# APPENDICES

## Appendix 1 Statutory requirements for the Outlook Report

### Extract from the *Great Barrier Reef Marine Park Act 1975*

**Great Barrier Reef Outlook Report**

(1) The Authority must prepare and give to the Minister a report in relation to the Great Barrier Reef Region every 5 years. The first report must be given to the Minister by 30 June 2009.

(2) The report must be prepared in accordance with the regulations (if any).

*Content of report*

(3) The report must contain the following matters:
- (a) an assessment of the current health of the ecosystem within the Great Barrier Reef Region and of the ecosystem outside that region to the extent it affects that region;
- (b) an assessment of the current biodiversity within that region;
- (c) an assessment of the commercial and non-commercial use of that region;
- (d) an assessment of the risks to the ecosystem within that region;
- (e) an assessment of the current resilience of the ecosystem within that region;
- (f) an assessment of the existing measures to protect and manage the ecosystem within that region;
- (g) an assessment of the factors influencing the current and projected future environmental, economic and social values of that region;
- (h) an assessment of the long-term outlook for the ecosystem within that region;
- (i) any other matter prescribed by the regulations for the purposes of this paragraph.

*Peer-review*

(4) The Minister must arrange for the content of the report to be peer-reviewed by at least 3 persons who, in the Minister's opinion, possess appropriate qualifications to undertake the peer-review. The peer-review must occur before the report is given to the Minister.

*Report to be tabled in Parliament*

(5) The Minister must cause a copy of each report to be tabled in each House of the Parliament within 15 sitting days of that House after the day on which the Minister receives the report.

### Extract from the *Great Barrier Reef Marine Park Regulations 2019*

**Part 18—Application, saving and transitional provisions**

**256 References to old regulations**

(1) In this Division, the old regulations are the *Great Barrier Reef Marine Park Regulations 1983*.

**266 Application of section 176**

(1) Section 176 applies to the Great Barrier Reef Outlook Report for 2024 and later such reports.

(2) Despite the repeal of regulation 116A of the old regulations, that regulation continues to apply, after the commencement of this instrument, in relation to the Great Barrier Reef Outlook Report for 2019.

# Extract from (repealed) *Great Barrier Reef Marine Park Regulations 1983*

**Part 4AB — Reporting requirements**

**116A Great Barrier Reef Outlook Report**

(1) For paragraph 54(3)(i) of the Act, an assessment of the heritage values of the Great Barrier Reef Region is prescribed as a matter that must be contained in the Great Barrier Reef Outlook Report.

(2) An *assessment of the heritage values*, of the Great Barrier Reef Region, includes the following:

(a) an assessment of the current heritage values of the region;
(b) an assessment of the risks to the heritage values of the region;
(c) an assessment of the current resilience of the heritage values of the region;
(d) an assessment of the existing measures to protect and manage the heritage values of the region;
(e) an assessment of the factors influencing the current and projected future heritage values of the region;
(f) an assessment of the long-term outlook for the heritage values of the region.

(3) In this regulation:
*heritage values*, of the Great Barrier Reef Region, include the following values for the region:

(a) the Commonwealth Heritage values;
(b) the heritage values;
(c) the indigenous heritage values;
(d) the National Heritage values;
(e) the world heritage values.

# Appendix 2 Key changes since the Outlook Report 2014

**Chapter 1 — About this report**

- New term added – Great Barrier Reef 'Catchment' is used throughout the report. The capitalisation distinguishes the term from river catchments.
- Section 266 of the *Great Barrier Reef Marine Park Regulations 2019* provides a transitional provision. Despite the repeal of regulation 116A of the *Great Barrier Reef Marine Park Regulations 1983*, that regulation continues to apply to the 2019 Outlook Report.
- Headers, including 'state and trend' have been amended to 'condition and trend' throughout the report for consistency.

**Chapter 2 — Biodiversity**

- *Open water* component has been renamed *Water column*, to clarify the habitat is the entire water body rather than a specifically offshore habitat. The scope of what is assessed remains consistent.
- *Macroalgae* and *Benthic microalgae* components have been combined and amended to *Benthic Algae* to enable consolidated discussion of all three types of benthic algae.

**Chapter 3 — Ecosystem health**

- *Sedimentation* component has been renamed adding 'exposure' to the title. The updated component name *Sediment exposure* reflects the process and emerging use of this term more widely.
- Term amended – *Terrestrial habitats that support the Great Barrier Reef*, the term *terrestrial habitats* has been replaced with *Coastal ecosystem* to be consistent with the Marine Park Authority's position statement released in 2018.
- Extent of woody vegetation clearing has been added to the assessment of 'Coastal ecosystems that support the Great Barrier Reef'.

**Chapter 4 — Heritage values**

- New terms defined – domains, components and attributes.
- Heritage assessment framework has been restructured.
- Historic heritage values – the assessment has been refined. Places on the Commonwealth Heritage List continue to be a standalone assessment. Also, the combined grades of the Commonwealth heritage lightstations are assessed with Other historic lightstations.
- Section on Benchmarking outstanding universal value has been deleted. This section was not a component that was assessed and graded. The Australian Government's State Party periodic report addresses this framework. Appendix 3 has been added.
- A broad assessment of the world heritage integrity test has been added in Appendix 4.

**Chapter 5 — Commercial and non–commercial use**

- *Shipping* has been moved from Section 5.5 to Section 5.8 for readability of common elements with ports in Section 5.7.

**Chapter 6 — Factors influencing the Region's values**

- Vulnerability of heritage values has been merged into a single section covering all four factors influencing the Region's values to enhance the readability of common elements.
- *Coastal development* component has been amended adding *'in the Catchment'* to the title. The original title implied the assessment was restricted to development on the coastline, whereas agricultural land uses (cropping and grazing) occur throughout the Catchment.

**Chapter 9 — Risks to the Region's values**

- New threats have been added to the risk assessment to identify key emerging threats and some specific threats to Indigenous heritage values.

**Appendices**

- The order of the appendices has been revised.
- Appendix 1 – updated regulatory provisions have been added.
- Appendix 3 – the content has been replaced with a table mapping Outlook Report components to the elements of the Reef's outstanding universal value.
- Appendix 4 – an assessment of the world heritage integrity test has been added.
- Appendix 6 – definitions of the new threats in the risk assessment have been added.

# Appendix 3 Complementary assessments — linking the Outlook Report to the Great Barrier Reef's outstanding universal value

The Outlook Report assesses around 87 components within a broad analysis of the Great Barrier Reef's natural, Indigenous and historic heritage value. This table maps these components against the Reef's outstanding universal value[28], and outlines where the assessment within the Outlook Report is broader than an assessment of outstanding universal value.

The *Statement of the Outstanding Universal Value of the Great Barrier Reef World Heritage Area*[28] is the official statement adopted by the World Heritage Committee outlining how the property meets the criteria for outstanding universal value (OUV). The following excerpts from the statement indicate the attributes considered to contribute to the property's outstanding universal value. The Great Barrier Reef Region Strategic Assessment[1446] Section 7.6.1, introduced an assessment of the Reef's outstanding universal value based on 38 attributes (in parentheses). The table below includes the current criteria (italic text in parentheses) as well as the original criteria (italic text in square brackets) applied at the time of inscription. Many Outlook Report components address several attributes and may be listed more than once in the left column.

| **Outlook Report 2019** Components | **World Heritage Area** Great Barrier Reef World Heritage Area |
|---|---|
| | **Statement of outstanding universal value: 38 attributes**<br>*(vii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance*<br>*[iii] unique, rare or superlative natural phenomena, formations or features or areas of exceptional natural beauty, such as superlative examples of the most important ecosystems to man* |
| 2.3.5 Coral reefs<br>2.4.4 Corals<br>2.4.7 Bony fishes<br>4.5.1 Social heritage values<br>4.5.2 Aesthetic heritage values<br>8.3.1 Coral reef case study | (1) Superlative natural **beauty** above and below the water<br>(2) Some of the most spectacular **scenery** on Earth<br>(3) One of a few living structures **visible** from space<br>(4) A complex string of reefal structures along Australia's north-east coast<br>(5) Unparalleled aerial panorama of **seascapes** comprising diverse shapes and sizes<br>(10) Beneath the ocean surface, there is an abundance and diversity of shapes, sizes and **colours** ... Spectacular coral assemblages of hard and soft corals<br>(11) Thousands of species of reef fish provide a myriad of **brilliant colours**, shapes and sizes<br>(12) The internationally renowned **Cod Hole** is one of many significant **tourist** attractions |
| 2.3.1 Islands<br>2.3.2 Beaches and coastlines<br>2.4.10 Marine turtles<br>2.4.12 Seabirds<br>4.2.2 Natural beauty and phenomena<br>8.3.5 Loggerhead turtles case study | (6) Whitsunday islands provide a magnificent vista of green vegetated **islands** and white sandy beaches spread over azure waters<br>(8) On many of the cays there are spectacular and globally important breeding colonies of **seabirds** and marine **turtles**<br>(9) Raine Island is the world's largest green **turtle** breeding area |
| 2.3.3 Mangrove forests<br>2.3.2 Beaches and coastlines<br>2.4.1 Mangroves<br>3.5.1 Saltmarshes<br>3.5.2 Freshwater wetlands<br>3.5.3 Forested floodplain<br>3.5.4 Heath and shrublands<br>3.5.5 Grass and sedgelands<br>3.5.6 Woodlands and forests<br>3.5.7 Rainforests | (7) Vast **mangrove** forests in Hinchinbrook Channel, or the rugged vegetated mountains and lush **rainforest** gullies |
| 2.3.5 Coral reefs<br>2.4.3 Corals<br>2.4.10 Marine turtles<br>2.4.14 Whales<br>8.3.1 Coral reef case study<br>8.3.5 Loggerhead turtles case study<br>8.3.7 Humpback whales case study | (13) Superlative natural phenomena include the annual **coral** spawning, migrating **whales**, nesting **turtles**, and significant **spawning aggregations** of many fish species |

