

Neart na Gaoithe Proposed Offshore Wind Farm

Preliminary Assessment
of Coarse Sediment
Benthic Habitats

Neart na Gaoithe Offshore Wind Farm.

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Document Release and Authorisation Record			
Job No:	J/1/03/1665	Version: 1	
Report No:		Status: Draft	
Date:	July 2011		
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1. Introduction

Following award of exclusive rights to develop the Neart na Gaoithe offshore wind farm, Mainstream commissioned EMU Limited (EMU) to conduct seabed characterisation surveys to inform the Environmental Statement (ES) associated with the development consent application. This document describes areas of coarse seabed sediments found during the benthic ecological characterisation survey and requests regulator advice on the potential nature conservation importance of these sediments.

Very coarse sediment benthic habitats can fall under the definition of geogenic 'reef' habitat defined by the EC Habitats Directive (92/43/EEC). Various interpretations of geogenic or stony reef currently exist, although consensus on common physical and biological criteria is being reached (e.g. Johnston, 2002; Irving, 2009; Limpenny *et al.*, 2010; Houghton *et al.*, 2011).

This short report presents the results of field observations and a preliminary assessment of coarse sediment benthic habitats recently identified as part of wider environmental impact assessment (EIA) investigations within the Neart na Gaoithe offshore wind farm development area (Figures 1 & 2). It compares field observations against current 'reef' criteria (see section 2 below) to assess resemblance to geogenic or stony reef.

The aim of this document is to draw regulatory opinion on the relative nature conservation value of these coarse sediment habitats. This is to inform the EIA process so that the significance of any impact of the wind farm aligns with regulator expectations. Seabed photographs, video review and species data are presented here to help inform judgement on feature status and value.

Statutory comment is now invited as to the value of these coarse sediment habitats and resemblance to geogenic or stony reef. This comment and guidance will be used to develop the wind farm impact assessment including assessment of effects on significant features, if deemed present.

2. Definition of Geogenic or Stony Reef

Reefs are listed under Annex I of the Habitats Directive. The definition has been subject to modification since adoption of the Directive with the most recent interpretation provided by the European Union in 2007 (CEC, 2007) as follows;

*“Reefs can be either biogenic concretions or of **geogenic** origin. They are hard compact substrata on solid and soft bottoms, which arise from the sea floor in the sublittoral and littoral zone. Reefs may support a zonation of benthic communities of algae and animal species as well as concretions and corallogenic concretions.”*

With regard to geogenic reef, the EU revised interpretation manual (CEC, 2007) provides the following clarification:

- Geogenic origin means reefs formed by non biogenic substrata;
- Hard compact substrata are rocks (including soft rock, e.g. chalk), boulders and cobbles (generally > 64 mm in diameter);
- Arise from the seafloor means the reef is topographically distinct from the surrounding seafloor; and
- Sublittoral and littoral zone means the reefs may extend from the sublittoral uninterrupted into the intertidal (littoral) zone or may only occur in the sublittoral zone, including deep water areas such as the bathyal. Such hard substrata that are covered by a thin and mobile veneer of sediment are classed as reefs if the associated biota is dependent on the hard substratum rather than the overlying sediment. Where an uninterrupted zonation of sublittoral and littoral communities exists, the integrity of the ecological unit should be respected in the selection of sites. A variety of subtidal topographic features are included in this habitat complex such as: Hydrothermal vent habitats, sea mounts, vertical rock walls, horizontal ledges, overhangs, pinnacles, gullies, ridges, sloping or flat bed rock, broken rock and boulder and cobble fields.

Additional clarification of ‘stony reef’ under the Habitats Directive was attempted during an inter-agency workshop and subsequent discussions in 2008 (Irving, 2009). Several key parameters of ‘reefiness’ were proposed including:

- Physical composition – > 10% of the seabed substratum should be composed of particles greater than 64 mm across, i.e. cobbles and boulders. The remaining supporting ‘matrix’ could be of smaller sized material;
- Biological cover – greater the dominance of epifaunal species indicating greater likelihood of an area of habitat being categorised as stony reef;
- Elevation – revert to Habitats Directive’s Interpretation Manual to include areas that ‘arise from the seafloor’ (i.e. are topographically distinct from the surrounding sea floor);
- Extent – minimum area which could be considered as stony reef is 25 m²; and
- Quality – including its structure and function i.e. as a refuge or shelter for mobile fauna such as crustaceans and fish.

In conclusion, the workshop developed a table summarising the main characterising features of the stony reef (see Table 2.1).



Characteristic	Not a 'stony reef'	'Resemblance' to being a 'stony reef'		
		Low	Medium	High
Composition:	<10%	10-40% Matrix supported	40-95%	>95% Clast supported
<i>Notes: Diameter of cobbles / boulders being greater than 64 mm. Percentage cover relates to a minimum area of 25 m². This 'composition' characteristic also includes 'patchiness'.</i>				
Elevation	Flat seabed	<64mm	64mm-5m	>5m
<i>Notes: Minimum height (64 mm) relates to minimum size of constituent cobbles. This characteristic could also include 'distinctness' from the surrounding seabed. Note that two units (mm and m) are used here.</i>				
Extent:	<25 m²	>25 m²		
Biota:	Dominated by infaunal species			>80% of species present composed of epifaunal species

Table 2.1. The main characterising features of a stony reef (source: Irving, 2009).

Using these criteria, current survey data obtained within the Neart na Gaoithe Wind farm survey array were compared for assessment of the presence of no, low, medium and high resemblance to a stony reef.

3. Results

Grab and video surveillance data covering areas of high reflexivity and elevation (see Figure 3.1) were selected for assessment of seabed resemblance to Annex I “reef” criteria. Data from a total of 19 stations were selected (see Appendix A) of which 13 had associated grab sample data. No grab sample data were available for the remaining six stations because of the hard nature of the seabed at these locations which was not amenable to sampling.

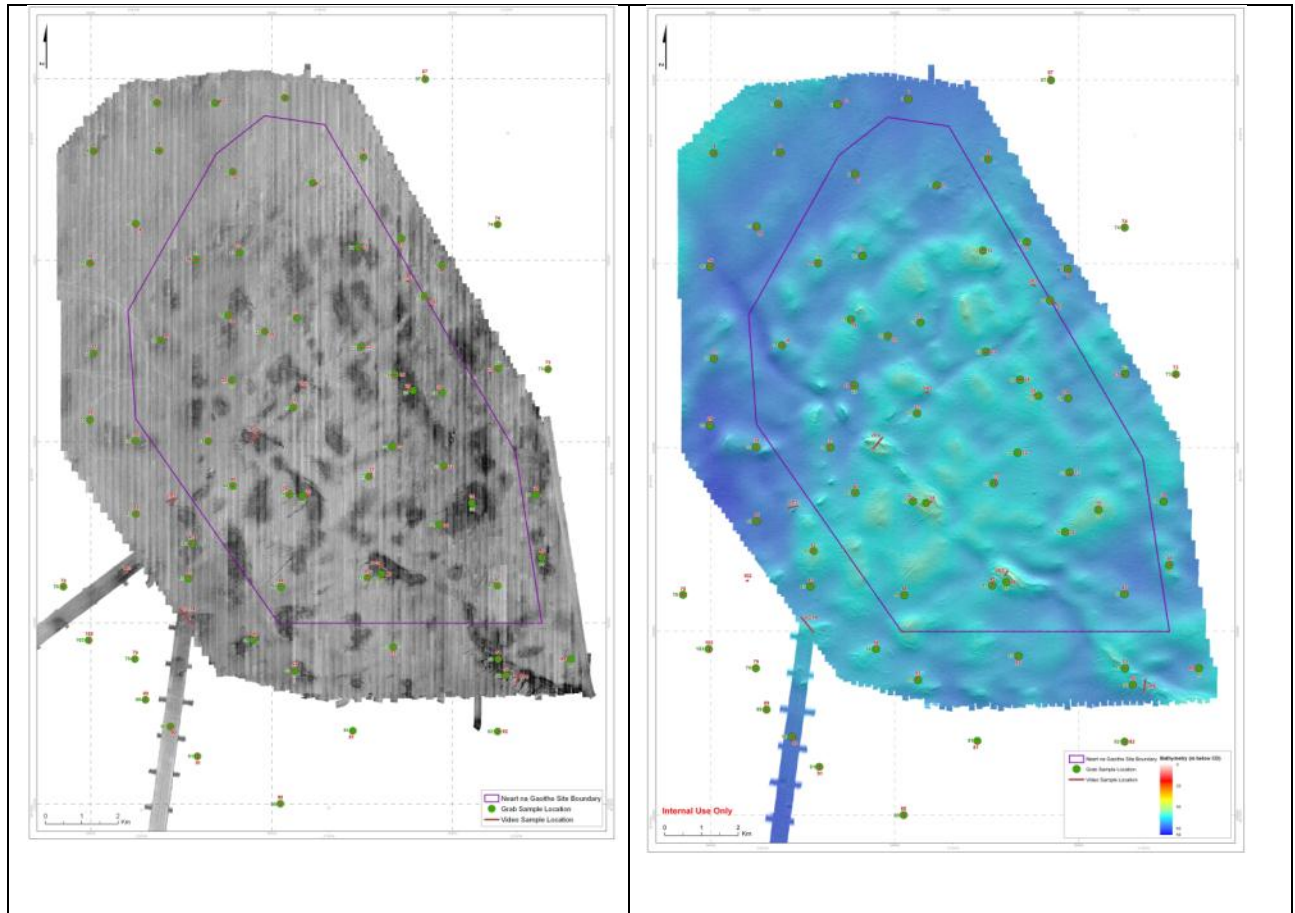


Figure 3.1. Neart na Gaoithe proposed offshore wind farm site side scan sonar mosaic and seabed bathymetry.

