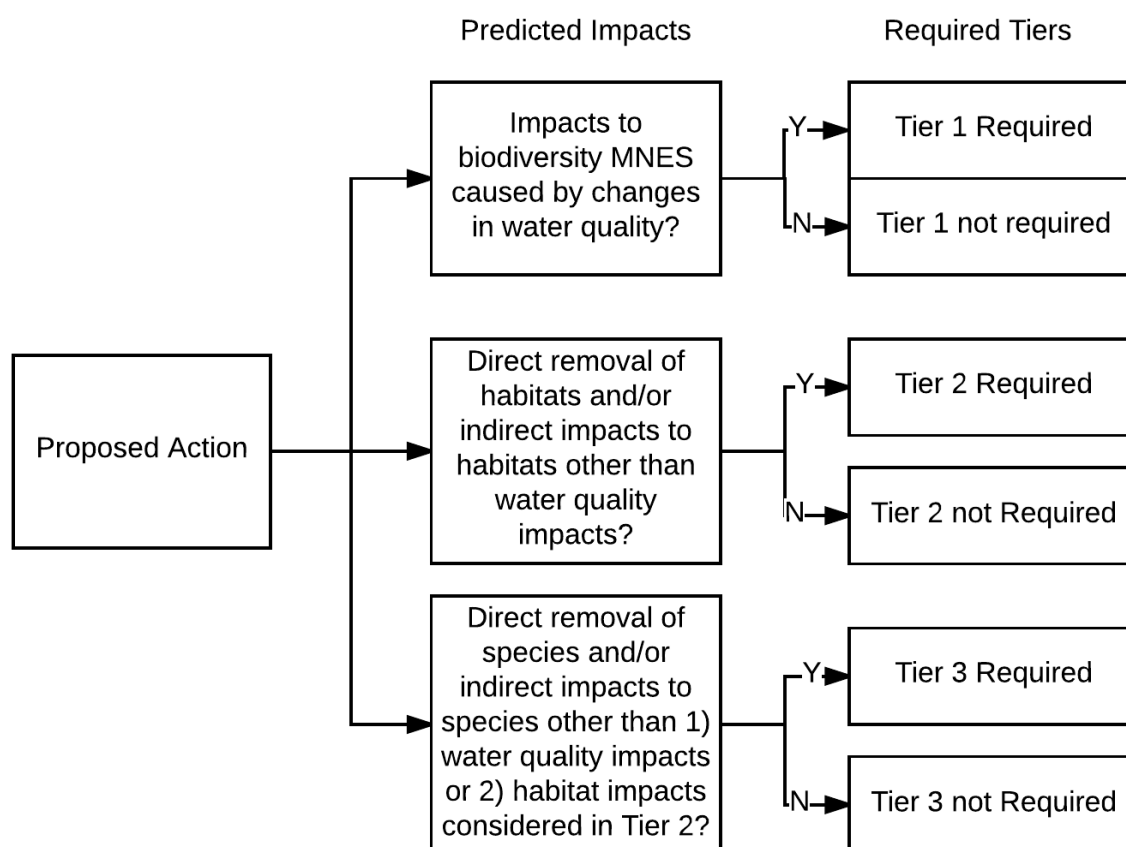
Table 1. Summary of Surrogates and Recommended Offset Actions, Costs, and Locations

Surrogates		Actions	Cost	Location
Tier 1. Water Quality	Sediment, Nitrogen	Catchment restoration based on underfunded WQIP actions	Reef Trust Offsets Calculator available; costs based on peer-reviewed GBR project costs	Offset to be implemented in the same catchment as impact when possible, and at minimum within same NRM region as impact
Tier 2. Habitats	Mangrove, Seagrasses, Shallow Reefs, Saltmarsh	Restoration & threat mitigation	Reef Trust Offsets Calculator available; costs based on peer-reviewed global project costs	Offset to be implemented in the same NRM region as impact
Tier 2. Habitats	Island Vegetation, Deep Reefs, Lagoon, Shoals, Halimeda, Intertidal	Implementation of offsets for these surrogates requires proponent-negotiated ad hoc offsets until further offset cost and efficacy data are available		
Tier 3. Species	Bony Fish, Sharks and Rays, Sea Snakes, Marine Turtles, Crocodiles, Seabirds, Shorebirds, Whales, Dolphins, Dugongs			