| Outlook Report 2019<br>Components | World Heritage Area<br>Great Barrier Reef World Heritage Area |
|---|---|
| | **Major stages of the Earth's evolutionary history (viii)**<br>*(viii) be outstanding examples representing major stages of Earth's history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features*<br>*[i] outstanding examples representing the major stages of the Earth's evolutionary history* |
| 3.4.8 Reef building<br>4.2.3 Major stages of the Earth's evolutionary history | (14) Globally outstanding example of an ecosystem that has evolved over millennia<br>(15) Area has been exposed and flooded by at least four glacial and interglacial cycles, and over the past 18,000 years reefs have grown on the continental shelf<br>(16) Today, the Great Barrier Reef forms the world's largest coral reef ecosystem ... Including examples of all stages of reef development<br>(17) Processes of **geological** and **geomorphological evolution** are well represented, linking continental islands, coral cays and reefs |
| 3.2.1 Currents<br>3.2.2 Cyclones and wind<br>3.2.3 Freshwater inflow<br>3.2.4 Sediment exposure<br>3.2.5 Sea level<br>3.2.6 Sea temperature<br>3.2.7 Light<br>3.3.2 Ocean pH (acidity)<br>3.3.3 Salinity<br>3.4.8 Reef building | (18) The varied seascapes and landscapes that occur today have been moulded by **changing climates** and **sea levels**, and the erosive power of **wind** and **water**, over long time periods |
| 2.3.9 Continental slope<br>2.3.10 Water column | (19) One-third of the Great Barrier Reef lies beyond the seaward edge of the shallower reefs (and) comprises continental slope and deep oceanic waters and abyssal plains |
| | **Ecological and biological processes (ix)**<br>*(ix) be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals*<br>*[ii] outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment* |
| 2.3.1 Islands<br>2.3.5 Coral reefs<br>2.3.8 *Halimeda* banks<br>2.4.4 Corals<br>3.4.8 Reef building<br>3.3.2 Ocean pH (acidity)<br>8.3.1 Coral reef case study | (20) Significant diversity of reef and island **morphologies** reflects ongoing geomorphic, oceanographic and environmental processes<br>(25) Biologically the unique diversity of the Great Barrier Reef reflects the maturity of an ecosystem that has **evolved over** millennia; evidence exists for the evolution of hard corals and other fauna |
| 3.2.1 Currents<br>3.2.2 Cyclones and wind<br>3.4.10 Connectivity | (21) Complex cross-shelf, longshore and vertical connectivity is influenced by dynamic **oceanic currents** |
| 3.3.1 Nutrient cycling<br>3.4.1 Microbial processes<br>3.4.2 Particle feeding<br>3.4.3 Primary production<br>3.4.5 Predation<br>3.4.6 Symbiosis<br>3.4.7 Recruitment | (22) Ongoing ecological processes, such as **upwellings, larval dispersal and migration** |
| 3.2.2 Cyclones and wind<br>3.2.4 Sediment exposure<br>3.4.4 Herbivory<br>3.4.8 Reef building<br>3.4.9 Competition | (23) Ongoing **erosion and accretion** of coral reefs, sand banks and coral cays combine with similar processes along the coast and around continental islands |
| 2.3.8 *Halimeda* banks | (24) Extensive beds of ***Halimeda* algae** represent active calcification and accretion over thousands of years |
| 2.4.12 Seabirds<br>2.4.13 Shorebirds<br>2.3.1 Islands<br>3.4.7 Recruitment | (26) Vegetation on the cays and continental islands exemplifies the important role of **birds** ... in seed dispersal and plant colonisation |

| Outlook Report 2019<br>Components | World Heritage Area<br>Great Barrier Reef World Heritage Area |
|---|---|
| | **Habitats for conservation of biodiversity (x)**<br>*(x) contain the most important and significant natural habitats for in situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation*<br>*[iv] habitats where populations of rare or endangered species of plants and animals still survive* |
| **2 Biodiversity**<br>**3 Ecosystem Health**<br>2.4.3 Benthic algae (includes macroalgae and microalgae)<br>2.4.5 Other invertebrates<br>2.4.6 Plankton and microbes<br>2.4.7 Bony fish<br>2.4.8 Sharks and rays<br>2.4.9 Sea snakes<br>2.4.11 Estuarine crocodiles<br>2.4.12 Seabirds<br>2.4.13 Shorebirds<br>8.3.3 Black teatfish case study<br>8.3.4 Coral trout case study | (28) One of the richest and most complex natural ecosystems on Earth, and one of the most significant for **biodiversity** conservation<br>(29) Tens of thousands of **marine** and **terrestrial species**, many of which are of global conservation significance |
| 2.3.5 Coral reefs<br>2.4.3 Corals<br>8.3.1 Coral reef case study | (30) The world's most complex expanse of **coral reefs** ... Contain some 400 species of corals in 60 genera |
| 2.3.3 Mangrove forests<br>2.4.1 Mangroves | (31) Large ecologically important inter-reefal areas. The shallower marine areas support half the world's diversity of **mangroves** |
| 2.3.4 Seagrass meadows<br>2.4.2 Seagrasses | (32) Large ecologically important inter-reefal areas. The shallower marine areas support … many **seagrass** species |
| 2.4.16 Dugongs<br>8.3.6 Urban coast dugongs case study | (33) Waters also provide major feeding grounds for one of the world's largest populations of the threatened **dugong** |
| 2.4.14 Whales<br>2.4.15 Dolphins<br>8.3.7 Humpback whales case study | (34) At least 30 species of **whales** and **dolphins** occur here<br>(35) A significant area for humpback **whale** calving |
| 2.3.1 Islands<br>2.4.10 Marine turtles<br>2.4.12 Seabirds<br>2.4.13 Shorebirds<br>8.3.5 Loggerhead turtles case study | (36) Six of the world's seven species of marine turtle occur in the Great Barrier Reef. As well as the world's largest green **turtle** breeding site at Raine Island, the Great Barrier Reef also includes many regionally important marine turtle rookeries<br>(37) Some 242 species of **birds** have been recorded in the Great Barrier Reef. Twenty-two seabird species breed on cays and some continental islands, and some of these breeding sites are globally significant<br>(38) The continental **islands** support thousands of plant species, while the coral cays also have their own distinct flora and fauna |
| 4.3.6 Integrity<br>**7 Existing protection and management** | Related to assessment of integrity of the property's outstanding universal value |
| **Broader than outstanding universal value** | |
| 4.3 Indigenous heritage values<br>5.9 Traditional use of marine resources | (27) Human interaction with the natural environment is illustrated by strong ongoing links between Indigenous people and their sea country, and includes numerous shell deposits (middens) and fish traps, plus the application of story places and marine totems |
| 2.2 Legacies and shifted baselines<br>3.6 Outbreaks of disease, introduced species and pest species<br>4.4 Historic heritage values<br>**5 Commercial and non-commercial use**<br>**6 Factors influencing the Region's values**<br>**7 Existing protection and management**<br>8.5 Heritage resilience (Indigenous and historic heritage value)<br>**9 Risks to the Region's values**<br>**10 Long-term outlook** | |

# Appendix 4 Integrity test — Great Barrier Reef World Heritage Area

Integrity of the Great Barrier Reef is a measure of the wholeness and intactness of the property's natural heritage value.[781] The integrity test involves the interaction with people, therefore, management and domestic policies are an element of the integrity test (unlike the assessment undertaken for the four world heritage criteria, which is about condition and trend of elements or components that make up a criterion). The test is broad and cuts across all the world heritage criteria and natural heritage attributes of the Reef. The test can also prioritise and consider the key aspects of a functioning system to gauge the integrity of the property. An overall integrity grade is included in Section 4.6.1.

**Integrity score**

Very good | Good | Poor | Very poor | Borderline

| World heritage criteria and integrity test criteria | Assessment | Integrity score |
|---|---|---|
| **(vii) Natural beauty and natural phenomena** | | |
| The Great Barrier Reef depends on scenic beauty as a value and areas that are integrally linked to the maintenance of the aesthetic qualities of the property | The aesthetic value and naturalness of the world heritage property are heavily reliant on the condition of the Region's biodiversity (Chapter 2) and ecosystem health (Chapter 3). The wholeness and intactness of the Reef's aesthetic attributes, above and below the water, are in good condition overall. But many elements which contribute to this criterion (such as clear water and bright colourful reef fish) are deteriorating. Some critical elements of natural phenomena, such as coral spawning, have deteriorated on a broad scale due to significant loss of coral broodstock following back-to-back bleaching events in 2016 and 2017. The criterion overall is considered good borderline poor. Quantifying the condition of this attribute on a Region-wide scale is difficult as it relies upon the state of the system, its appearance and perceptions of beauty. | |
| **(viii) Major stages of the Earth's evolutionary history** | | |
| The Great Barrier Reef contains all or most of the key interrelated and interdependent elements in their natural relationships | At a Region-wide scale the Reef continues to provide outstanding examples of the Earth's evolutionary history and geomorphological diversity. However, unprecedented recent disturbances will have long-lasting effects. Processes that influence reef formation and maintain sediment accumulation on reef islands (for example, ocean acidification, sea temperature and sea-level rise) have deteriorated since 2014. The processes are intensifying in a negative way due to climate change, and pose the greatest threat to the Reef's contemporary geomorphology. Further deterioration of this element may occur if supporting physical and chemical processes continue to alter the geomorphology of the Region. | |
| **(ix) Ecological and biological processes** | | |
| The Great Barrier Reef is a sufficient size and contains the necessary elements to demonstrate the key aspects of processes that are essential for the long-term conservation of the ecosystems and the biological diversity they contain | The condition of key processes that interlink and operate to keep the ecosystem functioning are assessed in Chapter 3. Ecological processes have not ceased to operate, although processes that are fundamental to a functioning ecosystem (such as symbiosis, recruitment and reef building) are considered to be in poor condition and are causing the good grade to be borderline with poor. Multiple disturbances have transformed the ecosystem on a broad scale and cumulatively hindered recovery. Historically, the Region's size has provided a buffer to periodic and dispersed damage due to its broad latitudinal extent. However, given the global scale of human-induced climate change, the size of the Region is becoming a less effective buffer to some broadscale impacts. Deterioration has been more rapid and widespread than was evident in the period 2009 to 2014. | |
| **(x) Habitats for conservation of biodiversity** | | |
| The Great Barrier Reef is one of the most important properties for the conservation of biological diversity and those that contain habitats for maintaining the most diverse fauna and flora characteristic of the bio-geographic province and ecosystems under consideration | As a value distributed throughout the whole of the property, habitats to support species continue to deteriorate and are assessed as poor overall. Habitats for conservation of biodiversity face growing direct threats and external pressures. Safeguard measures to mitigate climate change are essential for the long-term conservation of the ecosystem. Declines in key habitats have been more rapid and widespread than was evident in the period 2009 to 2014. An emerging field of science around intervention and restoration measures has established since 2014, but many measures are yet to be fully tested or implemented. | |

