

ASSESSMENT AGAINST THE MCZ SELECTION GUIDELINES

Waterfoot Proposed Marine Conservation Zone (pMCZ)

Subtidal seagrass (*Zostera marina*) beds



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Summary

The assessment against the Marine Conservation Zones (MCZs) selection guidelines in Northern Ireland Inshore Region is a document produced as part of the consultation evidence base, following the OSPAR design principles. This assessment helps to identify Areas of Search (AoS) and determine features proposed for protection within them. It also highlights where additional locations or features are required or when a different size or shape is needed to develop the MPA network.

Following the Guidance on Selection and Designation of MCZs in Northern Ireland Inshore Region the process includes five stages from the identification of the AoS (Stage 1) to the development of the MCZ proposals (Stage 5). Only locations which have passed through all the stages of the assessment are considered for formal designation and inclusion in the MPA network.

This document provides details of the assessment of Waterfoot pMCZ against the selection criteria.

Additional information on Waterfoot pMCZ and proposed features includes:

- Guidance on selection and designation of Marine Conservation Zones (MCZs) in the Northern Ireland Inshore Region
- Justification report for selection of proposed Marine Conservation Zone (pMCZ) features
- Guidance on the development of Conservation Objectives and potential Management Options
- Conservation Objectives and potential Management Options for Waterfoot pMCZ
- Data Confidence Assessment for Waterfoot pMCZ

History of development

The Waterfoot pMCZ is proposed for the protection of the pMCZ habitat Seagrass beds (SG) on subtidal sediments, in this case Subtidal sand (SS). The biotope for this habitat feature is [SS.SMp.SSgr.Zmar](#) (*Zostera marina* beds on infralittoral clean sand or muddy sand).

SG was recorded for the first time in Waterfoot embayment by the Department and National Museums in Northern Ireland Sublittoral Survey (NISS) in 1982 (Erwin *et al.*, 1986) and later through Sublittoral Survey Northern Ireland (SSNI) in 2006 (Goodwin *et al.*, 2011). Further work carried out by Seasearch Northern Ireland collected numerous records of SG in the AoS from different surveys in 2008, 2009 and 2012. Recent survey work completed by the Department (July and August 2015) included underwater video/still images, infaunal grab samples, quantitative data on diving transects using quadrats and Particle Size Analysis (PSA) which validated the SS seabed in the AoS (slightly gravelly sand). A good quality SG bed, distribution limits and patchy coverage was also reported within the pMCZ.

This pMCZ was included in the proposals following a third party nomination by Seasearch ([Seasearch recommendation, 2014](#)). The boundary of the pMCZ was drawn following the

SG extent and distribution in the area. To conserve its integrity and representing the diversity associated with the SG ecosystem, also taking on board information of the uses and activities in the area, the northern boundary line was drawn following the edge of SG records at a depth of 5-7m. For the other boundary lines a rational buffer from the coastline was included to achieve conservation objectives with an efficient management inside the pMCZ. A minimum buffer of 25m was allowed from SG records on the edges. Details on the supporting evidence are provided on the Waterfoot pMCZ data confidence assessment.

Glossary of Terms and Acronyms

AoS –Area of Search used to underpin the proposed Marine Conservation Zone

Conservation objective - A statement of the desired ecological/geological state (quality) of a feature (habitat, species or geological) for which the MCZ is designated

EUNIS –The European nature information system, is a habitat classification system used throughout Europe and covers all types of natural and artificial habitats, both aquatic and terrestrial

MCZ - Marine Conservation Zone used to refer to MCZs designated under section 13 of the Marine Act (Northern Ireland) 2013 in the Northern Ireland inshore region and in section 116 of the Marine and Coastal Access Act 2009 in the Northern Ireland offshore region adjacent to Northern Ireland

MPA - As a generic term Marine Protected Areas are a clearly defined geographical space, recognised, dedicated and managed, through legal or other means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. As a specific term it refers to a national designation in Scotland (equivalent to MCZ)

OSPAR - OSPAR is the mechanism by which fifteen Governments of the western coasts and catchments of Europe, together with the European Union, cooperate to protect the marine environment of the North-East Atlantic

OSPAR T&D - OSPAR List of Threatened and/or Declining Species and Habitats

PMF - Priority Marine Feature - collective term for those features (habitats, species and geological/geomorphological features) which are considered to be of conservation importance in the Northern Ireland inshore region

pMCZ - Proposed Marine Conservation Zone

pMCZ Feature - proposed Marine Conservation Zone features that will underpin the MCZ designation

PSA - Particle Size Analysis

NISS – Northern Ireland Sublittoral Survey

SG – Seagrass (*Zostera marina*) beds

SS – Subtidal (sublittoral) sand

SSNI – Sublittoral Survey Northern Ireland

VMS – Vessel Monitoring System

Waterfoot pMCZ – Application of the MCZ selection guidelines

Stage 1 - Identifying the Area of Search

Summary of assessment	<p>The Waterfoot AoS encompasses the pMCZ feature Subtidal SG (<i>Z. marina</i>), which is currently the largest subtidal SG bed and the best known example in Northern Ireland (Seasearch, 2009). The habitat is described as ‘Uncommon’ in the UK by JNCC (Connor <i>et al.</i>, 2004). SG appears to be in good condition in the AoS and restricted to the small area that is within the proposed boundary. Although the general coverage of the bed is patchy, the bed has good density and coverage ranges between 10-79% in different sites.</p> <p>Waycott <i>et al.</i> (2009) has revealed that seagrass beds are declining worldwide. The pMCZ habitat is on the OSPAR T&D List, and is also a Priority habitat in Northern Ireland (NI Habitat Action Plan, 2003) and in the UK Biodiversity Action Plan (UK BAP, 2008).</p> <p>SG presence is key for the functioning of the ecosystem, related to the habitat and the coastal system as a whole, providing nursery grounds for important commercial fish, shelter, surface attachment, slowing the water circulation, stabilising the sediment and protecting it from wave action, helping to reduce coastal erosion, improving the water quality by helping to reduce the risk of eutrophication (Terrados & Borum, 2004) and also as a source of food and organic matter (Lancaster <i>et al.</i>, 2014). SG is therefore considered of both economic and conservation importance (Davison & Hughes, 1998). SG beds are a carbon store and therefore have an important role in climate change mitigation (Duarte <i>et al.</i>, 2013).</p> <p>This habitat occurs in SS dominated by macrophytes, a broad scale habitat representative of Northern Ireland’s seas more generally.</p>
	Guideline met.