Table 3.1 presents deck photographs of grab samples collected at sampled locations together with summary sediment particle size distribution (PSD) data and summary species data (where available). Table 3.2 presents the results of seabed video review and shows the percentage cobble and boulder composition of the substrate, substrate description, conspicuous fauna and representative seabed photograph for each location. Appendix B shows additional seabed photos for each location.





Station	Deck photo of grab sample	Grab data										
14	 A photograph of a grab sample container for station 14. The container is dark and filled with sediment. A white label is attached to the top left, containing the following text: 'Nearit na Gaoithe Offshore Wind Farm Survey J1103/1483 SITE: 14 DATE: 20.7.09'.	<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>2.53</td> </tr> <tr> <td>%Sand</td> <td>91.16</td> </tr> <tr> <td>% Silt/Clay</td> <td>6.31</td> </tr> <tr> <td>Sorting coefficient</td> <td>1.24</td> </tr> <tr> <td>Folk sediment description</td> <td>Slightly Gravelly Sand</td> </tr> </table> <p>Faunal sample = 12% epifaunal species</p>	% Gravel	2.53	%Sand	91.16	% Silt/Clay	6.31	Sorting coefficient	1.24	Folk sediment description	Slightly Gravelly Sand
% Gravel	2.53											
%Sand	91.16											
% Silt/Clay	6.31											
Sorting coefficient	1.24											
Folk sediment description	Slightly Gravelly Sand											
17	 A photograph of a grab sample container for station 17. The container is dark and filled with sediment. A white label is attached to the top left, containing the following text: 'Nearit na Gaoithe Offshore Wind Farm Survey J1103/1483 SITE: 17 DATE: 20.7.09'.	<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>6.90</td> </tr> <tr> <td>%Sand</td> <td>85.57</td> </tr> <tr> <td>% Silt/Clay</td> <td>7.53</td> </tr> <tr> <td>Sorting coefficient</td> <td>1.55</td> </tr> <tr> <td>Folk sediment description</td> <td>Gravelly Sand</td> </tr> </table> <p>Faunal sample = 9% epifaunal species</p>	% Gravel	6.90	%Sand	85.57	% Silt/Clay	7.53	Sorting coefficient	1.55	Folk sediment description	Gravelly Sand
% Gravel	6.90											
%Sand	85.57											
% Silt/Clay	7.53											
Sorting coefficient	1.55											
Folk sediment description	Gravelly Sand											
18	 A photograph of a grab sample container for station 18. The container is dark and filled with sediment. A white label is attached to the top left, containing the following text: 'Nearit na Gaoithe Offshore Wind Farm Survey J1103/1483 SITE: 18 DATE: 20.7.09'.	<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>7.29</td> </tr> <tr> <td>%Sand</td> <td>85.83</td> </tr> <tr> <td>% Silt/Clay</td> <td>6.89</td> </tr> <tr> <td>Sorting coefficient</td> <td>1.58</td> </tr> <tr> <td>Folk sediment description</td> <td>Gravelly Sand</td> </tr> </table> <p>Faunal sample = 12% epifaunal species</p>	% Gravel	7.29	%Sand	85.83	% Silt/Clay	6.89	Sorting coefficient	1.58	Folk sediment description	Gravelly Sand
% Gravel	7.29											
%Sand	85.83											
% Silt/Clay	6.89											
Sorting coefficient	1.58											
Folk sediment description	Gravelly Sand											
22	 A photograph of a grab sample container for station 22. The container is dark and filled with sediment. A white label is attached to the top left, containing the following text: 'Nearit na Gaoithe Offshore Wind Farm Survey J1103/1483 SITE: 22 DATE: 17.7.09'.	<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>51.94</td> </tr> <tr> <td>%Sand</td> <td>43.06</td> </tr> <tr> <td>% Silt/Clay</td> <td>5.00</td> </tr> <tr> <td>Sorting coefficient</td> <td>3.80</td> </tr> <tr> <td>Folk sediment description</td> <td>Muddy Sandy Gravel</td> </tr> </table> <p>Faunal sample = 19% epifaunal species</p>	% Gravel	51.94	%Sand	43.06	% Silt/Clay	5.00	Sorting coefficient	3.80	Folk sediment description	Muddy Sandy Gravel
% Gravel	51.94											
%Sand	43.06											
% Silt/Clay	5.00											
Sorting coefficient	3.80											
Folk sediment description	Muddy Sandy Gravel											

Table 3.1. Deck photographs and summary particle size distribution (PSD) data for coarse sediment samples collected at the Neart na Gaoithe offshore wind farm area.




Station	Deck photo of grab sample	Grab data										
25	 A photograph of a grab sample container for station 25. The container is dark and filled with sediment. A white label is attached to the top left, containing the following text: 'Nearst na Gaoithe Offshore Wind Farm Survey J10031483 SITE: 25 DATE: 14/7/09'. The label also features logos for EMU and other organizations.	<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>16.06</td> </tr> <tr> <td>%Sand</td> <td>79.85</td> </tr> <tr> <td>% Silt/Clay</td> <td>4.09</td> </tr> <tr> <td>Sorting coefficient</td> <td>2.57</td> </tr> <tr> <td>Folk sediment description</td> <td>Gravelly Sand</td> </tr> </table> <p>Faunal sample = 21% epifaunal species</p>	% Gravel	16.06	%Sand	79.85	% Silt/Clay	4.09	Sorting coefficient	2.57	Folk sediment description	Gravelly Sand
% Gravel	16.06											
%Sand	79.85											
% Silt/Clay	4.09											
Sorting coefficient	2.57											
Folk sediment description	Gravelly Sand											
27	 A photograph of a grab sample container for station 27. The container is dark and filled with sediment. A white label is attached to the top left, containing the following text: 'Nearst na Gaoithe Offshore Wind Farm Survey J10031483 SITE: 27 DATE: 14/7/09'. The label also features logos for EMU and other organizations.	<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>1.09</td> </tr> <tr> <td>%Sand</td> <td>94.38</td> </tr> <tr> <td>% Silt/Clay</td> <td>4.53</td> </tr> <tr> <td>Sorting coefficient</td> <td>1.18</td> </tr> <tr> <td>Folk sediment description</td> <td>Slightly Gravelly Sand</td> </tr> </table> <p>Faunal sample = 11% epifaunal species</p>	% Gravel	1.09	%Sand	94.38	% Silt/Clay	4.53	Sorting coefficient	1.18	Folk sediment description	Slightly Gravelly Sand
% Gravel	1.09											
%Sand	94.38											
% Silt/Clay	4.53											
Sorting coefficient	1.18											
Folk sediment description	Slightly Gravelly Sand											
35	 A photograph of a grab sample container for station 35. The container is filled with a mixture of sediment and a large, rounded, light-colored object. A white label is attached to the top left, containing the following text: 'Nearst na Gaoithe Offshore Wind Farm Survey J10031483 SITE: 35 DATE: 16/7/09'. The label also features logos for EMU and other organizations.	<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>41.63</td> </tr> <tr> <td>%Sand</td> <td>56.37</td> </tr> <tr> <td>% Silt/Clay</td> <td>2.00</td> </tr> <tr> <td>Sorting coefficient</td> <td>2.71</td> </tr> <tr> <td>Folk sediment description</td> <td>Sandy Gravel</td> </tr> </table> <p>Faunal sample = 49% epifaunal species</p>	% Gravel	41.63	%Sand	56.37	% Silt/Clay	2.00	Sorting coefficient	2.71	Folk sediment description	Sandy Gravel
% Gravel	41.63											
%Sand	56.37											
% Silt/Clay	2.00											
Sorting coefficient	2.71											
Folk sediment description	Sandy Gravel											

Table 3.1 (cont'd). Deck photographs and summary particle size distribution (PSD) data for coarse sediment samples collected at the Neart na Gaoithe offshore wind farm area.