| World heritage criteria and integrity test criteria | Assessment | Integrity score |
|---|---|---|
| **Safeguarding (protection and management)** | | |
| The Great Barrier Reef World Heritage Area has adequately delineated boundaries | The size of the world heritage property has remained consistent since inscription, at about 348,000 square kilometres. The Region's size is becoming a less effective buffer to some broadscale impacts. A buffer zone to the boundary of the World Heritage Area has never been a feature of the property. However, the Wet Tropics World Heritage Area provides an upstream buffer to a small part of the property. The health of the adjacent coastal ecosystems which link to the property, influences the Reef's outstanding universal value. |  |
| The Great Barrier Reef is adequately protected at the national, regional, municipal, and/or traditional level by legislative, regulatory and contractual measures. Appropriate management plans are in place, specifying how the outstanding universal value of the property will be preserved | Adequate regulatory controls continue to be in place to protect and manage direct use of the property (Chapter 7). Aspects of management effectiveness for some management topics have improved since 2014 (ports, defence, shipping and research). However, management effectiveness has declined in some areas, particularly for complex and spatially broad topics (climate change and biodiversity). Complementary management arrangements between the Australian and Queensland governments strengthen the regulatory protection of outstanding universal value. The zoning regime of the Reef encompasses about 33 per cent of the World Heritage Area in 'no-take' or 'no-entry' zones. The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) also provides protection and management of potential impacts from proposed actions outside the World Heritage Area that may significantly impact on its values. External pressures from global drivers, such as climate change, remain the greatest threat to the World Heritage Area and other properties globally. |  |

# Appendix 5 Indicators used to assess management effectiveness

To determine the effectiveness of management for each management topic, 49 indicators were considered across the six management elements.

**Understanding of context**

- The values of the Reef relevant to managing the topic are understood by managers.
- The current condition and trend of values relevant to managing the topic are known by managers.
- Impacts (direct, indirect and cumulative) associated with the managing the topic are understood by managers.
- The broader (national and international) level influences relevant to managing the topic are understood by managers.
- The stakeholders relevant to managing the topic are well known by managers.

**Planning**

- There is a planning system in place that effectively addresses the topic.
- The planning system for the topic addresses the major factors influencing the Region's values.
- Actions for implementation regarding management of the topic are clearly identified within the plan.
- Clear, measurable and appropriate objectives for management of the topic have been documented.
- There are plans and systems in place to ensure appropriate and adequate monitoring information is gathered in relation to the topic.
- The main stakeholders and/or the local community are effectively engaged in planning to address the topic.
- Sufficient policy currently exists to effectively address the topic.
- There is consistency across jurisdictions when planning for the topic.
- Plans relevant to the topic provide certainty regarding where uses may occur, the type of activities allowed or specifically disallowed, conditions under which activities may proceed and circumstances where impacts are likely to be acceptable.

**Financial, staffing and information inputs**

- Financial resources are adequate and prioritised to meet management objectives to address the topic.
- Human resources within the managing organisations are adequate to meet specific management objectives to address the topic.
- The right skill sets and expertise are currently available to the managing organisations to address the topic.
- The necessary biophysical information is currently available to address the topic.
- The necessary socioeconomic information is currently available to address the topic.
- The necessary Indigenous heritage information is currently available to address the topic.
- The necessary historic heritage information is currently available to address the topic.
- There are additional sources of non-government input (for example, volunteers) contributing to address the topic.

**Management systems and processes**

- The main stakeholders and industries are effectively engaged in the ongoing management of the topic.
- The local community is effectively engaged in the ongoing management of the topic.
- There is a sound governance system in place to address management of the topic.
- There is effective performance monitoring, including regular assessment of appropriateness and effectiveness of tools, to gauge progress towards the objectives for management of the topic.
- Appropriate training is available to the managing agencies to address management of the topic.
- Management of the topic is consistently implemented across the relevant jurisdictions.
- There are effective processes applied to resolve differing views/conflicts regarding management of the topic.
- Impacts (direct, indirect and cumulative) of activities associated with the topic are appropriately considered.
- The best available biophysical research and monitoring information is applied appropriately to make relevant management decisions regarding the topic.
- The best available socioeconomic research and monitoring information is applied appropriately to make relevant management decisions regarding the topic.
- The best available Indigenous heritage information is applied appropriately to make relevant management decisions regarding the topic.
- The best available historic heritage information is applied appropriately to make relevant management decisions regarding the topic.
- Relevant standards are identified and being met regarding management of the topic.
- Targets have been established to benchmark management performance for the topic.

**Delivery of outputs**

- To date, the actual management program (or activities) have progressed in accordance with the planned work program for the topic.
- Implementation of management documents and programs relevant to the topic have progressed in accordance with timeframes specified in those documents.
- The results have achieved their stated management objectives for the topic.
- To date, products or services have been produced in accordance with the stated management objectives for the topic.
- Effective knowledge management systems regarding the topic are in place within agencies.
- Effective systems are in place to share knowledge on the topic with the community.

**Achievement of outcomes**

- The relevant managing agencies are to date effectively addressing the topic and moving towards the attainment of the desired outcomes.
- The outputs relating to management of the topic are on track to ensure the values of the Reef are protected.
- The outputs for management of the topic are reducing the major risks and the threats to the Reef.
- Use of the Reef relating to the topic is demonstrably environmentally sustainable.
- Use of the Reef relating to the topic is demonstrably economically sustainable.
- Use of the Reef relating to the topic is demonstrably socially sustainable, in terms of understanding and enjoyment.
- The relevant managing agencies have developed effective partnerships with local communities and stakeholders to address the topic.

# Appendix 6 Threats to the Region's values

The set of current and likely threats to the Region's ecosystem and heritage values (its natural, Indigenous, historic and other heritage values) considered in the risk assessment (Chapter 9) was developed from the evidence presented in the preceding chapters of this report (particularly 5 and 6), taking into account input from Reef scientists and managers and the outcomes of various community surveys. The 45 threats considered are listed in the table below. The table also provides a comparison with those assessed in the 2014 Outlook Report. As far as possible, the threats and their descriptions are consistent with those used in 2014; differences are shown in **bold** in the 2019 column.

| Outlook Report 2019 (45 threats) | Outlook Report 2014 (41 threats) |
|---|---|
| *Acid sulfate soils:* Exposure of acid sulfate soils | *Acid sulphate soils:* Exposure of acid sulphate soils |
| *Altered ocean currents:* Climate change induced altered ocean currents | *Altered ocean currents:* Climate change induced altered ocean currents |
| *Altered weather patterns:* Climate change effects on weather patterns (e.g. cyclones, wind, rainfall, air temperature), **includes both chronic and acute aspects** | *Altered weather patterns:* Climate change effects on weather patterns (e.g. cyclones, wind, rainfall, air temperature) |
| *Artificial light:* Artificial lighting, including from resorts, industrial infrastructure, mainland beaches and coastlines, vessels and ships | *Artificial light:* Artificial lighting, including from resorts, industrial infrastructure, mainland beaches and coastlines, vessels and ships |
| *Atmospheric pollution:* Pollution of the atmosphere related to domestic, industrial and business activities in both the Region and adjacent areas. The contribution of gases, such as carbon dioxide to climate change is not included as this is encompassed under threats, such as sea-temperature increase and ocean acidification | *Atmospheric pollution:* Pollution of the atmosphere related to domestic, industrial and business activities in both the Region and adjacent areas. The contribution of gases, such as carbon dioxide to climate change is not included as this is encompassed under threats, such as sea temperature increase and ocean acidification |
| *Barriers to flow:* Artificial barriers to riverine and estuarine flow (e.g. dams, weirs, breakwalls, gates, **roads and linear infrastructure**) | *Barriers to flow:* Artificial barriers to riverine and estuarine flow (e.g. dams, weirs, breakwalls and gates) |
| ***Behaviour impacting heritage values:* Disturbance of, or damage to, the values of intangible Indigenous and historic heritage site through inappropriate presence of people. Examples include: visitation to locations considered dangerous or sensitive in Indigenous culture; access by people of culturally inappropriate gender or seniority; overly high visitor traffic levels at Indigenous sites open to visitation (e.g. creating too much noise); and disrespectful behaviour or activities at Indigenous and historic heritage sites (e.g. burial areas)** | |
| *Damage to reef structure:* Physical damage to reef benthos (reef structure) through actions, such as snorkelling, diving, anchoring and fishing, but not vessel grounding (assessed separately) | *Damage to reef structure:* Physical damage to reef benthos (reef structure) through actions, such as snorkelling, diving, anchoring and fishing, but not vessel grounding |
| *Damage to seafloor:* Physical damage to non-reef benthos (seafloor) through actions, such as trawling and anchoring | *Damage to seafloor:* Physical damage to non-reef benthos (seafloor) through actions, such as trawling and anchoring |
| *Discarded catch:* Immediate or post-release effects (such as death, injury, reduced reproductive success) on discarded species (**non-retained catch**) as a result of interactions with fishing gear. Does not include species of conservation concern (assessed separately) | *Discarded catch:* Immediate or post-release effects (such as death, injury, reduced reproductive success) on discarded species as a result of interactions with fishing gear. Does not include species of conservation concern |
| *Disposal of dredge material:* Disposal and resuspension of dredge material | *Disposal of dredge material:* Disposal and resuspension of dredge material |
| *Dredging:* Dredging of the seafloor | *Dredging:* Dredging of the seafloor |
| *Exotic species:* Introduced exotic species from aquaculture operations, hull fouling, ballast release, **biocontrol, translocation of other marine species**, and release of aquarium specimens to the Region, plus the introduction of weeds, pests and feral animals to islands. **Includes both new introductions and outbreaks of previously introduced exotic species. Does not include considerations covered under the 'genetic modification' threat** | *Exotic species:* Introduced exotic species from aquaculture operations, hull fouling, ballast release, and release of aquarium specimens to the Region, plus the introduction of weeds, pests and feral animals to islands |
| *Extraction from spawning aggregations:* Retained take (extraction) of fish from unidentified or unprotected spawning aggregations | *Extraction from spawning aggregations:* Retained take (extraction) of fish from unidentified or unprotected spawning aggregations |
| *Extraction of herbivores:* Retained take (extraction) of herbivores (e.g. some fishes, molluscs, dugongs, green turtles) through commercial and non-commercial uses | *Extraction of herbivores:* Retained take (extraction) of herbivores (e.g. some fishes, molluscs, dugongs, green turtles) through commercial and non-commercial uses |
| *Extraction of particle feeders:* Retained take (extraction) of particle feeders (filter feeders, detritivores) through commercial and non-commercial uses | *Extraction of particle feeders:* Retained take (extraction) of particle feeders (filter feeders, detritivores) through commercial and non-commercial uses |
| *Extraction of predators:* Retained take (extraction) of predators (e.g. sharks, fish) through commercial and non-commercial uses | *Extraction of predators:* Retained take (extraction) of predators (e.g. sharks, fish) through commercial and non-commercial uses |