Detailed assessment			
Proposed protected features	Guideline 1a <i>Presence of key features</i>	Guideline 1b <i>Presence of features at threat and/or decline</i>	Guideline 1c <i>Presence of ecological resources/geological processes critical to functioning of the ecosystem</i>
<i>Biodiversity</i>			
Subtidal (sublittoral) sand ¹ (SS): - Seagrass (<i>Z. marina</i>) beds ² (SG)	✓	✓ OSPAR T&D ³	✓

¹ Broad scale habitat. EUNIS Habitat type [A5.2](#) (level 3)

² SS component (subscale) habitat. Biotope - SG (*Zostera marina* beds on infralittoral clean sand or muddy sand) [SS.SMp.SSgr.Zmar](#) – [EUNIS A5.533](#)

³ OSPAR list of Threatened and/or Declining habitat (OSPAR, 2009)

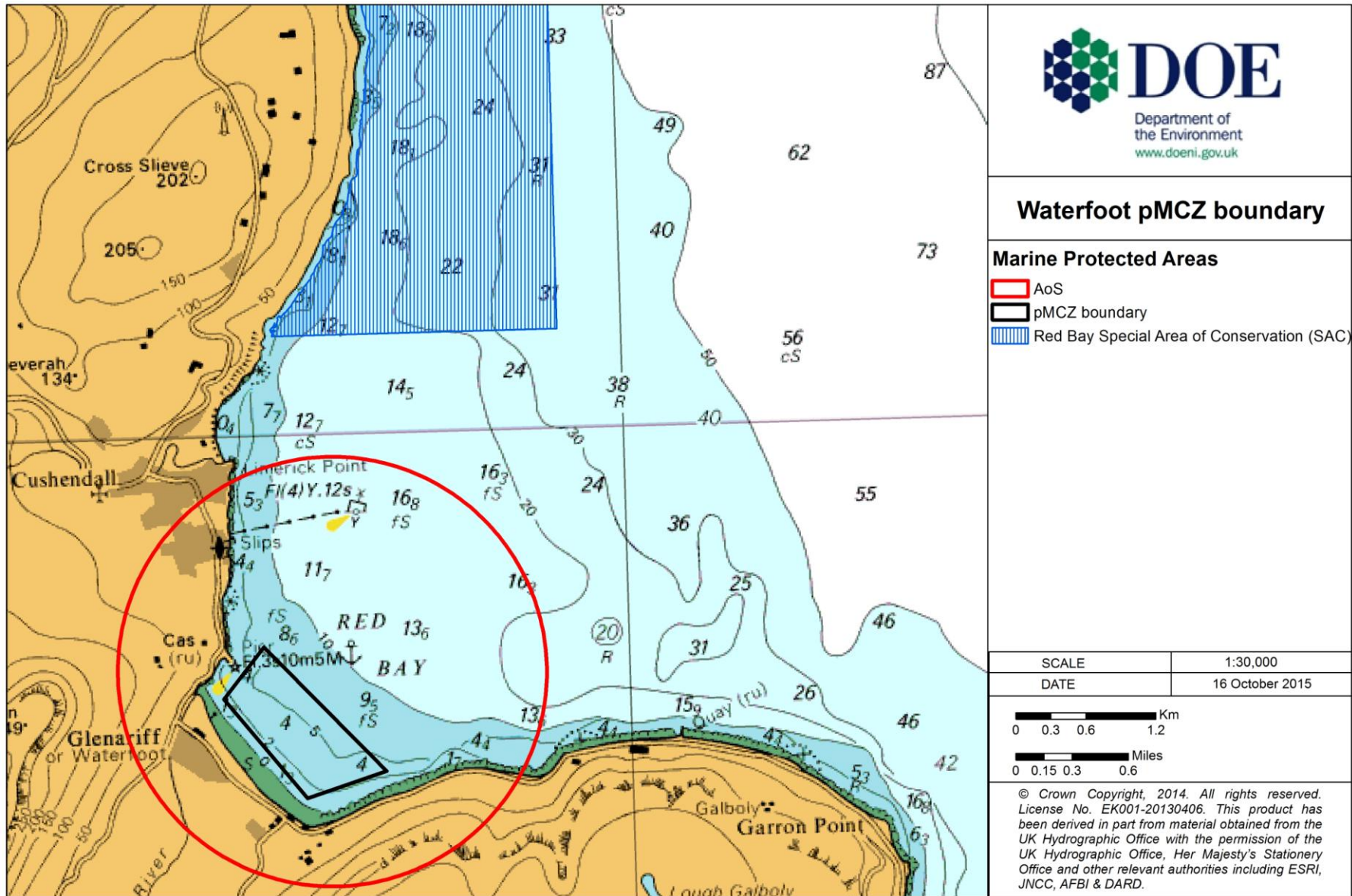


Figure 1 Location of Area of Search and the proposed boundary of Waterfoot pMCZ

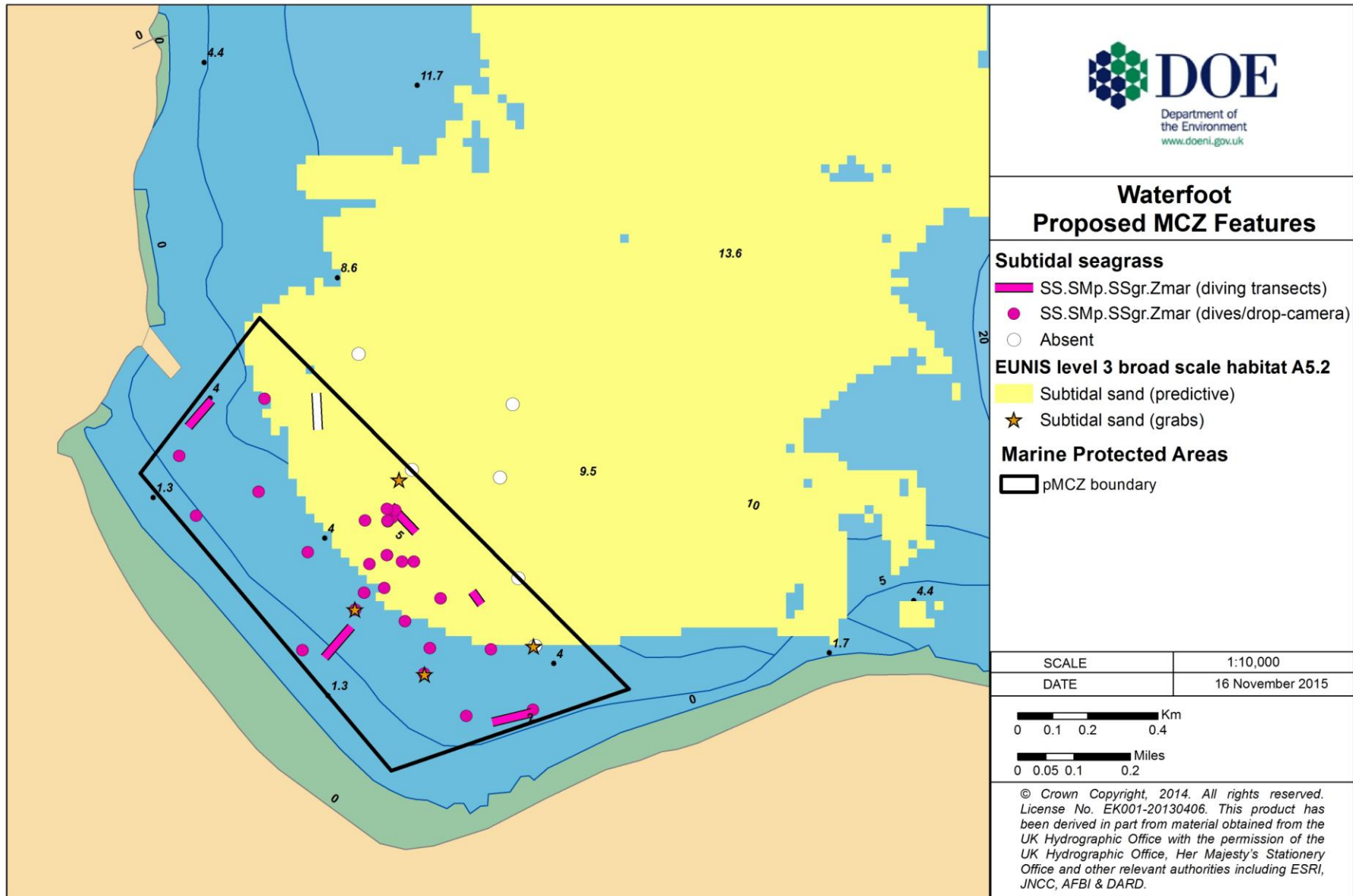


Figure 2 Distribution of the pMCZ features in Waterfoot

Stage 2 - Prioritise the Area of Search based on quality of pMCZ features contained

Summary of assessment	<p>Subtidal (sublittoral) SG beds are naturally diverse habitats, spatially and functionally linked to shallow subtidal coastal ecosystems such as Waterfoot Bay. The slightly gravelly sand seabed in the AoS is inhabited by a patchy but extensive and undisturbed SG bed (<i>Z. marina</i>) that currently represents the best known example and the largest bed in Northern Ireland (Seasearch, 2009; DOE, 2015). Waterfoot Bay is a popular area for recreational activities, but is not heavily impacted by human activity. As a consequence the pMCZ habitat remains in a near natural condition with little or no impact from human pressures. The pMCZ habitat is vulnerable to a range of pressures that occur or may occur in the area associated with moorings and anchoring, creeling and potting, finfish aquaculture