HEALTHY WATERS PARTNERSHIP
dry tropics

Townsville Dry Tropics
Waterways Report Card 2025

TECHNICAL REPORT

PART 1: Executive Summary

Reporting on data collected 2023 - 2024

JULY 2025 | Written by Adam Shand, Healthy Waters Partnership (HWP)

General

Authorship Statement

This technical report presents the results of the Townsville Dry Tropics 2023–2024 Report Card (released in July 2025) and was prepared by the Partnership's Technical Officer (TO), Adam Shand, with support and review from the Partnership's Senior Technical Officer (STO), Dinny Taylor. Significant support and review were received from the Regional Report Cards Technical Working Group (TWG) members, and the Wet Tropics Waterways Partnership and the Healthy Rivers to Reef Partnership. This report is endorsed by the Healthy Waters Partnership for the Dry Tropics (HWP).

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Current Townsville Dry Tropics TWG Members and their Respective Organisations

Table 1. Current HWP TWG members and respective organizations.

Member	Organisation
Diane Tarte	TWG: Chair (Independent)
Dinny Taylor	HWP: STO
Adam Shand	HWP: TO
Andrew Moss/Katie Hillyer	Department of Environment, Tourism, Science, and Innovation (DETSI)
Glynis Orr	DETSI
Reiner Mann	DETSI
Angus Thompson	AIMS
Michael Rasheed	James Cook University (JCU)
Alex Carter	JCU
Travis Sydes	Far North Qld Regional Organisation of Councils (FNQROC)
Nicole Flint	Central Queensland University (CQU)
Paula Cartwright	JCU
Jamie Corfield	DETSI
David Moffatt	DETSI
Stephen Lewis	JCU
Tyson Schmid	Townsville City Council (TCC)

Acknowledgements

We thank partners who kindly contributed their data, members of the Healthy Waters Partnership for the Dry Tropics (HWP) Management Committee, and members of the Technical Working Group (TWG) who provided feedback on the document. Partners providing data include Townsville City Council (Townsville Water & Waste), Port of Townsville, Australian Institute of Marine Science, Department of Environment, Tourism, Science, and Innovation, Queensland Herbarium (through the Department of Environment, Tourism, Science, and Innovation), James Cook University (TropWater), Ornatas, and Reef Check Australia. Creative Commons (Receiving Environment Monitoring Program, Sewage Treatment Plant data) by Townsville City Council is licensed under CC BY 4.0/Adapted Material. The Partnership acknowledges the Australian Marine Debris Initiative, Tangaroa Blue

Foundation, the community organisations, and individuals involved in the collection and the provision of data used in this report.

Members of the Reef Independent Science Panel are acknowledged for their advice and review of the document. The Partnership would like to acknowledge the assistance provided by Dr Bill Venables in the development of the litter model.

Executive Summary

This executive summary includes three summary sections covering:

- The Healthy Waters Partnership for the Dry Tropics,
- Climate and land use in the Townsville Dry Tropics region,
- The state and condition of the environment, including scores and grades for each index for each environment, and site-specific scores and grades for litter.

The Healthy Waters Partnership for the Dry Tropics

The Healthy Waters Partnership for the Dry Tropics (referred to as "the Partnership" or "HWP") was launched in January 2019, with a focus on producing an annual Report Card. The pilot annual Report Card was released in May 2019 and reports on data mainly from the 2017–2018 year. Following this pilot, each year an annual report card has been produced, with the current Report Card using data from the 2023–2024 year. Where a seasonal monitoring program extends outside of the year period, such as inshore coral, data from the whole monitoring period are included. For monitoring programs that collect data less frequently than annually (for example, wetland and riparian extent) then the most recent data set is included. In June 2021, the Partnership also began releasing annual Stewardship Reports, highlighting the management actions of partners (Table 2). In 2023 this evolved into the Stories of Stewardship presented as a series of web articles.

Table 2. Timeline of key HWP publications.

Released:	**2025**	**2024**	**2023**	**2022**	**2021**	**2020**	**2019**
Reporting period:	**23-24**	**22-23**	**21–22**	**20–21**	**19–20**	**18–19**	**17–18**
Report Card	✓ (current)	✓	✓	✓	✓	✓	✓ (pilot)
Stories of Stewardship	✓ (current)	✓	✓	✓	✓		

The key deliverable for the Report Card is an assessment of the state of the environment. The Report Card focuses on three indices that are directly dependent on waterway health: Water Quality, Habitat and Hydrology, and Fish. Indices are scored and graded for the freshwater, estuarine, inshore marine, and offshore marine environments within the Townsville Dry Tropics region. However, not all indices are scored and graded for each environment (for example, fish is only scored within the freshwater environment (Table 4).

The results presented in the 2023–2024 Report Card cover all areas of the Townsville Dry Tropics reporting region. On land, the Partnership region extends from the Crystal Creek catchment in the north, to the Ross River (lower) and Alligator Creek catchments in the south. In the marine environment the Partnership region extends from the coastline to the outer edge of the Great Barrier Reef (GBR) Marine Park. The reporting region for the Partnership incorporates all islands within this area, including Magnetic Island and the Palm Island group.

The Townsville Dry Tropics reporting region is divided into seven unique areas based on the environment type (freshwater, estuarine, inshore marine, and offshore marine), and riverine basin (Basin) (Black and Ross) or Bay (Zone) (Cleveland Bay and Halifax Bay) (Figure 1, Table 3). If required, Basins/Zones are divided into sub-basins/sub-zones based on the geographical definition and constructed boundaries (ports, weirs) provided by the Queensland water quality objectives (Department of Environment and Science 2018).

