



Photo 56 *Cynodon dactylon* var. *dactylon* growing at site 39 on Bird Islet  
Joy Brushe ©



Photo 57 *Solanum americanum* growing at site 44 on Bird Islet  
Joy Brushe ©



Photo 58 Pressed specimen of *Amaranthus viridis* collected from Site 51 on Bird Islet  
Joy Brushe ©

### Recommendations for weed management:

*Amaranthus viridis* (green amaranth) and *Solanum americanum* (nightshade) can easily be hand pulled and would not require chemical treatment, but to achieve eradication, the seed banks as well as live plants need to be totally eliminated. This would require regular visits to the cay - a number of visits each year for at least two to three years (depending on amount and timing of seasonal rain) to ensure removal of all regrowth plants before they have a chance to seed.

Eradication or control of *Cynodon dactylon* var *dactylon* would not be achievable without chemical herbicide treatment. Although some herbicides may have some residual effectiveness, chemical herbicide treatment would also require repeat visits to the cay to control or eradicate the current infestation. Selective herbicides are available that kill grasses without killing other herbaceous species. QPWS is currently investigating which herbicides would be safe to use in the natural environment of the Coral Sea as well as requirements for special permits for off label use of these chemicals. The QPWS advice had not been received at the time of submission of this report and their recommendations will be passed onto PAD as soon as they are available.

Alternative control measures for *Cynodon dactylon* var. *dactylon* (common couch):

- no treatment at present; undertake annual monitoring to ensure the current infestation is not increasing in size or spreading to other parts of the island.
- spraying once per year which may be sufficient to prevent further spread and gradually decrease the dominance of the couch in its current location.

Regardless of control methods used, if any, it is important to minimise the risk of these weeds spreading to other Coral Sea cays. Therefore, it is recommended that no human visits to Bird islet be permitted other than those authorized by PAD for the purpose of monitoring and/or managing weeds.

## Vegetation communities

No *Pisonia grandis* (pisonia) or other tree or shrub communities were present on the cay.

Narrow grasslands of *Lepturus repens* (stalky grass) and/or *Stenotaphrum micranthum* (beach buffalo grass) are present on dunes and terraces adjacent to the coastline around the entire cay.

*Boerhavia albiflora* var *albiflora* (tar vine) open herbland was present in swales and flats adjacent to the western coastline.

*Stenotaphrum micranthum* closed grasslands and closed herblands dominated by *Boerhavia albiflora* var. *albiflora* and/or *Achyranthes aspera* (chaff flower) were present on the northeastern slopes to and edges of the central plateau.

*Achyranthes aspera* communities dominated the interior of the centre and eastern end of the cay, with one large depression and a few smaller depressions dominated by *Portulaca oleracea* (pigweed) present within these *Achyranthes* communities.

*Boerhavia albiflora* var *albiflora* closed herblands were present between the coastal grasslands and the interior *Achyranthes aspera* communities with the most extensive area of this vegetation type located on flats at the western end of the cay.

*Portulaca oleracea* (pigweed) herblands to closed herblands were growing in small depressions in the central interior of the Cay.

A large infestation of the exotic grass, *Cynodon dactylon* var. *dactylon* (common couch) was present on the flats at the northwestern end of the cay. This is not a natural vegetation community and was completely dominated by the exotic naturalized species introduced species, *Cynodon dactylon* var. *dactylon* which formed a dense cover over approximately 7,000 square meters on the northwestern interior of the cay.

Vegetation communities present on Bird Islet in May 2022, the area of each and representative survey sites within each vegetation community are listed in [Table 28](#). The spatial distribution and extent of these vegetation communities are shown in the vegetation map in [Figure 35](#). Comparisons with equivalent and similar communities on other Coral Sea cays are shown in [Appendix 3](#).

Table 28 Vegetation communities on Bird Islet, Wreck Reefs

Veg map units	Summary description	Additional description	Total area (ha)	Sites
A	sandy shores		2.787	
B	lithified shores		2.943	
C	rubble banks		0.024	
0	bare areas		0.004	
<b>Vegetation of shorelines, beaches and sand spits</b>				
1a	<i>Lepturus repens</i> sparse to open grassland on sandy shorelines	<i>Lepturus repens</i> sparse to open grassland +/- <i>Stenotaphrum micranthum</i> +/- <i>Boerhavia albiflora</i> var. <i>albiflora</i> +/- <i>Portulaca oleracea</i> on sandy shorelines	0.312	37, 46, 53
1b	shoreline rubble bank sparse herbland		0.002	
<b>Grasslands</b>				
3b	<i>Lepturus repens</i> / <i>Achyranthes aspera</i> closed grassland to closed herbland (seasonally variable)	<i>Lepturus repens</i> / <i>Achyranthes aspera</i> closed grassland to closed herbland (seasonally variable) with <i>Boerhavia albiflora</i> var. <i>albiflora</i> , <i>Portulaca oleracea</i> and <i>Stenotaphrum micranthum</i>	0.120	49
4	<i>Lepturus repens</i> / <i>Stenotaphrum micranthum</i> closed grassland	<i>Lepturus repens</i> / <i>Stenotaphrum micranthum</i> closed grassland with <i>Boerhavia albiflora</i> var. <i>albiflora</i> and <i>Portulaca oleracea</i>	0.521	36, 47, 48, 54
5b	<i>Stenotaphrum micranthum</i> closed grassland	<i>Stenotaphrum micranthum</i> closed grassland with <i>Achyranthes aspera</i> , <i>Boerhavia albiflora</i> var. <i>albiflora</i> and <i>Tribulus cistoides</i> +/- <i>Lepturus repens</i> +/- <i>Portulaca oleracea</i>	0.760	50, M18
18	<i>Cynodon dactylon</i> var. <i>dactylon</i> naturalised closed grassland		0.674	39
<b>Herblands</b>				
6a	<i>Boerhavia albiflora</i> var. <i>albiflora</i> / <i>Portulaca oleracea</i> open herbland		0.159	55
6e	<i>Boerhavia albiflora</i> var. <i>albiflora</i> closed herbland	<i>Boerhavia albiflora</i> var. <i>albiflora</i> closed herbland with <i>Portulaca oleracea</i> , <i>Stenotaphrum micranthum</i> , <i>Lepturus repens</i> and <i>Tribulus cistoides</i>	1.194	
8a	<i>Achyranthes aspera</i> / <i>Boerhavia albiflora</i> var. <i>albiflora</i> closed herbland	<i>Achyranthes aspera</i> / <i>Boerhavia albiflora</i> var. <i>albiflora</i> closed herbland with <i>Portulaca oleracea</i> , <i>Stenotaphrum micranthum</i> and <i>Tribulus cistoides</i>	1.674	42, 44, M19
8b	<i>Achyranthes aspera</i> / <i>Stenotaphrum micranthum</i> / <i>Boerhavia albiflora</i> var. <i>albiflora</i> herbland	<i>Achyranthes aspera</i> / <i>Stenotaphrum micranthum</i> / <i>Boerhavia albiflora</i> var. <i>albiflora</i> herbland closed herbland with <i>Lepturus repens</i> , <i>Portulaca oleracea</i> and <i>Tribulus cistoides</i>	2.206	40, 45
16a	<i>Portulaca oleracea</i> open herbland to herbland	<i>Portulaca oleracea</i> open herbland to herbland +/- <i>Achyranthes aspera</i> +/- <i>Boerhavia albiflora</i> var. <i>albiflora</i> +/- <i>Tribulus cistoides</i>	0.388	41, 43
16b	<i>Portulaca oleracea</i> / <i>Lepturus repens</i> herbland	<i>Portulaca oleracea</i> / <i>Lepturus repens</i> herbland with <i>Boerhavia albiflora</i> var. <i>albiflora</i>	0.355	38, 52
Total vegetated area (ha)			8.368	

Note: Areas of sandy shores and rocky shores, particularly those of the rocky shores are only approximate due to the difficulty in determining the location of the boundary between the edge of the shoreline and the surrounding reef flat using the imagery.

The following pages contain photographs and detailed descriptions of all the vegetation communities observed at the time of the May 2022 survey.

Photographs and descriptions of Bird Islet vegetation communities

Shoreline, beaches and sand spit vegetation

1a *Lepturus repens* sparse to open grassland +/- *Stenotaphrum micranthum* +/- *Boerhavia albiflora* var. *albiflora* +/- *Portulaca oleracea* on sandy shorelines

ground truthing sites: 37, 46, 53



Photo 59 Veg map unit 1a, Site 46 Bird Islet  
Joy Brushe ©



Photo 60 Veg map unit 1a, Site 53 Bird Islet  
Joy Brushe ©

Vegetation community 1a also contained *Stenotaphrum micranthum* (beach buffalo grass, *Boerhavia albiflora* var. *albiflora* (tar vine) and *Portulaca oleracea* (pig weed)

**1b shoreline rubble bank sparse herbland**

no ground truthing sites or photographs for this community

**Grasslands**

**3b *Lepturus repens/ Achyranthes aspera* closed grassland to closed herbland (seasonally variable) with *Boerhavia albiflora* var. *albiflora*, *Portulaca oleracea* and *Stenotaphrum micranthum***

ground truthing site: 49



Photo 61 Veg map unit 3b, Site 49 Bird Islet  
Joy Brushe ©

Vegetation community 3b was growing on the edge of the central plateau on the northeastern end of the cay. Soil was brown sand with high organic content and contained coral rubble fragments.

**4 *Lepturus repens/Stenotaphrum micranthum* closed grassland with *Boerhavia albiflora* var. *albiflora* and *Portulaca oleracea* +/- *Achyranthes aspera***  
ground truthing sites: 36, 47, 48, 54

Vegetation community 4 was quite widespread on the cay growing mainly on low dunes adjacent to the coastline and adjacent slopes to the central plateau. Soil varied from beach sand to brown organic soil. Coral rubble surface fragments were present.



Photo 62 Veg map unit 4, Site 54 Bird Islet

Joy Brushe ©

**5b** *Stenotaphrum micranthum* closed grassland with *Achyranthes aspera*, *Boerhavia albiflora* var. *albiflora* and *Tribulus cistoides* +/- *Lepturus repens* +/- *Portulaca oleracea*

ground truthing site: 50, BioCondition monitoring site M18



Photo 63 Veg map unit 5b, Site 50 Bird Islet

Joy Brushe ©

Vegetation community 5b was present predominantly on the northern edge of the interior vegetation. Soil was brown organic sandy soil with some coral rubble.

- 18 *Cynodon dactylon* var. *dactylon* naturalised closed grassland  
ground truthing site: 39



Photo 64 Veg map unit 18, Site39 Bird Islet  
Joy Brushe ©

Vegetation community 18 was growing on the northwest interior of the cay in brown sand with some organic content and occasional fine coral rubble surface fragments.

## Herblands

- 6a *Boerhavia albiflora* var. *albiflora*/ *Portulaca oleracea* open herbland  
ground truthing site: 55



Photo 65 Veg map unit 6a in foreground, Site 55 Bird Islet  
Joy Brushe ©





Photo 66 Veg map unit 6a in foreground, Site 55 Bird Islet  
Joy Brushe ©

Vegetation community 6a was growing in swales adjacent to the western and southeastern shorelines on light brown sand with some organic content and fine coral rubble fragments on the surface.