farms, discharges, infrastructure development, tourism and recreation and potentially navigational dredging. Therefore the pMCZ feature could be significantly impacted by human activity resulting in a moderate risk of not meeting the conservation objectives if activities increase or new developments occur in the area.</p>
	Five of the six Stage 2 Guidelines have been met (2a-2e).

Detailed assessment

Guideline 2a The Area of Search contains a combination of features especially those that are functionally linked

Seagrass bed on Subtidal (sublittoral) sand	<p>SG meadows are functionally linked to coastal ecosystems (Lancaster <i>et al.</i>, 2014). <i>Z. marina</i> beds are known to occur typically on SS (occasionally with a mixture of gravels) in sheltered bays (OSPAR, 2009). SG forms dense meadows on these subtidal sediments, typically in shallow waters up to a maximum depth of 10m (Davison & Hughes, 1998; James, 2004; OSPAR, 2009). The sheltered SS offer a protective environment for the plants to establish (Tyler-Walters & Wilding, 2008) whilst the SG has a functional significance for the seabed through stabilisation of the sediment with rhizomes. This can act to reduce coastal erosion, may increase the biodiversity by dissipating wave energy and are an important source of organic matter (Lancaster <i>et al.</i>, 2014). The presence of mollusc bivalves in the AoS, such as Ocean quahog (<i>Arctica islandica</i>), is due to the sheltered and stable habitat provided by the SG bed on SS (Tyler-Walters & Wilding, 2008). The pMCZ features also provide shelter, a nursery area for flatfish and cephalopods and a food source for grazing over-wintering wildfowl. Moreover, leaves and rhizomes act as an attachment substrata for epibenthic species (Fletcher <i>et al.</i>, 2012).</p>	
	2a Result	Guideline met.