Station	Deck photo of grab sample	Grab data										
38		<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>11.34</td> </tr> <tr> <td>%Sand</td> <td>88.57</td> </tr> <tr> <td>% Silt/Clay</td> <td>0.08</td> </tr> <tr> <td>Sorting coefficient</td> <td>1.56</td> </tr> <tr> <td>Folk sediment description</td> <td>Gravelly Sand</td> </tr> </table> <p>Faunal sample = 3% epifaunal species</p>	% Gravel	11.34	%Sand	88.57	% Silt/Clay	0.08	Sorting coefficient	1.56	Folk sediment description	Gravelly Sand
% Gravel	11.34											
%Sand	88.57											
% Silt/Clay	0.08											
Sorting coefficient	1.56											
Folk sediment description	Gravelly Sand											
42		<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>31.60</td> </tr> <tr> <td>%Sand</td> <td>60.25</td> </tr> <tr> <td>% Silt/Clay</td> <td>8.15</td> </tr> <tr> <td>Sorting coefficient</td> <td>2.85</td> </tr> <tr> <td>Folk sediment description</td> <td>Muddy Sandy Gravel</td> </tr> </table> <p>Faunal sample = 5% epifaunal species</p>	% Gravel	31.60	%Sand	60.25	% Silt/Clay	8.15	Sorting coefficient	2.85	Folk sediment description	Muddy Sandy Gravel
% Gravel	31.60											
%Sand	60.25											
% Silt/Clay	8.15											
Sorting coefficient	2.85											
Folk sediment description	Muddy Sandy Gravel											
46		<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>25.74</td> </tr> <tr> <td>%Sand</td> <td>70.44</td> </tr> <tr> <td>% Silt/Clay</td> <td>3.83</td> </tr> <tr> <td>Sorting coefficient</td> <td>2.94</td> </tr> <tr> <td>Folk sediment description</td> <td>Gravelly Sand</td> </tr> </table> <p>Faunal sample = 26% epifaunal species</p>	% Gravel	25.74	%Sand	70.44	% Silt/Clay	3.83	Sorting coefficient	2.94	Folk sediment description	Gravelly Sand
% Gravel	25.74											
%Sand	70.44											
% Silt/Clay	3.83											
Sorting coefficient	2.94											
Folk sediment description	Gravelly Sand											
48		<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>12.32</td> </tr> <tr> <td>%Sand</td> <td>81.51</td> </tr> <tr> <td>% Silt/Clay</td> <td>6.17</td> </tr> <tr> <td>Sorting coefficient</td> <td>2.00</td> </tr> <tr> <td>Folk sediment description</td> <td>Gravelly Sand</td> </tr> </table> <p>Faunal sample = 17% epifaunal species</p>	% Gravel	12.32	%Sand	81.51	% Silt/Clay	6.17	Sorting coefficient	2.00	Folk sediment description	Gravelly Sand
% Gravel	12.32											
%Sand	81.51											
% Silt/Clay	6.17											
Sorting coefficient	2.00											
Folk sediment description	Gravelly Sand											

Table 3.1 (cont'd). Deck photographs and summary particle size distribution (PSD) data for coarse sediment samples collected at the Neart na Gaoithe offshore wind farm area.



Station	Deck photo of grab sample	Grab data										
51		<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>29.00</td> </tr> <tr> <td>% Sand</td> <td>67.32</td> </tr> <tr> <td>% Silt/Clay</td> <td>3.68</td> </tr> <tr> <td>Sorting coefficient</td> <td>3.17</td> </tr> <tr> <td>Folk sediment description</td> <td>Gravelly Sand</td> </tr> </table> <p>Faunal sample = 38% epifaunal species</p>	% Gravel	29.00	% Sand	67.32	% Silt/Clay	3.68	Sorting coefficient	3.17	Folk sediment description	Gravelly Sand
% Gravel	29.00											
% Sand	67.32											
% Silt/Clay	3.68											
Sorting coefficient	3.17											
Folk sediment description	Gravelly Sand											
54		<p>PSD Stats</p> <table border="1"> <tr> <td>% Gravel</td> <td>4.94</td> </tr> <tr> <td>% Sand</td> <td>89.79</td> </tr> <tr> <td>% Silt/Clay</td> <td>5.27</td> </tr> <tr> <td>Sorting coefficient</td> <td>1.52</td> </tr> <tr> <td>Folk sediment description</td> <td>Slightly Gravelly Sand</td> </tr> </table> <p>Faunal sample = 9% epifaunal species</p>	% Gravel	4.94	% Sand	89.79	% Silt/Clay	5.27	Sorting coefficient	1.52	Folk sediment description	Slightly Gravelly Sand
% Gravel	4.94											
% Sand	89.79											
% Silt/Clay	5.27											
Sorting coefficient	1.52											
Folk sediment description	Slightly Gravelly Sand											

Table 3.1 (cont'd). Deck photographs and summary particle size distribution (PSD) data for coarse sediment samples collected at the Neart na Gaoithe offshore wind farm area.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
14	<p>Video footage review: Muddy sand with burrows, mounds, soft polychaete tubes and casts. Very small patches of coarser grained sediments. Occasional cobbles and one small boulder.</p> <p>Static image review: Image 1 cobble/small boulder 4%/55% Image 2 - 11 cobble/small boulder 0%/0%</p> <p>Average cobbles and boulders = 5%</p>	<p>Elevation Cobbles and boulders, where present, where either embedded in sediment or on top of the soft sediment.</p> <p>Faunal community Muddy sand with seapens and burrows. Where cobbles were present these were colonised predominantly by <i>Alcyonium digitatum</i> and a hydroid turf.</p>	<p><i>Pennatula phosphorea</i> <i>Asterias rubens</i> Hydroid turf <i>Urticina eques</i> <i>Alcyonium digitatum</i> <i>Munida</i> sp. <i>Hydrallmania falcata</i> Nudibranch <i>Janolus</i> sp. <i>Abietinaria abietina</i> Paguridae Actinaria <i>Pomatoceros</i> sp. <i>Ophiothrix fragilis</i> <i>?Rhizocaulus</i> sp. <i>Bolocera tuediae</i> Cirripedia <i>?Limanda limanda</i> <i>Nephrops norvegicus</i> <i>Pecten maximus</i> <i>Nemertesia antennina</i></p>	

Table 3.2. Results of the seabed video review and image analyses.



Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
17	<p>Video footage review: Muddy sand with burrows, soft polychaete tubes and mounds. Two very small patches (<25m²) of cobbles and boulders.</p> <p>Static image review: Image 1 - 6 cobble/small boulder 0%/0% Image 7 cobble/small boulder 0%/25% Image 8-12 cobble/small boulder 0%/0%</p> <p>Average cobbles and boulders = 2%</p>	<p>Elevation No significant elevation throughout the transect, only two small patches of cobbles and small boulders.</p> <p>Faunal community Muddy sand with seapens and burrows. Where cobbles were present these were colonised predominantly by <i>Alcyonium digitatum</i>, anemones and a hydroid turf.</p>	<p><i>Pennatula phosphorea</i> <i>Munida</i> sp. Hydroid/bryozoan turf Callionymidae <i>Cancer pagurus</i> <i>Bolocera tuediae</i> <i>Alcyonium digitatum</i> Setularidae Paguridae <i>Urticina</i> sp. Actinaria <i>Corystes cassivelaunus</i> Paguridae <i>Ebalia</i> sp. <i>Hydrallmania falcata</i> <i>Abietinaria abietina</i> <i>?Rhizocaulus</i> sp. Hexacorallia Serpulidae Gastropoda <i>Ophiothrix fragilis</i></p>	
18	<p>Video footage review: Continuous gravelly sandy sediment (shelly gravelly sand), <i>Alcyonium digitatum</i> throughout, few scattered cobbles, and isolated small boulders.</p> <p>Video Image 1 cobbles: 0% Video Image 2 cobbles: 3% Video image 3 cobbles/small boulders: 10% / 15%</p> <p>Static image review: Image 1 cobbles: 3% Image 2 cobbles: 0% Image 3 cobbles: 0%</p> <p>Average cobbles and boulders = 1%</p>	<p>Elevation A few scattered cobbles with a veneer of sand over the surface.</p> <p>Faunal community Gravelly sand with mounds and burrows along transect. Associated with the coarser sediment is <i>Alcyonium digitatum</i>.</p>	<p>Gobiidae <i>Alcyonium digitatum</i> <i>Echinus esculentus</i> <i>Hyas/Inachus</i> sp. <i>Asterias rubens</i> Hydroid/Bryozoan turf <i>? Bolocera tuediae</i> <i>Pomatoceros</i> sp. <i>Munida</i> sp. <i>Metridium senile</i> Paguridae Porifera</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
22	<p>Video footage review: Slightly shelly sand with burrows, and soft polychaete tubes. Along the transect were occasional boulders and cobbles.</p> <p>Video image 1 – 6 cobbles : 0% Video image 7: small boulders: 10% Video image 8-10 cobbles: 0%</p> <p>Static image review: Image 1 cobbles: 0% Image 2 cobbles: 3% Image 3 cobbles: 0% Image 4 cobbles: 0% Image 5 cobbles: 0%</p> <p>Average cobbles and boulders = 1%</p>	<p>Elevation Occasional small boulders and cobbles. Cobbles were embedded within the sediment with a covering of sediment, whilst the boulders were on top of the sediment.</p> <p>Faunal community Patchy dense brittlestar bed on slightly shelly sand.</p>	<p><i>Asterias rubens</i> <i>Pagurus bernhardus</i> Hydroid/bryozoan turf <i>Alcyonium digitatum</i> <i>Ophiothrix fragilis</i> Callionymidae <i>Nemertesia antennina</i> <i>Astropecten irregularis</i> <i>?Rhizocaulus</i> sp. Paguridae <i>Chaetopterus variepedatus</i> tubes</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.