**6e Boerhavia albiflora var. albiflora closed herbland**

No data for this unit



Photo 67 Veg map unit 6e, adjacent to the southern coastline, Bird Islet  
Joy Brushe ©

8a *Achyranthes aspera*/ *Boerhavia albiflora* var. *albiflora* closed herbland with *Portulaca oleracea*, *Stenotaphrum micranthum* and *Tribulus cistoides*

ground truthing sites: 42, 44, BioCondition monitoring site M19



Photo 68 Veg map unit 8a, Site 42 Bird Islet

Joy Brushe ©

8b *Achyranthes aspera*/*Stenotaphrum micranthum*/ *Boerhavia albiflora* var. *albiflora* herbland/  
closed herbland with *Lepturus repens*, *Portulaca oleracea* and *Tribulus cistoides*

ground truthing sites 40, 45



Photo 69 Veg map unit 8b, Site 45 Bird Islet

Joy Brushe ©



Photo 70 Veg map unit 8b, closer view of the vegetation in Site 45 showing the good condition of the vegetation at the time of the survey  
Joy Brushe ©

Vegetation communities 8a and 8b were present on the central plateau on dark brown organic soil. More *Stenotaphrum micranthum* (beach buffalo grass) was present in vegetation community 8b, otherwise the two communities were very similar and in places formed mosaics of the two communities that were difficult to separate and had to be mapped as heterogeneous polygons.

**16a** *Portulaca oleracea* open herbland to herbland +/- *Achyranthes aspera* +/- *Boerhavia albiflora* var. *albiflora* +/- *Tribulus cistoides*

ground truthing sites 41, 43



Photo 71 Veg map unit 16a, Site 41 Bird Islet  
Joy Brushe ©

Vegetation community 6a was growing in a number of low lying depressions in the cay interior. Soil is a fine dark brown sandy loam with high organic content. The bare areas present in these depressions may be due to high salinity.

**16b** *Portulaca oleracea/Lepturus repens* herbland with *Boerhavia albiflora* var. *albiflora*  
ground truthing sites 38 and 52

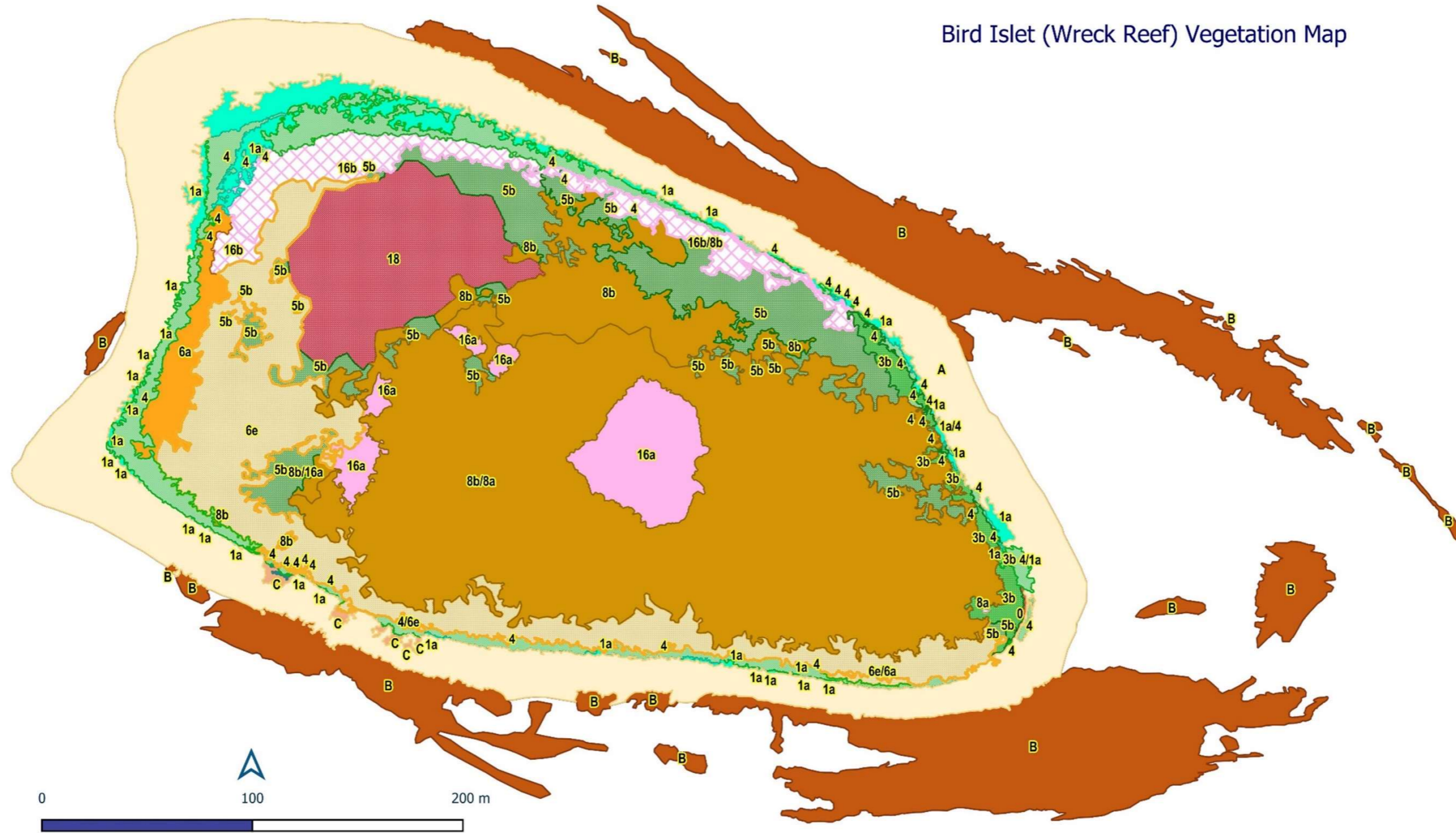
Vegetation community 16b was present adjacent to the coastal communities on the northern end of the cay on the northeastern facing slopes to the central plateau. Soil was light brown sand with some organic content and contained fine coral rubble fragments.



Photo 72 a and b Veg map unit 16b, Site 38 Bird Islet  
Joy Brushe ©



### Bird Islet (Wreck Reef) Vegetation Map



A	sandy beach	3b	<i>Lepturus repens/ Achyranthes aspera</i> closed grassland/herbland	6e	<i>Boerhavia albiflora</i> var. <i>albiflora</i> closed herbland	8b/8a	heterogeneous polygon containing 8b and 8a
B	lithified shore	4	<i>Lepturus repens/ Stenotaphrum micranthum</i> closed grassland	6e/1b	heterogeneous polygon containing 6e and 1b	16a	<i>Portulaca oleracea</i> herbland to closed herbland
C	rubblebank	4/1a	heterogeneous polygon containing 4 and 1a	6e/6a	heterogeneous polygon containing 6e and 6a	16b	<i>Portulaca oleracea/ Lepturus repens</i> closed herbland
1a	sparse to open grassland or herbland on sandy shores	4/6e	heterogeneous polygon containing 4 and 6e	8a	<i>Achyranthes aspera/ Boerhavia albiflora</i> var. <i>albiflora</i> closed herbland	16b/8b	heterogeneous polygon containing 16b and 8b
1a/4	heterogeneous polygon containing 1a and	5b	<i>Stenotaphrum micranthum</i> closed grassland	8b	<i>Achyranthes aspera/ Stenotaphrum micranthum/ Boerhavia albiflora</i> var. <i>albiflora</i> closed herbland	18	<i>Cynodon dactylon</i> var. <i>dactylon</i> naturalised closed grassland
1b	rubblebank sparse herbland	6a	<i>Boerhavia albiflora</i> var. <i>albiflora/ Portulaca oleracea</i> open herbland	8b/16a	heterogeneous polygon containing 8b and 16a	0	bare

Figure 35 Vegetation Map of Bird Islet, Wreck Reefs

Table 29 Site data recorded on Bird Islet, Wreck Reefs 28/05/2022

Datum = WGS 84; green shading = site dominants

Site	Lat	Long	Number of photos	Landform	Aspect	Estimated Altitude	Soil description	Total weed cover %	Veg map unit code	Community	Ground layer										Plant specimens collected	Birds	Turtle activity	Start	Finish	Dominant growth form	Ground FPC							
											Achyranthes aspera	Amaranthus viridis	Boerhavia albiflora var. albiflora	Cynodon dactylon var. dactylon	Lepturus repens	Portulaca oleracea	Solanum americanum	Stenotaphrum micranthum	Tribulus cistoides	Litter														
036	-22.170766	155.458391	3	swale		1	light coloured sand with occasional coral rubble surface fragments	0	4	Lepturus repens/ Stenotaphrum micranthum closed grassland			trace-5%	50-75%	trace-5%		25-50%	trace-5%											abundant brown noddies		8:25:28	8:32:09	grass	dense (>70)
037	-22.170504	155.458724	3	beach		1	white sand with occasional coral rubble surface fragments	0	1a	Lepturus repens sparse grassland				trace-5%																		grass	very sparse (<10%)	
038	-22.170817	155.458747	4	mid slope	NW	2	light brown sand with some organic content, occasional coral rubble surface fragments	0	16b	Portulaca oleracea/ Lepturus repens herbland			5-25%	5-25%	25-50%				5-25%		Portulaca oleracea Lepturus repens											herb	mid-dense (>30-70%)	
039	-22.171219	155.458874	3	upper slope	NW	3	brown sand with some organic content, occasional fine coral rubble surface fragments	75-95%	18	Cynodon dactylon var. dactylon closed grassland	trace-5%		5-25%	75-95%	5-25%				5-25%	5-25%	Cynodon dactylon var. dactylon											grass	dense (>70)	
040	-22.171718	155.459101	3	depression		3	brown sand with high organic content, occasional coral rubble surface fragments	0	8b	Achyranthes aspera/ Boerhavia albiflora var. albiflora/ Stenotaphrum micranthum closed herbland	25-50%		25-50%	trace-5%	5-25%				5-25%	5-25%	Achyranthes aspera Boerhavia albiflora var. albiflora Stenotaphrum micranthum Tribulus cistoides											herb	dense (>70)	
041	-22.172201	155.458976	2	depression		3	dark brown sandy loam with high organic content, occasional fine coral rubble surface fragments	0	16a	Portulaca oleracea open herbland	trace-5%		trace-5%		5-25%				trace-5%	trace-5%												forb	sparse (10-30%)	
042	-22.172510	155.459371	3	plateau		3	dark brown sand with high organic content	0	8a	Achyranthes aspera/ Boerhavia albiflora var. albiflora closed herbland	75-95%		5-25%		trace-5%			trace-5%	5-25%														forb	dense (>70)
043	-22.172022	155.460139	0	depression		3	dark brown clayey sandy loam with high organic content, ? saline, occasional coral rubble surface fragments	0	16a	Portulaca oleracea herbland					50-75%				5-25%													forb	mid-dense (>30-70%)	
044	-22.172168	155.460977	4	plateau		3	dark brown sandy loam with high organic content, occasional fine coral rubble fragments in soil, occasional fine coral rubble surface fragments	trace-5%	8a	Achyranthes aspera closed herbland	75-95%		5-25%		5-25%	trace-5%	trace-5%	trace-5%	5-25%	Solanum americanum													forb	dense (>70)
045	-22.172203	155.461405	3	plateau		3	brown sand with some organic content	0	8b	Achyranthes aspera/ Boerhavia albiflora var. albiflora/ Stenotaphrum micranthum closed herbland	25-50%		25-50%	trace-5%	trace-5%			25-50%	trace-5%	5-25%												herb	dense (>70)	
046	-22.172621	155.461896	4	beach		1	white sand with medium coral rubble surface fragments	0	1a	Lepturus repens sparse grassland				5-25%				trace-5%														grass	very sparse (<10%)	
047	-22.173040	155.461429	3	mid slope	S	2	light brown sand with some organic content, occasional coral rubble	0	4	Lepturus repens/ Portulaca oleracea closed grassland			5-25%	25-50%	5-25%			trace-5%	5-25%													grass	dense (>70)	





## Comparison with previous vegetation surveys

Bird Islet was mined for guano in the 1860s. This would have had a significant impact on the vegetation and surface profile at that time.

