

Outer Dowsing Offshore Wind

Offshore Export Cable Corridor

Sabellaria Spinulosa Reanalysis and Report

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Version	Person	Role	Status	Date
1	Charlotte Aldis	AUTHOR	Draft	09/08/2024
1	Lottie Turnbull	GIS/MAPS	Draft	09/08/2024
1	Ian Sotheran	EDITOR	Issued	21/08/2024
2	Charlotte Aldis	AUTHOR	Draft	27/08/2024
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PREPARED BY ENVISION
Mallan House
Bridge End
Hexham
Northumberland
NE46 4DQ
United Kingdom

T: +44 (0)1434 60 76 71

NOTES



ENVISION's environmental policy involves the use of 100% renewable electricity and recycled paper that is manufactured using wind-generated electricity.

I. Introduction

Outer Dowsing Offshore Wind (ODOW) (the Project) export cable corridor (ECC) passes through the Inner Dowsing Race Bank and North Ridge (IDRBNR) Special Area of Conservation (SAC) which is designated for sandbanks and biogenic reef (Figure I).

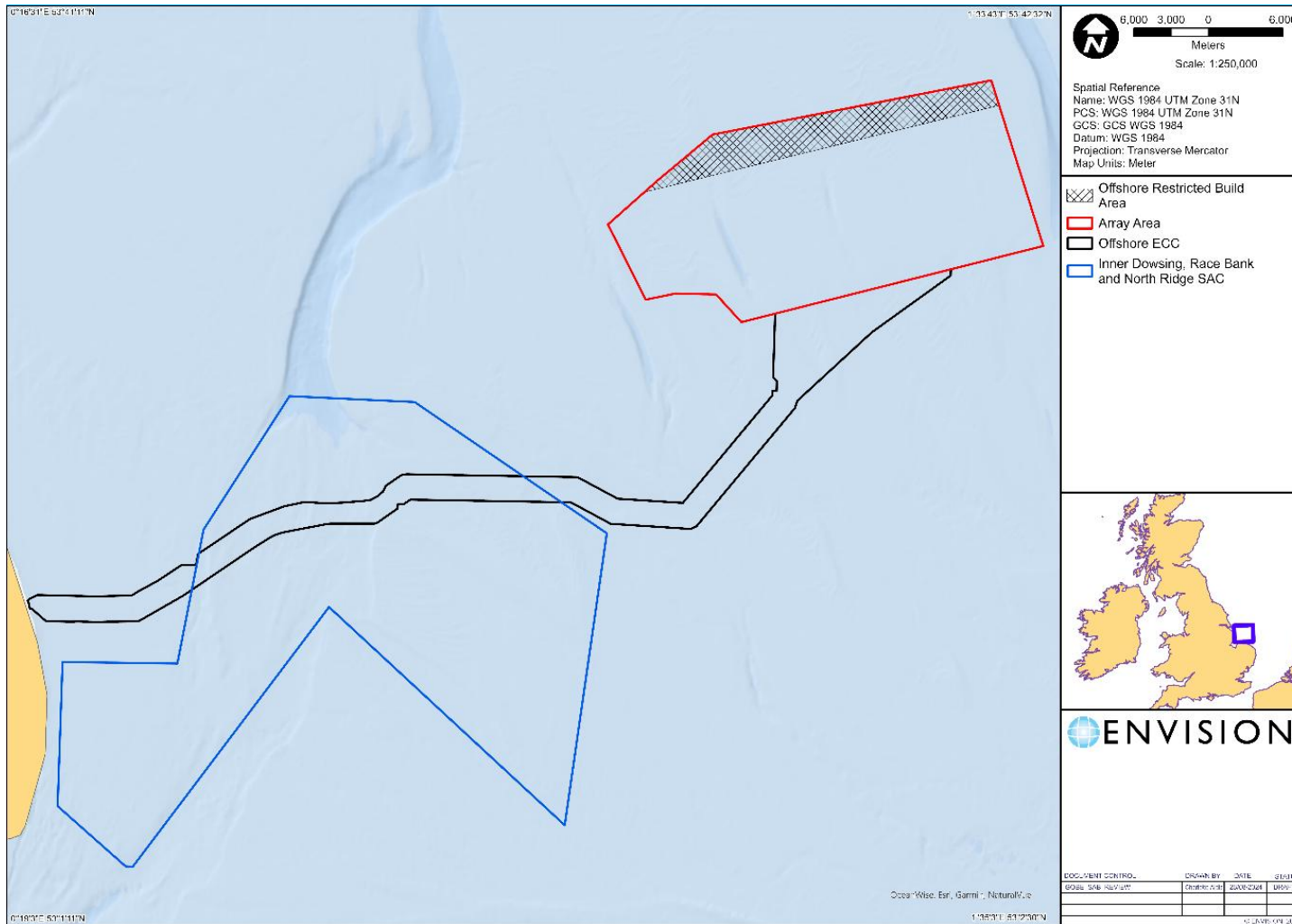


Figure 1.
 Array Area and Offshore ECC of the Project, with Inner Dowsing, Race Bank and North Ridge SAC shown.

ENVISION have previously undertaken a review of geophysical survey data and sample data for the Project ECC to update baseline characterisation maps with a focus on potential *Sabellaria spinulosa* habitats (ENVISION, 2024ⁱ) (Figure 2). Project specific data, along with any relevant third-party data (e.g. national datasets and archives), were reviewed to assess the likely location and probabilities of *Sabellaria* reef within the cable corridors and to increase the certainty of the predicted distribution of likely *S. spinulosa* reef (and other conservation features). This further analysis was also undertaken to ensure the Project conclusions of the reef extent were robust, and build confidence in the baseline characterisation.