Guideline 2b The Area of Search contains features with naturally high biodiversity (for habitats only)	
Seagrass bed on Subtidal (sublittoral) sand	<p>Within Waterfoot pMCZ the subtidal sediments are formed by the broad habitat type SS with biotope SS.SSa – EUNIS A5.2. This habitat is characterised by a range of taxa including bivalve molluscs (such as <i>A. islandica</i>, <i>Abra alba</i> or <i>Fabulina fibula</i>) and amphipods (JNCC, 2015). The polychaete <i>Arenicola marina</i> is abundant on the sandy sediment in the pMCZ.</p> <p>This SS also incorporates the biotope: SS.SMp.SSgr.Zmar – EUNIS A5.533 (SG: <i>Zostera marina</i> beds on infralittoral clean sand). In this habitat the community is generally dominated by <i>Z. marina</i> and associated biota (JNCC, 2015).</p> <p>The more sheltered locations (with fine sands) are generally the richest in terms of species abundance and density (Moore <i>et al.</i>, 2004).</p> <p>Cover of SG in the pMCZ is dense in some places, but varies considerably across the bed. The seagrass forms large patches with areas of bare sand or mixed algae in between and attached to the seagrass fronds (including <i>Chorda filum</i>, <i>Porphyra leucosticta</i>, <i>Hypoglossum hypoglossoides</i>, <i>Ulva lactuca</i>, sparse sugar kelp <i>Laminaria saccharina</i> and many others) (Seasearch, 2009). Epiphytes may be a prominent component of seagrass ecosystems when ambient nutrient concentrations are high (OSPAR, 2009). SG beds are an important source of food and shelter for many fish larvae and crustacean species (Davison & Hughes, 1998). Juvenile flatfish and gadoids are abundant and several other fish species including Gurnard, Gobies and Brill are common. Spider crabs such as <i>Maja brachydactyla</i> and <i>Macropodia sp.</i>, Hermit crab <i>Pagurus bernhardus</i> and Littoral crab have been recorded in the pMCZ. Additionally grazers such as gastropods (Common periwinkle <i>Littorina littorea</i>, Grey top shell <i>Gibbula cineraria</i>) are very common on the SG beds. Some cephalopods like Cuttlefish, <i>Sepia officinalis</i>, may lay their eggs on the plants (Tyler-Walters & Wilding, 2008).</p>
2b Result	Guideline met.
Guideline 2c The Area of Search contains coherent features not smaller fragmented ones	
Seagrass bed on Subtidal (sublittoral) sand	<p>Fragmentation is a major cause of SG decline. It is known that <i>Z. marina</i> coverage is highly variable and beds are typically patchy and dynamic (Hill <i>et al.</i>, 2010). Natural disturbance includes waves and currents while they are also heavily impacted by coastal activity (Davison & Hughes, 1998; Reed & Hovel, 2006; OSPAR, 2009). In the UK, typical SG beds range in size from 100m² to a few km² (Foden & Brazier, 2007) while many small patches exist resulting from seed dispersal and seasonal variance.</p> <p>Although there is little information about the spatial and temporal variability of the SG bed in Waterfoot pMCZ, recent evidence collected during the growing season suggests that although patchy, this SG bed is in good condition and contains reproductive plants. Moreover, Waterfoot currently supports the largest subtidal SG bed known in Northern Ireland with average coverage ranging between 10 to 79% (abundances from</p>

Guideline 2c The Area of Search contains coherent features not smaller fragmented ones	
	<p>frequent to abundant on the SACFOR scale (JNCC, 2014)).</p> <p>Additionally, camera and grab sample data in the area confirmed the presence of continuous SS habitat in the area comprising slightly gravelly sand.</p> <p>The pMCZ is considered to be stable and not fragmented and anthropogenic activities may have not affected the suitability of the sediment for SG communities.</p>
2c Result	Guideline not met as this is not applicable.

Guideline 2d The Area of Search contains features considered least damaged/more natural	
Seagrass bed on Subtidal (sublittoral) sand	<p>No indication of change or damage to this pMCZ feature has been reported, or was evident in recent camera and diving surveys performed by the Department (DOE, 2015). The proposed habitat is thought to be in near natural condition within the pMCZ boundary, according to the indicators of naturalness and damage taken from MarLIN sensitivity data (Tyler-Walters & Wilding, 2008; Lancaster <i>et al.</i>, 2014).</p> <p>There is recent fishing Vessel Monitoring System (VMS) data to suggest a small area in the pMCZ may have been dredged or trawled. The area is coincidental with low SG cover and exhibits a generally patchy distribution. This highlights the impact of mobile gear on such sensitive habitats and justifies the management required to prohibit the use of mobile fishing gear within the pMCZ. It is known that SG is highly sensitive to human activity, and although the anthropogenic disturbance in the AoS overall is minimal, anchoring has been suggested to pose a risk to the habitat, and could be linked to the patchiness of the bed by physical disturbance.</p> <p>Recent dives carried out by Seasearch NI confirmed that the SS in the area is in good condition and this was verified by the Department in 2015 through spyball camera footage, diving survey, PSA and side-scan data.</p>
2d Result	Guidelines met.

Guideline 2e The Area of Search contains features at risk⁴ of damage by human activity	
Seagrass bed on Subtidal (sublittoral) sand	<p>SG habitat is highly sensitive and vulnerable to current and future human activity. On the basis of the risk assessment (see Annex A), undertaken at a local level of the Waterfoot AoS, this feature is considered to be at moderate risk of damage associated with anthropogenic activities occurring in the area. This is a result of potential exposure to pressures associated with mooring and anchorage (considered to present a high risk), fishing (dredging, creeling and potting are considered to present a high risk), extraction of sand for navigational purposes (high risk), finfish farms (considered a moderate risk), infrastructure development (considered to be a moderate risk), discharges and waste disposal (moderate risk),</p>

⁴Information on the sensitivity of the proposed biodiversity protected features to pressures and their associated activities was taken from Tillin *et al.* (2010), FEAST (Feature Activity Sensitivity Tool) <http://www.marine.scotland.gov.uk/FEAST/Index.aspx> and more developed sensitivity matrices by JNCC. The degree to which a feature is exposed to activities associated with pressures to which it is sensitive in each AoS/pMCZ region was assessed to provide a qualitative measure of risk. Risk assessments for the various activities were examined to produce an overall qualitative risk assessment by pMCZ region. The conclusions may not reflect the level of risk at the level of the possible pMCZ.