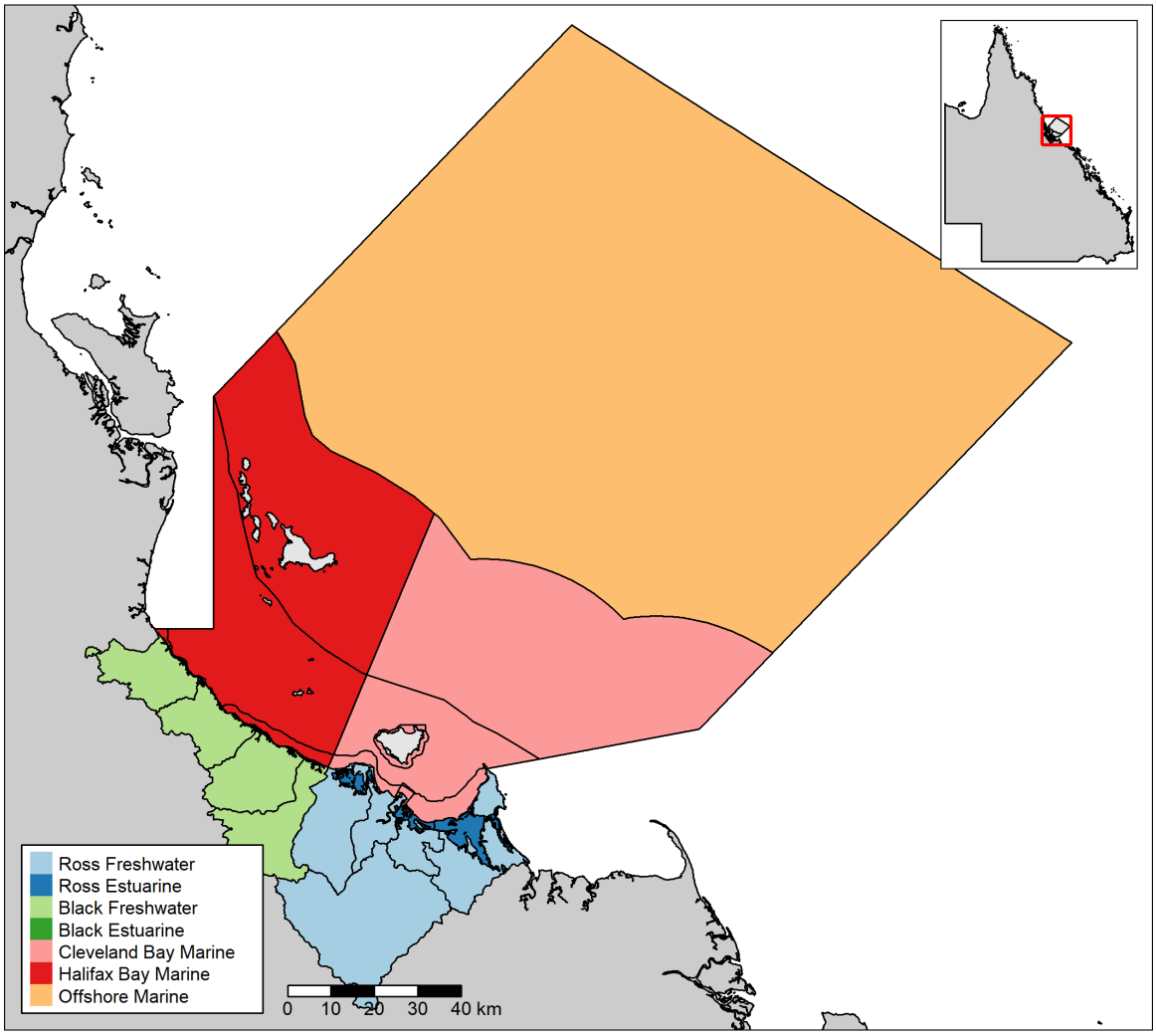

Figure 1. Geographic boundary of the HWP reporting region, divided into seven areas based on the environment type (freshwater, estuarine, inshore marine, and offshore marine), and riverine basin (Basin) (Black and Ross) or Bay (Zone) (Cleveland Bay and Halifax Bay). Each area is further divided into additional areas depending on water type, water quality objectives, and water dynamics (e.g. flow).

Table 3. The seven reporting areas in the Townsville Dry Tropics region.

Basin/Zone	Waterway
Ross Freshwater	Freshwater
Black Freshwater	Freshwater
Ross Estuarine	Estuarine
Black Estuarine	Estuarine
Cleveland Bay	Inshore Marine
Halifax Bay	Inshore Marine
Offshore Marine	Offshore Marine

This document is a detailed technical report that provides context and insight into the annual Report Card. It is intended to be read in conjunction with the "Townsville Dry Tropics Program Design" (Healthy Waters Partnership for the Dry Tropics 2024) and "Methods for Townsville Dry Tropics 2023–2024 Report Card (released in 2025)" (Healthy Waters Partnership for the Dry Tropics 2025). A table of every indicator measured is presented in 2.1 Terminology and Data Aggregation. An example of the coasters used for reporting results in the final Report Card is presented in 2.3 Presentation.

Climate and Land Use in the Townsville Dry Tropics Region

Between 1st July 2023 and 30th June 2024, the Townsville Dry Tropics region experienced one cyclone, Severe Tropical Cyclone Kirrily (approx. 50km away), and entered a neutral El Niño–Southern Oscillation (ENSO) (Bureau of Meterology 2025). Key influences for the 2023–2024 reporting period are summarised below.

- Grazing and conservation remain the two largest land use types by area. (Ross: 30.6% Conservation, 45.3% Grazing. Black: 43.0% Conservation, 39.9% Grazing).
    - Land use data has not been updated since the previous technical report (data for 2021, released 2023). The next update (2025 data) is expected to be released in 2027.
- Total rainfall was 930mm in the Ross Basin, and 1343mm in the Black Basin. Annual rainfall in both basins was classified in the "average" category, however, was less than the long-term mean (calculated from the most recent 30-year block of data: 1991 to 2020) of 1061mm and 1420mm respectively. Compared to the previous year, rainfall was much lower in the Ross Basin (1239mm to 930mm), and slightly lower in the Black Basin (1425mm to 1343mm).
    - Monthly rainfall was largely average throughout the year, ranging from the "below average" category to the "above average" category for 11 months of the year. In comparison, the previous year experienced notable peaks and troughs of rainfall.
- The annual average air temperature was 24.9°C in the Ross Basin, and 24.4°C in the Black Basin and was classified in the "very much above average" category in both basins. No month of the year recorded less than the long-term average temperature. Compared to the previous year, air temperatures were slightly higher (24.8°C to 24.9°C in the Ross Basin, 24.2°C to 24.4°C in the Black Basin).
    - Annual mean temperatures exceeded the long-term mean (calculated from the oldest 30-year block of data available in the dataset (from 1911 to 1940) by 1.2°C in the Ross Basin and 1.3°C in the Black Basin.
- The annual average sea surface temperature was 26.8°C, which was 0.6°C above the long-term average of 26.2°C. Compared to the previous year, sea surface temperature was slightly lower (27.1°C down to 26.8°C).
    - For 9 months of the year monthly sea surface temperatures ranged from the "above average" category to the "highest 1%" on record category, with only October, November, and December temperatures falling into the "average" category.
    - The proxy for risk of coral bleaching ranged from "low risk" to "very high risk", with most of the marine zone experiencing between 4 and 8+ Degree Heating Weeks.
    - These high temperatures (as noted by annual SST, and DHW) contributed to the 5th mass coral bleaching event for the Great Barrier Reef since 2016.

State and Condition of the Environment

The results presented in this document describe the state and condition of the waterways and environment in the seven reporting areas of the Townsville Dry Tropics region (Figure 1, Table 3). Within each area standardised scores and grades are produced for environmental indicators, indicator categories, and indices. Results from multiple indicators are aggregated into results for indicator categories, which are aggregated into results for indices (see Page 4). Indicators, and thus the indices reported for each area vary (Table 4). Confidence levels based on how the data were collected and analysed are also reported.

Table 4. Indices measured in each area of the Townsville Dry Tropics region.

Basin/Zone	Water Quality (WQ)	Latest update	Habitat and Hydrology (HH)	Latest update	Fish (F)	Latest update
Black Freshwater	✓	23–24	✓	22–23	✓	22-23
Black Estuarine	✓	23–24	✓ (Only Habitat)	22–23		
Halifax Bay	✓	23–24	✓ (Only Habitat)	23–24		
Ross Freshwater	✓	23–24	✓	22–23	✓	22-23
Ross Estuarine	✓	23–24	✓ (Only Habitat)	22–23		
Cleveland Bay	✓	23–24	✓ (Only Habitat)	23–24		
Offshore Marine	✓	19–20	✓ (Only Habitat)	23–24		

The index and standardised scores of each area for the 2023–2024 reporting period are presented below for quick reference. Selected key messages for results of particular interest are provided and refer to indicators which are presented in detail within the results sections.

Freshwater Environment

Table 5. Comparison of 2023–2024 weighted scores for Water Quality (WQ), Habitat and Hydrology (HH), Fish (F), and Pesticides (P) indices in the Ross Freshwater Basin and the Black Freshwater Basin against previous years.

Basin	2023-2024				2022-2023				2021–2022				2020–2021				2019–2020			
	WQ	HH	F	P[1]	WQ	HH	F	P[1]	WQ	HH	F	P[1]	WQ	HH	F	P[1]	WQ	HH	F	P[1]
Ross	67	X	X	75	67	61	49	81	70	X	X	89	73	X	X	94	70	X	57	89
Black	71	X	X	84	66	79	55	82	68	X	X	91	68	X	X	92	67	X	78	89

Standardised scoring range (WQ, HH, F): ■ Very Poor (E) = 0 to <21 | ■ Poor (D) = 21 to <41 | ■ Moderate (C) = 41 to <61 | ■ Good (B) = 61 to <81 | ■ Very Good (A) = 81 – 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

Standardised scoring range (P): ■ = Very High Risk: 0 to <21 | ■ = High Risk: 21 to <41 | ■ = Moderate Risk: 41 to <61 | ■ = Low Risk: 61 to <81 | ■ = Very Low Risk: 81 to 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

Key Messages

Water Quality

- The Ross Freshwater Basin grade remained "good" with no change in overall water quality score.
    - However, the nutrients grade and score did increase in the Ross Basin (from "moderate" (60) to "good" (72), while the physical chemical properties score decreased from 74 to 63.
    - In both instances these changes were predominantly driven by changes in the Lower Ross Sub Basin, with greatly improved DIN scores and reduced Low DO scores. For both indicators, no strong temporal trends are yet apparent.

