**Seagrass impact assessment in the permission system**

**Objective**
To provide guidance on assessing impacts to seagrass and seagrass meadows within the permission system.

**Target audience**
Primary: Great Barrier Reef Marine Park Authority officers assessing applications for permission. Secondary: Groups and individuals applying for permission; interested members of the public.

**CONSULTATION NOTES:**
1. These guidelines form part of a broader package which has been released for public comment and should be read in conjunction with:
   a. The draft revised *Environmental impact management policy: permission system* (Permission system policy) explains how the management of the permission system ensures consistency, transparency and achievement of the objects of the Act.
   b. The draft *Risk assessment procedure* explains how GBRMPA determines risk level and the need for avoidance, mitigation or offset measures.
   c. The draft *Guidelines: Applications for permission* (Application guidelines) explain when permission is required and how to apply.
   d. The draft *Checklist of application information* proposes information required to be submitted before an application is accepted by GBRMPA.
   e. The draft *Guidelines: Permission assessment and decision* (Assessment guidelines) explain how applications are assessed and decisions made.
   f. The draft *Information sheet on deemed applications under the Environment Protection and Biodiversity Conservation Act* (EPBC deemed application information sheet) explains how application, assessment and decision processes work for those applications that require approval under both the *Great Barrier Reef Marine Park Act* and the *Environment Protection and Biodiversity Conservation Act* (EPBC Act).
   g. The draft *Information sheet on joint Marine Parks permissions with Queensland* (Joint Marine Parks permissions information sheet) explains how GBRMPA and the Queensland Government work together to administer a joint permission system.
   h. The draft *Guidelines: Value impact assessment in the permission system* (Value assessment guidelines) provide further detail on specific values of the Marine Park, including how to determine risk and possible avoidance, mitigation or offset measures.
   i. The draft *Guidelines: Location-specific assessment in the permission system* (Location-specific assessment guidelines) highlight places in the Marine Park that have site-specific management plans, policies or other information which may be relevant to decisions.
   j. The draft *Guidelines: Activity impact assessment in the permission system* (Activity assessment guidelines) provide further detail on how GBRMPA assesses and manages specific activities.
   k. The Managing facilities discussion paper and draft *Guidelines: Activity impact assessment in the permission system – Fixed facilities* propose changes to how GBRMPA manages facilities in the Marine Park.
2. Amendments are underway to the *Great Barrier Reef Marine Park Regulations 1983*, as outlined in the *Response Document* prepared after consultation in December 2015. These guidelines have been written to reflect the proposed amendments.

**Purpose**
1. Permission decisions contribute to maintaining and enhancing the condition of seagrass and seagrass meadows within the Great Barrier Reef Marine Park (the Marine Park).
Context

Description of the value

2. Seagrasses are highly specialised flowering plants with roots, leaves and rhizomes. They are not a taxonomically unified group, and not true grasses. Seagrasses vary morphologically and ecologically, ranging from annual short-lived structurally small *Halophila* species to robust, long-lived structurally large species such as *Enhalus acoroides*. They reproduce either asexually through rhizome growth, or sexually via seeds from flowers fertilised by water-borne pollen.


4. The key elements for the survival of seagrass include:
   a. Suitable light - The health of seagrass communities relies heavily upon the amount of sunlight that penetrates the water column to reach submerged blades.
   b. Sediment of suitable depth and stability to anchor roots
   c. Appropriate salinity and temperature ranges
   d. An appropriate level of nutrients
   e. Minimal natural and human disturbance
   f. Health and availability of propagules (roots, shoots and seeds) for seasonal and annual recruitment and recovery (seeds and or adult plant population).

5. Generally the growth rate of seagrasses in the Marine Park is seasonally-dependent. The high-growth season is from June to December, with growth (both biomass and cover) peaking September to early December. In December to January, conditions generally become less favourable and growth slows, leading into the wet season (February to April) when conditions can become unfavourable for growth (depending on the severity of the wet season) and growth can even cease, sometimes resulting in losses of whole meadows.

6. Intertidal and shallow subtidal seagrasses (less than 15 metres deep) are estimated to cover approximately 5700 square kilometres of the Marine Park. Many of the locations and extent of these subtidal and intertidal seagrass meadows in the Marine Park have been mapped, and data exists on their condition and trend. [http://eatlas.org.au/map/gbr-seagrass](http://eatlas.org.au/map/gbr-seagrass)

7. Deep-water seagrasses (deeper than 15 metres) are estimated to cover approximately 40,000 square kilometres of the Marine Park. At these depths seagrass is often very sparse (less than five per cent cover) although it can form relatively dense and high cover meadows in some locations. The abundance and condition of deep-water seagrass meadows is not well studied, and few are routinely monitored. Throughout the Marine Park these meadows are exclusively pioneering species from the genus *Halophila* and can be highly seasonal or annual.