8. Surrogate Tiers

To ensure that all significant residual impacts requiring an offset are handled, but not double-counted, by the calculator, the Plan and Calculator use a tiered approach (Figure 2). This approach guides the user through three levels of surrogates in a process that continues until all impacts requiring an offset are accounted. The tiers are organised in such a way that the most commonly-encountered impact types are considered first, and if all impacts are accounted for in this first step, there is no need to go further through the process. However, the tiered nature of the process is purely for ease of use, and implies nothing about the relative importance of the different surrogates.

Figure 2. Tiered Approach to Surrogates



9. Offset Actions

This Plan provides guidance on appropriate offset actions for each surrogate. As per the EPBC Act Offsets Policy 2012, suitable offsets must be built around direct offsets but may include up to 10% other compensatory measures (including research, education, and other non-direct actions). Offset actions should be coordinated with and additional to other ongoing and planned conservation interventions - by governments, non-profits, communities, and industries - to maximise positive outcomes. Actions that benefit multiple surrogates should receive higher priority (given that the impacted value is adequately offset by the action).

For the water quality surrogates - suspended fine sediment and nitrogen - actions should be guided by the underfunded priority actions of each Natural Resources Management (NRM) region's Water Quality Improvement Plan (WQIP). Actions should focus on catchment restoration and decreasing polluted run-off, but must be above the minimum thresholds of industry best practices at the offset site. Details about proposed offset actions for water quality are contained in Appendix 2.

For the habitat surrogates for which adequate offset data are available - mangroves, seagrasses, shallow reefs, and saltmarsh - actions include restoration and threat mitigation (see details in Appendix 2.)

For the habitat and species surrogates for which adequate offset data are not available - island vegetation, deep reefs, lagoon, shoals, halimeda, intertidal, bony fish, sharks and rays, sea snakes, marine turtles, crocodiles, seabirds, shorebirds, whales, dolphins, and dugongs - offsets in the form of compensatory projects will be negotiated between Departmental assessment officers and the proponent. Relevant data and conservation strategies are included in Appendix 2 to provide guidance to the Department and proponents when considering these offsets.

10. Offset Costs

This Plan includes a Calculator to estimate the financial liability for offsets delivered through the Reef Trust. Adequate offset cost data are currently available for six surrogates - sediment, nitrogen, mangrove, seagrass, shallow reef, and salt marsh - and therefore the calculator is available for these surrogates. For the remaining fourteen surrogates, costs must be estimated on an ad hoc basis until further data are available for the Calculator.

Water quality offset costs in the calculator are based on a peer-reviewed analysis of on-ground conservation and restoration actions in the Reef region (Rolfe and Windle 2016). Costs for mangroves, seagrasses, shallow reefs, and saltmarsh are based on a peer-reviewed global meta-analysis of 235 studies with 954 observations from worldwide coastal and marine restoration projects (Bayraktarov et al 2016), due to the lack of data for the Reef region specifically. The median costs for developed countries for each surrogate have been extracted and converted to 2016 AUD. Appendix 2 contains the cost data for each surrogate. The Reef Trust Offsets Calculator - which uses the median costs from the literature, predicted impacts from the environmental assessment process, and risk multipliers, assesses the financial liability for each offset to be delivered by the Reef Trust (presented next).