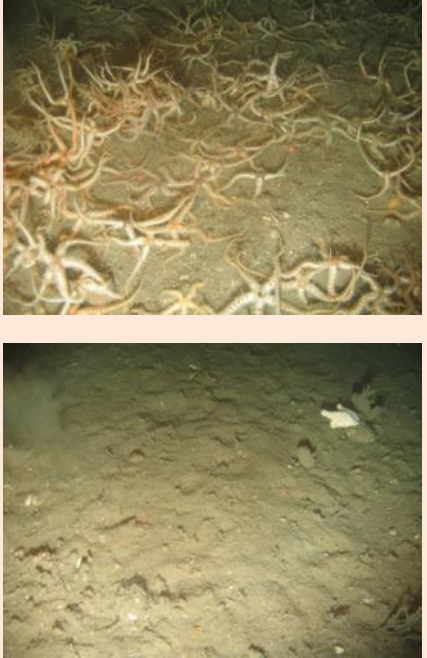
Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
25	<p>Video footage review Gravelly sand with occasional cobbles and small boulders.</p> <p>Video image 1 cobbles/small boulders:30%/20% Video image 2 cobbles/small boulders:0%/0% Video image 3 cobbles/small boulders: 10%/0% Video image 4 cobbles/small boulders: 0%/0% Video image 5 cobbles/small boulders: 0%/0% Video image 6 cobbles/small boulders: 15%/10% Video image 7 cobbles/small boulders: 0%/0% Video image 8 cobbles/small boulders: 5%/0%</p> <p>Static image review Static image 1 cobbles/small boulders:0%/0% Static image 2 cobbles/small boulder:5%/0% Static image 3 cobbles/small boulders:0%/0% Static image 4 cobbles/small boulders:0%/0% Static image 5 cobbles/small boulders:3%/0% Static image 6 cobbles/small boulders:0%/0%</p> <p>Average cobbles and boulders = 8%</p>	<p>Elevation Cobbles and small boulders were embedded within the soft sediment. Many were covered with a veneer of sediment.</p> <p>Faunal community In one patch along the transect, brittlestars were associated with the hard substrate. Elsewhere along the transects, <i>Alcyonium digitatum</i> was recorded on the cobbles/pebbles.</p>	<p><i>Alcyonium digitatum</i> <i>Asciidiella scabra</i> <i>Ophiothrix fragilis</i> <i>Munida</i> sp. <i>Pomatoceros</i> sp. Cirripedia Paguridae <i>Echinus esculentus</i> <i>Pecten maximus</i> <i>Flustra foliacea</i> <i>Urticina</i> sp. Hydroid/bryozoan turf <i>Chaetopterus variepedatus</i> tube Asciidiidae</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
27	<p>Video footage review: Slightly shelly muddy sand with burrows and worm casts. A small area with occasional cobbles.</p> <p>Video image 1 cobbles/small boulders: 0%/0% Video image 2 cobbles/small boulders: 5%/0% Video image 3 cobbles/small boulders: 8%/20% Video image 4 cobbles/small boulders: 5%/0%</p> <p>Static image review: Image 1 cobble/small boulder 0%/0% Image 2 cobble/small boulder 0%/0% Image 3 cobble/small boulder 0%/0% Image 4 cobble/small boulder:4%/0% Image 5 cobble/small boulder:0%/0%</p> <p>Average cobbles and boulders = 5%</p>	<p>Elevation Cobbles/ small boulders where present are embedded within sediment with a veneer of sediment overlying.</p> <p>Faunal community Muddy sand with seapens, where coarse sediments occur (pebbles/cobbles), <i>Alcyonium digitatum</i> is present.</p>	<p><i>Asterias rubens</i> <i>Alcyonium digitatum</i> <i>Pennatula phosphorea</i> <i>Cancer pagurus</i> Hydroid turf <i>Sertularia</i> sp. <i>Ophiothrix fragilis</i> <i>Ophiura ophiura</i></p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
35	<p>Video footage review: Shelly, gravelly, pebbly sand with occasional cobbles and small boulders, varying proportions of gravel and pebbles.</p> <p>Video Image 1 cobbles/small boulders: 5%/0% Video Image 2 cobbles/small boulders: 10%/0% Video Image 3 cobbles/small boulders: 0%/0% Video Image 4 cobbles/small boulders: 5%/5% Video Image 5 cobbles/small boulders:6%/0% Video Image 6 cobbles/small boulders:0%/0%</p> <p>Static image review: Image 1 cobble/small boulder 2%/25% Image 2 cobble/small boulder 3%/0% Image 3 cobble/small boulder 10%/5% Image 4 cobble/small boulder:2%/0% Image 5 cobble/small boulder:5%/0%</p> <p>Average cobbles and boulders = 8%</p>	<p>Elevation Occasional cobble and small boulder.</p> <p>Faunal community Abundant <i>Alcyonium digitatum</i> on shelly, gravelly, pebbly sand, <i>Pomatoceros</i> sp. present on coarser sediments.</p>	<p><i>Alcyonium digitatum</i> Hydroid/bryozoan turf <i>Pomatoceros</i> sp. Gobiidae <i>Pecten maximus</i> <i>Hydrallmania falcata</i> <i>Urticina</i> sp. <i>Metridium senile</i> Paguridae <i>Munida</i> sp. Bryozoan crusts <i>Asterias rubens</i> <i>Flustra foliacea</i> <i>Ophiothrix fragilis</i> <i>Asciidiella scabra</i> <i>Atelecyclus rotundatum</i> <i>Abietinaria abietina</i></p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
38	<p>Video footage review: Sediment quite consistent throughout transect- Slightly shelly, gravelly, pebbly sand with slight variations in coarseness, scattered cobbles and small boulders on the sediment. At the start of the transect there is a denser cobble/boulder area. Towards the end of the transect there is rippled sand.</p> <p>Video Image 1 cobbles/small boulders/large boulders: 10%/20%/60% Video Image 2 cobbles: 0% Video Image 3 cobbles: 0% Video Image 4 cobbles: 3% Video Image 5 cobbles: 0% Video Image 6 cobbles/small boulders: 2%/20%</p> <p>Static image review: Image 1 cobbles: 0% Image 2 cobbles: 0% Image 3 cobbles: 0% Image 4 cobbles: 10% Image 5 cobbles/small boulders: 5%/25%</p> <p>Average cobbles and boulders = 14%</p>	<p>Elevation Cobbles and boulders are on the gravelly muddy sand rather than embedded within. most have a thin veneer of overlying sediment</p> <p>Faunal community <i>Alcyonium digitatum</i> present along most of the transect, possibly attached to coarser material such as gravel/pebbles/cobbles, coverage gets denser where cobbles/boulders are present.</p> <p>Sea squirts and Hydroid/bryozoan turf are present throughout.</p> <p><i>Ophiothrix fragilis</i> present where cobbles/boulders were found.</p>	<p><i>Munida rugosa</i> <i>Hydroid/bryozoan turf</i> <i>Alcyonium digitatum</i> <i>Asciadiella scabra</i> <i>Pomatoceros</i> sp. <i>Crossaster papposus</i> <i>Echinus esculentus</i> <i>Ophiothrix fragilis</i> <i>Asterias rubens</i> <i>Lanice conchilega</i> <i>Tubularia</i> sp. <i>Chaetopterus variepedatus</i> tubes Paguridae <i>?Securiflustra securifrons</i></p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
42	<p>Video footage review:</p> <p>Along the transect the cobble / boulder habitat is interspersed with sand/ gravel and pebbles, with scattered cobbles/small boulders and occasional large boulders. Towards the end of the transect the percentage of cobbles and boulders increases.</p> <p>Video Image 1 cobbles/small boulders/large boulder: 20%/0%/5%</p> <p>Video Image 2 cobbles/small boulders: 0%/0%</p> <p>Video Image 3: cobbles/small boulders: 5%/60%</p> <p>Video Image 4 cobbles/small boulders: 0%/0%</p> <p>Video Image 5 cobbles/small boulders: 5%/40%</p> <p>Video Image 6 cobbles/small boulders: 10%/0%</p> <p>Video Image 7 cobbles/small boulders: 35%/0%</p> <p>Video Image 8 cobbles/small boulders: 10%/40%</p> <p>Video Image 9 cobbles/small boulders: 20%/20%</p> <p>Video Image 10 cobbles/small boulders: 10%/0%</p> <p>Video Image 11 cobbles/small boulders/large boulder: 5%/0%/90%</p> <p>Video Image 12 cobbles/small boulders: 20%/50%</p> <p>Video Image 13 cobbles/small boulders: 20%/65%</p> <p>Static image review:</p> <p>Image 1 cobbles/small boulders: 10%/0%</p> <p>Image 2 cobbles/small boulders: 0%/0%</p> <p>Image 3 cobbles/small boulders: 72%/0%</p> <p>Image 4 cobbles/small boulders: 10%/0%</p> <p>Image 5 cobbles/small boulders: 40%/25%</p> <p>Image 6 cobbles/small boulders: 0%/0%</p> <p>Image 7 cobbles/small boulders: 78%/5%</p> <p>Image 8 cobbles/small boulders: 60%/30%</p> <p>Average cobbles and boulders = 40%</p>	<p>Elevation:</p> <p>Cobbles and boulders are on the gravelly sand, with a thin veneer of sediment present on some cobbles/boulders.</p> <p>In localised areas, the cobbles and boulders are also on top of other cobbles.</p> <p>Faunal community:</p> <p>Dense <i>Ophiothrix fragilis</i> over cobble/boulder area and on soft sediment areas, along part of the transect.</p> <p>Soft sediment areas contain burrows, small burrowing anemones (<i>Cerianthus</i> sp.) and soft polychaete tubes.</p> <p>Squat lobsters (<i>Munida</i> sp.), large anemones (<i>Bolocera tuediae</i>), Hydroid/bryozoan turf and a crustose faunal community are associated with the dense cobble/boulder areas, where <i>Ophiothrix fragilis</i> are not present.</p>	<p><i>Alcyonium digitatum</i></p> <p>?<i>Cerianthus lloydii</i></p> <p><i>Asterias rubens</i></p> <p><i>Ophiura</i> sp.</p> <p>Hydroid/bryozoan turf</p> <p><i>Bolocera tuediae</i></p> <p><i>Munida</i> sp.</p> <p><i>Ophiothrix fragilis</i></p> <p><i>Pomatoceros</i> sp.</p> <p>Bryozoan crust</p> <p><i>Urticina</i> sp.</p> <p>Paguridae</p> <p><i>Nephrops norvegicus</i></p> <p><i>Ophiura albida</i></p> <p>Bryozoan crust</p> <p>Caridea</p> <p><i>Pomatoceros</i> sp.</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
46	<p>Video footage review: Consistent sediment type throughout site, abundant coarse material (pebbles/Gravel/shell) with scattered cobbles embedded in the sediment, partially covered in a layer of sand.</p> <p>Video Image 1 cobbles/small boulders: 5%/3% Video Image 2 cobbles/small boulders: 3%/0% Video Image 3 cobbles/small boulders: 5%/3% Video Image 4 cobbles/small boulders: 25%/0% Video Image 5 cobbles/small boulders: 15%/0% Video image 6 cobbles/small boulders: 0%/0%</p> <p>Static image review: Image 1 cobbles 2% Image 2 cobbles 0% Image 3 cobbles 3% Image 4 cobbles 2% Image 5 cobbles 2%</p> <p>Average cobbles and boulders = 6%</p>	<p>Elevation Few cobbles embedded within sediment. Most with a veneer of sediment.</p> <p>Faunal community <i>Alcyonium digitatum</i> on silt covered cobbles and pebbles throughout transect.</p> <p>Occasional clusters of sea squirts on exposed patches of cobble. Hydroid/Bryozoan turf present throughout.</p> <p><i>Pomatoceros</i> sp. were found on cobbles that were not covered in a veneer of silt/sand.</p>	<p><i>Alcyonium digitatum</i> <i>Urticina</i> sp. Hydroid/bryozoan turf <i>Asterias rubens</i> <i>Pecten maximus</i> <i>Asciella scabra</i> <i>?Securiflustra securifrons</i> Paguridae <i>Pomatoceros</i> sp. <i>Aequipecten opercularis</i> <i>Chaetopterus variepedatus</i> tubes</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.