Importance to the Marine Park

8. Seagrass meadows are an important part of the Great Barrier Reef ecosystem. They provide many benefits, from the provision of food and shelter to marine species to environmental regulatory processes. Many coastal societies depend on marine resources for food and livelihoods so seagrass ecosystems are also critical contributors to wellbeing and the economy in these communities. Important ecological and economic roles of seagrasses include:
   a. the functions they provide as nursery grounds, physical shelter and habitat for marine organisms including through their three-dimensional structure in the water column, including for commercially important faunal species (fish, crabs and molluscs)
   b. their role in the food chain of many marine animals, including as a direct food source for charismatic mega fauna such as dugongs and green turtles and foraging grounds for larger predators
   c. their importance as fishing grounds for coastal communities and attracting tourism
   d. their high rate of primary production, role in nutrient cycling, water filtration and the significant amounts of carbon they sequester
   e. their contribution to trapping and stabilising large amounts of sediment and protecting against erosion and sediment resuspension, protecting coastlines from storms and other weather events.
9. Seagrass and seagrass meadows are relevant to a number of matters of national environmental significance, such as green turtles and dugongs. In addition, the importance of seagrass and seagrass meadows is included in the Statement of Outstanding Universal Value for the Great Barrier Reef World Heritage Area.

10. Seagrasses represent good bio-indicators of overall marine and coastal health due to their:
   a. widespread distribution
   b. important ecological role
   c. fixed, immobile nature (anchored to the substrate)
   d. measurable and timely responses to environmental conditions and impacts (for example pollution, temperature, sediment resuspension, salinity).

Management

11. Refer to Appendix A for a full list of related legislation, standards and policy.

Zoning and Legislation


Policy

13. The primary (though not only) focus of actions to protect seagrass is to improve the quality of water entering the Great Barrier Reef. The Reef Water Quality Protection Plan 2009 sets targets for improvement and is supported by the resources of the Australian and Queensland governments, as well as significant investment by industry, to implement change and monitor progress.

Management Objectives

14. The values of the Marine Park, their integrity and current condition are described in the Great Barrier Reef Outlook Report 2014 and the Great Barrier Reef Region Strategic Assessment Report. Refer to Table 1 for summary assessment of seagrasses/meadows.

<table>
<thead>
<tr>
<th>Area</th>
<th>Current Condition</th>
<th>Trend</th>
<th>Management Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Inshore</td>
<td>Very good</td>
<td>Stable</td>
<td>Maintain</td>
</tr>
<tr>
<td>Northern Offshore</td>
<td>Very good</td>
<td>Stable</td>
<td>Maintain</td>
</tr>
<tr>
<td>Southern Inshore</td>
<td>Very poor</td>
<td>Declining</td>
<td>Improve</td>
</tr>
<tr>
<td>Southern Offshore</td>
<td>Poor</td>
<td>No clear trend</td>
<td>Improve</td>
</tr>
</tbody>
</table>

Common considerations

16. Information on locations and extent of seagrass meadows on the Great Barrier Reef can be found at http://eatlas.org.au/map/GBR-seagrass. This will help to determine which type of seagrass is likely to be present in the zone of impact.

17. The three coastal processes that seagrasses and seagrass meadows are most dependent on are light, sedimentation and freshwater inflow and salinity. Any activity which is likely to impact on one of these processes will likely also impact on seagrass.

18. Direct disturbance and destruction to seagrass can occur through physical activities such as vessel activity, anchoring, dredging and construction.

19. Generally, if only leaves and above-ground vegetation are impacted, seagrasses are able to recover from damage within a few weeks. However, when damage is done to roots and rhizomes, the ability of the plant to produce new growth is severely impacted, and plants may be very slow to recover, or never be able to recover.1, 2

20. Due to their highly seasonal nature, the timing of any seagrass survey is critical.
   a. At least three years of background data is desirable, preferably more.
   b. Information should be collected at the peak time for seagrass abundance and distribution where possible (August to December). Some seagrass meadows are only present as above ground biomass for part of the year or are greatly reduced in their extent during the low seagrass growth season.
   c. In the absence of data collected in the high season or limited background information, a conservative approach is to use a composite of previous seagrass distributions for the area (see the e-atlas for seagrass composite information).

Links to other Values

Social Values

21. Many of the ecosystem services that seagrasses provide have high economic importance, not least the provision of critical habitat for dugongs and marine turtles and for many commercially and recreationally important fish species. They are an important resource base for rural human populations contributing significantly to human welfare through the provision of fishing grounds, bait collection grounds, substrate for seaweed cultivation, traditional medicines and food as well as the social and cultural services and aesthetic value that they provide.

22. Any impacts on seagrass are likely to have flow-on impacts on social values, particularly for commercial and recreational fishing.

23. See the Guidelines: Social impact assessment in the permission system for more information.

Indigenous Heritage Values

24. Seagrasses and seagrass beds are an essential element of the living maritime culture of the Aboriginal and Torres Strait Islander peoples that live along the coast of the Marine Park, and seagrass meadows are important for cultural traditions. The use of places of significance such as seagrass beds for cultural practices such as fishing and collection greatly strengthens Aboriginal and Torres Strait Islander culture and connection with traditional sea country.