10.1 Reef Trust Financial Calculator

The Reef Trust Calculator estimates the financial liability for offsets delivered through the Reef Trust for the six surrogates for which there is currently adequate data (see Table 1). The financial calculator is summarised in Table 2 below, and the risk-adjusted cost per unit per surrogate are detailed in Table 3, followed by an explanation of each component of risk that is quantified in Table 3. The costs should be indexed to CPI.

Table 2. Summary of the Reef Trust Offsets Financial Calculator

Surrogate Name	Risk-adjusted cost per unit per surrogate	Predicted Significant Residual Impact	Monitoring and Administration fee	Offset liability (\$AUD)
<i>One row for each of the six surrogates for which calculator data are available</i>	<i>Drop-down list that allows selection of surrogate and region and then inputs standard cost per unit; see Table 3 for values</i>	<i>Data from environmental impact assessment entered here</i>	<i>15% (maximum 10% administration and 5% monitoring fees for the delivery agent; percentages set by the Department)</i>	<i>Calculated output for each surrogate; total liability is summed across rows</i>
Suspended Fine Sediment				
DIN				
Mangrove				
Seagrass				
Shallow Reef				
Salt marsh				
TOTAL				

10.2 Risk-Adjusted Cost per Unit

Several components of risk have been identified as being material to the offset liability calculation (see Table 3). Each component is explained next.

Success Rate Multiplier

The success rate multiplier accounts for the likelihood that an offset will achieve the no net loss target, and is based on peer-reviewed data. For example, each ha of mangrove restoration has a 53% chance of survival (Bayraktarov et al 2016) and therefore to achieve 1 ha of restored mangrove, on average, 1.9 ha must be replanted. Therefore the success rate multiplier for mangroves is 1.9. The success rate multipliers for seagrass, shallow reef, and salt marsh are calculated in the same manner using data from Bayraktarov et al 2016. For water quality surrogates, the success rate multiplier is set at the default of 1 until adequate data are available (*note to Reef Trust: we are still looking for appropriate data to inform a multiplier other than the default*)

Cost Data Confidence Multiplier

The cost data confidence multiplier accounts for the confidence that the cost data underlying the calculator will be sufficient to fund the achievement of no net loss. For the water quality surrogates, for which the cost data are based on actual Great Barrier Reef project cost data, confidence is high and therefore the confidence multiplier is set to 1 (no change in cost). For the four habitat surrogates - mangrove, seagrass, shallow reef, and salt marsh - the cost data are based on global median data from outside of the Great Barrier Reef region because regional data are not sufficient. This results in less confidence that the cost will be sufficient to achieve no net loss, and therefore a multiplier of "2" has been set for these surrogates to allow greater likelihood that the liability will be sufficient to cover the Reef Trust actual costs in meeting the targets.

Surrogate Condition Multiplier

The surrogate condition multiplier was devised in Phase 1 to account for the ability of the impact site - based on the condition and trend at that site - to respond to an intervention. In theory, a degraded site will be more difficult to restore and therefore a higher cost will be required. However due to the insufficient amount of quantified data, this multiplier is set to a default of "1" until significant new data becomes available.

Time Delay Factor

The time delay factor accounts for the time lag between the start of implementation of the offset, and the achievement of the offset benefits. For sediment and DIN, the average time to achieve benefits in the Reef is approximately ten years (Bainbridge et al 2009, Darnell et al 2012, Dutson et al 2015), and therefore the time delay factor is set to 1.55 (see Table 4).