More detailed information on the process can be found on the papers: Guidance on the development of Conservation Objectives and potential Management Options and Waterfoot Conservation Objectives and potential Management Options. The risk assessment for Waterfoot pMCZ is included in the Annex A.

Guideline 2e The Area of Search contains features at risk⁴ of damage by human activity	
	tourism and recreation (moderate risk) and navigation (low risk).
2e Result	Guidelines met.

Guideline 2f The Area of Search contains historic sites which could be restored	
2f Result	Guideline not met as this is not applicable.

Stage 3 - Assess the size of the Area of Search to ensure this is sufficient to maintain the integrity of features protected

Summary of assessment	The pMCZ reflects the distribution of the SG bed in Waterfoot Bay and the range of SS sediment suitable for colonisation by the main habitat component species. The proposed boundary is suitable for maintaining the integrity of the habitat feature for which the MCZ is being considered.
	Guideline met.

Detailed assessment

The size of the area of search should be adapted where necessary to ensure it is suitable for maintaining the integrity of the features for which the MCZ is being considered. Account should also be taken where relevant, of the need for effective management of relevant activities

Seagrass bed on Subtidal (sublittoral) sand	<p>The Waterfoot pMCZ boundary was drawn around all the <i>Z. marina</i> records in the bay to ensure the integrity of the entire Subtidal SG bed on the SS. The depth limit of <i>Z. marina</i> distribution (4-10m) was taken into account on the outer boundary. SG extends right up to the harbour in Waterfoot. Moreover, a buffer of 25m of sediment on the coastal sides was allowed for potential further colonisation (by rhizome extension or reproductive expansion), recovery from disturbance and changes on size and/or position of the meadows between years (Frederiksen <i>et al.</i>, 2004; Terrados & Borum, 2004).</p> <p>Furthermore, relevant activities occurring in the area were considered during the setting of the boundary size and shape, aiming for effective management within the proposed boundary.</p> <p>The proposed boundary incorporates a representative range of SS supporting individual SG meadows. The area of SS in the AoS has been verified by grab samples and PSA analysis, predicted habitat models and biotope assignment from photographic/video images.</p>
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Stage 4 - Assess the effectiveness of managing features within the proposed Area of Search

Summary of assessment	There is potential for management measures to be implemented successfully to achieve the conservation objectives of the pMCZ feature.
	Guideline met. As a result the original AoS and subsequent pMCZ progresses as potential area for MCZ to Stage 5.

Detailed assessment

There is a high probability that management measures, and the ability to implement them, will deliver the objectives of the MCZ

Seagrass bed on Subtidal (sublittoral) sand	<p>The conservation objective for the Waterfoot pMCZ habitat is to '<i>maintain the feature in favourable condition</i>'. The current available evidence indicates that the SG bed is in near natural condition within the pMCZ (see 2c&d); however, there are a number of activities (present and future) that are capable of adversely affecting the proposed feature and therefore there is a need to consider whether additional management is required. This will aid in the achievement of the conservation objectives for the pMCZ feature (see 2e).</p> <p>There are several management options to support the conservation of the feature in the Waterfoot pMCZ, such as implementing fisheries restrictions (DARD), licensing procedures with Environmental Impact Assessment (EIA) for future developments or activities (the Department), and assessments for new moorings or potentially creating a visitor mooring area. Under the Marine Act (Northern Ireland) 2013 the Department also has powers to introduce bye-laws or enforce activities if required. Promoting awareness of the importance of SG beds and implementing codes of conduct could reduce small-scale disturbances and minimise trampling and anchor damage.</p> <p>Potential management options for the pMCZ feature are provided in detail in the Waterfoot pMCZ Conservation Objectives and Potential Management Options paper.</p>
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Stage 5 - Assess the ecological coherence to prioritise between different areas based on the contribution to the MPA network

Summary of assessment	The pMCZ makes a contribution to the MPA network for the OSPAR T&D habitat Subtidal SG beds in OSPAR Region III. Also, this is the only pMCZ put forward for Subtidal SG as it is the best known example in Northern Ireland and contributes to the replication and connectivity with other SG beds within MPAs in the British Isles. The site also makes a contribution towards the MPA network for the broad scale habitat SS in OSPAR Region III.
	Guideline met.

Detailed assessment

The potential area contributes significantly to the coherence of the MPA network in the seas around Northern Ireland

Feature	Representation	Replication	Adequacy
Seagrass bed on Subtidal (sublittoral) sand	<p>In the UK and Ireland, SG beds are restricted to sheltered sea loughs, bays and inlets with uncontaminated water (Lancaster <i>et al.</i>, 2014). SG habitat is described as uncommon in the UK (Connor <i>et al.</i>, 2004)</p> <p>The AoS is a stronghold for this habitat feature as it contains the largest bed of Subtidal SG and the best known example in Northern Ireland (Seasearch, 2014).</p> <p>This habitat is on the OSPAR T&D List, the UK Biodiversity Action Plan (UK BAP, 2008) and is also a Priority habitat in Northern Ireland (NI Habitat Action Plan, 2003). SG beds are considered key for conservation due to their ecological</p>	<p>There is replication of this feature within the existing MPA network in Northern Ireland. Subtidal SG is a protected MCZ feature in Strangford Lough MCZ and a few small beds occur in existing SACs such as Rathlin Island SAC.</p> <p>There is also replication within the wider UK MPA network.</p> <p>The SS protected within this pMCZ will contribute towards replication of this feature within OSPAR Region III. The feature also contributes towards replication within NI waters as it is a proposed feature for Outer Belfast Lough pMCZ.</p>	<p>The whole SG bed is included in the pMCZ boundary. For Subtidal SG habitat, adequacy is best achieved by meeting viability, replication and connectivity principles (Natural England & JNCC, 2010).</p> <p>An area of SS within the bay is included in the pMCZ. For SS adequacy, a minimum proportion target of 15% is suggested to support the network of MPAs (A5.2) (Natural England & JNCC, 2010).</p> <p>At present, the estimated area of SS in Northern Ireland is 1643.3km² while 167km² of this total area is currently protected within the existing MPA network. Therefore a current proportion of 10.16% is</p>