25. See the Guidelines: Indigenous heritage impact assessment in the permission system for more information.
Biophysical Values

26. Seagrass and seagrass meadows are very important foraging and nursing habitat for juvenile fish, dugong and marine turtles. Invertebrates like lobsters, crabs and sea urchins also rely on seagrass as a food source. These species may be impacted by any direct loss or physical damage to the value, including any degradation and/or loss of seagrass meadows, changes in seagrass species composition or changes in nutrient content.

27. Much of the connectivity (how one habitat is connected to or reliant on another habitat) in tropical coastal ecosystems depends on intact and healthy non-coral habitats such as seagrass meadows. Seagrass and seagrass meadows are particularly important for the maintenance and regeneration of fish populations.

28. Seagrasses maintain water quality by trapping silt, dirt, nutrients and other sediments suspended in the water column. These materials are then incorporated into the benthic substratum, where they are stabilised by seagrass roots. In this way, seagrass helps to stabilise beaches and coastlines and to protect them from storms.

29. For information about how impacts to seagrass may create flow-on impacts to dugong, see the Guidelines: Dugong impact assessment in the permission system. Guidelines for other biophysical values may be developed by GBRMPA in the future.

Hazards

30. Table 2 summarises the hazards and associated impacts to the value, along with avoidance, mitigation and monitoring measures that may be appropriate depending on the activity. Further details on these impacts, listed by the hazard, are discussed in the text following the table.
<table>
<thead>
<tr>
<th>Hazard</th>
<th>Impact (effect on value)</th>
<th>Avoidance, Mitigation and Monitoring measures</th>
</tr>
</thead>
</table>
| Change in nutrients         | - Algal blooms from run off and waste discharge can reduce light levels and deplete nutrient supply leading to decreased seagrass growth rates which can kill whole populations.  
- An increase in nutrients (up to a tipping point) may also be beneficial to seagrass, and can result in increased seagrass growth. However, past the tipping point can lead to negative impacts. | - Avoid or reduce runoff and waste discharge.  
- Buffer storage and processing facilities for waste from impacts of extreme weather.  
- Enact a robust management and monitoring plan covering habitats within and adjacent to the action, to ensure nutrient supply is managed in a way that maintains seagrass health.  
- Set and act on triggers for management intervention.  
- Conduct hydrodynamic modelling to predict plumes and implement a plume management plan.                                                                                                                                                                                                                                                                                                                                                     |
| Change in salinity          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Change in light             | - Any activity that has the potential to shade seagrasses will impact on the value, reducing light levels for photosynthesis which leads to reduced growth or even death.  
- Turbidity can reduce the amount of light available to seagrasses, causing weakness or death.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | - Consider alternative locations for infrastructure to avoid shading impacts.  
- Manage turbidity generating activities in a way that ensures the minimum light requirements of seagrasses are maintained through the use of appropriate light/turbidity thresholds.  
- Observe light requirements for management of specific activities likely to impact on the light environment.                                                                                                                                                                                                                                                                                                                                                     |
| Change in hydrodynamics     | - Excessive sediment loading may cause turbidity in water column or smothering of seagrass, decreasing light levels available for photosynthesis and cutting off nutrient supply.  
- Sediment build-up can lead to increased periods of low tide exposure and higher temperatures.  
- Removal of sediment by dredging or erosion can lead to the area no longer being suitable for seagrass growth due to increased depth and reduced light reaching seagrass.  
- Changes in hydrodynamics or sediment transport (from vessel activity, dredging, carrying out works) can lead to sediment smothering seagrass, decreasing light levels available for photosynthesis, cutting off nutrient supply and potentially burying seagrasses causing mortality. This might also include destabilisation of the substrate which causes damage or removal of the root system.     | - Avoid actions that may cause the direct or indirect change in coastal profiles, including long-shore drift, erosion and accretion.  
- Use hydrodynamic modelling to predict potential changes and test options for minimising these changes.  
- Monitor during works to assess any changes to the site (including substrate stability).  
- Restrict works to certain seasons, times or tidal cycles to reduce the impacts.  
- Implement Go Slow zones (less than planing speed of 4 knots) for shallow areas to reduce stirring up sediments or scouring the seabed.  
- A combination of monitoring and modelling during activity to minimise the risk that suspended sediments will cause impacts on any nearby seagrass meadows.                                                                                                                                                                                                                     |
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| Contamination of water or sediment | • Contamination can directly poison, stress and kill seagrass.  
• Contamination can cause changes to nutrient levels and salinity, leading to reduced growth rates and death in some instances.  
• Reduced water clarity leads to reduction in light to seagrass, blocking photosynthesis and growth.  
• Seagrass habitat may be contaminated with toxic elements and synthetic compounds.  
• Flow-on impacts to the food chain for species that feed on seagrass. | • Prevent runoff or discharge of turbid or polluted water.  
• Analyse potential contaminants to understand their short-and long-term impacts on seagrass, including chain reactions if released into seawater.  
• Conduct hydrodynamic modelling to predict plumes and implement a plume management plan.  
• Set and act on triggers for management intervention.  
• Develop clean-up strategies or pollution management plans.  
• Enact a robust monitoring plan covering habitats within and adjacent to the action. |
| Direct injury or disturbance of living things, including translocation and Direct death or removal of living things, including vessel strike | • Any action that physically touches or uproots the plant from the seafloor can cause direct physical damage or direct death and removal of seagrass beds.  
• Increased vessel activity in a seagrass meadow creates impacts from propellers, anchors, mooring chains and rope – leading to localised physical damage and death to seagrasses (leaves, stems and roots).  
• Accidental or intentional groundings of vessels, barges and ships in shallow areas may lead to significant physical damage.  
• Propeller scarring often results in a continuous line of seagrass damage which can fragment the habitat, increasing erosion, vulnerability and destroying connectivity.  
• Flow-on effects to reliant species (alteration of feeding behaviour or displacement of animals) leading to reduced fitness, resilience, fecundity and even death. | • Consider timing for construction of a facility. The flowering and growing season (typically July to January) should be avoided, as this could reduce reproduction rates.  
• Dredging and disposal should be carefully managed and restricted to certain seasons where possible. Alternatives should be considered where possible, such as extending wharves and jetties.  
• Consider alternative infrastructure design that avoids seagrass impacts.  
• Limit physical access to the site. Moorings may mitigate the amount of anchor damage to a site, if placed in the correct place so they do not cause shading.  
• Avoid placing moorings within 10m of seagrass.  
• Consider using lower impact mooring systems as an alternative to swing moorings.  
• Regrow or recolonise small areas of seagrass following disturbance.  
• Establish exclusion/shut-down zones during works.  
• Establish and maintain a monitoring program to identify changes to seagrass from the permitted activity.  
• Set triggers for management intervention, for example death of seagrass at agreed percentage of reference sites. Ideally implement monitoring to detect sub-lethal stress levels in seagrass so that management action can be enacted prior to declines or losses. |
Change in hydrodynamics