[1] Pesticide results are not representative of the Ross and Black Basins, but rather of the specific pesticide sampling sites within the Ross and Black Basins. Pesticides were first added to the 2022-2023 Technical Report, previous scores have been added post-publication.

    - The Bohle River Total Phosphorus (TP) grade remained "very poor" for the sixth[2] year in a row, and the DIN grade remained "very poor" although increased its score slightly compared with 2022-2023.
    - DIN values in the Upper Ross and Paluma Lake sub basins remain "NA" due to the Water Quality Objective values (WQOs) being equal to or less than the Limit of Reporting values (LOR).
- The Black Freshwater Basin score increased from 66 to 71 within the same grade of "good".
    - This improvement was largely driven by an improvement in the physical-chemical indicator category from 63 to 74. Specifically, the turbidity indicator in the Bluewater Creek Sub Basin improved notably from "poor" (28) to "moderate" (59). This increase is after several years of lower scores and will need to be monitored for consistency.
    - Althaus Creek shows ongoing low scores and grades for the TP and Turbidity indicators (42 and 58, "moderate"), and further investigation would be required to isolate specific drivers. An increase in grade has been noted, however this may be driven by the limited number of samples collected (Appendix J), continued improvement is needed particularly in years with a greater number of samples.

Habitat and Hydrology

- There is no new data available for the freshwater habitat and hydrology section, thus scores have not changed since the previous report. Historic key messages are presented below:
    - Standardised scores for the habitat and hydrology index increased in both freshwater basins.
        - The riparian extent indicator category improved in both basins, with the Black Freshwater Basin recording its first increase in freshwater riparian vegetation score since the beginning of the HWP Technical Report.
    - Sub basin scores have been calculated and presented for the first time. This allowed for several new observations such as:
        - Identifying the Stuart Creek sub basin as the location with the greatest loss of riparian vegetation extent between 2019 and 2021.
        - Identifying the Bluewater and Rollingstone Creek sub basins as the locations with the greatest loss of wetland extent between 2019 and 2021.
        - Identifying several sub basins with the Black Freshwater Basins that have gained riparian vegetation extent between 2019 and 2021.

Fish

- There is no new data available for the freshwater fish section, thus scores have not changed since the previous report. Historic key messages are presented below:
    - This is the second time the fish index has been measured and scores for the fish index declined in both basins.
        - The primary driver was the PONIS indicator category in the Ross Basin (decreased from 60 to 41), and the POISE indicator category in the Black basin (decreased from 66 to 25).

[2] Note that only five years of historical data are shown in each technical report. However full historical scores are available upon request.

- Within the Ross Basin, 4011 fish from 29 species were caught during sampling.
  - 86% (3447) were indigenous and were released after identification.
  - 14% (564) were non-indigenous and were euthanised.
    - 529 fish were alien, 35 were translocated.
  - Scores indicate that most waterways were graded as “moderate”.
- Within the Black Basin, 2217 fish from 25 species were caught during sampling.
  - 83% (1830) were indigenous and were released after identification.
  - 17% (387) were non-indigenous and were euthanised.
    - All non-indigenous species were alien.
  - Scores indicate that some waterways were graded “very good’ whilst others were “very poor”.
  - The large decrease in the POISE indicator category score is most likely connected to heavy rainfall before sampling dispersing the fish populations.

Pesticides

- This is the second year in which pesticides data have been reported in the Townsville Dry Tropics Technical Report.
- Pesticide results and scores are not representative of the entire basin, as pesticides were only monitored at two sites (one in Ross River and one in Black River).
- The pesticides index is a risk metric, even if scores are “very low risk”, this does not indicate the absence of pesticides completely.
- The score for the Black Basin sample site increased from 82 to 84 although did not change grade.
- Notably, both the score and grade decreased for the Ross River sample site, from “very low risk” (81) to “low risk” (75).
  - Two new pesticides were detected (Hexazinone (PSII) and Metsulfuron-methyl (non-PSII)), for the first time in more than 5 years, while one pesticide was not detected from the previous year (Triclopyr (non-PSII)).
  - In particular, even a single detection of Metsulfuron-methyl for a single day can result in a notable contribution to the annual wet season Pesticide Risk Metric (PRM) due to its high toxicity and very low guideline value. Continued monitoring is required to understand if this sharp decrease in scores continues.

Estuarine Environment

Table 6. Comparison of 2023–2024 weighted scores for Water Quality and Habitat indices in the Ross Estuarine Basin and Black Estuarine Basin against previous years.

Basin	2023-2024		2022-2023		2021–2022		2020–2021		2019–2020		2018–2019	
	WQ	H	WQ	H	WQ	H	WQ	H	WQ	H	WQ	H
Ross	69 (B)	X	79 (B)	74 (B)	83 (A)	X	88 (A)	X	88 (A)	X	39 (D)	73 (B)
Black	61 (B)	X	68 (B)	50 (C)	64 (B)	X	66 (B)	X	47 (C)	X	52 (C)	71 (B)

■ Very Poor (E) = 0 to <21 | ■ Poor (D) = 21 to <41 | ■ Moderate (C) = 41 to <61 | ■ Good (B) = 61 to <81 | ■ Very Good (A) = 81 – 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

Key Messages

Water Quality

- The Ross Estuarine Basin overall water quality grade remained “good”, however the score decreased from 79 to 69.
    - Most influential was the decline in the score for DIN in the Louisa Creek watercourse, which saw a decrease in grade from “good” (67) to “very poor" (0). This decline is the first notable decrease in DIN scores in five years of reporting. The cause(s) of this decline have not been determined, however could have results from increasing land use impacts, weather conditions and/or the sample timing in relation to environmental events. Additional, years of sampling are required to establish trends.
    - Louisa Creek showed ongoing low scores and grades for the Low DO and Nutrients indicators, along with recent low scores for the DIN indicator. Further investigation would be required to isolate specific drivers.
- The Black Estuarine Basin overall water quality grade remained “good”, however the score decreased from 68 to 61.
    - Most influential was the decrease in score for the Low DO indicator in Camp Oven Creek (42 to 2), Turbidity in Bluewater Creek (63 to 28) and Sleeper Log Creek (59 to 35), and DIN in Bluewater Creek (65 to 50). However, minor improvements that occurred across several indicators in several watercourses “muted” the effect of this decline on the overall basin grade.
    - Althaus Creek showed ongoing low scores and grades for the turbidity indicator, and further investigation would be required to isolate specific drivers. An increase in grade has been noted, however continued improvement is needed.
    - Over several years Sleeper Log Creek has shown a consistent decline in Turbidity for both score and grade. It is recommended that further investigation is conducted to isolate specific drivers.
    - Scores and grades decreased in Crystal Creek for DIN, TP, and Turbidity. Ongoing monitoring is essential to determine if this continues.
- Across all estuaries in the Dry Tropics Region, 10 of 13 watercourses received a grade of “good” or “very good” for nutrients, and 8 of 13 received a grade of "good” or “very good” for physical-chemical properties.