| Outlook Report 2019 (45 threats) | Outlook Report 2014 (41 threats) |
|---|---|
| ***Foundational capacity gaps:*** **Lack of capacity of Traditional Owners to exercise their Indigenous heritage (cultural) rights by accessing and managing their land and sea country. Relates to capacity of Traditional Owners and their groups, and is not about loss of knowledge or about access restrictions or conflicting use. Potential impacts include those on the enduring connection Traditional Owners have with their land and sea country and on the maintenance of culture and the transfer of knowledge to younger generations (e.g. reduced opportunities to conduct knowledge transfer)** | |
| ***Fragmentation of cultural knowledge:*** **Loss and fragmentation of knowledge of tangible and intangible heritage values (e.g. as Indigenous Elders age and young people leave their traditional land and sea country, or availability of specialist skills in historic heritage preservation declines)** | |
| ***Genetic modification:*** **Genetic modification of native species, manipulation of natural genotype frequencies (e.g. through translocations or intentional/unintentional releases of specimens), and products of synthetic biology** | |
| *Grounding — large vessel:* Grounding of large vessels (>50m), including physical damage and the dislodging of antifoulants | *Grounding large vessel:* Grounding of large vessels (>50m), including physical damage and the dislodging of antifoulants |
| *Grounding — small vessel:* Grounding of small vessels (<50m), including physical damage and the dislodging of antifoulants | *Grounding small vessel:* Grounding of small vessels (<50m), including physical damage and the dislodging of antifoulants |
| *Illegal activities — other:* Illegal activities, such as entering a protected or restricted area, illegal release of industrial discharge, shipping outside of designated shipping areas, **and removal or damage of artefacts (e.g. ship anchors, stone implements), scar trees, middens, fish traps, burial grounds, stone arrangements, art work** | *Illegal activities — other:* Illegal activities, such as entering a protected or restricted area, illegal release of industrial discharge, shipping outside of designated shipping areas |
| *Illegal fishing and poaching:* Illegal fishing, collecting and poaching | *Illegal fishing and poaching:* Illegal fishing, collecting and poaching |
| *Incidental catch of species of conservation concern:* Immediate or post-release effects (such as death, injury, reduced reproductive success) of interactions of species of conservation concern with fishing gear | *Incidental catch of species of conservation concern:* Immediate or post-release effects (such as death, injury, reduced reproductive success) of interactions of species of conservation concern with fishing gear |
| *Incompatible uses:* Activities undertaken within the Region that disturb or exclude other users, such as recreational use in areas important for cultural activities | *Incompatible uses:* Activities undertaken within the Region that disturb or exclude other users, such as recreational use in areas important for cultural activities |
| *Marine debris:* Manufactured material discarded, disposed of or abandoned in the marine and coastal environment (including discarded fishing gear, plastics, **and abandoned or damaged equipment and infrastructure**) | *Marine debris:* Manufactured material discarded, disposed of or abandoned in the marine and coastal environment (including discarded fishing gear and plastics) |
| *Modifying coastal habitats:* Clearing or modifying wetlands, mangroves and other coastal **ecosystems in the Catchment or inshore areas or on islands** | *Modifying coastal habitats:* Clearing or modifying wetlands, mangroves and other coastal habitats |
| *Noise pollution:* Noise from human activities, both below and above water | *Noise pollution:* Noise from human activities, both below and above water |
| *Nutrient run-off:* Nutrients from diffuse land-based run-off | *Nutrient run-off:* Nutrients from diffuse land-based run-off |
| *Ocean acidification:* Decreasing pH of the Region's waters | *Ocean acidification:* Decreasing pH of the Region's waters |
| *Outbreak of crown-of-thorns starfish:* Outbreak of crown-of-thorns starfish | *Outbreak of crown-of-thorns starfish:* Outbreak of crown-of-thorns starfish |
| *Outbreak of disease:* Outbreak of disease, both naturally occurring and introduced | *Outbreak of disease:* Outbreak of disease, both naturally occurring and introduced |
| *Outbreak of other species:* Outbreak or bloom of naturally occurring species other than crown-of-thorns starfish | *Outbreak of other species:* Outbreak or bloom of naturally occurring species other than crown-of-thorns starfish |
| *Pesticide run-off:* Pesticides (including herbicides, insecticides, fungicides) from diffuse land-based run-off | *Pesticide run-off:* Pesticides (including herbicides, insecticides, fungicides) from diffuse land-based run-off |
| *Sea-level rise:* Rising sea level | *Sea level rise:* Rising sea level |
| *Sea-temperature increase:* Increasing **extreme and average** sea temperatures | *Sea temperature increase:* Increasing sea temperature |
| *Sediment run-off:* Sediments from diffuse land-based run-off | *Sediment run-off:* Sediments from diffuse land-based run-off |
| *Spill — large chemical:* Chemical spill that triggers a national or regional response or is more than 10 tonnes **(includes substances, such as sugar)** | *Spill — large chemical:* Chemical spill that triggers a national or regional response or is more than 10 tonnes |

| Outlook Report 2019 (45 threats) | Outlook Report 2014 (41 threats) |
|---|---|
| *Spill — large oil:* Oil spill that triggers a national or regional response or is more than 10 tonnes **(includes all petroleum products)** | *Spill — large oil:* Oil spill that triggers a national or regional response or is more than 10 tonnes |
| *Spill — small:* Chemical or oil spill that does not trigger a national or regional response and is less than 10 tonnes. **Includes materials (liquids and solids) used in attempts to restore or protect marine habitats but not materials considered under 'Marine debris'** | *Spill — small:* Chemical or oil spill that does not trigger a national or regional response and is less than 10 tonnes |
| *Terrestrial discharge:* Terrestrial point-source discharge **(including within ports), such as** polluted water, sewage, wastewater and stormwater | *Terrestrial discharge:* Terrestrial point-source discharge, including polluted water, sewage, wastewater and stormwater |
| *Vessel strike:* Death or injury to wildlife as a result of being struck by a vessel of any type or size | *Vessel strike:* Death or injury to wildlife as a result of being struck by a vessel of any type or size |
| *Vessel waste discharge:* Waste discharge from a vessel (including sewage) | *Vessel waste discharge:* Waste discharge from a vessel (including sewage) |
| *Wildlife disturbance:* Disturbance to wildlife (including from snorkelling, diving, fish feeding, walking on islands and beaches, and the presence of boats **and drones**); not including noise pollution | *Wildlife disturbance:* Disturbance to wildlife, including from snorkelling, diving, fish feeding, walking on islands and beaches, and the presence of boats; not including noise pollution |

# Appendix 7 Criteria for ranking likelihood and consequence of threats to the Region's values

A standard set of criteria allows comparison of different types of threats within a single risk assessment, based on the likelihood and consequence of each threat. The likelihood and consequence of each predicted threat is ranked on the five-point scale described below.

| Likelihood | Expected frequency of a given threat |
|---|---|
| **Almost certain** | Expected to occur more or less continuously throughout a year |
| **Likely** | Not expected to be continuous but expected to occur one or more times in a year |
| **Possible** | Not expected to occur annually but expected to occur within a 10-year period |
| **Unlikely** | Not expected to occur in a 10-year period but expected to occur in a 100-year period |
| **Rare** | Not expected to occur within the next 100 years |