31. Changes to hydrodynamics (depth profile, current direction, or current velocity) can threaten seagrasses by causing physical damage to the root system by uprooting the plant, eroding the substrate, changing sediment suitability, growth conditions and nutrient availability.

32. Activities which change the hydrodynamics of a site should be avoided or planned for areas where impact on seagrass habitat would be limited. Any action that may cause the direct or indirect change in coastal profiles, including long-shore drift, erosion and accretion should be avoided.

Changes in light levels

33. Water clarity is heavily affected by the amount and composition of run-off and other non-point sources of pollution. Water clarity is the primary influence that determines how much light ultimately reaches seagrass leaves, and therefore the health of the seagrass communities.

Changes in nutrient levels and Change in Salinity

34. Excess nutrient levels caused by runoff and waste discharge can cause massive blooms of algae that shade the seagrass. Algae can be suspended in the water column or epiphytic algal growth on the seagrass leaves. The resultant reduction in light decreases seagrass growth and can kill off whole meadows – sometimes irreversibly.

35. The activity should implement actions to reduce runoff and avoid waste discharge, including buffering storage and processing facilities for waste from impacts of extreme weather.

36. A monitoring plan with triggers for management intervention (such as sub-lethal levels for seagrass at agreed percentage of reference sites chosen) should be enacted to cover habitats within and adjacent to the action to assess changes in nutrient levels at regular intervals during construction and implementation of the activity, and modify actions through adaptive monitoring as required.

37. Where required, a plume management plan should be implemented to minimise impacts on seagrass. Model outcomes should be compared with plume monitoring during the activity, such as for maintenance dredging. Where seagrasses and seagrass meadows are impacted, an adaptive management strategy should be triggered.

Change in sedimentation

38. Removal of sediment, excessive sediment causing smothering of seabed, and modification of sediment characteristics (such as sediment grain size) caused by carrying out works on the seafloor such as pile driving or dredging and vessel traffic can cause physical damage to seagrass including permanent loss.

39. If sediment levels in the water column become excessive, turbidity increases and the penetration of sunlight is inhibited. In extreme cases, it can also smother seagrasses, leading to mortality.

40. Sediment build-up over time may result in seagrass growing in more shallow water. This can increase periods of low tide exposure and higher temperatures, increasing pressure on seagrass which can lead to death.

41. Changes in hydrodynamics or sediment transport can lead to sediment settling on and smothering seagrass. This is a common concern with dredging and spoil disposal but is also encountered where there is frequent vessel traffic stirring up sediment and reducing light levels in shallow seagrass habitat, such as barges pulling up onto beaches.

42. Implementing Go Slow zones (less than planing speed of 4 knots) for shallow areas within and adjacent to the proposed site of action for all vessels associated with the action, and scheduling vessel movement around low tides, can help to avoid sediment stirring.