According to National Herbarium, Canberra records, *Cynodon dactylon* var. *dactylon* (common couch) was collected on Bird Islet by Keith in 1961 but the record does not contain any information on the abundance or extent at that time.

*Amaranthus viridis* (green amaranth) was not recorded by Heatwole in 1979 and earlier herbarium collections from Bird Islet by Serventy in 1960, and Keith in 1961 do not include *Amaranthus viridis*. The only previous records of *Amaranthus viridis* on Coral Sea cays are herbarium specimens and records from South Islet (Willis Islets) collected and recorded by George Batianoff in 2007 and Donaldson in 1994.

## BioCondition monitoring site data

Two permanent BioCondition monitoring sites (M18 and M19) were established and surveyed on Bird Islet. The location of the centre transects of these sites are shown as the red lines in [Figure 33](#). [Table 30](#) and [Table 31](#) contain the data recorded at these sites.

The photographs included with the BioCondition attribute data are four of the 10 site photographs taken at each of these sites. Photographs shown are all taken from the centre point of the centre transect, the first facing along the transect bearing and then consecutively facing 90°, 180° and 270° from the direction of the centre transect bearing.

## BioCondition attributes

Table 30 BioCondition attribute data recorded in monitoring site M18, Bird Islet, Wreck Reefs on 28 May 2022

Site M18	
Cay	Bird Islet, Wreck Reefs
Vegetation community description	closed grassland/herbland dominated by <i>Stenotaphrum micranthum</i> and <i>Achyranthes aspera</i>
Transect start (WGS 84)	-22.171375 155.460598
Transect Centre (WGS84)	-22.17131 155.46038
Transect end (WGS 84)	-22.171233 155.46015
Transect bearing (degrees)	282
Median canopy height/range (metres)	0.4/0.15-0.5
Tree canopy cover %	n/a
Shrub canopy cover %	n/a
Basal area m <sup>2</sup> /ha (at 30 cm height, calculated from stem diameters)	n/a
Total number of large trees/ha	0
Total no of trees per ha	n/a
Total number of tree stems/ha	n/a
Total no. shrubs/ha	0
Total no. shrub stems/ha	n/a
Large shrubs - mean diameter at 30 cm height	n/a
Recruitment of ecologically dominant layer (%)	n/a
Tree species richness	0
Tree species present	n/a
Shrub species richness	0
Shrub species present (layer in brackets)	n/a
Median ground layer height/range (metres)	0.4/0.15-0.5
Total ground layer cover of native cay species (%)	77.2%
Grass species richness	2
Grass cover (%)	29.6%
Grass species present in order of decreasing cover - most abundant first (cover in brackets)	<i>Stenotaphrum micranthum</i> (29.6%), <i>Lepturus repens</i> (<0.1%)
Forb (including vines) species richness	4
Forb species cover (%)	47.6%
Forb species present in order of decreasing cover - most abundant first (cover in brackets)	<i>Achyranthes aspera</i> (22.6%), <i>Boerhavia albiflora</i> var. <i>albiflora</i> (10.4%), <i>Portulaca oleracea</i> (8%), <i>Tribulus cistoides</i> (6.6%)
Native shrub ground cover (%)	0%
Non-native plant cover (all strata) (%)	0%
Litter cover (%)	5.6%
Bare ground (%)	17.2%
Woody debris (m/ha of logs >0.5m long and >10cm wide)	0
Soil pH	8.62 (average for 0-30cm depths)



Photo 73  
Monitoring site  
M18, Bird Islet  
facing WNW



Photo 74  
Monitoring site  
M18, Bird Islet  
facing NNE



Photo 75  
Monitoring site  
M18, Bird Islet  
facing ESE



Photo 76  
Monitoring site  
M18, Bird Islet  
facing SSW

Joy Brushe ©

Table 31 BioCondition attribute data recorded in monitoring site M19 on Bird Islet, Wreck Reefs 28 May 2022

Site M19	
Cay	Bird Islet, Wreck Reefs
Vegetation community description	closed forbland dominated by <i>Achyranthes aspera</i> and <i>Boerhavia albiflora</i> var. <i>albiflora</i>
Transect start (WGS 84)	-22.172521 155.459354
Transect centre (WGS84)	-22.17254 155.459602
Transect end (WGS 84)	-22.171044 155.458804
Transect bearing (degrees)	85
Median canopy height/range (metres)	0.4/0.1-0.6
Tree canopy cover %	n/a
Shrub canopy cover %	n/a
Basal area m <sup>2</sup> /ha (at 30 cm height, calculated from stem diameters)	n/a
Total number of large trees/ha	0
Total no of trees per ha	n/a
Total number of tree stems/ha	n/a
Total no. shrubs/ha	0
Total no. shrub stems/ha	n/a
Large shrubs - mean diameter at 30 cm height	n/a
Recruitment of ecologically dominant layer (%)	n/a
Tree species richness	0
Tree species present	n/a
Shrub species richness	0
Shrub species present (layer in brackets)	n/a
Median ground layer height/range (metres)	0.4/0.1-0.6
Total ground layer cover of native cay species (%)	86.4%
Grass species richness	1
Grass cover (%)	<0.1%
Grass species present in order of decreasing cover - most abundant first (cover in brackets)	<i>Stenotaphrum micranthum</i> (<1.0%)
Forb (including vines) species richness	4
Forb species cover (%)	86.4%
Forb species present in order of decreasing cover - most abundant first (cover in brackets)	<i>Achyranthes aspera</i> (52%), <i>Boerhavia albiflora</i> var. <i>albiflora</i> (32.8%), <i>Portulaca oleracea</i> (1.2%), <i>Tribulus cistoides</i> (0.4%)
Native shrub ground cover (%)	0%
Non-native plant cover (all strata) (%)	0%
Litter cover (%)	11%
Bare ground (%)	2.6%
Woody debris (m/ha of logs >0.5m long and >10cm wide)	0
Soil pH	8.35 (average for 0-30cm depths)



Photo 77  
Monitoring site  
M19, Bird Islet  
facing E



Photo 78  
Monitoring  
site M19, Bird  
Islet facing S



Photo 79  
Monitoring site  
M19, Bird Islet  
facing W

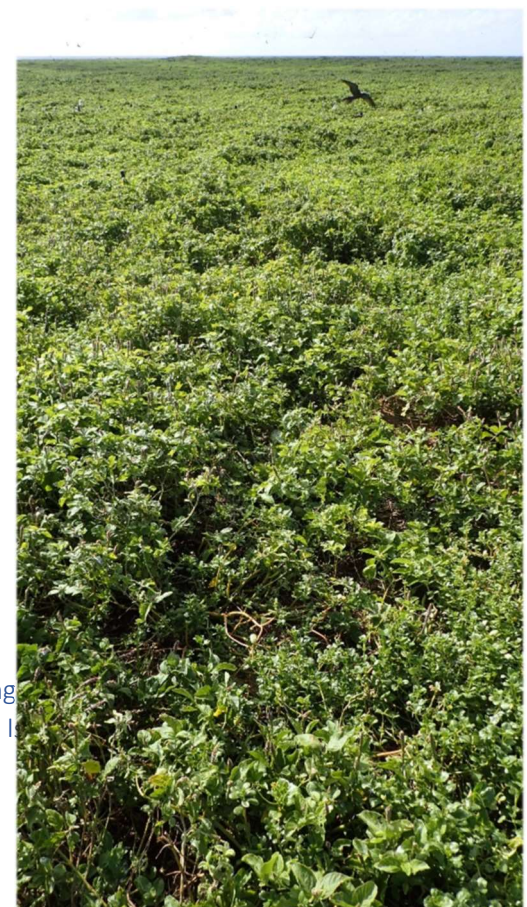


Photo 80  
Monitoring  
M19, Bird I  
facing N

Joy Brushe ©

## Soil data

Soil samples were collected from BioCondition monitoring sites M18 and M19 on Bird Islet.

Refer to [Appendix 5](#) for results of all the soil analyses for M18 and M19 and the other sites sampled during the 2022 voyage. For comparison of M18 and M19 soil analysis data with data from previous Coral Sea and Southern GBR soil surveys, refer to the [Soils section](#) under [Methodologies, general results and discussion](#) in this report.

Total sulphur levels at all 2022 sample sites were high – Refer to [Figure 13](#) and explanatory text in the [Soils section](#) under [Methodologies, general results and discussion](#) in this report.

### M18

Organic carbon, total and Colwell phosphorus, total potassium and total sodium and all trace elements (copper, iron, manganese and zinc) levels were higher than levels obtained in other interior grassland soils.

pH, total nitrogen, total calcium, exchangeable potassium and total aluminium were similar to those of other interior grassland sites.

Electrical conductivity, exchangeable calcium, exchangeable sodium and cation exchange capacity were similar to that in other Coral Sea grassland soils except for the grassland sites on South Islet (Willis Islets) which had higher average electrical conductivity, exchangeable calcium, exchangeable sodium and cation exchange capacity than all the other interior grassland sites.

Total and exchangeable magnesium levels were lower than those in all other interior grassland sites sampled.

### M19

Colwell phosphorus and total potassium levels were higher than in any other soils sampled.

Total nitrogen levels were higher than at all other sites except for those of the Coringa Herald cays where total nitrogen was higher in all vegetation types sampled.

Total phosphorus and zinc were also quite high in comparison to other interior herbland locations except for the grey water outlet site on South Islet (Willis Islets) which had much higher zinc than all the other interior herbland locations and one of the Cato Island Interior herbland sites which had slightly higher total phosphorus and zinc levels.

Total sodium was slightly higher than all interior herbland locations except for the Cato Island herblands.

Organic carbon levels were higher than those of interior herblands on the Willis Islets, Diamond Islets and Lihou Reef cays.

pH, electrical conductivity, total calcium, exchangeable potassium and exchangeable sodium levels were similar to other interior herbland sites.

Exchangeable calcium, cation exchange capacity, total aluminium levels and levels of the other trace elements (copper, iron and manganese) levels were similar to other interior herbland sites except for the grey water outlet site on South Islet (Willis Islets) which higher exchangeable calcium and cation exchange capacity and considerably higher levels of aluminium and trace elements (particularly iron) than all the other interior herbland sites.

Exchangeable magnesium levels were slightly lower than those in most other interior herbland locations whilst total magnesium levels were relatively higher than or similar to those of other interior herbland sites.