Habitat

- There is no new data available for the estuarine habitat section, thus scores have not changed since the previous report. Historic key messages are presented below:
  - Sub Basins scores have been calculated and presented for the first time. This allowed for several new observations such as:
    - Identifying the Bohle River and Crystal Creek sub basins as the main areas of mangrove and saltmarsh loss and all other sub basins either undergoing no change or receiving small increases in mangrove and saltmarsh vegetation.
    - Identifying the Black River, Bluewater Creek and Rollingstone Creek sub basins as key drivers of riparian vegetation loss and several sub basins as the main areas of gain of riparian vegetation.
  - The Black Estuarine Basin recorded its first increase (11.7ha) in mangrove and saltmarsh vegetation since the beginning of the Dry Tropics Technical Report.
  - The Black Estuarine Basin also recorded its first ever loss in riparian vegetation (-9.8ha) since the beginning of the Dry Tropics Technical Report.
    - This may be connected to the ongoing urban development throughout the basin.
  - In the Ross Estuarine Basin mangrove and saltmarshes decreased (-8.5ha) and riparian vegetation increased (0.2ha).

Inshore Marine Environment

Table 7. Comparison of 2023–2024 weighted scores for Water Quality and Habitat in Cleveland Bay and Halifax Bay against previous years.

Zone	2023-2024		2022-2023		2021–2022		2020–2021		2019–2020	
	WQ	H	WQ	H	WQ	H	WQ	H	WQ	H
Cleveland Bay	76 (B)	37 (D)	73 (B)	53 (C)	78 (B)	57 (C)	73 (B)	54 (C)	79 (B)	48 (C)
Halifax Bay	65 (B)	44 (C)	73 (B)	47 (C)	69 (B)	45 (C)	73 (B)	49 (C)	54 (C)	52 (C)

■ Very Poor (E) = 0 to <21 | ■ Poor (D) = 21 to <41 | ■ Moderate (C) = 41 to <61 | ■ Good (B) = 61 to <81 | ■ Very Good (A) = 81 – 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

Key Messages

Water Quality

- The Cleveland Bay inshore marine zone overall water quality grade remained “good” and the score increased from 73 to 76.
  - Grades for indicators with the nutrient indicator category continue to remain moderate to “very poor” within the Magnetic Island Sub Zone. These scores are the result of high concentrations of nutrients, stringent water quality objectives, and proximity to a range of anthropogenic activities.
  - Grades for Turbidity and TSS remained “very poor” in the Enclosed Coastal Outside Port Zone area. This location has had several years of low results, and it is recommended that further investigation is conducted to determine the cause of the decline.
- The Halifax Bay inshore marine zone overall water quality grade remained “good” however declined from 73 to 65.

- Most influential was the Chlorophyll a indicator in the Open Coastal and Midshelf Sub Zones.
- Chlorophyll a decline from “good” (61) to “poor” (40) in the Open Coastal and Sub Zone and decline from “moderate” (43) to “poor” (36) in the Midshelf Sub Zone. Continued sampling is required to monitor for trends.

Habitat

- The Cleveland Bay inshore marine zone grade declined from moderate to poor, and also showed a large score decrease (53 to 37).
  - The seagrass grade within Cleveland Bay declined from good to poor, while the score decreased from 68 to 37.
    - The biomass condition indicator is the primary driver of decline scores, with several meadows exhibiting losses of meadow “hotspots”. However, the area and composition condition indicators largely remain stable for all meadows, indicating the potential for recovery.
    - Biomass losses are driven primarily by system-wide pressures such as TC Kirrily, as well as periods of high cloud cover, high winds, elevated wave heights and rainfall that are resulting in extended periods of low light.
    - Successive environmental conditions that are not favourable for seagrass growth and persistence, during and over multiple years are likely to have caused the seagrass condition loss recorded in the Townsville region.
  - The coral grade within Cleveland Bay remained “poor”, however the score decreased slightly from 39 to 37. Scores and grades from coral in Cleveland Bay have fluctuated within this range for the past four years due to exposure to several pressures including cyclones, and increased water temperatures leading to bleaching.
  - Low scores are primarily driven by the Juvenile and macroalgae indicators, suggesting limited coral recruitment and a high density of macroalgae competing for available space.
- The Halifax Bay inshore marine zone grade remained “moderate” although the score decreased slightly from 47 to 44.
  - The coral grade with Halifax Bay was 44 (moderate), the lowest score received in the past five years (by 1).
  - There remains a notable amount of macroalgae recorded at three of six sites.

Offshore Marine Environment

Table 8. Comparison of 2023–2024 weighted scores for Habitat in the Offshore Marine Environment against previous years.

Zone	2023-2024		2022-2023		2021–2022		2020–2021		2019–2020	
	WQ	H	WQ	H	WQ	H	WQ	H	WQ	H
Offshore	ND	64 (B)	ND	63 (B)	ND	64 (B)	ND	62 (B)	100 (A)	56 (C)

■ Very Poor (E) = 0 to <21 | ■ Poor (D) = 21 to <41 | ■ Moderate (C) = 41 to <61 | ■ Good (B) = 61 to <81 | ■ Very Good (A) = 81 – 100 | ND = No Data | NA = Not Applicable (data available but not usable) | X = Data was not updated this year.

Key Messages

Water Quality

- No data were available for the 2023–2024 Townsville Dry Tropics Technical Report.

Habitat

- The Offshore Marine Zone coral grade remained “good”, with minimal changes to the previous Technical Report.
    - Juvenile density was graded as “very good” at 7 of 9 reefs surveyed.
    - All coral reefs had an overall grade of “moderate” or “good”.
    - John Brewer Reef shows signs of recovering from a recent crown-of-thorns starfish outbreak.
    - TC Kirrily had a limited impact on total coral cover at survey sites; however, the positioning of some sites (e.g. leeward) may have provided protection.

Litter

Litter was first included in the 2019–2020 report card. The data used to derive the scores and grades for the litter index is from Tangaroa Blue Foundation's (TBF) Australian Marine Debris Initiative Database (AMDI). The data is collected by volunteers, and partners through the Reef Clean program which is funded through the Australian Government's Reef Trust.

The methodology has been updated from the initial year of data collection, and data collected from new sites. Zone scores are not comparable as the sites litter is collected from each year in each Zone varies, thus only site-specific scores and grades are presented (Table 9).

Table 9. Comparison of 2022–2023 standardised scores and grades for Litter in the Townsville Dry Tropics region against previous years.