	<p>significance (OSPAR, 2008; Barnard <i>et al.</i> 2014).</p> <p>SS sediments with fine gravels are a key broadscale habitat supporting the species <i>Z. marina</i> and associated communities. These two features are considered to be functionally linked as SG beds stabilises sediments and provides a food source for waterfowl (Davison & Hugh, 1998).</p>		<p>protected within Northern Ireland's MPAs. The addition of the pMCZ (0.788km²) would increase this area to 167.788km², and the proportion of SS protected to 10.21% (Barnard <i>et al.</i> 2014)</p>
	Viability	Connectivity	Management
	<p>Individual SG plants have a small home range of a few cm² but the clone complex, interconnected by a subterranean network of rhizomes can extend to many metres (Hill <i>et al.</i>, 2010). They also have the potential to disperse over large distances (up to 60km) through seed dispersal and so large areas (2827km²) would be required to protect the whole life-cycle (Hill <i>et al.</i>, 2010).</p> <p>JNCC guidance suggests a minimum viable patch diameter of 0.5km</p>	<p>Not applicable⁵.</p> <p><i>Z. marina</i> maximum dispersal distance is 60km (Hill <i>et al.</i>, 2010). There is, therefore, a possible connectivity with Scottish MPA network on the West coast for SG within this distance.</p>	<p>There is potential for management measures to be implemented successfully to achieve the conservation objectives of the pMCZ feature through fisheries management measures, licensing activities (through by-laws) and education.</p>

⁵ Connectivity between different regional networks and individual MPAs has only been assessed for some mobile species and large scale features. There is currently little evidence on linkages for low mobility species and sea-bed habitats in UK waters. More modelling work for assessing linkages is needed.

	<p>(Natural England & JNCC, 2010). An area of 188m² is thought to be appropriate to protect the genetic viability of most species in this habitat. Additionally, it is recommended that where the feature occurs in a restricted location protection of the whole patch is required to meet viability criteria (Hill <i>et al.</i>, 2010).</p> <p>The pMCZ boundary covers the whole SG bed extension with an area of 788m². The minimum diameter in the pMCZ is 0.53km. Therefore the proposed boundary is thought to be adequate for viability of the proposed habitat.</p>		
	<p>Best available evidence</p>	<p>Economic, cultural and social issues</p>	
	<p>Best available evidence has been used to arrive at the decision regarding the feature and boundary development. Refer to the Data confidence assessment for Waterfoot pMCZ for further details.</p>	<p>For further details see Waterfoot pMCZ Conservation Objectives and potential Management Options paper and the Regulatory Impact Assessment (RIA).</p>	

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Annex A

Sensitivity, exposure and vulnerability Matrix for Waterfoot pMCZ

Sensitivity and Exposure Key: ●●● High ●● Moderate ● Low ○ Not sensitive ? No information

Vulnerability Key: High vulnerability Moderate vulnerability Low vulnerability No vulnerability Unknown

Table 1: Subtidal (sublittoral) sand (SS): Seagrass bed (SG) Vulnerability Assessment

Pressure category	Pressures	Activities associated in the area	SS: SG		
			Sensitivity	Exposure	Vulnerability
Physical Loss	Physical loss	Infrastructure – coastal defence & land claim	●●●	●	Moderate Vulnerability
		Physical change (to another seabed type)	Infrastructure – pier, pipelines, coastal defence & land claim		●
	Fishing – scallop dredging			●●●	High Vulnerability
	Aquaculture – finfish		●●	●	Low Vulnerability
	Discharges/waste disposal – waste water treatment plant & outfalls			●●	Moderate Vulnerability
	Extraction – maintenance dredging		●●	Moderate Vulnerability	
Physical Damage	Siltation rate changes (low)	Extraction – maintenance dredging		●●	High Vulnerability
		Discharges/waste disposal – waste water treatment	●●●	●●	High Vulnerability

	plant & outfalls			
Siltation rate changes (high)	Extraction – maintenance dredging		••	High Vulnerability
	Discharges/waste disposal – waste water treatment plant & outfalls	•••	••	High Vulnerability
Sub-surface abrasion/ penetration: damage to seabed surface and penetration ≤25mm	Infrastructure – harbour, pipelines, coastal defence & land claim		•	Moderate Vulnerability
	Extraction – maintenance dredging	•••	••	High Vulnerability
	Marine traffic – moorings, anchoring & navigation (jet-ski/powerboat)		••	High Vulnerability
Surface abrasion: damage to seabed surface features	Fishing – scallop dredging, creeling & potting		••	Moderate Vulnerability
	Aquaculture – finfish		•	Low Vulnerability
	Marine traffic – moorings, anchoring & navigation (jet-ski/powerboat)	••	••	Moderate Vulnerability
	Tourism & recreation		••	Moderate Vulnerability
Physical removal (extraction of substratum)	Infrastructure – pipelines	•••	•	Moderate Vulnerability
	Extraction – maintenance		••	High Vulnerability

		dredging			
	Barrier to species movement (behaviour, reproduction)			○	No Vulnerability
	Death or injury by collision			○	No Vulnerability
Non-physical disturbance & Climate change	Litter		?		Unknown
	Introduction of light		?		Unknown
	Electromagnetic changes		○		No Vulnerability
	Underwater noise		○		No Vulnerability
	Visual disturbance (behaviour)		○		No Vulnerability
	Temperature changes - regional/national		●●	?	Unknown
	Temperature changes - local		○		Unknown
	Atmospheric climate change		●●	?	Unknown
	Emergence regime changes (sea level) - regional/national	Marine traffic – navigation	●●●	?	
	Emergence regime changes - local	Infrastructure – pier, pipelines, coastal defence & land claim	●●	?	
	Water flow (tidal & ocean current) changes - regional/national	Marine traffic – navigation	●●	?	Unknown
	Wave exposure changes - regional/national	Marine traffic – navigation	●●	?	Unknown
	Water flow (tidal current) changes -	Extraction – maintenance	●●	●●	Moderate