## 2.5.4 Birds

Table 32 Bird species and their breeding status – Bird Islet, Wreck Reefs

Bird Islet		Breeding stages present			Breeding pairs	Adolescents and adults
common name	scientific name	Nests	Chicks	Young		
red-tailed tropicbird	<i>Phaethon rubricauda roseotinctus</i>	0	0	0	0	0
Herald petrel	<i>Pterodroma heraldica</i>	0	0	0	0	0
wedge-tailed shearwater	<i>Ardenna pacifica</i>	0	0	0	0	0
great frigatebird	<i>Fregata minor</i>	0	0	0	0	0
lesser frigatebird	<i>Fregata ariel</i>	317	2	25	344	323
masked booby	<i>Sula dactylatra dactylatra</i>	0	0	0	0	20
brown booby	<i>Sula leucogaster</i>	1	0	0	1	165
red-footed booby	<i>Sula sula</i>	0	0	0	0	38
sooty tern	<i>Onychoprion fuscatus</i>	P	P	P	11890	12150
bridled tern	<i>Onychoprion anaethetus</i>	0	0	0	0	0
crested tern	<i>Thalasseus bergii</i>	25	0	0	25	34
roseate tern	<i>Thalasseus bengalensis</i>	0	0	0	0	0
black-naped tern	<i>Sterna sumatrana</i>	0	0	0	0	0
New Caledonian fairy tern	<i>Sternula nereis exsul</i>	0	0	0	0	0
black noddy	<i>Anous minutus</i>	0	0	0	0	0
brown noddy	<i>Anous stolidus</i>	P	P	P	4490	4680
buff-banded rail	<i>Gallirallus philippensis tounelieri</i>	0	0	0	0	0
purple swamphen	<i>Porphyrio melanotus</i>	0	0	0	0	0
sacred kingfisher	<i>Todiramphus sanctus</i>	0	0	0	0	0
white-faced heron	<i>Egretta novaehollandiae</i>	0	0	0	0	0
Pacific golden plover	<i>Pluvialis fulva</i>	0	0	0	0	7-10
ruddy turnstone	<i>Arenaria interpres</i>	0	0	0	0	5
wandering tattler	<i>Tringa incana</i>	0	0	0	0	1
grey-tailed tattler	<i>Tringa brevipes</i>	0	0	0	0	0
lesser sand plover	<i>Charadrius mongolus</i>	0	0	0	0	0

### Notes

- Crested tern breeding pairs were made up of two small colonies – 10 and 15 pairs.
- Lesser frigatebirds bred in scattered colonies. Drone footage matched ground counts.
- No great frigatebirds were nesting. This is due to a lack of shrubs and no available raised nesting platforms.
- Sooty tern breeding stages were combined as it was impossible to check on total numbers of nests versus chicks versus young.
- Recently fledged red-footed boobies were roosting in an area they were probably raised in. This was within a current lesser frigatebird nesting area. Both species tolerated each other.
- Pacific golden plover numbers were given a confidence interval as it was difficult to determine if some birds were counted twice.

- A patch of introduced grass had fewer nesting birds in it than an adjacent patch of natural vegetation. This however could be due to normal, variable selections in breeding areas i.e., sooty terns were not nesting in consistent densities across other contiguous vegetation types.
- The density of the introduced grass could influence burrow selection of wedge-tailed shearwaters and affect site selection of species preferring vegetation with patches of bare substrate.



Photo 81 Mixed seabird breeding colony

Collette Bagnato © Queensland Government



Photo 82 Lesser frigatebird colony

Andrew McDougall © Queensland Government





Photo 83 General view of vegetation

Collette Bagnato © Queensland Government

### 2.5.5 Pest and invertebrate sampling

(Refer to Health Check section for map)  
25-26 May 2022

Table 33 Rodents

Collection period	Sampling methods	Sampling sites	Rodent species
overnight	baited tunnel traps/ink pads	8	nil



Photo 84 Typical “consortium” of hermit crabs in shelter

Collette Bagnato © Queensland Government

Table 34 Invertebrates

Collection period	Sampling methods	baited sites	Species
daylight search	Bait stations and ground search	7	See below

Order	Family	Spp ID	Common name
Diptera	Milichiidae	? <i>Leptometa</i> sp.	freeloader fly
Orthoptera	Acrididae	<i>Aiolopus thalassinus</i>	Acrididae grasshopper
Coleoptera	Anthicidae	<i>Anthicius</i> sp.	flower beetle
Blattodea		Blattodea	cockroach
Hymenoptera	Formicidae	<i>Cardiocondyla nuda / atalanta</i>	ant
Dermaptera		Dermaptera	earwig
Araneae	Lycosidae	<i>Hogna crispipes</i>	wolf spider
		Isopoda	slater
Hymenoptera	Formicidae	<i>Monomorium pharaonis</i>	pharaoh ant
Hemiptera	Lygaeidae	<i>Nysius caledoniae</i>	Caledonia seed bug
Hemiptera	Pentatomidae	Pentatomidae	shield bug
Pseudoscorpiones		Pseudoscorpiones	false scorpion
Lepidoptera	Pterophoridae	Pterophoridae	plume moth
Blattodea	Blaberidae	<i>Pycnoscelus surinamensis</i>	Surinam cockroach
Orthoptera	Tettigoniidae	Tettigoniidae	katydid

### 2.5.6 Health Checks and Island Watch

Eight Health Checks (HC) were assessed at Bird Islet, Wreck Reefs.

Condition class at six of the eight sites were assessed as Good, one Good with some concern and one as Significant Concern (see [Table 35](#)).

The Significant Concern condition rating for HC19 was due to the potentially invasive *Cynodon dactylon* var. *dactylon* and its potential or current threat to the integrity of the natural vegetation communities and to seabird breeding habitat (see Bird Islet vegetation chapter).

The overall condition class for Bird Islet, Wreck Reefs is Significant Concern.

Detailed criteria for each Health Check site are included in [Appendix 8](#).

Table 35 Assessed condition class for each HC site

	Bird Islet, Wreck Reefs			
HC Site	Overall condition class			
HC17	Good	Good with concern	Significant concern	Critical
HC18	Good	Good with concern	Significant concern	Critical
HC19	Good	Good with concern	Significant concern	Critical
HC20	Good	Good with concern	Significant concern	Critical
HC21	Good	Good with concern	Significant concern	Critical
HC22	Good	Good with concern	Significant concern	Critical
HC23	Good	Good with concern	Significant concern	Critical
HC24	Good	Good with concern	Significant concern	Critical

Table 36 Summary of vegetation communities around each HC site (reference with Figure 36)

HC Site	Ecosystems/vegetation communities				
HC17	16a				
HC18	8a	8b			
HC19	5b	8b	18		
HC20	1a	4	16b		
HC21	1a	4	6a	6e	
HC22	5b	8b	6e	16a	
HC23	6e	8a	8b		
HC24	3b	4	5b	16b	

## Island Watch

A summarised table of all Island Watch information can be found at [Appendix 9](#).



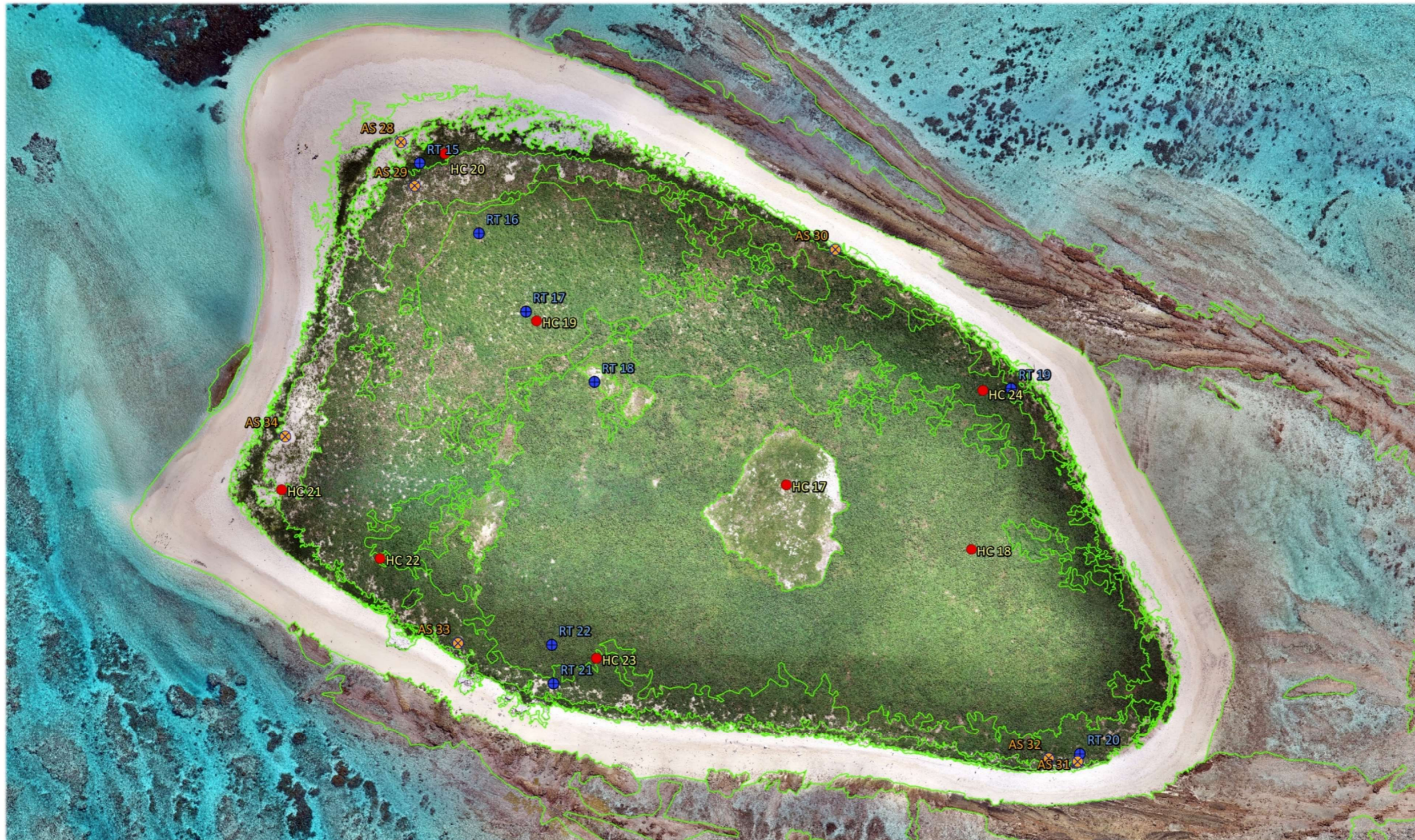
Photo 85 Health Check site HC18 South



Photo 86 Health Check site HC21 East



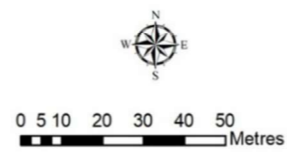
Photo 87 Health Check site HC24 West



**Bird Islet, Wreck Reefs**

Area: 8.4 ha (area above HAT)

- Vegetation communities
- Health check
- Rodent tunnel
- ⊗ Ant bait station



Printed on:  
25/11/2022

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere  
Projection: Mercator Auxiliary Sphere  
Datum: WGS1984

Figure 36 Health Check, rodent tunnel and ant bait station sites on Bird Islet, Wreck Reefs