43. A combination of monitoring and modelling during any dredging activity should be used to minimise the risk that suspended sediments will cause impacts on any nearby seagrass meadows.
Contamination of water or sediment

44. Discharge of contaminants, either intentionally or unintentionally, may impact the water quality of seagrass habitats or directly affect the health of seagrass. Contaminants (including freshwater) where not managed properly can stress, disturb or kill seagrass populations through changes to nutrient levels, reduced light levels and changes to salinity.

45. In addition to input of new contaminants into the system, contaminants that have already settled into the sediment can re-enter the water column through resuspension caused by dredging, propeller action and vessel movements.

46. Further flow-on effects to species reliant on seagrass as a food source include ingestion of seagrass contaminated with toxic elements and synthetic compounds. For example, polychlorinated dibenzodioxins (PCDDs) reported from tissues of dugongs in Queensland occurred from contaminated sediments and associated seagrass. The long-term effect of such contamination on species is still mostly unknown, as well as to what extent these elements and compounds can impact on human health through consumption of such species is not well known.

47. Individual contaminants should be assessed on a case-by-case basis using scientific research.

48. Where there is a risk of contamination, the activity should implement actions to reduce turbid runoff and polluted water, including buffering storage and processing facilities for waste from impacts of extreme weather, storing clean up equipment and chemicals in locations accessible to the project, and enacting clean-up strategies or pollution management plans for dealing with a water pollution event.

49. A monitoring plan with triggers for management intervention (such as sub lethal limits for seagrass at agreed percentage of reference sites chosen) should be enacted to cover habitats within and adjacent to the action to assess changes water quality at regular intervals during construction and implementation of the activity, and modify actions through adaptive monitoring as required. The monitoring and management plan should use ecologically relevant thresholds of water quality (light/nutrients etc.) and use of sub-lethal tools such as molecular stress assessment or similar to measure stress.

50. Where required, a plume management plan should be implemented to minimise impacts on seagrass. Where seagrasses and seagrass meadows are predicted to be impacted, an adaptive management strategy should be triggered. The strategy should assess changes in integrity or functionality of water and sediment, including the monitoring of agreement between actual plume and modelled plume under a range of conditions.

Direct injury or disturbance of living things, including translocation and Direct death or removal of living things, including vessel strike

51. Any activity that physically touches or uproots the plant from the seafloor can cause direct physical damage or removal of the root system, degrading or destroying seagrass beds and whole meadows. The physical damage might be a destabilisation of the substrate which causes damage or removal of the root system (leaves, stems and roots), smothering of seagrass in sediment, or increased turbidity and sediments in the water column – further affecting light levels for photosynthesis. Actions causing these impacts might include anchoring, propeller scarring, dredging, mooring chains, installing pipes and constructing facilities.

52. Given seagrasses’ high dependence on light, any activity likely to shade seagrass more than temporarily (less than two months) will also reduce the light available for photosynthesis, causing it stress or death. Further direct damage may be associated with such activities due to larger amount of traffic, vessels, and human disturbance on the habitat. An example would be constructing or operating a facility.

53. Accidental or intentional groundings of vessels, barges and ships in shallow areas may also lead to significant damage. Vessels entering these shallows often dig up the seagrass beds as they motor, cutting not only the blades, but more seriously, slashing underground rhizomes and roots as well. Propeller scarring often results in a continuous line of seagrass damage, which acts to fragment the habitat, especially in areas where seagrass coverage is sparse. Seagrasses that remain in fragmented
areas are then susceptible to erosion effects and are more vulnerable to other pressures. Connectivity is also affected.

54. Direct loss or physical damage to seagrass and seagrass meadows also has the potential to impact reliant species through flow-on effects. Impacts of habitat loss and degradation may include alteration of feeding behaviour, or displacement of animals from habitats critical to survival in the search for more abundant nutrient rich seagrass meadows. Animals may become malnourished, resulting in reduced fitness. As a result, their resilience to other pressures (for example declining water quality) and to natural extreme weather events (such as floods and cyclones) can be reduced.

55. Suitable background information on the spatial distribution of seagrass habitats and meadow types should be collected to facilitate appropriate assessment of options to minimise impacts to seagrass. This background mapping should take into account the likely year-to-year changes to seagrasses and should be collected over at least three years. In locations where seagrass impact is unavoidable, consideration of the different types of seagrasses, their relative value and likelihood of recovery should be made in assessing the most favourable options.

56. A monitoring program should be established and maintained by an appropriately qualified person (with seagrass experience) to identify changes to seagrass. Survey and monitoring methods and protocols should follow those laid out in Chartrand 4, 6 and should be commensurate with the potential scale of the impact both in space and time. The program should set triggers for management intervention, such as sub-lethal limits for seagrass at agreed percentage of reference sites. These triggers should be modified in response to monitoring as required.