Table 3. Risk-Adjusted Cost per Unit per Surrogate

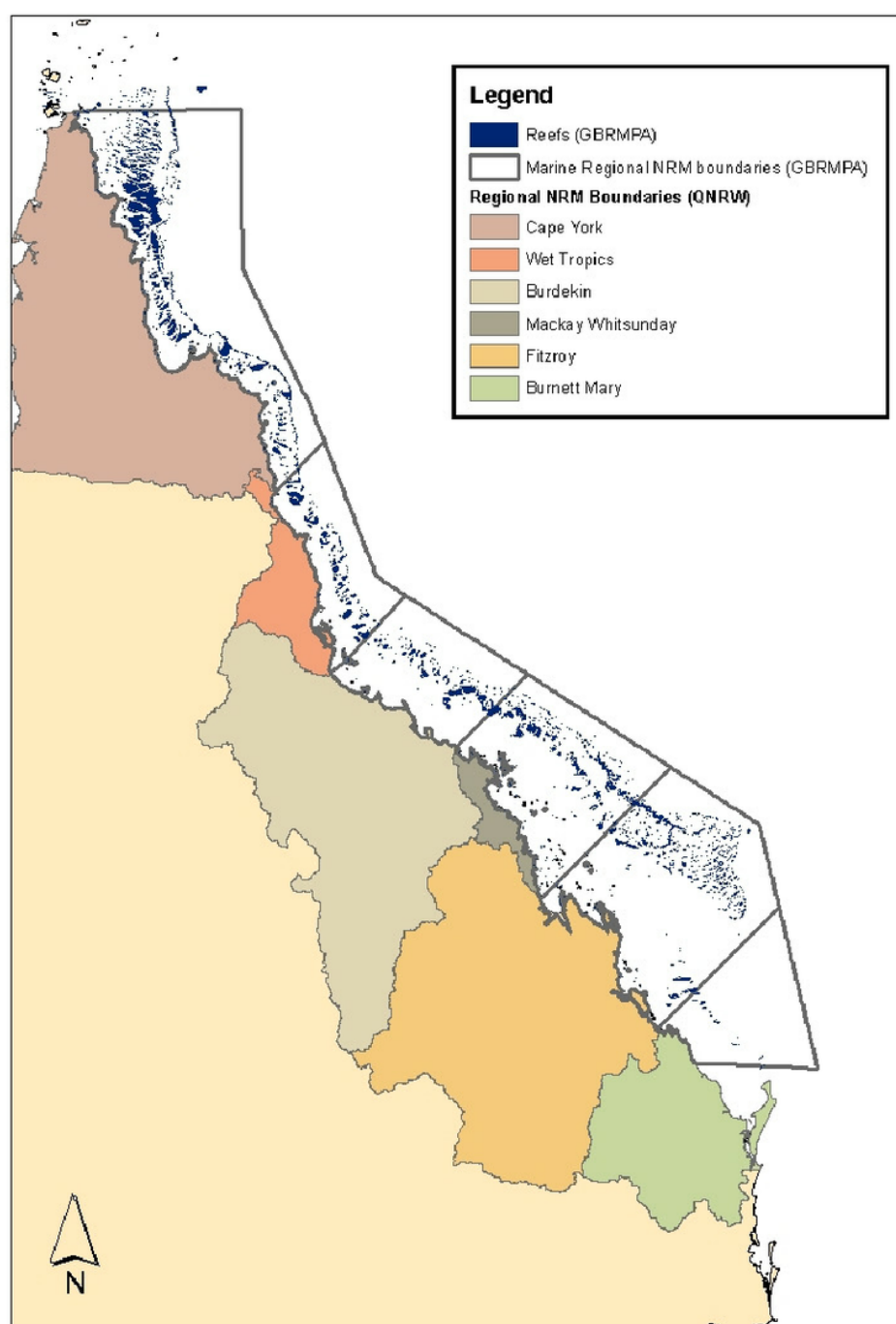
Surrogate	NRM Region	Unit	Restoration Cost per unit (2016 AUD)	Success Rate Multiplier	Cost Data Confidence Multiplier	Surrogate Condition Multiplier	Time Delay Factor	Risk-Adjusted Cost (2016 AUD)
Suspended Fine Sediment	Cape York	tonnes	\$297	1	1	1	1.55	\$460
	Wet Tropics	tonnes	\$375	1	1	1	1.55	\$581
	Burdekin	tonnes	\$106	1	1	1	1.55	\$164
	Mackay-Whitsundays	tonnes	\$987	1	1	1	1.55	\$1530
	Fitzroy	tonnes	\$513	1	1	1	1.55	\$795
	Burnett-Mary	tonnes	\$1,343	1	1	1	1.55	\$2082
DIN	Cape York	kg	\$150	1	1	1	1.55	\$233
	Wet Tropics	kg	\$142	1	1	1	1.55	\$220
	Burdekin	kg	\$124	1	1	1	1.55	\$192
	Mackay-Whitsundays	kg	\$157	1	1	1	1.55	\$243
	Fitzroy	kg	\$150	1	1	1	1.55	\$233
	Burnett-Mary	kg	\$150	1	1	1	1.55	\$233
Mangrove	All Regions	ha	\$58,546	1.9	2	1	1	\$222,475
Seagrass	All Regions	ha	\$160,373	2.6	2	1	1	\$833,940
Shallow Reef	All Regions	ha	\$2,742,928	1.6	2	1	1	\$8,777,370
Saltmarsh	All Regions	ha	\$100,818	1.6	2	1	1	\$322,618