## 2.6. South West (Boulder) Cay, Kenn Reefs

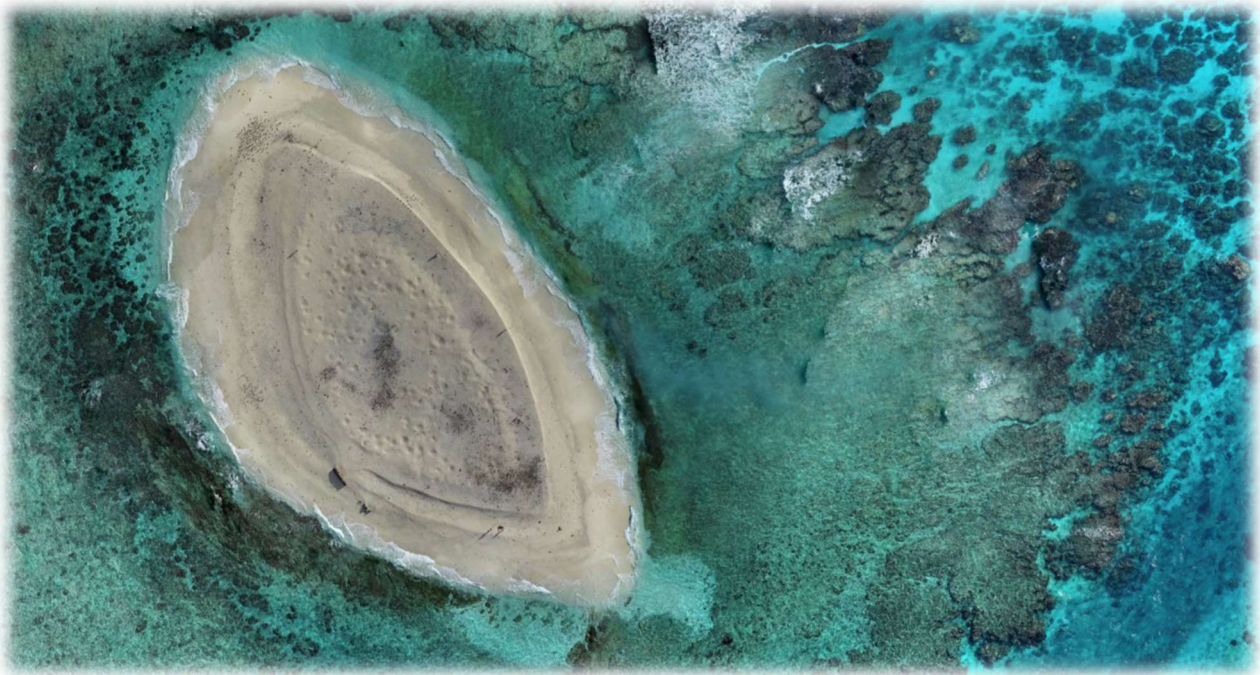


Figure 37 South West Cay

Jake Sanders © Queensland Government

### 2.6.1 Drone imagery

29 May 2022:

- Drone - Phantom 4 RTK
- Image capture height 60m
- Resolution 1.8cm/px
- Map stitching software – Drone Deploy

### 2.6.2 Physical description

- Low tide extent 204m x 111m
- Approximate high tide extent 140m x 72m
- Approximate area above high tide 0.7ha

South West Cay, shown in [Figure 37](#), is an unvegetated sand and coral rubble cay located 677km east of Mackay, Queensland at -21.273 degrees latitude and 155.710 degrees longitude.

### 2.6.3 Vegetation

On 29 May 2022, South West Cay was unvegetated.

## 2.6.4 Birds

Table 37 Bird species and their breeding status – South West Cay, Kenn Reefs

South West Cay 29/05/2022		Breeding stages present			Breeding pairs	Adolescents and adults
common name	scientific name	Nests	Chicks	Young		
red-tailed tropicbird	<i>Phaethon rubricauda roseotinctus</i>	0	0	0	0	0
Herald petrel	<i>Pterodroma heraldica</i>	0	0	0	0	0
wedge-tailed shearwater	<i>Ardenna pacifica</i>	0	0	0	0	0
great frigatebird	<i>Fregata minor</i>	0	0	0	0	0
lesser frigatebird	<i>Fregata ariel</i>	0	0	0	0	0
masked booby	<i>Sula dactylatra dactylatra</i>	14	5	1	20	28
brown booby	<i>Sula leucogaster</i>	1	2	45	48	71
red-footed booby	<i>Sula sula</i>	0	0	0	0	0
sooty tern	<i>Onychoprion fuscatus</i>	99	4	26	129	230
bridled tern	<i>Onychoprion anaethetus</i>	0	0	0	0	0
crested tern	<i>Thalasseus bergii</i>	0	0	0	0	0
roseate tern	<i>Thalasseus bengalensis</i>	0	0	0	0	0
black-naped tern	<i>Sterna sumatrana</i>	0	0	0	0	0
New Caledonian fairy tern	<i>Sternula nereis exsul</i>	0	0	0	0	0
black noddy	<i>Anous minutus</i>	0	0	0	0	0
brown noddy	<i>Anous stolidus</i>	208	9	119	336	980
buff-banded rail	<i>Gallirallus philippensis tounelieri</i>	0	0	0	0	0
purple swamphen	<i>Porphyrio melanotus</i>	0	0	0	0	0
sacred kingfisher	<i>Todiramphus sanctus</i>	0	0	0	0	0
white-faced heron	<i>Egretta novaehollandiae</i>	0	0	0	0	0
Pacific golden plover	<i>Pluvialis fulva</i>	0	0	0	0	0
ruddy turnstone	<i>Arenaria interpres</i>	0	0	0	0	0
wandering tattler	<i>Tringa incana</i>	0	0	0	0	0
grey-tailed tattler	<i>Tringa brevipes</i>	0	0	0	0	0
lesser sand plover	<i>Charadrius mongolus</i>	0	0	0	0	0

### Notes

- Brown noddy nests were observed in raised partitions of a shipwreck on the cay.
- Some inundation areas on the eastern side of the cay had claimed unidentified seabird chicks. The chicks were only recently hatched and would not have been capable of moving to higher ground.
- A mixed colony of sooty terns and brown noddies was located on the southern end of the cay.
- Smaller brown noddy colonies were located near the middle of the Cay.
- No threats were observed.



Photo 88 Young brown nobby in shipwreck

Andrew McDougall © Queensland Government



Photos 89a and 89b Quarrels over coral. A young masked booby (L) and young brown booby (M) have a disagreement over trinkets.

Andrew McDougall © Queensland Government.



## 2.6.5 Pest and invertebrate sampling

(Refer to Health Check section for map)

29 May 2022

**Rodents** – unvegetated cay, no rodent tunnels deployed. No rodents observed.

Table 38 Invertebrates

Collection period	Sampling methods	baited sites	Species
daylight search	ground search	0	0

## 2.6.6 Health Checks and Island Watch

Three Health Checks (HC) were assessed at South West Cay, Kenn Reefs.

The overall condition class of the cay's ecosystem was **Good** (the highest rating, see [Table 39](#)).

Detailed criteria for each HC site are included in [Appendix 8](#).

Table 39 Assessed condition class for each HC site.

South West Cay, Kenn Reefs				
HC Site	Overall condition class			
HC25	Good	Good with concern	Significant concern	Critical
HC26	Good	Good with concern	Significant concern	Critical
HC27	Good	Good with concern	Significant concern	Critical

Table 40 Summary of ecosystem type around each HC site (reference with [Figure 38](#))

South West Cay, Kenn Reefs	
HC Site	Ecosystems/vegetation communities
HC25	Unvegetated, sandy substrate, fine sediments with coral rubble
HC26	Unvegetated, sandy substrate, fine sediments with coral rubble
HC27	Unvegetated, sandy substrate, fine sediments with coral rubble

## Island Watch

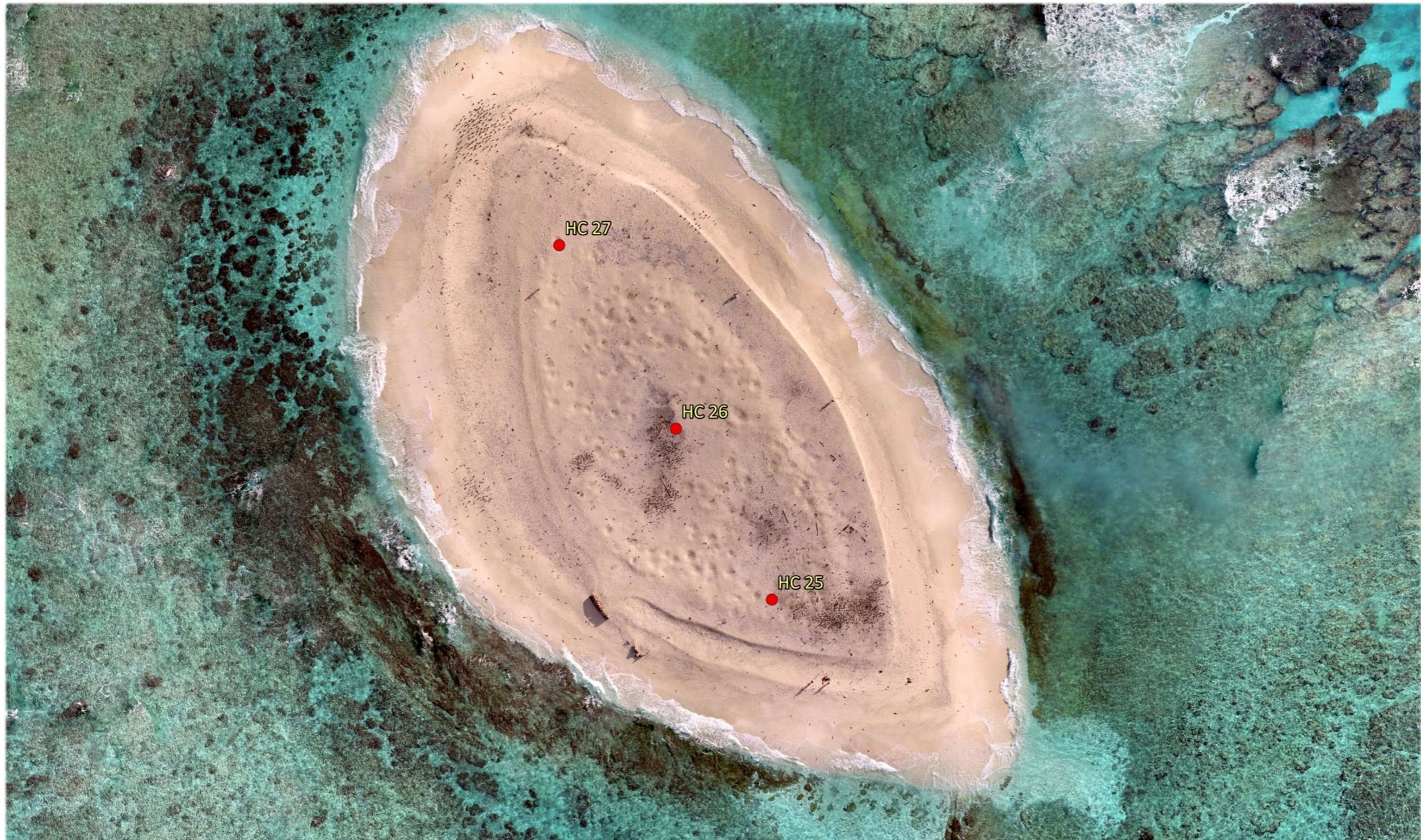
A summarised table of all Island Watch information can be found at [Appendix 9](#).