57. To support the health of all species present, either for the dominant species or as one of a suite of species that are known to occur in the region, general light requirements as set by Chartrand et al 4, 6, 7 should be observed. Locally derived absolute thresholds ideally should be obtained for management of specific activities likely to impact on the light environment.

58. Alternative infrastructure design should be considered that provides the smallest footprint and maximises conservation of seagrass. Moorings should not be located within 10m of seagrass. Where relocation is not possible, swing moorings should be replaced with more environmentally friendly mooring apparatus. Moorings may however mitigate the amount of anchor damage to a site.

59. Where possible, limit physical access to the site to avoid propeller scarring and install moorings to avoid anchor damage. There may be the ability to regrow or recolonise small areas of seagrass following disturbance, so long as the habitat is not so fragmented as to cause die-off.

60. Where seagrass disturbance is temporary, the capacity for seagrasses to recover should be a consideration. Not all seagrass species have the same potential. For example Halophila species can recover rapidly and will often be found colonising disturbed areas such as spoil grounds. Other species once lost will have significantly longer recovery times, if at all.

Permission types

Carrying out works

61. The most likely impacts on seagrass from carrying out works (such as dredging and spoil disposal) are:
   a. direct physical damage or direct death and removal of seagrass beds due to dredging, anchoring systems, destabilisation of substrate or smothering in sediment
   b. potential for increasing turbidity and suspended sediments in the water column, affecting light levels for photosynthesis
   c. potential for changes to hydrodynamics (depth profile, current direction, or current velocity) threatening seagrass habitat.
Operating a facility

62. The most likely impacts on seagrass from operating a facility are:
   a. direct physical damage or direct death from construction activities, shading, reducing light levels for photosynthesis
   b. direct disturbance and physical damage from larger amount of traffic, anchoring and human disturbance
   c. chronic reductions in water quality from continual discharge.

Conducting a tourist program

63. The most likely impacts on seagrass from conducting a tourist program are:
   a. localised physical damage and death due to increased vessel activity leading to damage from propellers, anchors, mooring chains and marine debris
   b. groundings of vessels, barges and ships in shallow areas
   c. propeller scarring that causes fragmentation to the habitat, increasing erosion, vulnerability and destroying connectivity.

Consequence

64. Examples of consequences of impacts to seagrass and seagrass meadows are described in Table 3. The Risk assessment procedure provides more information on how to determine risk and consequence.

65. The much larger allowable change for meadows dominated by pioneering, highly variable species (such as *Halophila*) reflects that these meadows naturally have very large changes from year to year and also are very quick to recover\(^a\). They are also likely to have a much lower biophysical value on a per hectare basis (sparse, low biomass species).

66. A 'local' scale impact is confined to a single bay or reef, generally an area less than 100 square kilometres.

67. A 'regional' scale impact is one which, although it may affect only a single location, has broader implications for seagrass health in the region. Regional impacts may occur when multiple meadows are impacted or where a 'critical meadow' is affected.

68. A 'critical meadow' is one which serves a regional function, for example:
   a. an important source seed bank for other areas
   b. critical habitat for dependent species (dugong, turtle, juvenile fish)
   c. rare or unusual seagrass species or assemblages
   d. genetically isolated, fragmented or subject to other pressures, and therefore more vulnerable to additional impacts.

69. There may also be regionally specific factors that influence the consequence rating, such as in areas recently impacted by extreme weather events, flood plumes or past disturbance.
Table 3. Consequence table for Seagrass values

<table>
<thead>
<tr>
<th>Consequence to value</th>
<th>Degrees of Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive (Enhance)</td>
</tr>
<tr>
<td>Pioneering, highly variable meadows or species (such as <em>Halophila</em>)</td>
<td>All scales: Damaged or degraded seagrass meadow is improved or rehabilitated. Seagrass habitats are identified, managed, monitored, protected and conserved. Water quality is improved to ensure seagrass requirements are being met.</td>
</tr>
</tbody>
</table>

|                      | Local scale: Loss of 20% to 50% of a single meadow, with full recovery likely within 5 years. | Local scale: Loss of 20% to 50% of a single meadow, with full recovery likely within 5 years. | Local scale: Permanent or long-term modification of 50% to 100% of a single seagrass meadow, making it unsuitable for seagrass for more than 10 years. | Local scale: None – Localised seagrass loss (even permanently) is unlikely to result in extreme consequences on the overall value of seagrass, unless the meadow is critical or part of a larger scale, cumulative loss. |

|                      | Regional or widespread scale: Loss of up to 20% of a critical meadow, or of multiple meadows, for up to 1 year. | Regional or widespread scale: Loss of 20% to 50% of a critical meadow, or of multiple meadows, for up to 5 years. | Regional or widespread scale: Loss of more than 50% of a critical meadow, or of multiple meadows, for more than 5 years. | |

|                      | Regional or widespread scale: Loss of more than 50% of a critical meadow, or of multiple meadows, for more than 5 years. | |

|                      | Local scale: None – Localised seagrass loss (even permanently) is unlikely to result in extreme consequences on the overall value of seagrass, unless the meadow is critical or part of a larger scale, cumulative loss. | |

|                      | Regional or widespread scale: Loss of more than 50% of a critical meadow, or of multiple meadows, for more than 5 years. | |
### Consequence to value