Zone	Site	Scores and Grades				
		2023-2024	2022-2023	2021-2022	2020-2021	2019-2020
Halifax Bay	North West Beach, Pelorus Island	ND	ND	ND	ND	95 (VLP)
	West Beach, Pelorus Island	ND	ND	ND	ND	80 (VLP)
	North Beach, Orpheus Island	ND	ND	ND	ND	4 (VHP)
	Little Pioneer Bay, Orpheus Island. underwater	ND	91 (VLP)	ND	ND	ND
	Rocky Beach, Orpheus Island	39 (HP)	ND	ND	ND	ND
	Fig Tree Bay, Orpheus Island	ND	28 (HP)	ND	ND	ND
	Big Rock Bay, Orpheus Island	ND	7 (VHP)	7 (VHP)	7 (VHP)	21 (HP)
	Fig Tree Beach, Orpheus Island	41 (MP)	ND	19 (VHP)	16 (VHP)	ND
	Pioneer Bay, Orpheus Island	ND	84 (VLP)	ND	ND	ND
	Picnic Bay, Orpheus Island	ND	5 (VHP)	2 (VHP)	11 (VHP)	0 (VHP)
	Boulder Beach North, Orpheus Island	ND	ND	14 (VHP)	ND	ND
	Yanks Jetty, Orpheus Island	ND	ND	ND	76 (LP)	74 (LP)
	Boulder Beach, Orpheus Island	ND	ND	1 (VHP)	ND	ND
	South Beach, Orpheus Island	ND	ND	10 (VHP)	ND	42 (MP)
	Fantome Island, Northern End	ND	57 (MP)	36 (HP)	12 (VHP)	ND
	North West Beach, Fantome Island	ND	61 (LP)	ND	ND	ND
	Ollera Beach	ND	ND	ND	ND	39 (HP)
	Rollingstone Beach	ND	ND	ND	ND	50 (MP)
	Toomulla Beach	ND	ND	ND	ND	53 (MP)
	Toomulla main beach	ND	ND	83 (VLP)	ND	ND
	Saunders Beach	ND	ND	ND	ND	71 (LP)
Cleveland Bay	Bushland Beach, Townsville	ND	55 (MP)	ND	62 (LP)	ND
	Myrmidon Reef underwater	ND	ND	ND	98 (VLP)	ND
	Radical Bay, Magnetic Island	ND	96 (VLP)	ND	ND	ND
	Horseshoe Bay, Magnetic Island	91 (VLP)	83 (VLP)	34 (HP)	ND	ND
	Florence Bay, Magnetic Island	ND	51 (MP)	ND	ND	ND
	Arthur Bay, Magnetic Island	ND	ND	ND	43 (MP)	ND
	Alma Bay, Magnetic Island	33 (HP)	60 (LP)	71 (LP)	63 (LP)	45 (MP)
	Alma Bay, Magnetic Island underwater	98 (VLP)	100 (VLP)	ND	98 (VLP)	97 (VLP)
	Geoffrey Bay, Magnetic Island	ND	ND	ND	80 (VLP)	ND
	Geoffrey Bay Reef, Magnetic Island underwater	ND	ND	ND	ND	93 (VLP)
	Nelly Bay Beach, Magnetic Island	73 (LP)	77 (LP)	73 (LP)	77 (LP)	53 (MP)
	Nelly Bay, Magnetic Island underwater	ND	99 (VLP)	99 (VLP)	99 (VLP)	100 (VLP)
	Shelly Beach, Pallarenda	ND	44 (MP)	ND	29 (HP)	63 (LP)
	Shelly Cove, Cape Pallarenda Conservation Park	98 (VLP)	92 (VLP)	91 (VLP)	70 (LP)	67 (LP)

Zone	Site	Scores and Grades				
		2023-2024	2022-2023	2021-2022	2020-2021	2019-2020
	Cape Pallarenda Old Jetty Area	56 (MP)				
	Pallarenda Beach	85 (VLP)	84 (VLP)	72 (LP)	ND	ND
	Rowes Bay	64 (LP)	89 (VLP)	87 (VLP)	75 (LP)	75 (LP)
	Kissing Point, Townsville	ND	ND	ND	79 (LP)	ND
	Strand Park, Townsville	80 (VLP)	ND	ND	74 (LP)	62 (LP)
	Strand Waterpark Beach	83 (VLP)	ND	ND	86 (VLP)	ND
	Secret Beach, Ross River, Townsville,	91 (VLP)	81 (VLP)	ND	ND	ND
Ross	Three Mile Creek, Pallarenda	ND	ND	ND	37 (HP)	ND
	Strand Rock Pool, Townsville	ND	74 (LP)	ND	47 (MP)	ND
	Jezzine Barracks Townsville Heritage Precinct	ND	63 (LP)	ND	ND	ND
	West End, Townsville	ND	66 (LP)	ND	ND	ND
	Ross Creek, Townsville	ND	59 (MP)	46 (MP)	ND	ND
	Queensland Country Bank Stadium	ND	ND	21 (HP)	23 (HP)	ND
	South Townsville Recreational Boat Park	ND	ND	ND	33 (HP)	ND
	Anderson Park, Townsville	ND	ND	91 (VLP)	ND	ND
	Sherriff Park Townsville	ND	ND	73 (LP)	ND	ND
	Aplins Weir Rotary Park	ND	74 (LP)	69 (LP)	35 (HP)	41 (MP)
	Lake Idalia Wetland Foreshore	ND	45 (MP)	ND	ND	ND
	Riverside Gardens Community Centre, Ross River, Douglas	48 (MP)	ND	ND	ND	ND
	Apex Park, Condon	ND	ND	62 (LP)	ND	ND

Standardised scoring range: ■ Very High Pressure (VHP) = 0 to <20 | ■ High Pressure (HP) = 20 to <40 | ■ Moderate Pressure (MP) = 40 to <60 | ■ Low Pressure (LP) = 60 to <80 | ■ Very Low Pressure (VLP) = 80 to 100 | NA = No data available

Sites where litter has been collected underwater are indicated. Where there are two sites with the same location name, for example, Alma Bay, Magnetic Island is the beach area above the low tide mark and Alma Bay, Magnetic Island underwater is collected by diving out from the beach. If a site is not designated as underwater and is on the coast, it is above the low tide mark.

Key Messages

- Alma Bay beach at Magnetic Island had the highest litter pressure in the region.
- The litter pressure on the east coast of Orpheus Island appears to be decreasing which may be associated with regular collection as well as local factors.
- The most amount of litter pressure on the mainland was at Cape Pallarenda Old Jetty area with moderate litter pressure and Shelly Cove, Cape Pallarenda Conservation park had the least with very low litter pressure on the mainland for Cleveland Bay.
- The only site within the Ross Basin, the Riverside Gardens Community Centre had a moderate litter pressure.

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Glossary of Terms

Table 10. Glossary of terms used in the Townsville Dry Tropics Report Card Results 2025 Technical Report.

AIMS	Australian Institute of Marine Science
Alien species	Species that are not native to any part of Australia
AMDI	Australian Marine Debris Initiative
Artificial barriers	Any barrier that prevents or delays connectivity between key habitats. Potentially impacting migratory fish populations, reducing diversity of aquatic species and the condition of aquatic ecosystems (Moore 2016)
Basin	Area of land where surface water runs to smaller creeks or rivers discharging into a common point, may include many sub-basins or sub-catchments
BOM	Bureau of Meteorology
Catchment area	Area of land from which rainfall flows into a river, lake or reservoir and discharges into a common point
Chlorophyll-*a*	An indicator of phytoplankton biomass, widely considered a useful proxy of nutrient availability and system productivity
Climate	Refers to both natural climate variability and climate change
CVA	Conservation Volunteers Australia
DETSI	Department of Environment, Tourism, Science and Innovation of the Queensland Government
DHW	An accumulated measurement of sea surface temperature (SST) that assesses the instantaneous bleaching heat stress during the prior 12-week period. (Significant coral bleaching usually occurs when the DHW value reaches 4 °C-weeks. By the time the DHW value reaches 8 °C-weeks, severe, widespread bleaching and significant mortality are likely)
DIN	Dissolved Inorganic Nitrogen. Comprised of nitrate, nitrite, and ammonium
DO	Dissolved Oxygen
HWP	Healthy Waters Partnership for the Dry Tropics
Ecosystem	A dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit
Ecosystem Health	An ecological system is healthy and free from 'distress syndrome' if it is stable and sustainable. That is, if it is active and maintains its organization and autonomy over time and is resilient to stress. Ecosystem health is thus closely

	linked to the idea of sustainability, which is seen to be a comprehensive, multiscale, dynamic measure of system resilience, organization, and vigour.
Enclosed Coastal (EC)	A partially smooth, semi protected water body including shallow, enclosed waters near an estuary mouth and generally considered the interface between coastal and inland waters. Its boundaries depend on the local or regional authorities.
Environmental values (EV)	Characteristics or qualities of a natural system that supports viable natural communities and human uses
eReefs	Integrated modelling system to visualise, communicate and report reef information for the GBR
Floor rounding	Rounding decimal places down to the nearest integer. (for example, 60.9 = 60)
Flow (as an indicator)	The degree that the natural river currents or stream flows have been modified, influencing waterways and ecosystem health
FRP	Filterable Reactive Phosphorus
GBR	Great Barrier Reef
GBR Report Card	GBR Report Card under the Reef Water Quality Protection Plan (2013)
GBRMPA	Great Barrier Reef Marine Park Authority
GBRMP	Great Barrier Reef Marine Park
High DO	High Dissolved Oxygen. Can be a sign of algae growth and poor water quality
Impoundment length	An indicator used in the 'in-stream habitat modification' indicator for freshwater basins in the region. The proportion (%) of the linear length of the main river channel when at the full capacity of artificial in-stream structures, such as dams and weirs.
Index	The aggregation of indicator categories. For example, the water quality index is an aggregation of nutrient, phys-chem, and Chlorophyll *a* indicator categories.
Indicator	A measure of one component of an environment. For example, the total amount of phosphorus (TP) present in the water.
Indicator category	The aggregation of indicators. For example, the nutrient indicator category is an aggregation of TP and DIN indicators.
Inshore Marine environment	Includes Enclosed Coastal (EC), Open Coastal (OC) and Midshelf (MS) waters, extending east to the boundary with the offshore waters (Department of Environment and Science 2018, Great Barrier Reef Marine Park Authority 2010).