## Consequence scale

Based on current management

| Consequence | **Ecosystem** (natural heritage) | | **Heritage** (Indigenous, historic and other) |
|---|---|---|---|
| | **Broad scale** | **Local scale** | |
| Catastrophic | Impact is clearly affecting, or would clearly affect, the nature of the ecosystem over a wide area. Recovery periods greater than 20 years likely. | — | Impact is destroying or has the potential to destroy, a class or collection of heritage places on a large scale; or is clearly affecting, or would clearly affect, a range of heritage values over a wide area. |
| Major | Impact is, or would be, significant at a wider scale. Recovery periods of 10 to 20 years likely. | Impact is, or would be, extremely serious and possibly irreversible to a sensitive population or community. Condition of an affected part of the ecosystem possibly irretrievably compromised. | Impact is adversely affecting, or would adversely affect, the heritage values of a number of places; destroy individual heritage places of great significance; or significantly affect the heritage values over a wide area. |
| Moderate | Impact is, or would be, present at a wider scale, affecting some components of the ecosystem. Recovery periods of five to 10 years likely. | Impact is, or would be, serious and possibly irreversible over a small area. Recovery periods of 10 to 20 years likely. | Impact is affecting, or would affect, individual heritage places or values of significance; or affect to some extent the heritage values at a wider scale. |
| Minor | Impact is, or would be, not discernible at a wider scale. Impact would not impair the overall condition of the ecosystem, or a sensitive population or community, over a wider level. | Impact is, or would be, significant to a sensitive population or community at a local level. Recovery periods of five to 10 years likely. | Impact is affecting, or would affect, heritage places or values of local significance, but not at a wider scale. Impact would not impair the overall condition of the heritage values. |
| Insignificant | No impact; or if impact is, or would be, present then only to the extent that it has no discernible effect on the overall condition of the ecosystem. | No impact; or if impact is, or would be, present then only to the extent that it has no discernible effect on the overall condition of the ecosystem. | No impact; or if impact is, or would be, present then only to the extent that it has no discernible effect on the heritage values; or positive impact. |

## Risk matrix legend

Likelihood and consequence is combined to determine risk level, consistent with the principles and guidelines of the Australian Standard for risk management (AS/NZS ISO 31000:2018). Risk is considered to be residual — the risk that remains once existing management measures have been taken into consideration.

| | **Consequence** | | | | |
|---|---|---|---|---|---|
| **Likelihood** | Insignificant | Minor | Moderate | Major | Catastrophic |
| Almost certain | *Low* | *Medium* | *High* | *Very high* | *Very high* |
| Likely | *Low* | *Medium* | *High* | *High* | *Very high* |
| Possible | *Low* | *Low* | *Medium* | *High* | *Very high* |
| Unlikely | *Low* | *Low* | *Low* | *Medium* | *High* |
| Rare | *Low* | *Low* | *Low* | *Medium* | *High* |

# Appendix 8 Assessment of risks to the Region's values

The assessment of the 45 threats is provided first for the Region's ecosystem (natural heritage values) and then for its heritage values (Indigenous, historic and other heritage). The description of each threat is included in Appendix 6.

## Risks to the ecosystem

| Potential threats — ecosystem | Likelihood | Consequence | Risk |
|---|---|---|---|
| **Acid sulfate soils:** Future coastal development in the Catchment in certain locations and intertidal areas creates possible risk of exposure to acid sulfate soils. Post-storm removal of vessels marooned in coastal mangroves and dredging can also expose these soils. Once disturbed, if not treated, acidic water and heavy metals would continue to be released during rain events over decades, if not longer, causing effects that may be irreversible in a small area. | Possible | Moderate | |
| **Altered ocean currents:** A major change in oceanic currents of the Reef over the next few decades is unlikely. However, an increase in the speed and southern extent of the East Australian Current has already been observed. Major changes to ocean currents would have widespread and potentially irreversible implications for biodiversity, including through implications for connectivity and recruitment. | Almost certain | Moderate | |
| **Altered weather patterns:** A number of weather aspects are predicted to change as a result of climate change, including the frequency and intensity of cyclones, floods and heatwaves (acute events) and changes in wind patterns and average rainfall and temperatures (chronic effects). For example, cyclones, a natural process in tropical regions, are predicted to become more severe, but less frequent, under current climate change scenarios. Severe cyclones have significant broadscale effects, with recovery times of at least 10 to 20 years. | Almost certain | Major | |
| **Artificial light:** Growth in shipping and urban and industrial development is likely to continue to increase the amount of artificial light. The main known issue is the effect on turtle hatchlings' orientation, including where artificial light leads to misdirection, aggregation and increased predation. Current hotspots for elevated light near turtle nesting beaches include the Woongarra coast, Gladstone and Mackay. Other impacts include effects on fish behaviour, including on juvenile fish and the orientation of pelagic species around vessel lights, and potential effects on seabird behaviour. | Almost certain | Moderate | |
| **Atmospheric pollution:** Projected increases in urban and industrial development are likely to increase the local contribution of atmospheric pollution, including the potential for more frequent impacts from coal dust at loading ports. Atmospheric pollution may start to affect some values into the future, however, effects are expected to be minor. The contribution of gases, such as carbon dioxide, to climate change is excluded here as this is encompassed under climate change related threats. | Possible | Minor | |
| **Barriers to flow:** Artificial barriers in the Catchment will continue to affect estuarine systems and connectivity. There are concerns that fisheries productivity is reduced by reduced connectivity and freshwater flow. | Almost certain | Moderate | |
| **Behaviour impacting heritage values:** Only assessed for heritage values. | | | |
| **Damage to reef structure:** There is likely to be damage from anchors, diving and snorkelling throughout the year. Marine debris, including from poorly secured equipment, may also cause damage. Damage from these sources is now occurring within a context of declined coral reef condition in many areas. If recreational vessel ownership and ease of access to the Region increase without a continued corresponding increase in education and supporting infrastructure (including reef protection markers and public moorings) it is likely damage will increase. | Almost certain | Moderate | |
| **Damage to seafloor:** Current levels of trawling activity pose low risk to shallow (<90m) habitats at a Reef-wide scale, given existing protection through zoning, but local effects may be higher in intensely trawled areas. Consequences could increase if trawl fishing effort increases under more favourable economic conditions. Some areas are affected by ship anchoring. | Almost certain | Minor | |
| **Discarded catch:** The discard of non-retained catch from fishing activities is predicted to occur continuously, with combined broadscale consequences for populations of species commonly caught. Although equipment, such as bycatch reduction devices, assists animals to escape from fishing gear, these and other interactions have associated risk of stress and injury (immediate and post-release effects). | Almost certain | Moderate | |

| Risk score | | | |
|---|---|---|---|
| **Low** | **Medium** | **High** | **Very high** |

| Potential threats — ecosystem | Likelihood | Consequence | Risk |
|---|---|---|---|
| **Disposal of dredge material:** Disposal of major amounts of dredge material from capital works is no longer allowed in the Marine Park. The frequency and volume of disposal of maintenance dredge material in the Region is likely to increase as already approved expansions and development continue to occur at priority ports. The disposal and resuspension of sediment affects the condition of values at a local-scale, adding further pressure to already declining inshore ecosystems. Uncertainty around the broader effects on the Region's values remains. | Likely | Minor | |
| **Dredging:** While maintenance dredging is expected to occur at least one or more times per year in the Region, capital dredging is not expected to occur annually and only at priority ports with existing permissions. The consequence for biodiversity within the footprint of the dredging site would be serious and possibly irreversible. | Likely | Minor | |
| **Exotic species:** Despite technological improvements for better detection and prevention, the projected increases in shipping, recreational visitation to islands, resort redevelopment and conservation intervention activities, make the transport and (re)introduction of exotic species likely. Some activities facilitate outbreaks of existing infestations. Consequences depend on the particular exotic species but are likely to be serious in a small area, such as adjacent to a marina or port, or on an island. Competition with, or predation of, native species is common. | Likely | Minor | |
| **Extraction from spawning aggregations:** While a number of fish spawning aggregations are currently protected, some fishing effort is targeted at unprotected aggregations. Targeting of spawning aggregations can have implications for recruitment and future population sizes of the species. | Likely | Moderate | |
| **Extraction of herbivores:** Herbivorous fishes and molluscs are not the primary target of most commercial and recreational fishing. The aquarium supply industry collects some species, a modest trochus harvest fishery is still in place, there is some spearfishing take, and discards occur in the trawl fishery (see Discarded catch). Current take of herbivorous fishes is low and is unlikely to become very common. Traditional hunting of green turtles and dugongs is currently managed in a number of areas under Traditional Use of Marine Resources Agreements, and more agreements may be implemented in the future. Although not continuous through the year, traditional hunting is likely to occur several times a year with potential effects at a small-scale. | Likely | Minor | |
| **Extraction of particle feeders:** Commercial, recreational and traditional fisheries that extract particle feeders are projected to continue, with the potential for the trawl fishery effort to increase under current management arrangements. The resilience and biology of these species generally allow them to be sustainably extracted if appropriately managed. Saucer scallops have experienced significant decline and are now considered recruitment overfished. | Almost certain | Moderate | |
| **Extraction of predators:** Trends in fishing effort are predicted to remain stable, with effects at a wider level likely to require recovery periods of five to 10 years for most species. Some shark species extracted through the East Coast Inshore Fin Fish Fishery have life history traits that lend themselves to sustainable exploitation. A range of other top predators are slow breeding and extraction is likely to have at least moderate consequences. The network of no-take zones has already benefited populations of some predators. However, for larger, more mobile predators, benefits are limited. | Almost certain | Moderate | |
| **Foundational capacity gaps:** Only assessed for heritage values. | | | |
| **Fragmentation of cultural knowledge:** Only assessed for heritage values. | | | |
| **Genetic modification:** Manipulation and modification of coral genetics is an accelerating area of research in the search for ways to increase the resilience of reefs to high sea temperatures, decreased ocean pH and other stressors. Potential negative impacts and, therefore, overall risk are not well understood. Major impacts could occur when modified organisms are released into the wild or attempts to influence genotype frequencies are implemented. | Possible | Minor | |
| **Grounding — large vessel:** Despite projected increases in shipping and reports of skipper fatigue, it is considered that current management of shipping, including the vessel traffic service, significantly reduces the likelihood of groundings. They are, therefore, not predicted to occur every year but possibly once in 10 years. Cruise ships and superyachts are an increasing presence in the Region. Groundings can have extremely serious impacts on biodiversity at the site with long recovery periods, and longer term and broader scale effects due to dispersal of antifouling paint. | Possible | Moderate | |
| **Grounding — small vessel:** Small vessel groundings are expected to continue to occur throughout the year and increase as recreational vessel use increases. These events are likely to be concentrated in areas of high use, such as the Whitsundays, where self-drive bareboats are common. Although most vessels are small in size, the decreasing condition of coral reefs generally in the Region has increased the potential for ecosystem-level consequence of cumulative damage caused by groundings of small vessels. | Almost certain | Minor | |