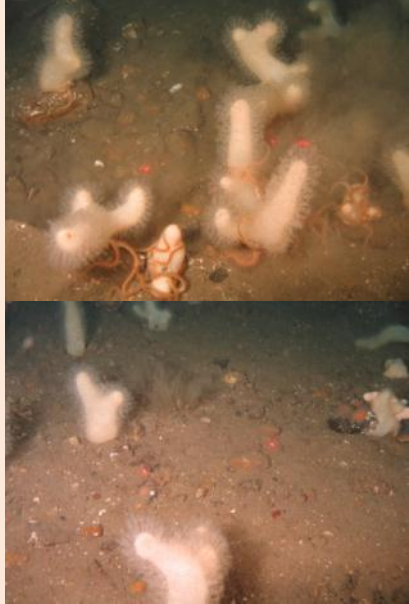
Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
48	<p>Video footage review: Consistent sediment throughout transect. Shelly, gravelly, pebbly, muddy sand (or more pebble than gravel on some occasions) Coarseness varied slightly along the transect. There were a few scattered cobbles and small boulders, with slightly more towards the end of the transect. Cobbles and boulders sitting on sediment usually, otherwise coarse material usually covered by sand.</p> <p>Video Image 1 cobbles: 0% Video Image 2 cobbles: 5%/2% Video Image 3 cobbles/small boulders: 5%/ 10% Video Image 4 cobbles: 10% Video image 5 cobbles: 5%</p> <p>Static image review: Image 1 cobbles: 20% Image 2 cobbles: 0% Image 3 cobbles 10% Image 4 cobbles 8% Image 5 cobbles 5%</p> <p>Average cobbles and boulders = 8%</p>	<p>Elevation Minimal elevation. Few cobbles embedded within sediment. Most with a veneer of sediment.</p> <p>Faunal community At the beginning of the transect was a patch of abundant <i>Ophiothrix fragilis</i>.</p> <p>Abundant <i>Alcyonium digitatum</i> throughout transect.</p>	<p><i>Ophiothrix fragilis</i> <i>Alcyonium digitatum</i> <i>Echinus esculentus</i> <i>Munida rugosa</i> Hydroid/bryozoan turf Paguridae <i>Aequipecten opercularis</i> <i>Pomatoceros</i> sp. Gobiidae <i>Crossaster papposus</i> <i>Flustra foliacea</i> <i>Limanda limanda</i> Actinaria Bryozoan crust</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
51	<p>Video footage review: Consistent sediment composition along transect. Muddy gravel, shell, pebbles and small cobbles overlain with muddy sand.</p> <p>Video Image 1 cobbles/small boulders: 5%/0% Video Image 2 cobbles/small boulders: 5%/0% Video Image 3 cobbles/small boulders: 0%/0% Video image 4 cobbles/small boulders: 5%/0% Video image 5 cobbles/small boulders: 7%/0%</p> <p>Static image review: Image 1 cobbles 2% Image 2 cobbles 0% Image 3 cobbles 1% Image 4 cobbles 8% Image 5 cobbles 2%</p> <p>Average cobbles and boulders = 4%</p>	<p>Elevation No elevation from sediment along transect, no areas of larger cobbles and boulders, consistent coarse material embedded in sediment.</p> <p>Faunal community Large areas of <i>Alcyonium digitatum</i> on silt covered cobbles and pebbles.</p> <p>Soft Polychaete tubes present, associated with sediment composition along transect. <i>Munida</i> sp. and Hydroid/bryozoan turf abundant throughout most of the transect</p>	<p><i>Alcyonium digitatum</i> Hydroid/bryozoan turf Paguridae <i>Munida</i> sp. <i>Pagurus prideaux</i> <i>Adamsia carcinopados</i> Ascidiacea <i>Pomatoceros</i> sp. <i>Janolus</i> sp. <i>Flustra foliacea</i> <i>Ophiothrix fragilis</i> <i>Chaetopterus variepedatus</i> tubes</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
54	<p>Video footage review: Scattered cobbles and small boulders on shelly, silty sand at the start of the transect. Further along transect the sediment becomes muddy sand with burrows.</p> <p>Video image 1 cobbles/small boulders: 5%/0% Video image 2 cobbles/small boulders: 10%/15% Video image 3 cobbles/small boulders: 10%/0% Video image 4 cobbles/small boulders: 0%/0% Video image 5 cobbles/small boulders: 0%/0%</p> <p>Static image review: Image 1 cobble/small boulder 0%/0% Image 2 cobble/small boulder 0%/0% Image 3 cobble/small boulder 0%/0% Image 4 cobble/small boulder 5%/0% Image 5 cobble/small boulder 0%/0%</p> <p>Average cobbles and boulders = 4%</p>	<p>Elevation Occasional scattered cobbles and small boulders on the sediment surface.</p> <p>Faunal community Dense <i>Ophiothrix fragilis</i> initially on soft sediment and cobbles with <i>Alcyonium digitatum</i>.</p> <p><i>Associated with the muddy sediment were the seapens, Pennatula phosphorea.</i></p>	<p><i>Ophiothrix fragilis</i> <i>Alcyonium digitatum</i> <i>Pennatula phosphorea</i> <i>Pomatoceros</i> sp. Bryozoan crust <i>Munida</i> sp. <i>Asterias rubens</i> <i>?Limanda limanda</i> <i>Paguridae</i> <i>Nephrops norvegicus</i> Hydroid/bryozoan turf <i>Virgularia mirabilis</i> <i>Chaetopterus variepedatus</i> tubes</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
VP2	<p>Video footage review: Patchy cobble/boulder area. The density varies along the transect, with localised areas of dense cobbles and boulders interspersed with soft sediment areas. Cobbles/boulders range from 10-90% in the densest areas, possible bedrock exposures, although covered in brittlestars, so difficult to ascertain. Between these areas, a muddy sand with sea pens habitat predominates.</p> <p>Video Image 1 cobbles/small boulders: 0%/0% Video Image 2 cobbles/small boulders: 0%/20% Video Image 3 cobbles/small boulders/large boulder: 5%/0%/45% Video Image 4 cobbles/small boulders: 15%/0% Video image 5 cobbles / small boulders: 40%/50% Video image 6 cobbles/small boulders: 60% / 15% Video image 7 cobbles/small boulders 0%/0%</p> <p>Static image review: Image 1 cobbles/small boulders: 0%/0% Image 2 cobbles/small boulders: 0%/0% Image 3 cobbles/small boulders: 1%/0% Image 4 cobbles/small boulders/large boulder/bedrock: 0%/0%/80%/20% Image 5 cobbles/small boulders/large boulder/bedrock: 20%/20%/40%/20%</p> <p>Average cobbles and boulders = 38%</p>	<p>Elevation: Cobbles/boulders are on the muddy sand and not embedded within the sediment. Some have a thin overlying sandy veneer.</p> <p>Faunal community: The cobble/boulder areas have a distinctly different associated fauna to the surrounding area, consisting of dense brittlestars (<i>Ophiothrix fragilis</i>), anemones and a crustose faunal community on the boulders.</p> <p>The muddy sand areas are associated with scattered sea pens (<i>Pennatula phosphorea</i>), soft worm tubes, burrows and a few scattered <i>Alcyonium digitatum</i>.</p>	<p><i>Ophiothrix fragilis</i> <i>Pomatoceros</i> sp. Anthozoa sp. <i>Munida</i> sp. <i>Asterias rubens</i> <i>Pennatula phosphorea</i> <i>Alcyonium digitatum</i> <i>Urticina</i> sp. <i>Pomatoceros</i> sp. <i>Bolocera tuediae</i> <i>Setularia</i> sp. <i>Nephrops norvegicus</i> <i>Pagurus bernhardus</i> <i>Flustra foliacea</i> <i>Ophiura albida</i> <i>Abietinaria abietina</i> <i>Echinus esculentus</i> <i>Cahetopterus variepedatus</i> tubes Cirripedia</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
VP3	<p>Video footage review: Patchy cobble/boulder area. Between the dense cobble/boulder areas, gravelly, pebbly, muddy sand is present.</p> <p>Video Image 1 cobbles/small boulders: 0%/0% Video Image 2 cobbles/small boulders: 35%/0% Video Image 3 cobbles/small boulders: 65%/15% Video Image 4 cobbles/small boulders: 0%/5% Video Image 5 cobbles/small boulders: 5%/20% Video Image 6 cobbles/small boulders: 5%/25% Video Image 7 cobbles/small boulders: 50%/0% Video Image 8 cobbles/small boulders: 5%/80% Video Image 9 cobbles/small boulders: 80%/0% Video Image 10 cobbles/small boulders: 90%/0% Video Image 11 cobbles/small boulders: 0%/0% Video Image 12 cobbles/small boulders: 50%/0%</p> <p>Static image review: Image 1 cobbles/small boulders: 0%/0% Image 2 cobbles/small boulders/large boulders: 63%/0%/20% Image 3 cobbles/small boulders: 91%/0% Image 4 cobbles/small boulders: 45%/20% Image 5 cobbles/small boulders: 60%/0%</p> <p>Average cobbles/boulders = 49%</p>	<p>Elevation: Cobbles and boulders are on the gravelly muddy sand rather than embedded within, and also on top of other cobbles.</p> <p>Veneer of sediment overlying many of the cobbles/boulders.</p> <p>Faunal community: Patches of dense <i>Ophiothrix fragilis</i> observed over the soft sediment and dense cobble/boulder areas.</p> <p><i>Echinus esculentus</i>, Hydroid/bryozoan turf, squat lobsters (<i>Munida</i> sp.) and a crustose faunal community observed associated with many of the dense cobble/boulder areas.</p>	<p><i>Urticina</i> sp. <i>Alcyonium digitatum</i> Hydroid/bryozoan turf <i>Munida</i> sp. <i>Ophiothrix fragilis</i> <i>Echinus esculentus</i> <i>Asterias rubens</i> <i>Bolocera tuediae</i> <i>Nephrops norvegicus</i> Paguroidea <i>Pomatoceros</i> sp. Bryozoan crust Cirripedia Porifera Caridea <i>Zeugopterus</i> sp. Nudibranch Pectinacea ?<i>Rhizocaulus</i> sp. <i>Chaetopterus variepedatus</i> tubes</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
VP4 (VT1)	<p>Video footage review: The sediment coarseness varies greatly along the transect. Initially the substrate comprises muddy sand, which then coarsens into shelly, gravelly, pebbly muddy sand with scattered cobbles embedded in the sediment. Next, a continuous long stretch of dense cobbles/small boulders with scattered large boulders is present, followed by another area of coarse sediment before reverting back to muddy sand.</p> <p>Video Image 1 cobbles/small boulders: 25%/0% Video Image 2 cobbles/small boulders: 60%/0% Video Image 3 cobbles/small boulders: 50%/20% Video Image 4 cobbles/small boulders: 40%/50% Video Image 5 cobbles/small boulders: 75%/10% Video Image 6 cobbles/small boulders: 0%/0% Video Image 7 cobbles/small boulders: 0%/0% Video Image 8 cobbles/small boulders: 15%/0%</p> <p>Static image review: Image 1 cobbles/small boulders: 0%/0% Image 2 cobbles/small boulders: 0%/0% Image 3 cobbles/small boulders: 63%/10% Image 4 cobbles/small boulders: 76%/0% Image 5 cobbles/small boulders: 68%/0% Image 6 cobbles/small boulders: 0%/0%</p> <p>Average cobbles and boulders = 40%</p>	<p>Elevation: Some cobbles/boulders are embedded within the sediment, others are on the sediment and many are covered with a veneer of sediment.</p> <p>Faunal community: Sea pens (<i>Pennatula phosphorea</i>), soft worm tubes and burrows were observed within the muddy sand areas.</p> <p>Dense brittlestars (<i>Ophiothrix fragilis</i>) occurred within the dense cobble/boulder area, together with occasional <i>Echinus esculentus</i>, <i>Bolocera tuediae</i>, <i>Alcyonium digitatum</i>, Bryozoan/Hydrozoan turf and, in places, a crustose faunal community.</p> <p>Abundant <i>Alcyonium digitatum</i> were present on cobbles at the end of the dense cobble/boulder area and on the coarse sediment following this.</p>	<p><i>Pennatula phosphorea</i> <i>Echinus esculentus</i> <i>Bolocera tuediae</i> <i>Alcyonium digitatum</i> <i>Ophiothrix fragilis</i> <i>Pecten maximus</i> Paguroidea Hydroid/bryozoan turf Galatheididae <i>Caridea</i> Pectinacea Cirripedia <i>Pomatoceros</i> sp. <i>Asciadiella scabra</i> Bryozoan crust</p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
VP5 (VT2)	<p>Video footage review: Initially, shelly, gravelly, muddy sand with scattered cobbles. Then, a small dense cobble/boulder patch is present, becoming less dense towards the end of the transect.</p> <p>Video Image 1 cobbles/small boulders: 5%/0% Video Image 2 cobbles/small boulders: 15%/0% Video Image 3 cobbles/small boulders: 0%/0% Video Image 4 cobbles/small boulders: 0%/0% Video Image 5 cobbles/large boulders: 0%/20% Video Image 6 cobbles/small boulders: 55%/25% Video Image 7 cobbles/small boulders: 70%/30% Video image 8 cobbles/small boulders: 40%/60% Video Image 9 cobbles/small boulders: 10%/0%</p> <p>Static image review: Image 1 cobbles/small boulders: 2%/0% Image 2 cobbles/small boulders: 4%/0% Image 3 cobbles/small boulders: 10%/0% Image 4 cobbles/small boulders: 67%/30% Image 5 cobbles/small boulders: 6%/0% Image 6 cobbles/small boulders: 20%/0%</p> <p>Average cobbles and boulders = 31%</p>	<p>Elevation: Cobbles and boulders are on the gravelly muddy sand rather than embedded within. Some have a thin veneer of overlying sediment. The cobble/boulder area is distinctly different to the proceeding substrate.</p> <p>Faunal community: Scattered <i>Alcyonium digitatum</i> are associated with scattered cobbles on the gravelly, muddy sand.</p> <p>Dense cobble/boulder area covered in abundant brittlestars (<i>Ophiothrix fragilis</i>) whose quantities reduce when the cobbles/boulders become less dense.</p>	<p><i>Alcyonium digitatum</i> <i>Ophiothrix fragilis</i> Paguroidea Hydroid/bryozoan turf <i>Crossaster papposus</i> <i>Pomatoceros</i> sp. <i>Ciocalypta penicillus</i> <i>Asterias rubens</i> Bryozoan crust <i>Munida</i> sp. <i>Nemertesia antennina</i></p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
VP6 (VT3)	<p>Video footage review: Lots of mounds formed from coarse sediment covered in a layer of sand, also scattered cobbles (not covered). Later on in the transect rippled sand can be seen.</p> <p>Video Image 1 cobbles: 2% Video Image 2 cobbles: 0% Video Image 3 cobbles: 5% Video Image 4 cobbles/large boulder: 10%/ 50% Video Image 5 cobbles: 0%</p> <p>Static image review: Image 1 cobbles: 0% Image 2 cobbles: 0% Image 3 cobbles: 0% Image 4 cobbles: 0% Image 5 cobbles: 0%</p> <p>Average cobbles and boulders = 7%</p>	<p>Elevation Lots of mounds (made up of coarser sediment covered in a veneer of sand), also a few scattered cobbles were found in the earlier part of the transect.</p> <p>Faunal community Lots of fish scattered throughout the transect; flatfish, gobies and possibly Callionymidae.</p> <p><i>Alcyonium digitatum</i>, sometimes attached to cobbles. Soft polychaete tubes also present in the sediment.</p>	<p>Paguridae Pisces (flatfish, gobies and possibly dragonets) Hydroid/Bryozoan turf <i>Bolocera tuediae</i> <i>Urticina</i> sp. <i>Flustra foliacea</i> <i>Callionymus lyra</i> <i>Ophiura</i> sp. Gurnard <i>Asterias rubens</i> <i>Pennatula phosphorea</i></p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.