	local	dredging			Vulnerability
		Infrastructure – harbour, pipelines, coastal defence & land claim		•	Low Vulnerability
		Aquaculture – finfish		•	Low Vulnerability
	Wave exposure changes - local	Extraction – maintenance dredging		••	Moderate Vulnerability
		Infrastructure – pier, pipelines, coastal defence & land claim	••	•	Low Vulnerability
		Aquaculture – finfish		•	Low Vulnerability
Toxic Contamination	Introduction of other substances (solid, liquid or gas)		?		Unknown
	Non-synthetic compound contamination (inc. heavy metals, hydrocarbons, produced water)		○		No Vulnerability
	Synthetic compound contamination (inc. pesticides, antifoulants, pharmaceuticals)		○		No Vulnerability
	Radionuclide contamination		○		No Vulnerability
Non-toxic Contamination	Organic enrichment	Aquaculture – finfish	••	•	Low Vulnerability
		Discharges/waste disposal –		••	Moderate Vulnerability

		waste water treatment plant & outfalls			
	Salinity changes - local	Infrastructure – coastal defence & land claim	●●	●	Low Vulnerability
	Salinity changes - regional/national		○		No Vulnerability
	pH changes		?		Unknown
	De-oxygenation		○		No Vulnerability
	Nitrogen & phosphorus enrichment	Aquaculture – finfish		●	Low Vulnerability
		Discharges/waste disposal – waste water treatment plant & outfalls	●●	●●	Moderate Vulnerability
	Water clarity changes	Extraction – maintenance dredging		●●	High Vulnerability
		Infrastructure – pier, pipelines, coastal defence & land claim	●●●	●	Moderate Vulnerability
Biological Disturbance	Removal of target species (lethal)		○		No Vulnerability
	Removal of non-target species (lethal)	Fishing – scallop dredging, creeling & potting		●●	High Vulnerability
		Tourism & recreation – recreational fishing, diving other causes	●●●	●	Moderate Vulnerability
	Genetic modification & translocation of indigenous			○	No Vulnerability

	species				
	Introduction of microbial pathogens (disease)		○		No Vulnerability
	Introduction or spread of non-indigenous species & translocations (competition)	Aquaculture – finfish		●	Low Vulnerability
		Marine traffic – moorings, anchoring & navigation	●●●	●●	High Vulnerability

Risk of Damage Assessment for Waterfoot pMCZ

Risk Key: ■ High risk ■ Moderate risk ■ Low risk

Table 2: Subtidal (sublittoral) sand (SS): Seagrass bed (SG) Risk of Damage Matrix (based on Vulnerability identified in Table 1).

SS:SG							
List of pressures which may cause deterioration or disturbance		Activity associated with pressure	Vulnerability	Is the current management adequate?*	Comments	Level of Risk	Action Advised
Physical loss	Physical loss	Infrastructure – coastal defence & land claim	Moderate Vulnerability	Yes	New developments require future management action (licensing/permits).	Low	- Reduce or limit new coastal defences or expansion
	Physical change (to another seabed type)	Infrastructure – pier, pipelines, coastal defence & land claim	Low Vulnerability	Yes	New developments require future action (licensing/permits).	Low	- Remove or avoid new developments - Reduce or limit new coastal defences or expansion
		Fishing – scallop dredging	High Vulnerability	No	No site specific management of this activity in place.	High	- Remove or avoid mobile gear fishing inside the pMCZ

* This does not refer to any future activities or situations where active management is not required *Assessment against the MCZ*

		Aquaculture – finfish	Low Vulnerability	Yes	This is a licensed farm in a high energy site however, new applications require future action (licensing/permits).	Moderate	- Reduce or limit new finfish farms or expansion/relocation of the existing ones where they are likely to impact the pMCZ features.
		Discharges/waste disposal – waste water treatment plant & outfalls	Moderate Vulnerability	Yes	New developments require future management action (licensing/permits which should ensure the pMCZ features are not impacted.	Moderate	- Remove or avoid new waste water discharges and dredge disposal and expansion or relocation of existing disposal activities
		Extraction – maintenance dredging	Moderate Vulnerability	Yes	New developments require future management action (licensing/permits which should ensure the pMCZ features are not impacted.	Low	- Remove or avoid new extraction activities where they are likely to impact the pMCZ features
Physical damage	Siltation rate changes (low)	Extraction – maintenance	High Vulnerability	Yes	New developments require future	Moderate	- Remove or avoid new extraction

		dredging			management action (licensing/permits which should ensure the pMCZ features are not impacted.		activities where they are likely to impact the pMCZ features
		Discharges/waste disposal – waste water treatment plant & outfalls	High Vulnerability	Yes	New developments require future management action (licensing/permits which should ensure the pMCZ features are not impacted.	Moderate	- Remove or avoid new waste water discharges and dredge disposal and expansion or relocation of existing disposal activities
	Siltation rate changes (High)	Extraction – maintenance dredging	High Vulnerability	Yes	New developments require future management action (licensing/permits which should ensure the pMCZ features are not impacted.	Moderate	- Remove or avoid new extraction activities where they are likely to impact the pMCZ features
		Discharges/waste disposal – waste water treatment plant & outfalls	High Vulnerability	Yes	New developments require future management action (licensing/permits	Moderate	- Remove or avoid new waste water discharges and dredge disposal and expansion or