Inshore Marine Zone	Inshore Marine Zone is a reporting zone in the Townsville Dry Tropics Report Card that includes Inshore Marine environments
ISP	Independent Science Panel
Invasive species	Invasive species include both alien and translocated species
JCU	James Cook University
Litter	Any type of waste material that is less than 200 litres in volume and that has been deposited unlawfully
Low DO	Low Dissolved Oxygen. Can result in anoxic waterways (depletion of oxygen) and poor water quality.
LTMP	Long Term Monitoring Program of GBR Midshelf and offshore reef communities
Macroalgae (cover)	Indicator used to assess coral health. Macroalgae includes seaweed and other visible benthic (attached to the bottom) marine algae.
Marine Debris	Also called marine litter. Defined as any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment.
MD	Moderate disturbed waters
Midshelf Waters	Midshelf Waters lie offshore of the open coastal waters and extend from 12 to 48 km offshore in the Burdekin region (waters south of approximately Pelorus Island) and 6 to 24 km offshore in the Wet Tropics region (waters north of Pelorus Island) (Great Barrier Reef Marine Park Authority 2010).
MMP	Marine Monitoring Program of the inshore reef communities along Wet Tropics, Burdekin, Mackay, Whitsunday, and Fitzroy regions of the GBR
Modified Wetland	Modified wetlands are existing wetlands which were also former natural wetlands, where activities that modify wetland hydrology and/or structures associated with these activities have been observed from aerial or satellite imagery or from field survey data (Queensland Wetlands Program 2023).
MSL	Mean Sea Level
Non-indigenous species	See Invasive species
NOx	Generic term for nitrogen oxides such as mixtures of nitrites and nitrates
NRM	Natural resource management
NTU	Nephelometric Turbidity Unit. The units that turbidity is measured in.

OGBRWH	Office of the Great Barrier Reef and World Heritage, Queensland Government
Offshore waters	Offshore waters lie offshore of midshelf waters and extend 48 to 180 km from the coast in the Burdekin region (waters south of approximately Pelorus Island) and 24 to 170 km offshore in the Wet Tropics region (waters north of Pelorus Island) (Great Barrier Reef Marine Park Authority 2010)
Offshore Marine	Offshore is a reporting zone in the Townsville Dry Tropics Report Card that includes offshore waters
Open Coastal (OC)	Open Coastal Waterbodies extend from the coast, or if present, the seaward edge of an enclosed coastal waterbody. The seaward limit extends 12 km offshore in the Burdekin region (waters south of approximately Pelorus Island) and 6 km offshore in the Wet Tropics region (waters north of Pelorus Island) (Great Barrier Reef Marine Park Authority 2010).
Palustrine wetlands	Vegetated, non-riverine or non-channel systems that include billabongs, swamps, bogs, springs, soaks etc and have more than 30% emergent vegetation
Physical-chemical properties	(Phys-chem properties). Indicator category that includes dissolved oxygen and turbidity.
PN	Particulate Nitrogen
POTL	Port of Townsville Limited
PP	Particulate Phosphorus
QA/QC	Quality Assurance / Quality Control
QPSMP	Queensland Ports Seagrass Monitoring Program
RE	Regional Ecosystem
Reef 2050 Plan	The overarching framework of the Australian and Queensland governments for protecting and managing the reef until 2050
REMP	Receiving Environment Monitoring Program. A REMP provides a basis for evaluating whether the discharge limits or other conditions imposed upon an activity have been successful in maintaining or protecting receiving environment values over time.
Riparian extent	Vegetation with a 50m buffer from a waterway
RIMReP	Reef 2050 Integrated Monitoring and Reporting Program
Secchi	Secchi depth. A measure used to gauge the transparency (clarity) of water.
TBF	Tangaroa Blue Foundation

TCC	Townsville City Council
Translocated species	Species that are native to Australia but not native to the specific waterway
TP	Total Phosphorus
TSS	Total Suspended Solids
Turbidity	A measure of how cloudy/opaque water is, recorded in NTU
Waterway	A land-based body of water, e.g. a creek, river, or stream
WQO	Water Quality Objectives. Defined for specific regions, these values act as a management target. They do not necessarily reflect 'natural' condition but rather a state that is considered acceptable considering environmental, social, and economic factors.
WQGV	Water Quality Guideline Values. Defined for broad scale regions, these values act as an 'earliest baseline' and ideally reflect the natural state of the environment pre-European/pre-developed settlement (or pre-land clearing). They allow managers to assess how water quality has changed from 'natural' condition.

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1 Introduction

1.1 Overview

The Healthy Waters Partnership for the Dry Tropics (referred to as "the Partnership" or "HWP") was launched in January 2019, with a focus on producing an annual Report Card. The current Report Card is for the 2023–2024 year.

Where a seasonal monitoring program extends outside of the year period, such as inshore coral, data from the whole monitoring period are included. For monitoring programs that collect data less frequently than annually (for example, wetland and riparian extent) then the most recent data set is included. In June 2021, the Partnership also began releasing annual Stewardship Reports, highlighting the actions of partners to improve waterway health (Table 11).

Table 11. Timeline of key HWP publications.

Released:	**2025**	**2024**	**2023**	**2022**	**2021**	**2020**	**2019**
Reporting period:	**23-24**	**22-23**	**21–22**	**20–21**	**19–20**	**18–19**	**17–18**
Report Card	✓ (current)	✓	✓	✓	✓	✓	✓ (pilot)
Stewardship Report	✓ (current)	✓	✓	✓	✓		

The key deliverable for the Report Card is an assessment of the state of the waterway health. The Report Card focuses on three indices for waterway health: Water Quality, Habitat and Hydrology, and Fish. Indices are scored and graded for the freshwater, estuarine, inshore marine, and offshore marine environments within the Townsville Dry Tropics region. However, not all indices are scored and graded for each environment (for example, fish is only scored within the freshwater environment). To assess trends over time, summary results from previous reports are presented alongside this year's results.

1.2 Report Card Zones

The results presented in the 2023–2024 Report Card cover all areas of the Townsville Dry Tropics reporting region. On land, the Partnership region extends from the Crystal Creek catchment in the north, west to the Ross River (upper) catchment and to the Alligator Creek catchment in the south. In the marine environment the Partnership extends from the coastline to the outer edge of the Great Barrier Reef (GBR) Marine Park. The reporting region for the partnership incorporates all islands within this area, including Magnetic Island and the Palm Island group.