Site	General overall site description	Description of cobble and boulder component	Conspicuous species	Representative Photographs
VCT4	<p>Video footage review: Largely muddy sand with burrows with varying proportions of gravel, shell and pebbles. Along the transect are patches of cobbles and small boulders. Areas of coarser substrate are present along transect with occasional cobbles.</p> <p>Video image 1 cobbles/small boulders: 0%/0% Video image 2 cobbles/small boulders: 0%/0% Video image 3 cobbles/small boulders: 20%/30% Video image 4 cobbles/small boulders: 0%/0% Video image 5 cobbles/small boulders: 0%/0% Video image 6 cobbles/small boulders: 20%/40% Video image 7 cobbles/small boulders: 0%/0% Video image 8 cobbles/small boulders: 0%/0% Video image 9 cobbles/small boulders: 0%/0% Video image 10 cobbles/small boulders: 0%/0%</p> <p>Static image review: Image 1 cobbles/small boulders 0%/0% Image 2 cobbles/small boulders 0%/0% Image 3 cobbles/small boulders 10%/25% Image 4 cobbles/small boulders 0%/0% Image 5 cobbles/small boulders 30%/10% Image 6 cobbles/small boulders 0%/0%</p> <p>Average cobbles and boulders = 11%</p>	<p>Elevation A few scattered boulders and cobbles but largely covered in a veneer of sediment.</p> <p>Faunal community <i>Alcyonium digitatum</i> abundance is distinctly increased at the areas of the transect where the substrate is coarser.</p> <p>The areas of muddy sand are populated by sea pens (<i>Pennatula phosphorea</i>) soft polychaete tubes, burrows and mounds. Along the transect there are patches of dense <i>Ophiothrix fragilis</i>.</p>	<p><i>Ophiothrix fragilis</i> <i>Pennatula phosphorea</i> <i>Alcyonium digitatum</i> Callionymidae Hydroid/bryozoan turf Bryozoan crust <i>Pomatoceros</i> sp. <i>Liocarcinus</i> sp. <i>Munida rugosa</i> <i>Asterias rubens</i> <i>Urticina</i> sp. <i>Abietinaria abietina</i> <i>Bolocera tuediae</i></p>	