Photo 90 Health Check site HC26 South



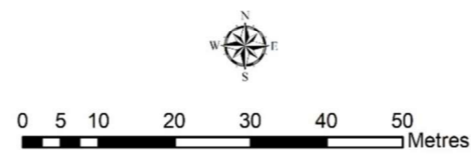
Photo 91 Health Check site HC27 North



### South West Cay (Boulder Cay), Kenn Reefs

Area: Approx. 0.698 ha (area above HAT)  
Approx. 1.995 ha (total area of cay)

● Health check



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17/11/2022

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere  
Projection: Mercator Auxiliary Sphere  
Datum: WGS1984

Figure 38 Health Check sites on South West Cay, Kenn Reefs

## 2.7 Observatory Cay, Kenn Reefs

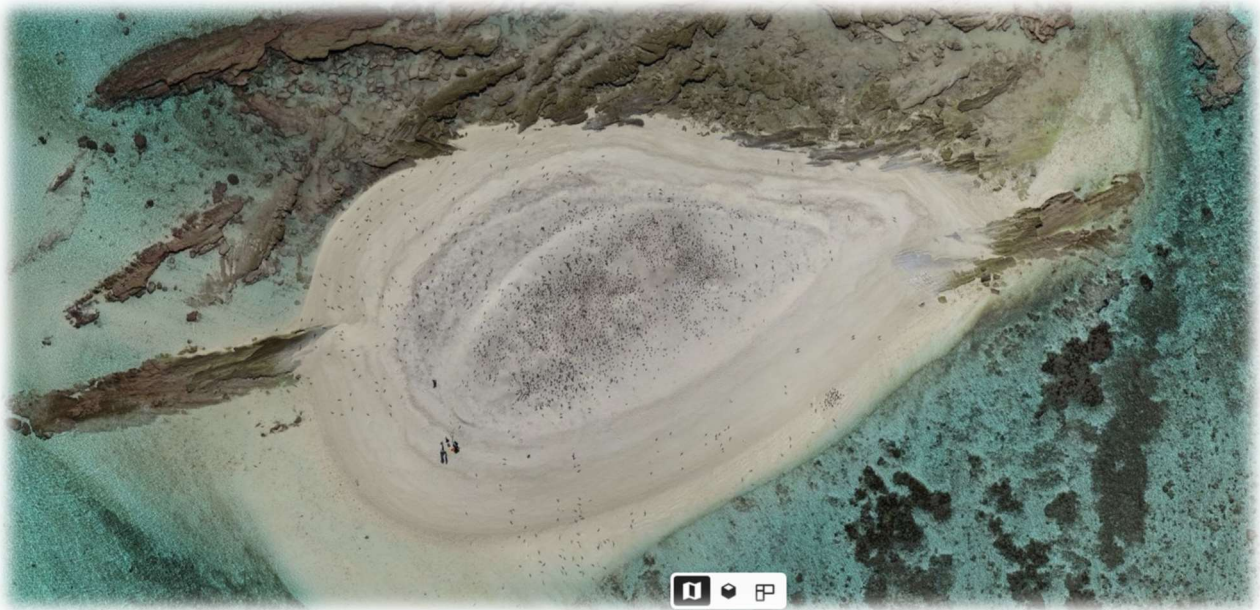


Figure 39 Observatory Cay

Jake Sanders © Queensland Government

### 2.7.1 Drone imagery

29 May 2022:

- Drone - Phantom 4 RTK
- Image capture height 69m
- Resolution 2cm/px
- Map stitching software – Drone Deploy

### 2.7.2 Physical description

- Low tide extent 124m x 72m
- Approximate high tide extent 70m x 36m
- Approximate area above high tide 0.18ha

Observatory Cay, Kenn Reefs, shown in [Figure 39](#), is an unvegetated sand and coral rubble cay located 684km east of Mackay, Queensland at -21.255 degrees latitude and 155.771 degrees longitude.

### 2.7.3 Vegetation

On 29 May 2022, Observatory Cay was unvegetated.

## 2.7.4 Birds

Table 41 Bird species and their breeding status – Observatory Cay, Kenn Reefs

Observatory Cay 29/05/2022		Breeding stages present			Breeding pairs	Adolescents and adults
common name	scientific name	Nests	Chicks	Young		
red-tailed tropicbird	<i>Phaethon rubricauda roseotinctus</i>	0	0	0	0	0
Herald petrel	<i>Pterodroma heraldica</i>	0	0	0	0	0
wedge-tailed shearwater	<i>Ardenna pacifica</i>	0	0	0	0	0
great frigatebird	<i>Fregata minor</i>	0	0	0	0	0
lesser frigatebird	<i>Fregata ariel</i>	0	0	0	0	2
masked booby	<i>Sula dactylatra dactylatra</i>	0	0	0	0	3
brown booby	<i>Sula leucogaster</i>	0	0	0	0	145
red-footed booby	<i>Sula sula</i>	0	0	0	0	0
sooty tern	<i>Onychoprion fuscatus</i>	155	0	0	155	0
bridled tern	<i>Onychoprion anaethetus</i>	0	0	0	0	0
crested tern	<i>Thalasseus bergii</i>	0	0	55	55	43
roseate tern	<i>Thalasseus bengalensis</i>	0	0	0	0	0
black-naped tern	<i>Sterna sumatrana</i>	0	0	0	0	0
New Caledonian fairy tern	<i>Sternula nereis exsul</i>	0	0	0	0	0
black noddy	<i>Anous minutus</i>	0	0	0	0	0
brown noddy	<i>Anous stolidus</i>	320	485		805	1255
buff-banded rail	<i>Gallirallus philippensis tounelieri</i>	0	0	0	0	0
purple swamphen	<i>Porphyrio melanotus</i>	0	0	0	0	0
sacred kingfisher	<i>Todiramphus sanctus</i>	0	0	0	0	0
white-faced heron	<i>Egretta novaehollandiae</i>	0	0	0	0	0
Pacific golden plover	<i>Pluvialis fulva</i>	0	0	0	0	0
ruddy turnstone	<i>Arenaria interpres</i>	0	0	0	0	0
wandering tattler	<i>Tringa incana</i>	0	0	0	0	0
grey-tailed tattler	<i>Tringa brevipes</i>	0	0	0	0	0
lesser sand plover	<i>Charadrius mongolus</i>	0	0	0	0	0

### Notes

- Sooty terns and brown noddies shared nesting areas.
- Crested tern young were mobile and located to beach rock areas to the north.
- Adult birds of several species moved from Observatory Cay to adjacent sand banks while research activities were conducted. These birds were not counted twice with all numbers reflected in the Observatory Cay totals.
- No threats were observed.



Photo 92 Brown noddy colony with the Kenn Reefs sand bank complex in the background.  
Collette Bagnato © Queensland Government

### 2.7.5 Pest and invertebrate sampling

29 May 2022

**Rodents** – unvegetated cay, no rodent tunnels deployed. No rodents observed.

Table 42 Invertebrates

Collection period	Sampling methods	baited sites	Species
daylight search	ground search	0	Nil

## 2.7.6 Health Checks and Island Watch

One Health Check (HC) was assessed at Observatory Cay, Kenn Reefs.

The overall condition class of the cay's ecosystem was **Good** (the highest rating, see [Table 43](#)).

Detailed criteria for each HC site are included in [Appendix 8](#).

Table 43 Assessed condition class for each HC site

Observatory Cay, Kenn Reefs				
HC Site	Overall condition class			
HC28	Good	Good with concern	Significant concern	Critical

Table 44 Summary of each ecosystem type around HC sites (reference with [Figure 40](#))

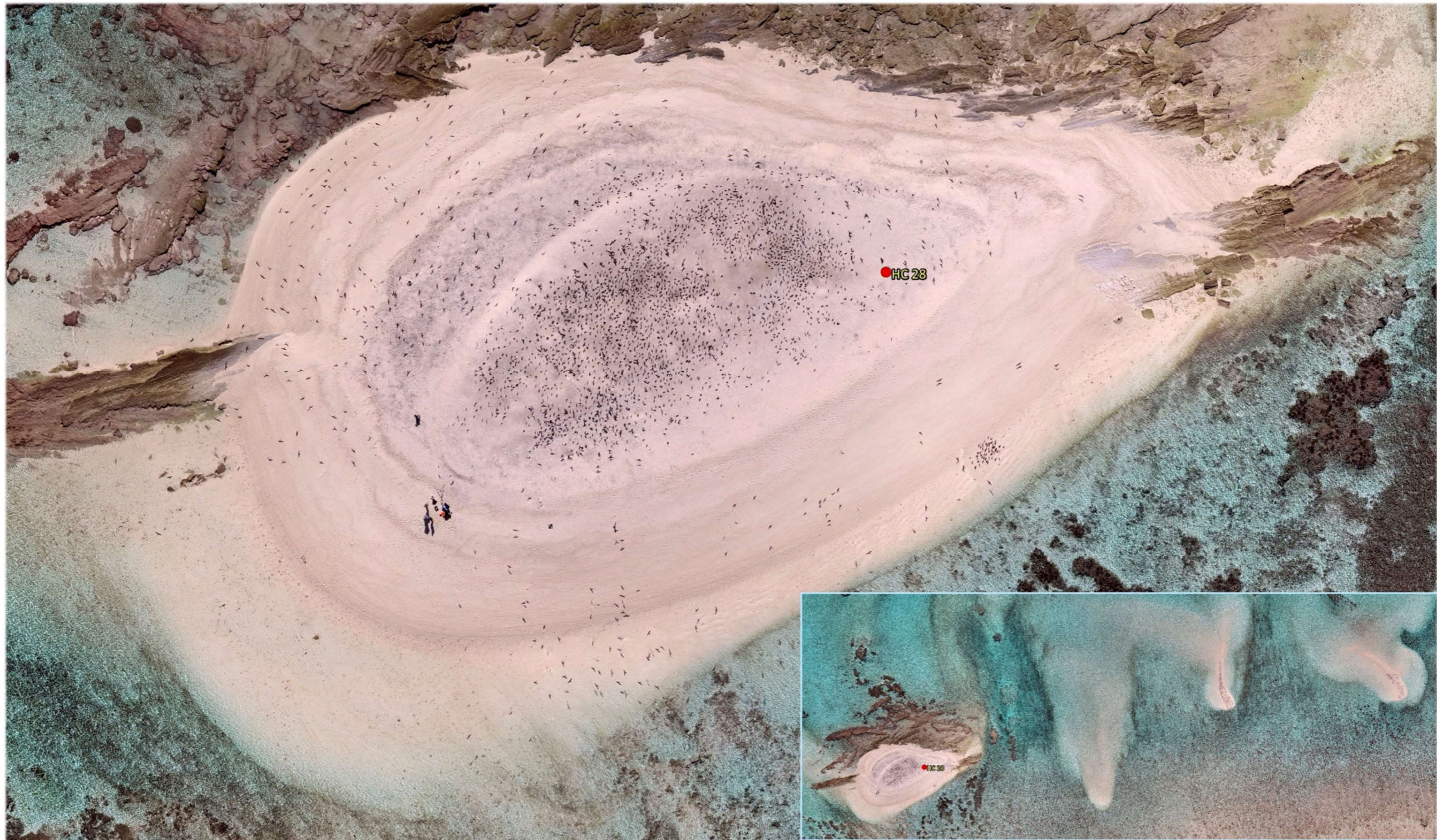
HC Site	Ecosystems/vegetation communities
HC28	Unvegetated, sandy substrate, fine sediments with coral rubble



Photo 93 Health Check site HC28 West

## Island Watch

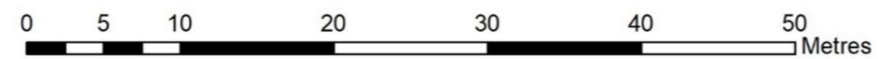
A summarised table of all Island Watch information can be found at [Appendix 9](#).