Table 4. Time Delay Factor

# Years between start of offset and predicted achievement of no net loss target	Time Delay Factor
1	1.00
2	1.05
3	1.10
4	1.16
5	1.22
6	1.28
7	1.34
8	1.41
9	1.48
10	1.55
11	1.63
12	1.71
13	1.80
14	1.89
15	1.98
16	2.08
17	2.18
18	2.29
19	2.53
20	2.65

11. Offset Location

The location of the offsets will be selected to maximise the likelihood of achieving no net loss. When relevant, co-location of offsets with other offsets and conservation interventions is preferred to leverage positive outcomes and to increase cost-effectiveness of implementation and monitoring. Offsets will be implemented in areas where the environmental conditions are supportive of natural recovery, which will often be away from the impact site. For water quality and habitat surrogates, offsets will be implemented within the same catchment as the impact when possible, and at a minimum within the same NRM region as the impact (see Figure 3). The location of species surrogate offsets will be proponent negotiated on an ad hoc basis, based on the considerations provided in Appendix 2.



12. Case Studies

The Plan and Calculator have been tested with four realistic case studies (see Appendix 4 and summaries below).

1. PORT EXPANSION	Large port terminal expansion involving 1 million cubic metres capital dredge	\$12 million liability for sediment and seagrass offsets, plus additional (not yet costed) offsets required for whales, dolphins, dugongs, turtles
2. NEW MARINA	Construction of new resort and marina	\$22 million liability for mangrove, seagrass, and shallow reef offsets, plus additional (not yet costed) offsets required for turtles, whales, dolphins, turtles and dugongs
3. AQUACULTURE	Construction of new aquaculture facility	\$1 million liability for seagrass offsets plus additional (not yet costed) offsets required for intertidal habitat and turtles
4. HARBOUR	Construction of a harbour	\$21 million liability for sediment, nitrogen, mangrove, seagrass, and salt marsh offsets, plus additional (not yet costed) offsets for birds and marine megafauna

13. Review and Adaptation

The Plan and Calculator will be reviewed and adapted over time to ensure that offsets can most effectively and efficiently lead to no net loss.

It is recommended that data on offset and non-offset projects in the region - including but not limited to restoration, revegetation, threat mitigation, and other conservation actions - are collected in a transparent and publicly-available database to allow for ongoing review of the cost and efficacy of relevant actions. The database and the review of the Plan and Calculator should be connected to the Reef 2050 - Reef Integrated Monitoring and Reporting Program when possible.

It is recommended that the Plan and Calculator be reviewed initially after two years (2019) and then every five years in line with the GBR Outlook Report, or when significant new data becomes available (as determined by the Reef Trust).

It is recommended that stakeholders - including but not limited to industry representatives, managers, scientists, and practitioners - be included in the review and adaptation of the Plan and Calculator.