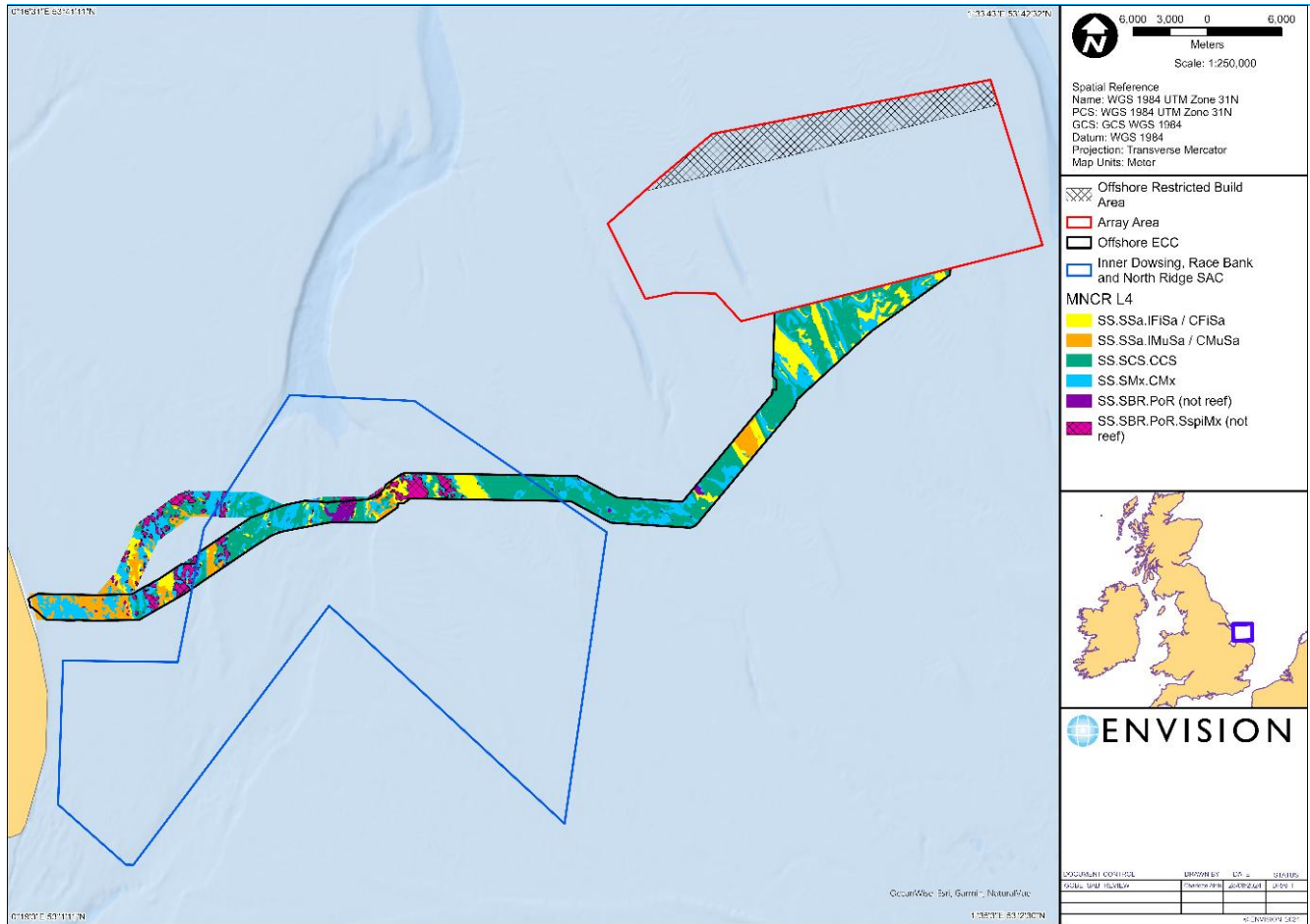


Figure 2. Marine habitat map at Level 4 MNCR for the Project ECC, produced using project specific data from the most recent benthic habitat surveys (ENVISION, 2024ⁱ).

SS.SBR.PoR.SspiMx (*Sabellaria spinulosa* on stable circalittoral mixed reef) is a component part of *S. spinulosa* reefs, however Annex I reefs are not always present where the biotope occurs and additional assessment is required to determine if Annex I reef is present at any location. To meet this requirement, ENVISION has undertaken an independent re-analysis of underwater imagery data available for the ECC, to assess for potential *S. spinulosa* reef.

2. Methodology

ENVISION reviewed a total of 43 underwater videos from 33 stations within the ECC to verify the presence of *S. spinulosa* and to assess presence of any Annex I biogenic reef observed within the imagery (Figure 3). A further 1,078 still images from all 33 stations were reviewed alongside the video(s) for each station, to aid with recording presence or absence of *S. spinulosa*. Underwater video was reviewed, processed and analysis in accordance with current guidelines, including the standards for analysis in Visual Seabed Surveys (BS EN 16260:2012) and Turner *et al.*, (2016ⁱⁱ).