**Observatory Cay, Kenn Reefs**

Area: 0.244 ha (area above HAT)  
 0.779 ha (total area of cay)

● Health check



Printed on:  
 30/11/2022

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere  
 Projection: Mercator Auxiliary Sphere  
 Datum: WGS1984

Figure 40 Health Check sites on Observatory Cay, Kenn Reefs



## 2.8. Unnamed cay, northern end of Kenn Reefs

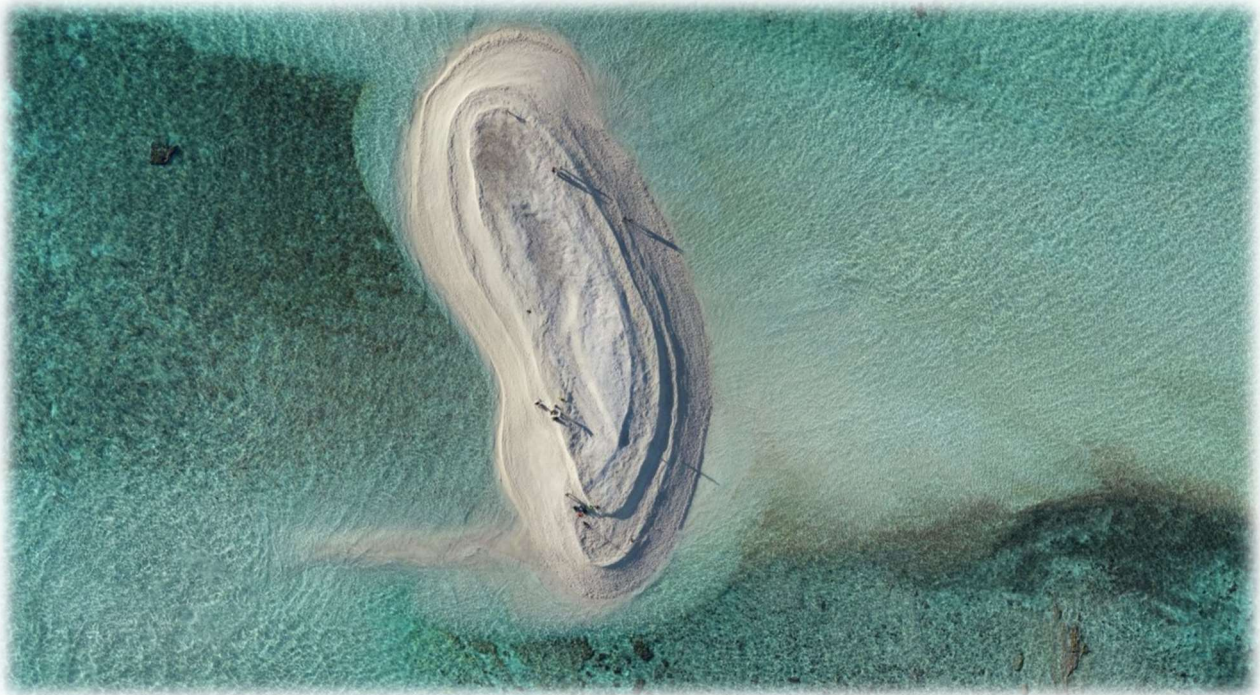


Figure 41 Unnamed cay, Kenn Reefs

Jake Sanders © Queensland Government

### 2.8.1 Drone imagery

29 May 2022:

- Drone - Phantom 4 RTK
- Image capture height 64m
- Resolution 1.9cm/px
- Map stitching software – Drone Deploy

### 2.8.2 Physical description

- Low tide extent 86m x 35m
- Approximate high tide extent 53m x 14m
- Approximate area above high tide 520m<sup>2</sup>

The unnamed cay at the northern end of Kenn Reefs, shown in [Figure 41](#), is an unvegetated coral rubble cay located 684km east of Mackay, Queensland at -21.204 degrees latitude and 155.776 degrees longitude.

### 2.8.3 Vegetation

On 29 May 2022, unnamed cay at the northern end of Kenn Reefs was unvegetated.

## 2.8.4 Birds

Table 45 Bird species and their breeding status – unnamed cay, Kenn Reefs

unnamed cay		29/05/2022			Breeding stages present		Breeding pairs	Adolescents and adults
common name	scientific name	Nests	Chicks	Young				
red-tailed tropicbird	<i>Phaethon rubricauda roseotinctus</i>	0	0	0	0	0	0	
Herald petrel	<i>Pterodroma heraldica</i>	0	0	0	0	0	0	
wedge-tailed shearwater	<i>Ardenna pacifica</i>	0	0	0	0	0	0	
great frigatebird	<i>Fregata minor</i>	0	0	0	0	0	1	
lesser frigatebird	<i>Fregata ariel</i>	0	0	0	0	0	0	
masked booby	<i>Sula dactylatra dactylatra</i>	0	0	0	0	0	1	
brown booby	<i>Sula leucogaster</i>	0	0	0	0	0	4	
red-footed booby	<i>Sula sula</i>	0	0	0	0	0	51	
sooty tern	<i>Onychoprion fuscatus</i>	0	0	0	0	0	0	
bridled tern	<i>Onychoprion anaethetus</i>	0	0	0	0	0	0	
crested tern	<i>Thalasseus bergii</i>	0	0	0	0	0	0	
roseate tern	<i>Thalasseus bengalensis</i>	0	0	0	0	0	0	
black-naped tern	<i>Sterna sumatrana</i>	0	0	0	0	0	3	
New Caledonian fairy tern	<i>Sternula nereis exsul</i>	0	0	0	0	0	0	
black noddy	<i>Anous minutus</i>	0	0	0	0	0	0	
brown noddy	<i>Anous stolidus</i>	old	0	0	0	0	36	
buff-banded rail	<i>Gallirallus philippensis tounelieri</i>	0	0	0	0	0	0	
purple swamphen	<i>Porphyrio melanotus</i>	0	0	0	0	0	0	
sacred kingfisher	<i>Todiramphus sanctus</i>	0	0	0	0	0	0	
white-faced heron	<i>Egretta novaehollandiae</i>	0	0	0	0	0	0	
Pacific golden plover	<i>Pluvialis fulva</i>	0	0	0	0	0	0	
ruddy turnstone	<i>Arenaria interpres</i>	0	0	0	0	0	0	
wandering tattler	<i>Tringa incana</i>	0	0	0	0	0	0	
grey-tailed tattler	<i>Tringa brevipes</i>	0	0	0	0	0	0	
lesser sand plover	<i>Charadrius mongolus</i>	0	0	0	0	0	0	

### Notes

- This unnamed cay had been stable enough for brown noddies to at least attempt nesting. Old nests were observed. It is unknown if nesting was successful, although no dead chicks or young were seen.
- The cay was well used as a roost site, particularly by red-footed boobies. There was a substantial mat of guano on the northern end (darker stained patch in *Figure 42*).
- This cay would be suitable as a nesting site for black-naped terns and possibly New Caledonian fairy terns.



Photo 94 Old brown noddy nests were observed on this unnamed cay in the Kenn Reefs system  
Collette Bagnato © Queensland Government

### 2.8.5 Pest and invertebrate sampling

29 May 2022

**Rodents** – unvegetated cay, no rodent tunnels deployed. No rodents observed.

Table 46 Invertebrates

Collection period	Sampling methods	baited sites	Species
daylight search	ground search	0	Nil

### 2.8.6 Health Checks and Island Watch

One Health Check (HC) was assessed at the unnamed cay, Kenn Reefs.

The overall condition class of the cay's ecosystem was **Good** (the highest rating, see [Table 47](#)).

Detailed criteria for each HC site are included in [Appendix 8](#).

Table 47 Assessed condition class for each HC site

unnamed cay, Kenn Reefs				
HC Site	Overall condition class			
HC29	Good	Good with concern	Significant concern	Critical

Table 48 Summary of each ecosystem type around HC sites (reference with [Figure 42](#))

HC Site	Ecosystems/vegetation communities
HC29	Unvegetated coral rubble cay

### Island Watch

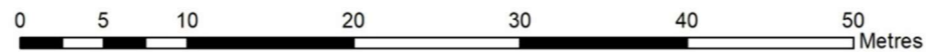
A summarised table of all Island Watch information can be found at [Appendix 9](#).



## North Cay, Kenn Reefs

Area: Approx. 0.301 ha (area above HAT)  
 Approx. 0.104 ha (total area of cay)

● Health check



Printed on:  
17/11/2022

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere  
 Projection: Mercator Auxiliary Sphere  
 Datum: WGS1984

Figure 42 Health Check sites on unnamed cay ("North Cay") Kenn Reefs

## 2.9 Observatory Cay, Frederick Reefs



Figure 43 Observatory Cay.

Jake Sanders © Queensland Government

### 2.9.1 Drone imagery

30 May 2022:

- Drone - Phantom 4 RTK
- Image capture height 83m
- Resolution 2.3cm/px
- Map stitching software – Drone Deploy

### 2.9.2 Physical description

- Low tide extent (combined cays) 356m x 28m
- Approximate high tide extent 30m x 4m
- Approximate area above high tide 76m<sup>2</sup>

Observatory Cay, Frederick Reefs, shown in [Figure 43](#), is an unvegetated sand and coral rubble cay located at 540km east of Mackay, Queensland at -22.022 degrees latitude and 154.376 degrees longitude.

The cay is one in a series of dynamic cays near the southern end of the reef complex. It is likely the size, structure and even location of the cays will be ephemeral, all dependent on weather and sea conditions.

### 2.9.3 Vegetation

On 30 May 2022 Observatory cay was unvegetated.

## 2.9.4 Birds

Table 49 Bird species and their breeding status – Observatory Cay, Frederick Reefs

Observatory Cay 30/05/2022		Breeding stages present			Breeding pairs	Adolescents and adults
common name	scientific name	Nests	Chicks	Young		
red-tailed tropicbird	<i>Phaethon rubricauda roseotinctus</i>	0	0	0	0	0
Herald petrel	<i>Pterodroma heraldica</i>	0	0	0	0	0
wedge-tailed shearwater	<i>Ardenna pacifica</i>	0	0	0	0	0
great frigatebird	<i>Fregata minor</i>	0	0	0	0	0
lesser frigatebird	<i>Fregata ariel</i>	0	0	0	0	0
masked booby	<i>Sula dactylatra dactylatra</i>	0	0	0	0	0
brown booby	<i>Sula leucogaster</i>	0	0	0	0	4
red-footed booby	<i>Sula sula</i>	0	0	0	0	0
sooty tern	<i>Onychoprion fuscatus</i>	0	0	0	0	1
bridled tern	<i>Onychoprion anaethetus</i>	0	0	0	0	0
crested tern	<i>Thalasseus bergii</i>	0	0	0	0	2
roseate tern	<i>Thalasseus bengalensis</i>	0	0	0	0	0
black-naped tern	<i>Sterna sumatrana</i>	0	0	0	0	5
New Caledonian fairy tern	<i>Sternula nereis exsul</i>	0	0	0	0	0
black noddy	<i>Anous minutus</i>	0	0	0	0	0
brown noddy	<i>Anous stolidus</i>	old	0	0	0	340
buff-banded rail	<i>Gallirallus philippensis tounelieri</i>	0	0	0	0	0
purple swamphen	<i>Porphyrio melanotus</i>	0	0	0	0	0
sacred kingfisher	<i>Todiramphus sanctus</i>	0	0	0	0	0
white-faced heron	<i>Egretta novaehollandiae</i>	0	0	0	0	0
Pacific golden plover	<i>Pluvialis fulva</i>	0	0	0	0	0
ruddy turnstone	<i>Arenaria interpres</i>	0	0	0	0	0
wandering tattler	<i>Tringa incana</i>	0	0	0	0	0
grey-tailed tattler	<i>Tringa brevipes</i>	0	0	0	0	0
lesser sand plover	<i>Charadrius mongolus</i>	0	0	0	0	0

### Notes

- This cay and series of sand banks is highly dynamic and would only provide opportunistic and limited breeding substrate.
- Some old brown noddy nests were observed with most having been impacted by rubble washed over from storms or high tide events.