					which should ensure the pMCZ features are not impacted.		relocation of existing disposal activities
	Sub-surface abrasion/penetration: damage to seabed surface and penetration ≤25mm	Infrastructure – pier, pipelines, coastal defence & land claim	Moderate Vulnerability	Yes	New developments require future management action (licensing/permits which should ensure the pMCZ features are not impacted.	Low	- Remove or avoid new developments where they are likely to impact the pMCZ features
		Extraction – maintenance dredging	High Vulnerability	Yes	New developments require future management action (licensing/permits which should ensure the pMCZ features are not impacted.	Moderate	- Remove or avoid new extraction activities where they are likely to impact the pMCZ features
		Marine traffic – moorings, anchoring & navigation (jet-ski/powerboat)	High Vulnerability	No	No site specific management of this activity in place.	High	- Remove or avoid anchoring inside the pMCZ
	Surface abrasion: damage to seabed	Fishing – scallop dredging,	Moderate Vulnerability	No	No site specific management of	High	- Remove or avoid mobile gear fishing

	surface features	creeling & potting			this activity in place.		inside the pMCZ Reduce or limit static gear fishing inside the pMCZ
		Aquaculture – finfish	Low Vulnerability	Yes	This is a licensed farm in a high energy site however, new applications require future action (licensing/permits).	Moderate	- Reduce or limit new finfish farms or expansion/relocation of the existing ones where they are likely to impact the pMCZ features.
		Marine traffic – moorings, anchoring & navigation (jet-ski/powerboat)	Moderate Vulnerability	No	No site specific management of this activity in place.	Moderate	- Remove or avoid anchoring inside the pMCZ
		Tourism & recreation	Moderate Vulnerability	No	No site specific management of these activities in place.	Moderate	- Remove or avoid anchoring inside the pMCZ
		Physical removal (extraction of substratum)					
		Infrastructure – pipes	Moderate Vulnerability	Yes	New developments require future action (licensing/permits).	Low	- Remove or avoid new pipelines
		Extraction – maintenance	High Vulnerability	Yes	New applications require future	Moderate	- Remove or avoid new extraction


		dredging			action (licensing/permits).		activities where they are likely to impact the pMCZ features
Non-physical disturbance & Climate change	Water flow (tidal current) changes - local	Extraction – maintenance dredging	Moderate Vulnerability	Yes	New applications require future action (licensing/permits).	Low	- Remove or avoid new extraction activities where they are likely to impact the pMCZ features
		Infrastructure – harbour, pipelines, coastal defence & land claim	Low Vulnerability	Yes	New developments require future action (licensing/permits).	Low	-Remove or avoid new developments where they are likely to impact the pMCZ features
		Aquaculture – finfish	Low Vulnerability	Yes	This is a licensed farm in a high energy site however, new applications require future action (licensing/permits).	Moderate	- Reduce or limit new finfish farms or expansion/relocation of the existing ones where they are likely to impact the pMCZ features.
	Wave exposure changes - local	Extraction – maintenance dredging	Moderate Vulnerability	Yes	New applications require future action (licensing/permits).	Low	- Remove or avoid new extraction activities where they are likely to impact the pMCZ features
		Infrastructure – harbour, pipelines, coastal	Low Vulnerability	Yes	New developments require future action	Low	-Remove or avoid new developments where they are likely

		defence & land claim			(licensing/permits).		to impact the pMCZ features
		Aquaculture – finfish	Low Vulnerability	Yes	This is a licensed farm in a high energy site however, new applications require future action (licensing/permits).	Low	- Reduce or limit new finfish farms or expansion/relocation of the existing ones where they are likely to impact the pMCZ features.
Non-toxic Contamination	Organic enrichment	Aquaculture – finfish	Low Vulnerability	Yes	This is a licensed farm in a high energy site however, new applications require future action (licensing/permits).	Low	- Reduce or limit new finfish farms or expansion/relocation of the existing ones where they are likely to impact the pMCZ features.
		Discharges/waste disposal – waste water treatment plant & outfalls	Low Vulnerability	Yes	New developments require future management action (licensing/permits).	Low	- Remove or avoid new waste water discharges and dredge disposal and expansion or relocation of existing disposal activities
	Salinity changes - local	Infrastructure – coastal defence & land claim	Low Vulnerability	Yes	The pMCZ is located in open water with strong tidal flow; salinity changes are highly	Low	-Remove or avoid new developments where they are likely to impact the pMCZ

					unlikely to occur.		features
		Nitrogen & phosphorus enrichment	Aquaculture – finfish	Low Vulnerability	Yes	This is a licensed farm in a high energy site however, new applications require future action (licensing/permits).	Low
	Discharges/waste disposal – waste water treatment plant & outfalls		Moderate Vulnerability	Yes	New developments require future management action (licensing/permits).	Low	- Remove or avoid new waste water discharges and dredge disposal and expansion or relocation of existing disposal activities
	Water clarity changes	Extraction – maintenance dredging	High Vulnerability	Yes	New applications require future action (licensing/permits).	Moderate	- Remove or avoid new extraction activities where they are likely to impact the pMCZ features
		Infrastructure – pier, pipelines, coastal defence & land claim	Moderate Vulnerability	Yes	New developments require future action (licensing/permits).	Low	Remove or avoid new developments where they are likely to impact the pMCZ features - Reduce or limit new coastal

							defences or expansion
Biological disturbance	Removal of non-target species (lethal)	Fishing – scallop dredging, creeling & potting	High Vulnerability	No	No site specific management of this activity in place.	High	- Remove or avoid mobile gear fishing inside the pMCZ - Reduce or limit static gear fishing inside the pMCZ
		Tourism & recreation – recreational fishing, diving	Moderate Vulnerability	No	No site specific management of these activities in place.	Moderate	- Reduce or limit tourism & recreation pressures where they are likely to impact the pMCZ features - Remove or avoid anchoring inside the pMCZ
	Introduction or spread of non-indigenous species & translocations (competition)	Aquaculture – finfish	Moderate Vulnerability	Yes	This is a licensed farm in a high energy site however, new applications require future action (licensing/permits).	Low	- Reduce or limit new finfish farms or expansion/relocation of the existing ones where they are likely to impact the pMCZ features.

		Marine traffic – moorings, anchoring & navigation	High Vulnerability	No	No site specific management of this activity in place.	High	- Remove or avoid anchoring inside the pMCZ
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Photos represent Priority Marine Features found
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