| Risk score | | | |
|---|---|---|---|
| **Low** | **Medium** | **High** | **Very high** |

| Potential threats — ecosystem | Likelihood | Consequence | Risk |
|---|---|---|---|
| **Illegal activities** — *other:* Illegal activities, such as entering a protected or restricted area, illegal release of industrial discharge, shipping outside designated shipping areas and operating without a permit, are almost certain. The consequence of the activity will vary greatly depending on its type and location. | Almost certain | Minor | |
| **Illegal fishing and poaching:** Declining global fish stocks are likely to increase the demand on Australian fisheries. This, in turn, will increase the incentive for illegal foreign and domestic fishing activity. Numbers of detected offences are significant (including among recreational fishers). Greater uptake of vessel monitoring systems may reduce likelihood of commercial fishing offences. The consequence is likely to be major at a broad scale. Increasing illegal activity could have major consequences, particularly for sensitive areas and species. | Almost certain | Major | |
| **Incidental catch of species of conservation concern:** Turtle excluder devices and bycatch reduction devices have significantly reduced the incidental catch of turtles in the Queensland trawl fishery. Death of discarded and incidentally caught species of conservation concern across all fishing activities could have major consequences for a population. | Almost certain | Major | |
| **Incompatible uses:** Only assessed for heritage values. | | | |
| **Marine debris:** Ocean currents transport debris around the world's oceans making the Region vulnerable to debris from both local and more distant sources. Given the rapid increase in plastic production globally, the longevity of this material and the disposable nature of plastic items, plastic marine debris is likely to persist into the future and be present at a broad scale within the Region. While knowledge on distribution and movement of marine debris of all sizes continues to grow, less is known about the frequency, geographic extent and broadscale effects of its interactions with the Region's species. | Almost certain | Moderate | |
| **Modifying coastal habitats:** The potential expansion and intensification of agricultural activities and continued growth in urban and industrial development makes the likelihood of vegetation clearing and modifying supporting terrestrial habitats almost certain. The consequence to the Region's values is likely to be major over a broad scale. Modification and loss of coastal ecosystems reduces their ability to provide important ecosystem services (including for marine species and habitats). | Almost certain | Major | |
| **Noise pollution:** Current vessel use, projected increases in shipping, port development and recreational boat ownership means underwater anthropogenic noise is likely to be more or less continuous in the Region. Little is known about the effects of noise on the Region's species, but evidence from elsewhere indicates that effects can be broadscale with serious consequences close to some noise sources. Improved understanding of its effects in the Region may change the future risk rating of this threat. | Almost certain | Minor | |
| **Nutrient run-off:** Ongoing improvements in Catchment management are likely to reduce nutrient loads in land-based run-off in the future. However, there is likely to be a significant lag time between changes in agricultural practice and measurable water quality improvements in the Region. It is projected that nutrients will continue to enter and remain in the Region well into the future with potentially major consequences on biodiversity. | Almost certain | Major | |
| **Ocean acidification:** Projections suggest the pH of waters of the Reef are almost certainly going to decrease. Regardless of the rate of change, even relatively small changes in ocean pH reduces the capacity of corals and other calcifying organisms to build skeletons and shells, which in turn reduce their capacity to create habitat. | Almost certain | Catastrophic | |
| **Outbreak of crown-of-thorns starfish:** Reductions in nutrient loads in land-based run-off may reduce the number of juvenile crown-of-thorns starfish that reach adulthood. Regardless, the presence of an active outbreak on the Reef at any given time is considered very likely into the future, resulting in continued coral mortality. The cumulative effects of a range of impacts are severely compromising the ability of coral reefs to recover from outbreak events. | Almost certain | Major | |
| **Outbreak of disease:** The causes of disease are difficult to ascertain but are likely to be varied. Increased susceptibility is caused by stress from both acute and chronic influences. For example, outbreaks of coral disease have been linked to increased sea temperature, making further outbreaks likely. Similarly, high disease rates in some commercially caught coral trout in 2016 may have been influenced by heavy bleaching on source reefs. Consequences will vary depending on the disease and duration of outbreak but could have major effects at a broad scale. | Likely | Major | |
| **Outbreak of other species:** Changes in ecological processes as a result of other impacts may cause population explosions of some species. Considering outbreaks and blooms to date, the risk would be significant to a sensitive population or community at a local scale. However, there is a high level of uncertainty and the risk is likely to increase in the future. | Likely | Minor | |

| Risk score | | | |
|---|---|---|---|
| **Low** | **Medium** | **High** | **Very high** |

| Potential threats — ecosystem | Likelihood | Consequence | Risk |
|---|---|---|---|
| **Pesticide run-off:** Pesticides pose potentially serious consequences to some estuarine, seagrass and freshwater ecosystems. Ongoing use of pesticides in the Catchment means the Region will almost certainly continue to receive pesticides via land-based run-off. Concentration levels of pesticides in the Region vary, and for many areas are below those expected to cause significant risk to marine organisms. However, some locations are at higher risk. Additionally, the effect of ongoing low-level pesticide exposure on the inshore Reef area is a knowledge gap. | Almost certain | Moderate | |
| **Sea-level rise:** Sea level increases are expected to continue into the future. This will have a noticeable effect on coastal and shallow-water habitats and species at a broad scale. | Almost certain | Major | |
| **Sea-temperature increase:** The average annual sea surface temperature is almost certain to continue to rise. Regardless of the variation in climate scenarios, it is predicted that by 2035 the average sea surface temperature will be warmer than any previously recorded. Higher temperatures will affect the nature of the entire ecosystem over a broad scale (for example, through its effect on the process of symbiosis within corals). | Almost certain | Catastrophic | |
| **Sediment run-off:** Although improved agricultural land management practices and some restoration of riparian vegetation in some Catchment areas has continued to reduce sediment input, high anthropogenic sediment loads will continue to be transported to, and remain in, the Region. Improvements in agricultural land management practices may take some time to become evident in water quality within the Region due to the lag time of sediments passing through the ecosystem and into sinks within the marine system. Projected increased rainfall variability may also contribute to sediment loads through the erosion of top soils during floods. Consequences of sedimentation for marine life will depend on the concentration and duration of exposure, however, there are likely to be major effects on biodiversity. | Almost certain | Major | |
| **Spill — large chemical:** Although a large chemical spill is unlikely, the effects on biodiversity could be extremely serious and possibly irreversible at a local-scale. Consequences would vary depending on the type and amount of spill and are considered major given current management and response plans. | Unlikely | Major | |
| **Spill — large oil:** While shipping is projected to increase, recent improvements in management make the potential for a large oil spill unlikely. The physical smothering of plants and animals, combined with oil toxicity and its chemical reactions with water, mean a large spill is likely to have serious and persistent effects for several years. | Unlikely | Major | |
| **Spill — small:** Small chemical and oil spills are likely to occur frequently in the Region. Projected increases in the number of ships and other vessels are likely to increase the likelihood of small spills in the future. There could be some effects on sensitive marine life in the area of the spill, with consequences depending on size and type of spill. Given the increasing interest in reef restoration and adaptation interventions, it is also possible that over the next decade unintentional pollution will be created by trials of new approaches (such as ultrathin films) — neither likelihood nor consequence for this aspect are well understood at present. | Almost certain | Insignificant | |
| **Terrestrial discharge:** Projected increases in urban, industrial and mining developments in the coastal zone (within five kilometres of the coastline) and on islands will make discharges, such as sewage and stormwater, almost certain in the future. As regulations require sewage to be treated, sewage discharge is likely to be only a small component of the nutrient load entering the marine environment and have only minor effects. Discharges of wastewater from industrial development and mining that could have irreversible effects over a small area of the Region are possible, but are not expected to occur annually. The occurrence and impact of a range of firefighting and pharmaceutical compounds entering the Region is not well known. | Almost certain | Minor | |
| **Vessel strike:** Continuing growth in shipping and recreational boating will increase the potential for vessel strikes on wildlife. Surface-breathing animals are most at risk (for example, humpback whales). Capital build projects, such as ports and other infrastructure, increase localised vessel use in coastal and island areas that contain important habitat for marine turtles, dugongs and inshore dolphins. The consequences of vessel strike may be more significant in some locations and for some species, than others. | Likely | Minor | |
| **Vessel waste discharge:** Increases in vessel traffic and the continued unavailability of onshore pump-out facilities means there is likely to be more vessel-based waste discharge in the future. Effects on biodiversity are expected to be minor under current management arrangements. | Almost certain | Minor | |
| **Wildlife disturbance:** Projected increases in population, tourism and expected associated increases in recreational vessel ownership are likely to lead to an increase in disturbance of wildlife from the presence of boats, drones, snorkelling and diving activities, and access to islands. These increases may cause some localised effects (for example, on seabirds and shorebirds). | Almost certain | Minor | |

| Risk score | | | |
|---|---|---|---|
| **Low** | **Medium** | **High** | **Very high** |