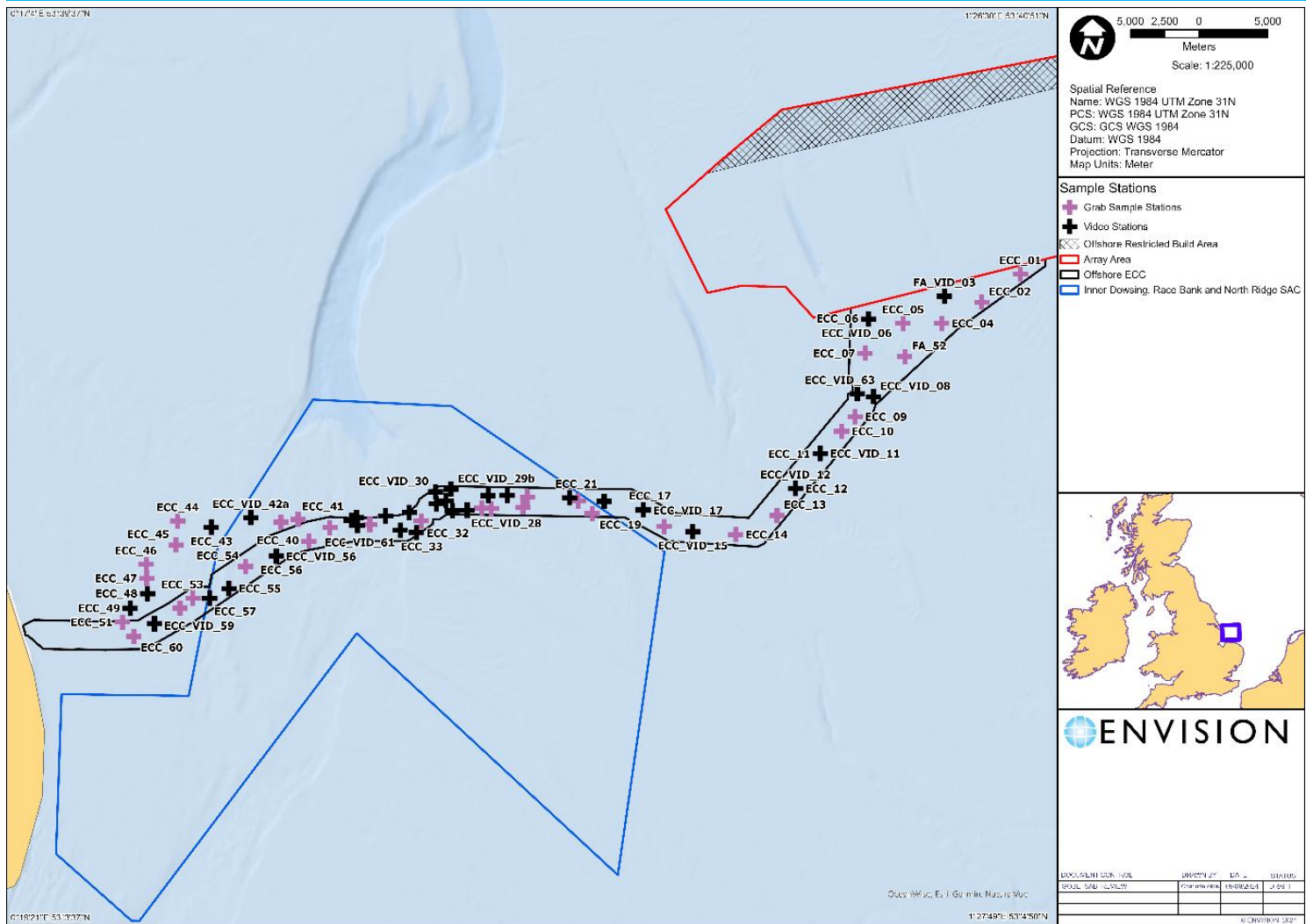


Figure 3.
Location of underwater imagery and benthic grab sample stations within the Project ECC.

2.1. Screening Process and Grab Sample Review Methodology

All underwater videos were firstly 'screened' to identify the presence of *S. spinulosa* habitat by watching the videos through in their entirety and recording presence or absence of *S. spinulosa* per minute of footage. Videos in which *S. spinulosa* was present in abundances over 1% were earmarked for further assessment. The still images for each station were reviewed alongside the video(s) for the station and used to aid the screening process and full *S. spinulosa* 'reefiness' assessment if videos were low resolution.

Benthic grab samples were collected from 59 stations throughout the Project ECC (Figure 4) and infaunal analysis results were reviewed. Out of the 59 grab stations, underwater imagery was collected at 28 stations.

The number of individuals of *S. spinulosa* identified in the benthic grab samples were assessed in line with the density thresholds detailed in Limpenny *et al* (2010ⁱⁱⁱ). All underwater imagery stations which had associated grab samples containing 375 individuals of *S. spinulosa* were assigned for further biogenic reef assessment in line with guidance from Limpenny *et al.*, (2010)ⁱⁱⁱ. The geophysical data (bathymetry and sidescan sonar) at the locations of grab samples with over 375 individuals, which did not have associated underwater imagery, were also reviewed.