Photo 95 Brown noddies have bred or attempted to breed on this highly dynamic cay.  
Collette Bagnato © Queensland Government

### 2.9.5 Pest and invertebrate sampling

30 May 2022

**Rodents** – unvegetated cay, no rodent tunnels deployed. No rodents observed.

Table 50 Invertebrates

Collection period	Sampling methods	baited sites	Species
daylight search	ground search	0	Nil

## 2.9.6 Health Checks and Island Watch

One Health Check (HC) was assessed at Observatory Cay, Frederick Reefs.

The overall condition class of the cay's ecosystem was **Good** (the highest rating, see [Table 51](#))

Detailed criteria for each HC site are included in [Appendix 8](#).

Table 51 Assessed condition class for each HC site

Observatory Cay, Frederick Reefs				
HC Site	Overall condition class			
HC30	Good	Good with concern	Significant concern	Critical

Table 52 Summary of ecosystem type around each HC site (reference with [Figure 44](#))

HC Site	Ecosystems/vegetation communities
HC30	Unvegetated, sandy substrate, fine sediments with coral rubble

## Island Watch

A summarised table of all Island Watch information can be found in [Appendix 9](#).



Photo 96 Health Check site HC30 East



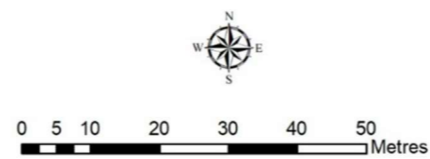


**Observatory Cay, Frederick Reefs**

Area (west cay)  
 Approx. 0.063 ha (above HAT)  
 Approx. 0.217 ha (total area)

Area (east cay)  
 Approx. 0.208 ha (above HAT)  
 Approx. 0.573 ha (total area)

● Health check



Printed on:  
 30/11/2022

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere  
 Projection: Mercator Auxiliary Sphere  
 Datum: WGS1984

Figure 44 Health Check sites on Observatory Cay, Frederick Reefs

## 2.10. Lighthouse Cay, Frederick Reefs



### 2.10.1 Drone imagery

30 May 2022:

- Drone - Phantom 4 RTK
- Image capture height 60m
- Resolution 1.7cm/px
- Map stitching software – Drone Deploy

### 2.10.2 Cay description

- Low tide extent 331m x 68m
- Approximate high tide extent 60m x 8m
- Approximate area above high tide 310m<sup>2</sup>

Lighthouse Cay, shown in [Figure 45](#), is an unvegetated sand and coral rubble cay located 542km east of Mackay, Queensland at -20.937 degrees latitude and 154.400 degrees longitude.

### 2.10.3 Vegetation

On 30 May 2022 Lighthouse Cay was unvegetated.

Figure 45 Lighthouse Cay

Jake Sanders © Queensland Government



Photo 97 The 33m tower at Lighthouse Cay

Andrew McDougall © Queensland Government

## 2.10.4 Birds

Table 53 Bird species and their breeding status – Lighthouse Cay, Frederick Reefs

Lighthouse Cay		30/05/2022			Breeding stages present		Breeding pairs	Adolescents and adults
common name	scientific name	Nests	Chicks	Young				
red-tailed tropicbird	<i>Phaethon rubricauda roseotinctus</i>	0	0	0	0	0	0	
Herald petrel	<i>Pterodroma heraldica</i>	0	0	0	0	0	0	
wedge-tailed shearwater	<i>Ardenna pacifica</i>	0	0	0	0	0	0	
great frigatebird	<i>Fregata minor</i>	0	0	0	0	0	1	
lesser frigatebird	<i>Fregata ariel</i>	0	0	0	0	0	0	
masked booby	<i>Sula dactylatra dactylatra</i>	0	0	0	0	0	0	
brown booby	<i>Sula leucogaster</i>	0	0	0	0	0	8	
red-footed booby	<i>Sula sula</i>	0	0	0	0	0	95	
sooty tern	<i>Onychoprion fuscatus</i>	0	0	0	0	0	0	
bridled tern	<i>Onychoprion anaethetus</i>	0	0	0	0	0	0	
crested tern	<i>Thalasseus bergii</i>	0	0	0	0	0	2	
roseate tern	<i>Thalasseus bengalensis</i>	0	0	0	0	0	0	
black-naped tern	<i>Sterna sumatrana</i>	0	0	0	0	0	2	
New Caledonian fairy tern	<i>Sternula nereis exsul</i>	0	0	0	0	0	0	
black noddy	<i>Anous minutus</i>	0	0	0	0	0	0	
brown noddy	<i>Anous stolidus</i>	old	0	0	0	0	240	
buff-banded rail	<i>Gallirallus philippensis tounelieri</i>	0	0	0	0	0	0	
purple swamphen	<i>Porphyrio melanotus</i>	0	0	0	0	0	0	
sacred kingfisher	<i>Todiramphus sanctus</i>	0	0	0	0	0	0	
white-faced heron	<i>Egretta novaehollandiae</i>	0	0	0	0	0	0	
Pacific golden plover	<i>Pluvialis fulva</i>	0	0	0	0	0	0	
ruddy turnstone	<i>Arenaria interpres</i>	0	0	0	0	0	0	
wandering tattler	<i>Tringa incana</i>	0	0	0	0	0	0	
grey-tailed tattler	<i>Tringa brevipes</i>	0	0	0	0	0	0	
lesser sand plover	<i>Charadrius mongolus</i>	0	0	0	0	0	0	

### Notes

- A highly dynamic cay offering limited breeding opportunities.
- Old brown noddy nests had been washed over.

## 2.10.5 Pest and invertebrate sampling

30 May 2022

**Rodents** – unvegetated cay, no rodent tunnels deployed. No rodents observed.

Table 54 Invertebrates

Collection period	Sampling methods	baited sites	Species
daylight search	ground search	0	Nil

## 2.10.6 Health checks and Island Watch

Two Health Checks (HC) were assessed at Lighthouse Cay, Frederick Reefs.

The overall condition class of the cay's ecosystem was Good (the highest rating, see [Table 55](#)).

Detailed criteria for each HC site are included in [Appendix 8](#).

Table 55 Assessed condition class for each HC site

Lighthouse Cay, Frederick Reefs				
HC Site	Overall condition class			
HC31	Good	Good with concern	Significant concern	Critical
HC32	Good	Good with concern	Significant concern	Critical

Table 56 Summary of ecosystem types around each HC site (reference with [Figure 46](#))

HC Site	Ecosystems/vegetation communities
HC31	Unvegetated, coarse sands with coral rubble
HC32	Unvegetated, coarse sands with coral rubble

The condition of **Good** takes into consideration the natural dynamics of this site. It is not currently a valuable breeding area for seabirds but does hold value as a roosting site.

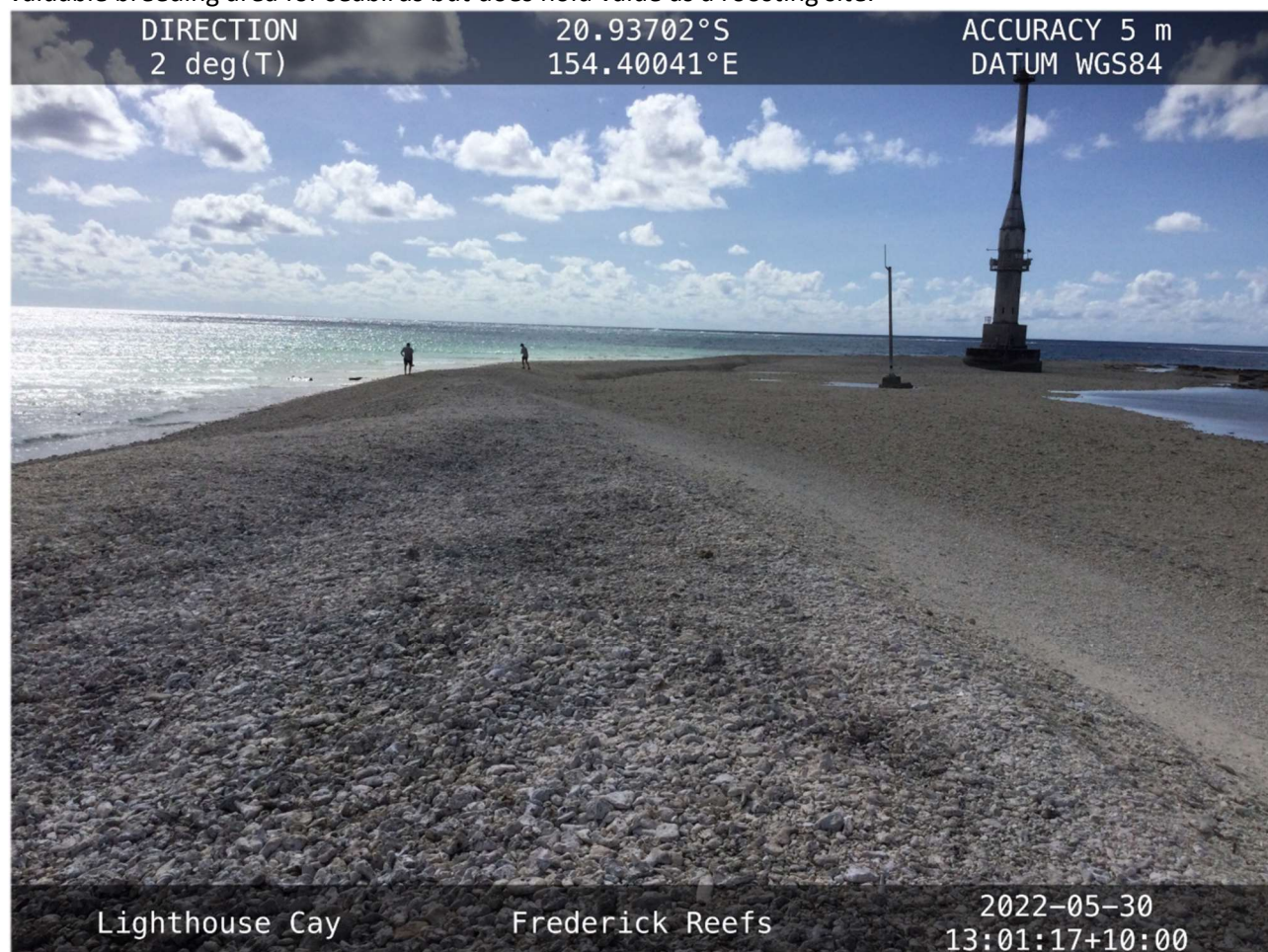


Photo 98 Health Check site HC31 North

## Island Watch

A summarised table of all Island Watch information can be found at [Appendix 9](#).