**More stable species or meadows (such as shallow *Zostera, Cymodocea, Halodule, Thalassia*)**

<table>
<thead>
<tr>
<th>Degrees of Severity</th>
<th>Positive (Enhance)</th>
<th>Negligible (Maintain)</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All scales:</strong></td>
<td>Damaged or degraded seagrass meadow is improved or rehabilitated.</td>
<td>All scales: No discernible lasting impact on seagrass health.</td>
<td>Local scale: Temporary loss of up to 10% of a local meadow, but no discernible impact on dependent species as other nearby meadows are able to meet their needs. The local meadow is likely to recover within 1 year.</td>
<td>Local scale: Temporary loss of between 10 and 20% of a single seagrass meadow, with full recovery likely within 3 years.</td>
<td>Local scale: Loss of 50% to 100% of a single seagrass meadow, with full recovery likely within 3 years.</td>
<td>Local scale: None – Localised seagrass loss (even permanently) is unlikely to result in extreme consequences on the overall value of seagrass, unless the meadow is critical or part of a larger scale, cumulative loss.</td>
</tr>
<tr>
<td></td>
<td>Seagrass habitats are identified, managed, monitored, protected and conserved.</td>
<td>Local scale: Frequent, small-scale disturbance over a small percentage of the total meadow area (such as boat propeller damage) which results in a small section of the meadow being damaged but does not impair its overall health or ecosystem function.</td>
<td>Regional or widespread scale: Temporary loss of up to 10% of a critical meadow or multiple meadows. Full recovery is likely within 3 years.</td>
<td>Regional or widespread scale: Temporary loss of 10% to 20% of a critical meadow, or of multiple meadows. Full recovery is likely within 3 years.</td>
<td>Regional or widespread scale: Loss of more than 20% of a critical meadow, or of multiple meadows, for more than 5 years. Even if the activity ceases, natural recovery is unlikely within 10 years.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water quality is improved to ensure seagrass requirements are being met</td>
<td>Water quality is improved to ensure seagrass requirements are being met</td>
<td>Regional or widespread scale: No discernible lasting impacts on a critical meadow, or on multiple meadows. Impacts are confined to a single non-critical meadow.</td>
<td>Regional or widespread scale: Temporary loss of 10% to 20% of a critical meadow, or of multiple meadows. Full recovery is likely within 3 years.</td>
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</tbody>
</table>

**NOT GOVERNMENT POLICY – Draft for consultation**
Assessment information

CONSULTATION NOTES:
The draft Checklist of Application Information provides a list of information that is proposed to be required before an application is accepted as valid. Following public consultation, the application forms will be updated to include the required information.

70. Additional information may be required depending on the type of activity. Other examples of information that may be useful and could be requested through a further information request when assessing potential impacts on seagrass includes:
   a. description of any seagrass present (or known in the past 10 years) in the impact area, using locally available information and personal observations
   b. explanation of the possible impacts on seagrass, likelihood, and how these will be avoided or mitigated
   c. explanation of proposed incident response plan and equipment
   d. explanation of proposed waste minimisation and waste management plans.

71. For higher risk or more complex proposals (those requiring public comment), an Environmental Management Plan should be submitted by the applicant with their application. Information useful to this EMP might include:
   a. Bathymetric and topographic surveys before any action is undertaken using at least three (3) years of consecutive data. Surveys should explain the presence/absence of seagrass, extent, cover or biomass, and species composition using methods appropriate to the scale of potential impact and type of seagrass meadows likely to be encountered. Ideally methods should be compatible with previous seagrass assessments conducted at the site or to those at nearby locations to allow historical or regional comparisons. Approaches identified in the Queensland monitoring manual can provide guidance to the design and approach.
   b. Provide a literature review of impacts from similar proposals in similar settings.
   c. Provide an expert analysis to support proposed light trigger values – timing, concentration, light attenuation.
   e. Proposed monitoring program with indicators, thresholds, trigger values and intervention actions. The program should include real-time monitoring (with trigger values) for likely contaminants or nutrients and environmental indicators (such as dissolved oxygen and pH) and cover habitats within and adjacent to the action. The plan should assess changes in integrity or functionality, including monitoring for any unexpected changes. The plan should include a pre-impact background assessment of seagrasses that can account for likely seasonal and inter-annual change. At least three (3) years of background data is required.

72. The following resources may help with an assessment on this value. This list is not exhaustive, and may be added to from time to time.
Tropical Sciences Research Facility. Reef and Rainforest Research Centre Limited, Cairns (55pp.).
g. JCU TropWater research reports: https://research.jcu.edu.au/tropwater/research-programs/seagrass-ecology-1/seagrass-ecology
n. Seagrass Watch monitoring program: http://www.seagrasswatch.org/home.html
p. Biologically Important Areas, Cetacean Sound and Mapping, NOAA. http://cetsound.noaa.gov/important

Implementation
73. These draft guidelines have been prepared for the purpose of seeking public feedback.
74. After the consultation closes, GBMRPA will consider public submissions in finalising the guidelines.
75. The final guidelines are planned for public release in July 2017, to coincide with amendments to the Regulations taking effect.