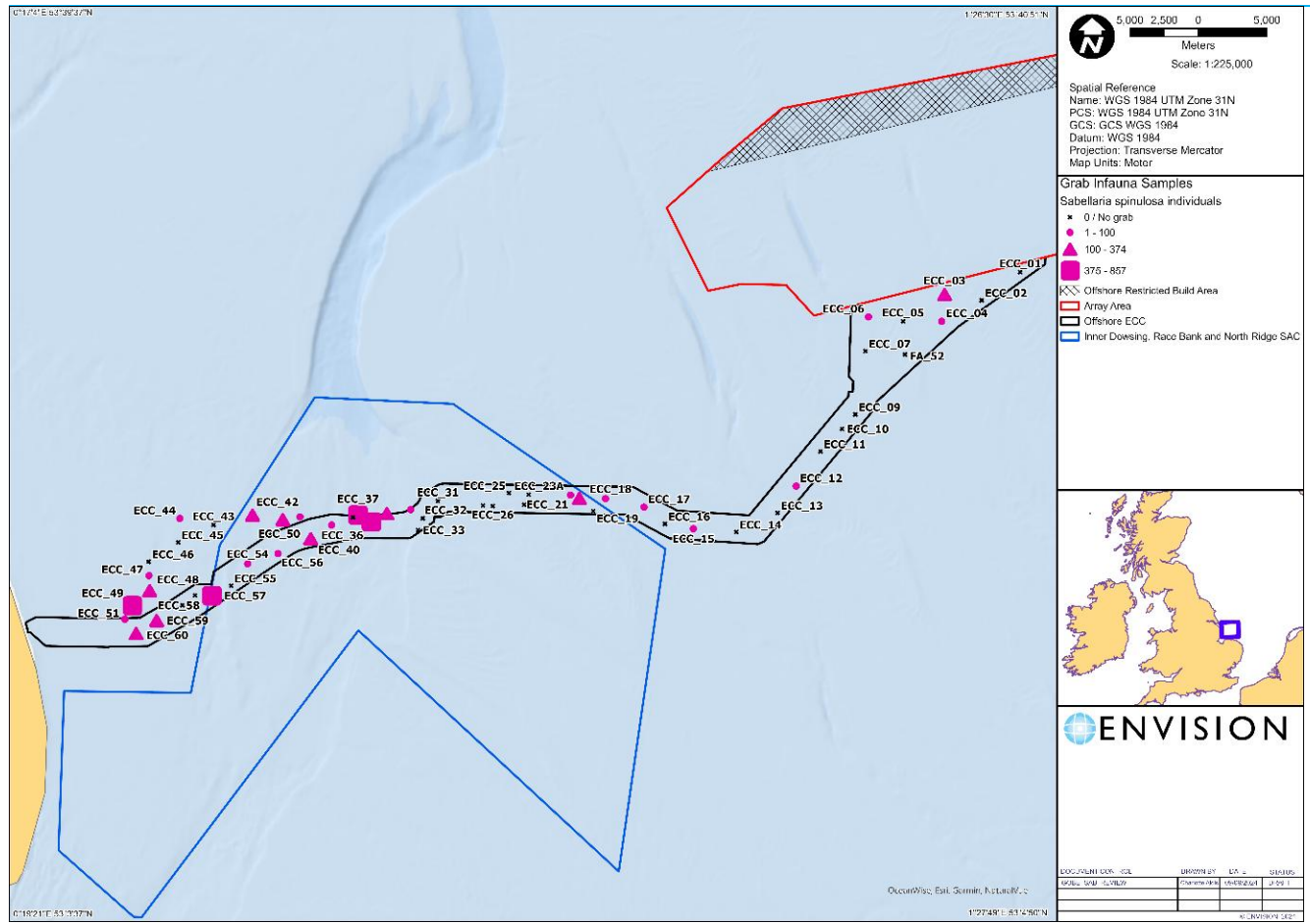


Figure 4.
 Numbers of *Sabellaria spinulosa* individuals recorded from benthic grab samples across the Project ECC.