Table 3.2 (cont'd). Results of the seabed video review and image analyses.

4. Assessment of Geogenic or Stony Reef

Table 4.1 applies developed criteria for stony reef to the current video and grab sample data to determine resemblance to guidelines. This showed that despite relatively large areas initially giving high reflexivity and topographic distinctness (see Figure 3.1), the grab and video ground truthing data highlighted only a few locations which may resemble stony reef (see Table 4.1). Furthermore, the video data showed that stony reef areas were not extensive and appeared to coincide with small areas of elevation and ridges arising from areas of exposed bedrock or Wee Bankie formation. On this basis other elevated areas of seabed and apparent ridges not surveyed by the grab and video were also classified as stony reef. Appendix C presents the mapped extents of Annex I stony reef within the boundaries of the Neart na Gaoithe development.

Station	Composition Cobbles/boulders	Elevation	Extent	Biota * (% epifauna)	Resemblance
14	5%	<64 mm overall	>25 m ²	12%	Not reef
17	2%	<64 mm overall	>25 m ²	9%	Not reef
18	1%	<64 mm overall	>25 m ²	12%	Not reef
22	1%	<64 mm overall	>25 m ²	19%	Not reef
25	8%	<64 mm overall	>25 m ²	21%	Not reef
27	5%	<64 mm overall	>25 m ²	11%	Not reef
35	8%	<64 mm overall	>25 m ²	49%	Not reef
38	14%	<64 mm overall	>25 m ²	3%	Not reef
42	40%	64 mm - ~1 m in places	>25 m ²	5%	Low
46	6%	<64 mm overall	>25 m ²	26%	Not reef
48	8%	<64 mm overall	>25 m ²	17%	Not reef
51	4%	<64 mm overall	>25 m ²	38%	Not reef
54	4%	<64 mm overall	>25 m ²	9%	Not reef
VP2	38%	64 mm - ~1m in places	>25 m ²	No grab sample	Low
VP3	49%	64 mm - ~1m in places	>25 m ²	No grab sample	Low

*the percentage of epifaunal species was derived from grab sample analysis

Table 4.1. Resemblance of observed coarse sediment habitats to geogenic or stony reef.

Station	Composition Cobbles/boulders	Elevation	Extent	Biota * (% epifauna)	Resemblance
VP4	40%	64 mm - ~1m in places	>25 m ²	No grab sample	Low
VP5	31%	64 mm - ~1m in places	>25 m ²	No grab sample	Low
VP6	7%	<64 mm overall	>25 m ²	No grab sample	Not reef
VCT4	11%	<64 mm overall	>25 m ²	No grab sample	Not reef

*the percentage of epifaunal species was derived from grab sample analysis

Table 4.1 (cont'd). Resemblance of observed coarse sediment habitats to geogenic or stony reef.

The remaining areas of high reflexivity comprised mixed gravel with isolated cobbles and boulders. These areas were deemed not to resemble Annex I stony reef.

Species typically associated with areas of stony reef included the soft coral *Alcyonium digitatum*, the epifaunal brittlestar *Ophiothrix fragilis* together with turf forming bryozoans and hydroids, the erect hydroid *Flustra foliacea*, the encrusting keel worm *Pomatoceros* sp., anemones *Urticina* sp and *Bolocera tuediae*. The squat lobster *Munida rugosa* was often observed sheltering beneath larger cobbles and boulders. *O. fragilis* commonly occurred as dense aggregations on the upper surfaces of raised areas of cobbles and boulders.

Because of the high degree of sediment heterogeneity these areas are probably best represented as mosaics of different coarse and mixed circalittoral biotopes (**SS.SCS.CCS** and/or **SS.SMx.CMx**) as well as additional biotopes such as **CR.MCR.EcCr.FaAlCr.Pom** (dense calcareous tube worms *Pomatoceros* spp.) and **CR.MCR.EcCr.FaAlCr.Adig** (dense *Alcyonium digitatum*).

5. Assessment of Effects

The following outlines the general approach that will be adopted within the EIA with regard to the consideration of Annex I stony reef. At this stage, it is considered that the development of the wind farm will have the following potential effects on Annex I reef:

- (i) reduction in extent through the placement of turbines on the seabed; and
- (ii) temporary physical disturbances as a result of construction and decommissioning activities.

5.2 Reduction in extent

From the GIS mapping presented in Appendix C, it can be determined that the total area of potential Annex I stony reef present with the boundaries of the development site is 0.953 km². The known extent of this habitat will be used to quantify the proportion predicted to be lost as a result of the placement of turbines on the seabed within the context of the total extent of habitat available at the appropriate geographical scale. Given the small footprint of wind turbines and associated infrastructure then only a very small amount of habitat is forecast to be lost as a result of the construction of the wind farm. At this stage, therefore, the impact of potential loss of coarse sediment habitats is considered to be of **minor significance** although the ES will refine assessments based on final design. Depending upon the material used, the placement of scour protection together with the turbine foundations themselves may mitigate for loss of stony reef habitat as a substrate for attachment of epibenthic communities.

5.3 Temporary physical disturbances

The dominant sessile colonial epibenthic communities associated with the areas of stony reef may be comparatively sensitive to the effects of raised suspended sediments arising from construction activities as a result of potential damage to feeding and respiratory apparatus or smothering. Recovery of local sessile epibenthic fauna is however, likely to be relatively quick (as assessed below) and will proceed as soon as the disturbance has abated so that long term adverse effects are not anticipated in this regard.

Current benthic ecological data suggest that coarse sediment habitats at the Neart na Gaoithe wind farm area are represented by a mosaic of circalittoral biotopes (**SS.SCS.CCS** and/or **SS.SMx.CMx**) as well as additional biotopes such as **CR.MCR.EcCr.FaAICr.Pom** and **CR.MCR.EcCr.FaAICr.Adig**.

Assessment of sensitivity of the biotope **CR.MCR.EcCr.FaAICr.Pom** (Tyler-Walters, 2008) indicates an intermediate intolerance to smothering and physical disturbance, but high community recovery rates. As evident from the video footage, much of the hard substrate was subject to natural physical disturbance (a thin veneer of sediment over many of the cobbles). The disturbance impacts associated with the installation of turbines, inter-turbine cabling, feet of jack-up rigs and anchors, will be short lived with recovery of the community occurring within a few weeks to months (so long as comparable habitat conditions remain post-construction). Disturbance effects are also likely to be highly localised (subject to detailed modelling within the ES) and restricted to the footprint of the turbine, substations and cabling activity. As such, potential physical disturbances are considered to be of **minor significance** only.