# Risks to heritage values

| Potential threats — heritage values (Indigenous, historic and other) | Likelihood | Consequence | Risk |
|---|---|---|---|
| **Acid sulfate soils:** Disturbance of acid sulfate soils by coastal development in the Catchment in certain locations and intertidal areas, may affect heritage places or values in a small area. Impacts may erode subsistence lifestyles of local Traditional Owners or corrode artefacts. | Possible | Moderate | |
| **Altered ocean currents:** Dynamic ocean currents are recognised as an ecological process that contributes to the Reef's outstanding universal value. Changes could have flow-on effects to Indigenous heritage values, especially if species that have cultural significance for customary practice, lore, storylines and songlines are affected. Any changes in ocean currents are likely to have only minor effects on historic heritage values, such as shipwrecks. | Almost certain | Moderate | |
| **Altered weather patterns:** A number of weather aspects are predicted to change as a result of climate change. An increase in extreme weather events will affect the Reef's outstanding universal value. Significant broadscale impacts from such events on some habitats and geomorphological features, especially coral reefs and seagrass meadows, will affect attributes that underpin the World Heritage Area's heritage values and integrity. In addition, cyclones can affect culturally important sites (including sacred sites) and places of Indigenous significance. It is likely that historic heritage sites and features, such as shipwrecks, lighthouses, World War II sites and reefs of significance in the path of a severe cyclone will be damaged, potentially seriously. | Almost certain | Major | |
| **Artificial light:** Growth in shipping and urban and industrial development is likely to continue to increase the amount of artificial light. The main known issue with artificial light is its effect on turtle hatchlings' orientation in the nesting season (a recognised natural phenomenon in the world heritage listing). Reductions in turtle nesting success and hatchling survival could have future flow-on effects on Indigenous cultural values, such as totems and traditional hunting. Reduced dark sky area and lowered visibility of stars (from skyglow effects) may disrupt natural beauty and Indigenous storylines and songlines. | Almost certain | Moderate | |
| **Atmospheric pollution:** Atmospheric pollution may start to affect some heritage values into the future. However, effects are expected to be only minor. Corrosion, bio-degradation and soiling of materials used in built structures are some of the potential effects of atmospheric pollution. Natural beauty may also be affected by human-caused haze and deposition of particulate matter, such as coal dust or terrigenous dust. The contribution of gases, such as carbon dioxide, to climate change is excluded here as this is encompassed under other threats, such as sea-temperature increase. | Possible | Minor | |
| **Barriers to flow:** Artificial barriers in the Catchment will continue to affect estuarine systems and biological connectivity between freshwater and marine environments, affecting some species and processes that contribute to the Reef's outstanding universal value. There are also effects on the overall integrity of the world heritage property. In addition, these barriers may affect connectivity crucial to some totem species and could interrupt the flow of some storylines across the landscape. | Almost certain | Moderate | |
| **Behaviour impacting heritage values:** There is ongoing possibility of people exhibiting behaviours at Indigenous and historic heritage sites that affect the site's intangible cultural heritage values. The likelihood of impact may be higher at sites where visitors are more likely to not be aware of the site's local cultural significance or behavioural guidelines desired by Traditional Owners. Severity and longevity of impact varies depending on the nature, frequency and intensity of the undesirable presence or behaviour. | Possible | Moderate | |
| **Damage to reef structure:** There is likely to be damage to the reef structure from anchors, diving and snorkelling throughout the year. Poorly secured equipment may also cause damage. This could affect the natural underwater beauty in heavily visited locations. Damage to culturally significant features is also possible. | Almost certain | Moderate | |
| **Damage to seafloor:** Local effects on the seafloor are likely in intensely trawled areas and in ship anchorages. It is unlikely that any damage will significantly affect the condition of the area's ecologically important inter-reefal areas — an attribute of the Reef's outstanding universal value. Depending on the location of the damage, culturally significant sites (including sacred sites, burial sites and sites that have storylines associated with them) could be affected. It is possible that undiscovered heritage sites (including wrecks) and features could be damaged. If an interaction occurs, the consequences are likely to be serious, or even irreversible. | Possible | Moderate | |
| **Discarded catch:** The discard of non-retained catch from fishing activities is predicted to occur continuously. While bycatch reduction devices and turtle excluder devices in the trawl fishery have reduced deaths of some culturally important species (including marine turtles), risks remain for a range of others. If discarded catch floats or is washed ashore it can affect natural beauty. | Almost certain | Moderate | |

| Risk score | | | |
|---|---|---|---|
| **Low** | **Medium** | **High** | **Very high** |

| Potential threats — heritage values (Indigenous, historic and other) | Likelihood | Consequence | Risk |
|---|---|---|---|
| **Disposal of dredge material:** Large amounts of dredge material from capital works can no longer be disposed in the Marine Park, although disposal from maintenance dredging continues. The disposal and resuspension of significant volumes of sediment could affect the condition of a number of attributes that contribute to the Reef's outstanding universal value by adding further pressure to already declining inshore ecosystems. Resuspended dredge material can also affect water clarity and, therefore, aesthetic beauty and ability to perform some cultural practices. Disposal of dredge material in areas with undiscovered heritage sites and features is possible but would not be likely to affect heritage values over a wider area. | Likely | Minor | |
| **Dredging:** Continued development of ports is expected to require capital and ongoing maintenance dredging. The effect on the natural environment within the dredging site would be serious and possibly irreversible, but the activity's footprint is small. Assessment processes aim to avoid disturbance of heritage sites from dredging. However, some risk remains for unrecorded sites of Indigenous cultural significance, such as burial sites and sacred sites, and unrecorded historic heritage sites. While in progress, dredging can also affect the scenic values of an area and increase noise levels. | Likely | Minor | |
| **Exotic species:** Despite improvements in detection and prevention of exotic species, projected increase in shipping, island-based activities and conservation interventions makes their introduction likely. The consequence would depend on the species and the heritage value affected, but there could be serious effects on attributes that contribute to the Reef's outstanding universal value and Indigenous heritage values in a local area. | Likely | Minor | |
| **Extraction from spawning aggregations:** While a number of fish spawning aggregations are currently protected, some fishing effort is targeted at unprotected aggregations. Spawning aggregations are recognised as a natural phenomenon that contributes to the Reef's outstanding universal value. Effects on these aggregations will have consequences for the Indigenous heritage values connected to the species concerned. Local depletions may also affect social and economic values. | Likely | Moderate | |
| **Extraction of herbivores:** Herbivorous fishes and molluscs are not the primary target of most commercial and recreational fishing. Traditional hunting of green turtles and dugongs is currently managed in a number of areas under Traditional Use of Marine Resources Agreements, and there is the aim of implementing more agreements in the future. This traditional use is likely to continue, is thought to be largely sustainable, and has a positive impact on Indigenous heritage values. | Likely | Insignificant | |
| **Extraction of particle feeders:** Trends in fishing effort are predicted to remain stable. There are concerns for some species (including saucer scallops). Given the important role of particle feeders in the ecosystem, there is likely to be some effects on attributes that contribute to outstanding universal value on a wide scale. There may be effects on the cultural practices of Traditional Owners. | Almost certain | Moderate | |
| **Extraction of predators:** Trends in fishing effort are predicted to remain stable. Given the important role of predators in the ecosystem, there is likely to be some effects on attributes that contribute to outstanding universal value on a wide scale. There may be effects on the cultural practices of Traditional Owners. In addition, some targeted predators are totems for many Traditional Owners. The exploitation of these animals and the localised impacts on populations will affect the cultural values of Traditional Owners with sea country estates. | Almost certain | Moderate | |
| **Foundational capacity gaps:** There is variable capacity (skills and equipment) among Traditional Owner groups to visit and manage country. Some areas are quite remote and safe transport is critical to frequency and efficiency of access to country. Management agencies have increased opportunities for Traditional Owners to join their trips. Potential impacts of capacity gaps include those on the enduring connection Traditional Owners have with their land and sea country, the maintenance of culture and the transfer of knowledge to younger generations. | Likely | Minor | |
| **Fragmentation of cultural knowledge:** Efforts to reconnect with cultural knowledge are increasing within Reef and Catchment Traditional Owner groups and participation in Indigenous junior and adult ranger programs is growing. Availability of specialist skills in historic heritage preservation is thought to be stable. | Likely | Major | |
| **Genetic modification:** Potential negative impacts and, therefore, overall risk for heritage values are not well understood. However, impacts on the ecosystem may have flow-on effects on Indigenous cultural values. | Possible | Minor | |
| **Grounding — large vessel:** Current management of shipping significantly reduces the likelihood of groundings. However, if a grounding occurs, severe impacts on coral reef habitats can result at the site with long recovery periods. Many reefs have strong cultural value to Traditional Owners. Song and storylines are connected to them and, in some cases, they are sacred sites. The destruction and damage caused by a ship grounding could have significant and long-term effects on Indigenous heritage values. A ship grounding is likely to be rare at a site of historic significance, but it could have major consequences. | Possible | Moderate | |

| Risk score | | | |
|---|---|---|---|
| **Low** | **Medium** | **High** | **Very high** |