The Townsville Dry Tropics reporting region is divided into seven unique areas based on the environment type (freshwater, estuarine, inshore marine, and offshore marine) and riverine basin (Basin) (Black and Ross) or Bay (Zone) (Cleveland Bay and Halifax Bay) (Table 12, Figure 2). If required, Basins/Zones are divided into sub-basins/sub-zones based geographical definition and constructed boundaries (ports, weirs) provided by the Queensland water quality objectives (Department of Environment and Science 2018). The freshwater and estuarine zones for Magnetic Island and the Palm Island group are not currently included as there is no data available.

Table 12. The seven reporting areas in the Townsville Dry Tropics region.

Basin/Zone	Waterway
Ross Freshwater	Freshwater
Black Freshwater	Freshwater
Ross Estuarine	Estuarine
Black Estuarine	Estuarine
Cleveland Bay	Inshore Marine
Halifax Bay	Inshore Marine
Offshore Marine	Offshore Marine

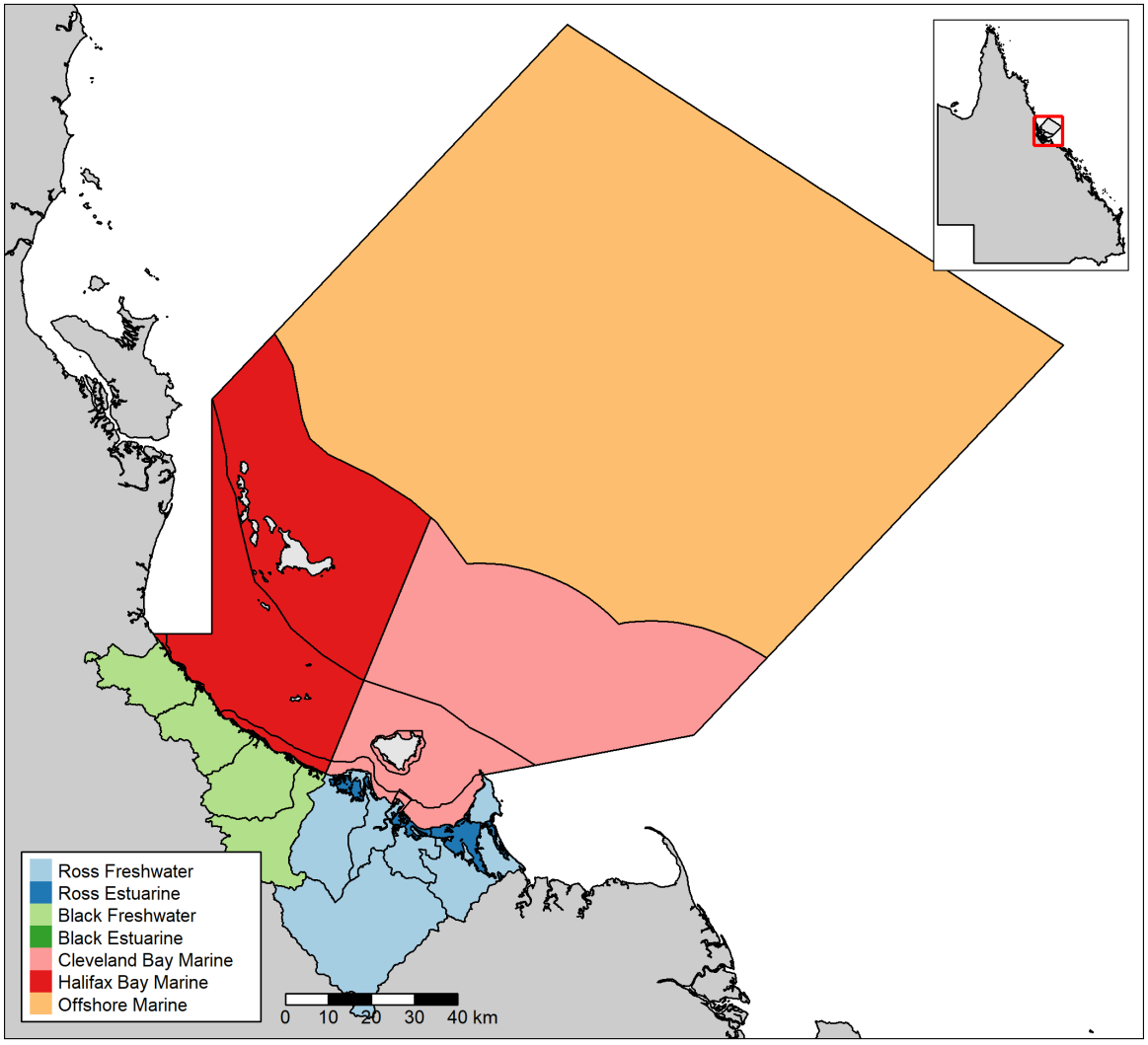

Figure 2. *Geographic boundary of the HWP reporting region, divided into seven areas based on the environment type (freshwater, estuarine, inshore marine, and offshore marine), and riverine basin (Basin) (Black and Ross) or Bay (Zone) (Cleveland Bay and Halifax Bay). Each area is further divided into additional areas depending on water type, water quality objectives, and water dynamics (e.g. flow).*

The topography of the Townsville Dry Tropics also plays a critical role in the division and understanding of the dynamics of the local environment. A digital elevation model (DEM) is

presented below that exemplifies the key mountain ranges and coastal planes that will be discussed throughout this technical report (Figure 3).

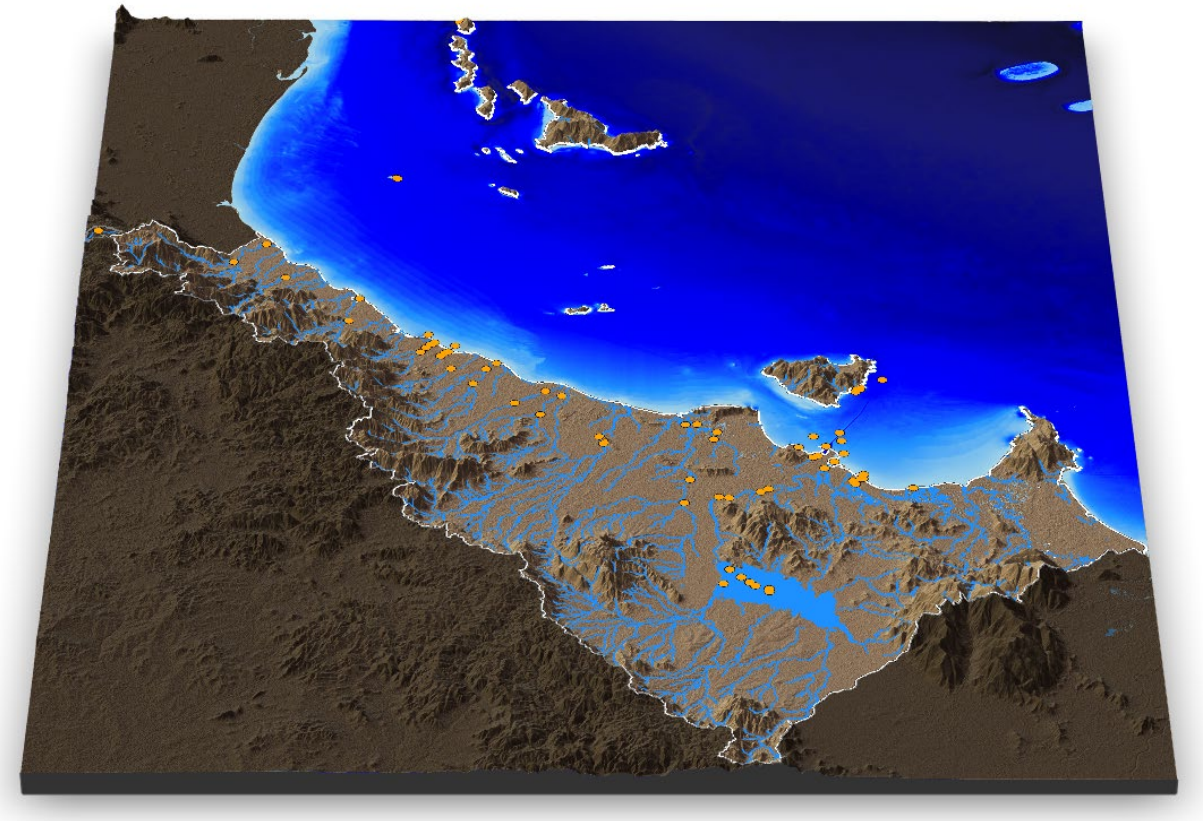

Figure 3. Digital Elevation Model (DEM) of the Townsville Dry Tropics region. Orange points symbolise water quality sampling locations. Note the high mountain ranges and low coastal planes.