The EIA will provide a detailed appraisal of the benthic communities present including biotope classification and sensitivity to further refine this assessment.



6. Conclusions

Despite comparatively large areas of high reflexivity and topographic distinctness, video and grab ground truthing data indicated that at the Neart na Gaoithe wind farm development, only relatively small areas of apparent ridges resembled potential Annex I stony reef criteria. The total area of these ridges within and close to the boundaries of the development was 0.953 km². Resemblance to Annex I geogenic or stony reef feature was considered to be low.

The EIA will assess possible impacts on potential Annex I stony reef feature within the context of the total footprint of the wind farm and the availability of similar reef feature at appropriate geographic scales. Subject to the nature of the material used, any scour protection may mitigate for loss of reef habitat providing an adequate equivalent substrate for comparable epibenthic communities to become established. The potential loss of Annex I stony reef feature is therefore judged to be of **minor significance** at this stage.

Whilst relatively intolerant to the effects of disturbed sediments, local epibenthic communities are judged to have the capacity to recover quickly once the disturbance has abated. Impacts related to the re-distribution of sediments as a result of the construction of the wind farm on benthos are therefore considered to be of **minor significance**.

Statutory advice is now invited to confirm the value and extent of these potential Annex I reef features and to identify any other information that may be required to be considered within the forthcoming EIA.

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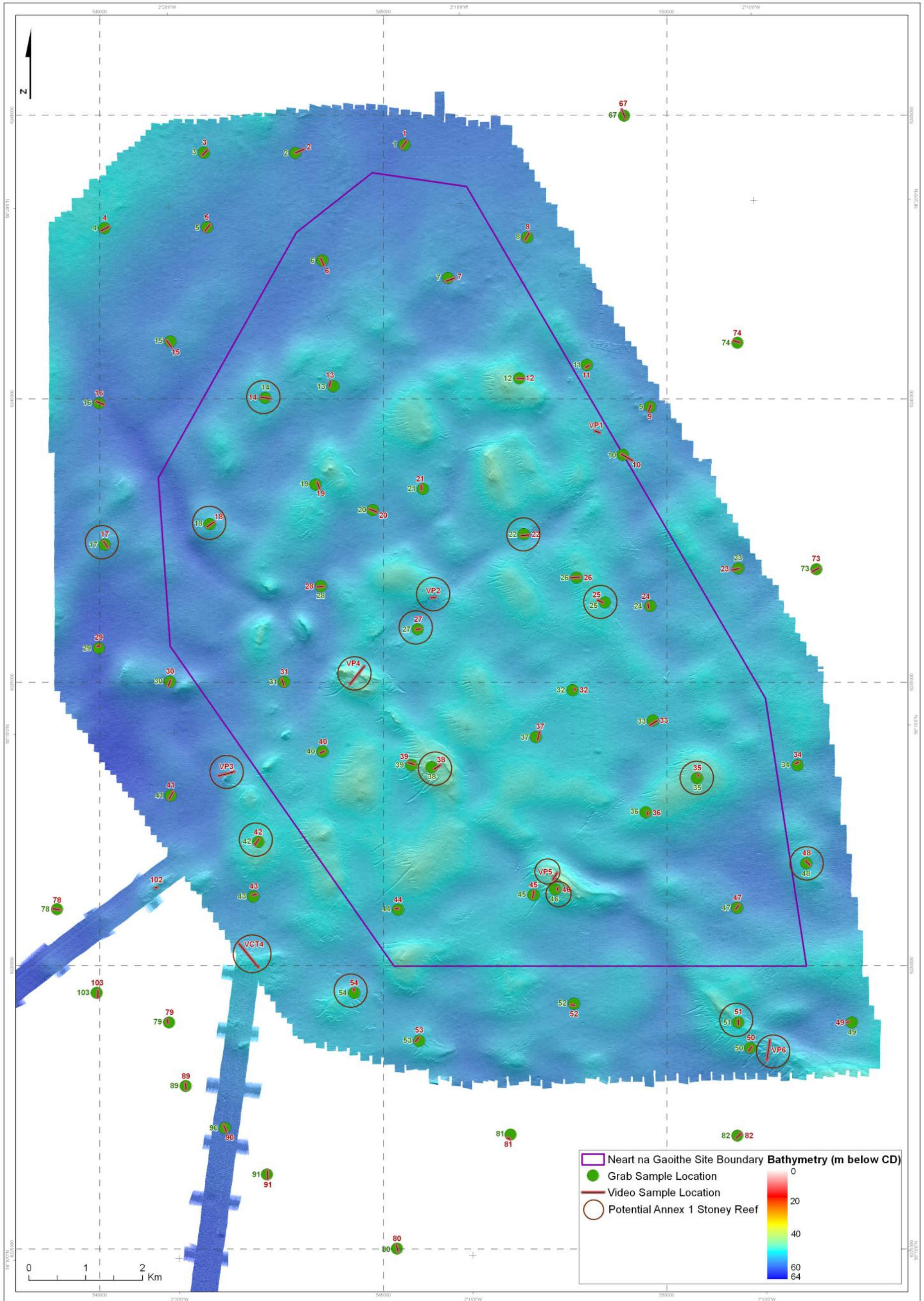
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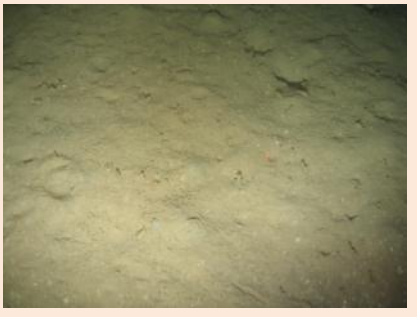








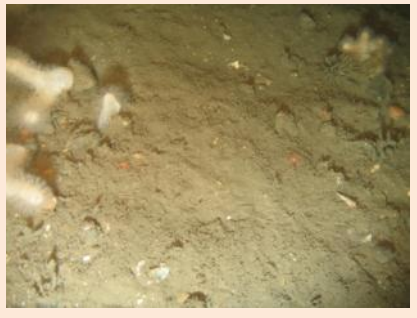





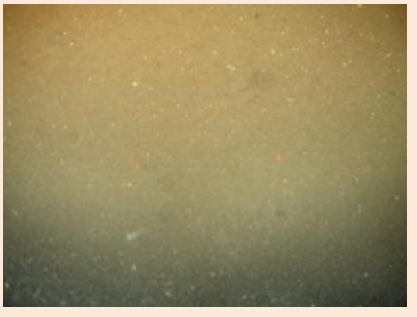





APPENDIX A: Samples Selected for Comparison with Annex I Stony Reef Criteria

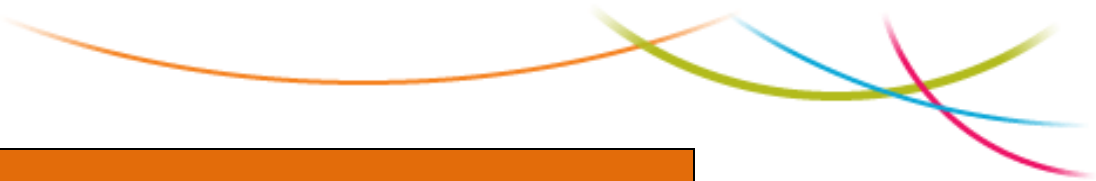




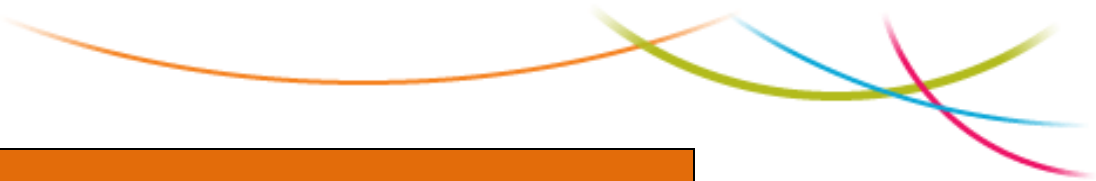
APPENDIX B: Seabed Photographs



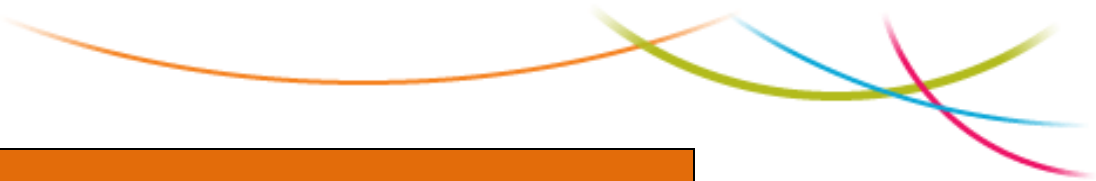
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Site Number	Stills Photographs				
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Site Number	Stills Photographs				
48					
51					
54					
VP2					
VP3					



Site Number	Stills Photographs				
VP4					
VP5					
VP6					
VCT4					

APPENDIX C: Mapping of Potential Annex I Stony Reef