Definitions
Avoidance measures
Actions that, if implemented, would avoid risk (usually by avoiding exposing a value to a hazard).

Bathymetric survey
A study of the underwater depth of lake or ocean floors.

Consequence
The outcome of an event affecting objectives; to what degree an impact may affect a value of the Marine Park (and, as a result, the objects of the Act). Consequences may be certain or uncertain and can have positive or negative effects on objectives.

Event
A change in situation; something happening or not happening (when it was expected); an incident or occurrence that exposes a value to a hazard

Hazard
A source of potential harm; a situation, action or behaviour that may negatively impact a Marine Park value, whether intentionally or unintentionally; some may be outside the ability of GBRMPA’s permission system to control (such as global greenhouse gas emissions).

Impact
The result or effect that happens when a Marine Park value is exposed to a hazard; may be positive or negative”).

Likelihood
The chance of an event happening; may be determined based on probability or frequency
Marine Park values
The values of the Marine Park as defined in the 5-yearly Outlook Report.

Mitigation measures
Actions that, if implemented, would reduce risk (by reducing the consequence and/or likelihood of impacts).

Objectives
Within the permission system, this means the objects of the Act.

Permission system
The regulated system of managing activities in the Marine Park which require GBRMPA’s permission, accreditation, notification or exemption. Refer to GBRMPA’s Environmental Impact Management Policy: Permission System (Permission System Policy) for more information.

Risk
Defined by the Australia/New Zealand Standard for Risk Management (AS/NZS 31000:2009) as “effect of uncertainty on objectives;” within the permission system, ‘risk’ relates to uncertainty as to whether the objects of the Act can be achieved.

Sensitivity
The degree to which a Marine Park value is responsive to a specific impact.

Severity
How serious a consequence would be if it occurred; the degree of degradation that would occur to the value if that consequence occurred.

Threat
Another term used for ‘hazard’ (see definition of ‘hazard’).

Topographic survey
A study used to identify and map the contours of the ground and existing features on the surface of the earth or slightly above or below the earth’s surface

Turbidity
A measure of the degree to which water loses its transparency due to the presence of suspended particulates. The more total suspended solids in the water, the murkier it seems and the higher the turbidity.

Vulnerability
The degree to which a Marine Park value is susceptible to degradation from impacts. Vulnerability is a function of the value’s exposure, sensitivity and adaptive capacity.

Supporting information


Further information

Director - Environmental Assessment and Protection

Great Barrier Reef Marine Park Authority
2 - 68 Flinders Street
PO Box 1379
Townsville Qld 4810
Australia

Phone + 61 7 4750 0700
Fax + 61 7 4772 6093
Email: consultation@gbrmpa.gov.au

www.gbrmpa.gov.au
APPENDIX A: Related Legislation, Standards and Policy

1. Great Barrier Reef Marine Park Act 1975 (C'th)
2. Marine Park Act 2004 (QLD)
5. Great Barrier Reef Marine Park Zoning Plan 2003 (C'th)
6. Marine Parks (Great Barrier Reef Coast) Zoning Plan 2004 (QLD)
7. Great Barrier Reef Intergovernmental Agreement
8. Environment Protection and Biodiversity Conservation Act 1999
13. Hinchinbrook Plan of Management 2004
15. Shoalwater Bay (Dugong) Plan of Management 1997
17. Privacy Act 1988
18. Native Title Act 1993
20. Great Barrier Reef Region Strategic Assessment Report (the Strategic Assessment)
21. Great Barrier Reef Region Strategic Assessment Program Report (the Program Report)
22. Policy on Moorings in the Great Barrier Reef
23. Cruise Shipping Policy for the Great Barrier Reef Marine Park (under review)
24. Managing Tourism Permissions to Operate in the Great Barrier Reef Marine Park (including Allocation, Latency and Tenure)
27. Managing Scientific Research in the Great Barrier Reef Marine Park
28. Managing Activities that Include the Direct Take of a Protected Species from the Great Barrier Reef Marine Park
30. Dredging and Spoil Disposal Policy
31. Dredging coral reef habitats policy
32. Sewage Discharges from Marine Outfalls to the Great Barrier Reef Marine Park
33. Guidelines on Coral Transplantation
34. Guidelines for the Emergency Disposal of Foreign Fishing Vessels
35. Guidelines for the Management of Artificial Reefs in the Great Barrier Reef Marine Park
36. Guidelines for Managing Visitation to Seabird Breeding Islands
37. Management of Commercial Jet Ski Operations Around Magnetic Island
38. Indigenous Participation in Tourism and its Management