1.3 Purpose of This Document

This report (hereby referred to as the Technical Report) provides insight into the results found in the 2023–2024 Report Card. Within are weighted and unweighted scores for indicators, indicator categories, and indices for all sites in the seven areas (Table 12). Key messages and confidence scores for each index are also provided. For further details on the design of the Report Card program, refer to the "Townsville Dry Tropics Program Design" and "Methods for Townsville Dry Tropics 2023–2024 Report Card (released in 2025)" (Healthy Waters Partnership for the Dry Tropics 2025).

1.4 Report Card History

A history of the Partnerships' Report Cards can be found in "Methods for Townsville Dry Tropics 2023–2024 Report Card (released in 2025)" (Healthy Waters Partnership for the Dry Tropics 2025).

2 Methods

Detailed methods can be found in "Methods for Townsville Dry Tropics 2023–2024 Report Card (released in 2025)". Key components to understand the Technical Report are presented below.

2.1 Terminology and Data Aggregation

Data is reported and aggregated at multiple levels: indicator, indicator category, and index. Results from indicators are aggregated into indicator categories, which are aggregated into indices. Results can only be aggregated if they meet the follow rules:

1. ≥50% of indicators are required to aggregate to an indicator category,
2. ≥60% of indicator categories are required to aggregate to an index.

There are three indices in the report card: Water Quality, Habitat and Hydrology, and Fish. Some indices are only measured in certain areas. A complete list can be found in Table 13.

Table 13. All indicators, indicator categories, and indices used in the 2023-2024 Technical Report and Report Card.

Environment	Index	Indicator Category	Indicator
Freshwater	Water Quality	Nutrients	Dissolved Inorganic Nitrogen
			Total Phosphorus
		Phys-Chem	Turbidity
			High/Low DO
	Habitat and Hydrology	Riparian vegetation	Change in riparian extent
		Wetlands	Change in wetland extent
		Artificial barriers	Fish barriers
			Impoundment length
	Fish	Proportion of Indigenous Species Expected	Indigenous Species
		Proportion of Non-Indigenous Species Expected	Translocated Species
			Alien Species
	Pesticides	Pesticides	Pesticides
Estuarine	Water Quality	Nutrients	Dissolved Inorganic Nitrogen
			Total Phosphorus
		Phys-Chem	Turbidity
			High/Low DO
	Habitat	Mangrove and Saltmarsh Extent	Change in mangrove and saltmarsh extent
		Riparian Vegetation	Change in riparian extent
Inshore	Water Quality	Nutrients	Total Phosphorus
			Nitrogen Oxides
			Total Nitrogen
			Filterable Reactive Nitrogen
			Particulate Nitrogen
			Particulate Phosphorus
		Phys-Chem	Total Suspended Solids

			Turbidity
			Secchi Depth
		Chlorophyll a	Chlorophyll a
	Habitat	Coral	Hard Coral Composition
			Coral Cover
			Change in coral cover
			Juvenile Density
			Macroalgae cover
		Seagrass	Biomass
			Meadow area
			Species composition
Offshore	Habitat	Coral	Change in coral cover
			Coral Cover
			Juvenile Density
All	Litter	Litter	Litter

2.2 Scoring

Data are graded using five ordinal values commonly used in Report Cards: “Very Good” (A) to “Very Poor” (E). Each indicator is scored on a scale appropriate for the variable being measured and thus some indicators have different scoring ranges. To ensure results for all indicators are comparable, all scores are converted (if required) into a standardised score between 0 and 100 (Table 14).

Table 14. Standardised scoring range and corresponding grades used in the Technical Report.

Scoring Range[3]	**Grade and Colour Code**
81 to 100	Very Good, (A), or Very Low Pressure
61 to <81	Good, (B), or Low Pressure
41 to <61	Moderate, (C), or Moderate Pressure
21 to <41	Poor, (D), or High Pressure
0 to <21	Very Poor, (E), or Very High Pressure

2.3 Presentation

The information in this technical report is summarised in an annual Report Card. The Report Card uses a stylized coaster to present the final grades for each index with their associated colours (Figure 4. B). This coaster is a slimmed down version of the aggregation used within the technical report (Figure 4. A). Coasters are created for each of the seven areas in the Townsville Dry Tropics region (Figure 2).

[3] Some indicators may have slightly different scoring ranges than demonstrated in this table.

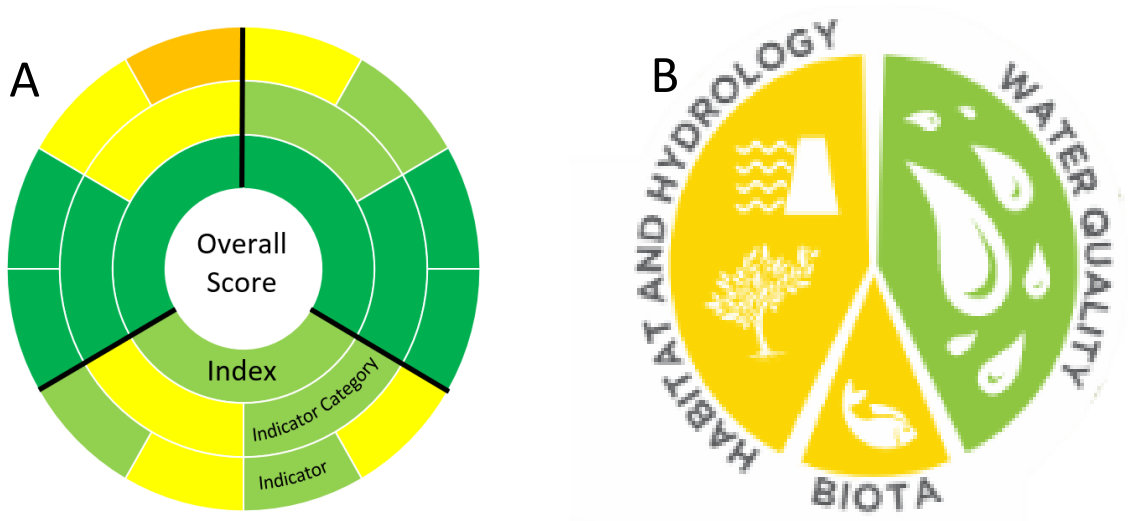

Figure 4. Coasters used within the Technical Report (A) and Report Card (B).

2.4 Confidence Measure

Results are given a qualitative confidence score based on the accuracy and appropriateness of the data used in the analysis. Scores are calculated using five criteria which are weighted to reflect their importance (Table 15). Final confidence scores range from 4.5 (very low) to 13.5 (very high).

Table 15. The criteria, score and weighting used to generate indices confidence scores.

Criteria	Score	Weighting
Maturity of Methodology	New = 1; Developed = 2; Established = 3	0.36
Validation	Limited = 1; Not comprehensive = 2; Comprehensive = 3	0.71
Representativeness	Low = 1; Moderate = 2; High = 3	2
Directness	Conceptual = 1; Indirect = 2; Direct = 3	0.71
Measured error	>25% = 1; 10% – 25% = 2; <10% = 3	0.71