| Potential threats — heritage values (Indigenous, historic and other) | Likelihood | Consequence | Risk |
|---|---|---|---|
| **Grounding — small vessel:** Small vessel groundings are likely to occur throughout the year and be concentrated in areas of high use. Given the decreasing condition of coral reefs generally in the Region, the potential consequences of groundings for linked cultural heritage values has increased. Should there be an accumulation of such groundings at a site of heritage significance, the local condition of associated values may be further affected. If this occurs for multiple sites, it would affect heritage values at a wider scale. | Almost certain | Minor | |
| **Illegal activities — other:** There is also ongoing possibility of intentional and unintentional illegal removal of, or damage to, the Region's Indigenous and historic heritage sites and associated artefacts. Occurrence of other illegal activities, such as entering a protected or restricted area, illegal release of industrial discharge, shipping outside designated shipping areas and operating without a permit, are almost certain. The likelihood of an illegal activity affecting a heritage value and the consequence of its effect will vary greatly depending on its type and location and the heritage values affected. Damage can be hard or impossible to repair. Monitoring of looting, souveniring, vandalism and other activities remains difficult due to limited availability of information on location and condition for many heritage sites. The maintenance of traditional cultural ties can be affected by use of the Region that does not keep to management arrangements designed to support traditional use. | Almost certain | Moderate | |
| **Illegal fishing and poaching:** Illegal fishing is likely to increase in the future and its consequence for attributes of the Reef's outstanding universal value is likely to be major at a broad scale. Illegal fishing and poaching activities directly affect Traditional Owners' ability to practice customary lore, use their cultural tools and technology, and follow cultural observances. | Almost certain | Major | |
| **Incidental catch of species of conservation concern:** There are immediate or post-release effects on some species of conservation concern, many of which contribute to the Reef's outstanding universal value. Many are also of cultural significance to Traditional Owners as either a food source or totem, or for customary practice. | Almost certain | Major | |
| **Incompatible uses:** The increasing volume and variety of uses occurring in the Region affects the capacity of Traditional Owners to continue their cultural practices and fulfil their customary responsibilities. Localised effects from commercial and recreational fishing can cause changes to customary practice if Traditional Owners have to fish or collect in non-traditional areas. Structures associated with tourism, ports and other activities can affect the scenic beauty of an area, as can commercial and recreational vessels. | Almost certain | Moderate | |
| **Marine debris:** Marine debris affects many of the species that contribute to the outstanding universal value of the Reef as well as diminishing its natural beauty. Some marine animals and birds of Indigenous cultural significance can become entangled in, or killed by, marine debris. It also washes up in culturally important areas and sacred sites. On rare occasions, debris (such as discarded fishing nets) could become entangled on submerged historic sites, potentially degrading their heritage value. | Almost certain | Moderate | |
| **Modifying coastal habitats:** Clearing and modifying of supporting terrestrial habitats in the Catchment is almost certain. This is likely to continue to affect the outstanding universal value and integrity of the world heritage property, especially through diminishing the ecosystem services these habitats provide. Coastal habitat degradation may also diminish natural scenic values of the property. Even relatively small changes to land and seascapes have very significant consequences for Indigenous cultural values. Cultural observances, customs, storylines and songlines can be lost through changes to terrestrial habitats. In addition, without adequate consultation with Traditional Owners, reclamation on culturally significant sites may occur and the values could be irretrievably compromised. Similarly, there is the potential that reclamation could occur on or close to an unrecorded site of historic heritage. | Almost certain | Major | |
| **Noise pollution:** Little is known about the effects of noise on the Region's species, including for species that have particular cultural significance to Traditional Owners. Effects on auditory experiences may affect an area's natural beauty. Improved understanding of its effects may change the future risk rating of this threat. | Almost certain | Minor | |
| **Nutrient run-off:** The widespread effects of increased nutrients in coastal waters diminish many components of the Reef's outstanding universal value. This threat is closely aligned to modifying coastal ecosystems. Such declines in the environment will, in turn, affect the Indigenous heritage values of the Region. Nutrients are unlikely to affect historic heritage values, other than contributing to declines in the health of reefs of historic significance. | Almost certain | Major | |

| Risk score | | | |
|---|---|---|---|
| **Low** | **Medium** | **High** | **Very high** |

| Potential threats — heritage values (Indigenous, historic and other) | Likelihood | Consequence | Risk |
|---|---|---|---|
| **Ocean acidification:** The pH of waters of the Reef is almost certainly going to decrease, which will affect coral reef habitats and many reef species. Given coral reefs are one of the fundamental attributes contributing to the Reef's outstanding universal value, this threat could have major consequences for the Region's world heritage values. The decline in environmental condition will have consequent effects on Indigenous heritage values. Ocean acidification could have an effect on shipwrecks of historic significance, but it is likely to be insignificant. | Almost certain | Catastrophic | |
| **Outbreak of crown-of-thorns starfish:** The projected almost continual presence of an active crown-of-thorns starfish outbreak on the Reef will severely compromise the ability of coral reefs to recover after disturbances. As with other threats that are likely to seriously affect coral reefs, continued outbreaks will seriously diminish the outstanding universal value of the Reef. The decline in coral reef health will have consequent effects on Indigenous heritage values. | Almost certain | Major | |
| **Outbreak of disease:** The likelihood and consequences to the natural environment of a disease outbreak will vary, however, overall susceptibility to disease is likely to increase as the Reef's condition deteriorates. Widespread disease outbreaks would diminish the Reef's outstanding universal value. Outbreaks of disease, such as in corals and turtles, can diminish Indigenous heritage values through affecting cultural practices, customs and lore. Outbreaks that may seem moderate at a broad scale could have significant impacts at a smaller, more local level. | Likely | Major | |
| **Outbreak of other species:** Changes in ecological processes as a result of other impacts may cause outbreaks of some naturally occurring species. Little is known of the potential effects of outbreaks or blooms of other species on Indigenous cultural values, but any declines in ecosystem health will have consequent effects on Indigenous heritage values. | Likely | Minor | |
| **Pesticide run-off:** Ongoing use of pesticides in the Catchment means the Region will almost certainly experience pesticides from land-based run-off into the future. The effects of pesticides on some estuarine, seagrass and freshwater ecosystems will diminish some components of the Reef's outstanding universal value. This threat is closely aligned with modifying coastal ecosystems. Such declines in the ecosystem will, in turn, affect the Indigenous heritage values of the Region. Bioaccumulation of toxic components of pesticides will have additional adverse effects if this makes some species unsafe for consumption as part of cultural practices. | Almost certain | Moderate | |
| **Sea-level rise:** Continued increases in sea level will have noticeable effects on coastal and shallow-water habitats and species over a broad scale. In particular, rising sea levels will affect the phenomena of outstanding universal value, such as turtle and seabird nesting. Rising sea level could also affect coastal and shallow-water Indigenous heritage sites, as well as cause changes to custom. Loss of access to fish traps, burial sites (which may be in coastal sand dunes), or rock art located in beach caves will have adverse consequences for cultural practices. Rising sea level is also likely to have some minor effects on coastal and shallow-water historic heritage sites. | Almost certain | Major | |
| **Sea-temperature increase:** The average annual sea surface temperature is almost certain to continue to rise, affecting almost all attributes of outstanding universal value over a broad scale, from its ecological processes and key habitats and species to its natural beauty and natural phenomena. Such declines in the environment will simultaneously affect the Indigenous heritage values of the Region. On a smaller scale, increased sea temperatures could accelerate the natural degradation of historic heritage sites. | Almost certain | Catastrophic | |
| **Sediment run-off:** Although improved agricultural land management practices and some vegetation restoration has continued to reduce sediment input, elevated anthropogenic loads will continue to be transported to, and remain in, the Region. The widespread effects of increased sediments, especially in coastal waters, diminish many attributes of the Reef's outstanding universal value (including habitats, species, ecological processes and geomorphological processes). Increases in turbidity also decrease the underwater natural beauty of the World Heritage Area. Declines in the environment caused by increased sediments will affect the Indigenous heritage values of the Region. Increased sediments are unlikely to significantly affect historic heritage values. | Almost certain | Major | |

| Risk score | | | |
|---|---|---|---|
| **Low** | **Medium** | **High** | **Very high** |

| Potential threats — heritage values (Indigenous, historic and other) | Likelihood | Consequence | Risk |
|---|---|---|---|
| **Spill — large chemical:** A large chemical spill is unlikely and the consequences would vary depending on the type and amount of spill. A large chemical spill that affects biodiversity would have flow-on effects to the Reef's outstanding universal value and the cultural values of Traditional Owners. A spill that had severe effects on the local environment could have extremely serious and possibly irreversible effects on Indigenous cultural practice, observances, story and song lines, and places of cultural significance at a local scale. In addition, a large chemical spill close to a historic heritage site could present a serious risk to its values. | Unlikely | Major | |
| **Spill — large oil:** A large oil spill is unlikely, however, the physical smothering of plants and animals, combined with oil toxicity and its chemical reactions with water, mean a large spill would likely have serious and persistent effects on some attributes of outstanding universal value, such as coral reefs, seabirds and turtles. It would also affect the natural beauty of the spill area in the short term. Any impacts on animals or land and seascapes would have a similarly negative effect on Indigenous heritage values. It is expected that a large spill would rarely affect a historic site or feature. | Unlikely | Major | |
| **Spill — small:** Small chemical and oil spills are likely to occur frequently in the Region, with consequences depending on size and type of spill. Scenic beauty above and below the water may be slightly affected in small local areas. However, there is unlikely to be serious consequences to the Region's heritage values from small chemical and oil spills. | Almost certain | Insignificant | |
| **Terrestrial discharge:** Projected increases in urban and industrial development will make point-source discharges, such as polluted water, sewage, wastewater and stormwater, almost certain in the future. While the discharges are unlikely to affect the outstanding universal value of the Reef, there may be localised effects on some Indigenous heritage values. For example, elevated concentrations of heavy metals in culturally significant species, such as dugong and turtle, or concentrations of bacteria unsafe for human immersion, could place cultural values and practices at further risk. | Almost certain | Minor | |
| **Vessel strike:** Continuing growth in shipping and recreational boating increases the potential for vessel strikes on wildlife. Some of the species that contribute strongly to the Reef's outstanding universal value, such as dugongs, turtles, dolphins and whales, are most at risk. As these species also have cultural significance for Traditional Owners, there is likely to be local effects on Indigenous cultural heritage. | Likely | Minor | |
| **Vessel waste discharge:** Increases in vessel traffic will mean there is likely to be more vessel-based waste discharge in the future. The likely minor effects on the natural environment will have flow-on effects on Indigenous heritage values. | Almost certain | Minor | |
| **Wildlife disturbance:** Projected increases in population, tourism and associated recreational vessel ownership, access to islands, drone use, snorkelling and diving activities are likely to lead to an increase in disturbance of wildlife. The increase could cause localised effects on attributes of outstanding universal value, such as the natural phenomena of seabird and turtle nesting. Changes to animal behaviour caused by the presence of boats or people can change the nature of Traditional Owner customary practice and change storylines. | Almost certain | Minor | |

| Risk score | | | |
|---|---|---|---|
| **Low** | **Medium** | **High** | **Very high** |