2.2. Sabellaria spinulosa Reef Assessment Methodology

Following the 'screening' process, all stations identified for further assessment were reviewed for Annex I biogenic reef following the appropriate JNCC guidance notes (Gubbay, 2007^{iv}).

The method used for assessing the underwater imagery for *S. spinulosa* reef is based on outputs (Table 1) from an expert workshop (Gubbay, 2007^{iv}), which evaluates various characteristics of reefs, with attributes originally defined by Hendrick and Foster-Smith (2006)^v.

Table 1.

Method for assessing Sabellaria spinulosa reef from an expert workshop, Gubbay (2007^{iv}).

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

Where reef assessment indicated low, medium or high 'reefiness' in any of the measures of 'reefiness', the location of these with associated sidescan sonar or backscatter data were reviewed to ascertain if any features could be identified on the seabed and therefore the extent of any reef features better defined.

3. Results

3.1. Screening Process and Grab Sample Counts

All 43 videos from 33 stations were screened for the presence or absence of *S. spinulosa* per minute of footage. A total of 19 stations were recorded as having *S. spinulosa* present, with 12 stations assigned for full *S. spinulosa* reef assessment. In total 17 videos were assessed for 'reefiness' as there were some instances where a station had two video samples collected from difference video systems.

Two stations were segmented due to the varying levels of *S. spinulosa* present within the imagery. Stations ECC_VID_64 and ECC_VID_48a were each segmented into two, with one segment from each being assigned for full assessment. A summary of the screen process results is shown in Table 2, with full results table found in Appendix 5.1: Screening Process Results.

Table 2.

Summary of the results from the screening process for presence and absence of Sabellaria spinulosa in the Project ECC video stations.

STATION	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
ECC_03	YES	NO	No elevation, dead empty tubes, less than 1% of <i>Sabellaria</i> present in video, counts of <i>Sabellaria</i> from grab under 375 threshold (236).

STATION	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
ECC_06	NO	NO	No <i>Sabellaria</i> present, relatively low counts of <i>Sabellaria</i> found in grab (9).
ECC_08	YES	NO	No elevation, one very small clump of dead tubes, less than 1% of <i>Sabellaria</i> present in video.
ECC_11	NO	NO	No <i>Sabellaria</i> present or in grab.
ECC_12	YES	NO	No elevation, less than 1% of <i>Sabellaria</i> present in video, one very small clump of dead tubes, relatively low numbers found in grab (24).
ECC_15	YES	NO	No elevation, dead empty tubes, less than 1% of <i>Sabellaria</i> present in video, relatively low numbers found in grab (50).
ECC_17	NO	NO	No <i>Sabellaria</i> present, relatively low numbers found in grab (12).
ECC_18	YES	NO	No elevation, one very small clump of dead tubes, less than 1% of <i>Sabellaria</i> present in video, relatively low numbers found in grab (1).
ECC_21	YES	NO	<i>Sabellaria</i> present in still images but not in video, no elevation, dead empty tubes, less than 1% present throughout stills and video, relatively low numbers found in grab (96).
ECC_25	NO	NO	No <i>Sabellaria</i> present or in grab.
ECC_28	YES	NO	<i>Sabellaria</i> present in still images but not in video, no elevation, dead empty tubes, less than 1% present throughout stills and video.
ECC_29b	YES	YES	Patches of <i>Sabellaria</i> throughout.
ECC_30	NO	NO	No <i>Sabellaria</i> present.
ECC_31	NO	NO	No <i>Sabellaria</i> present or in grab.
ECC_33	NO	NO	No <i>Sabellaria</i> present or in grab.
ECC_34	YES	YES	Video quality too poor to see presence or absence of <i>Sabellaria</i> , stills images show presence of <i>Sabellaria</i> throughout.
ECC_35	YES	YES	Patches of <i>Sabellaria</i> throughout.
ECC_37	YES	YES	<i>Sabellaria</i> present, relatively high numbers of <i>Sabellaria</i> in grab sample over the 375 threshold (493).
ECC_38	NO	NO	No <i>Sabellaria</i> present or in grab.
ECC_42a	NO	NO	No <i>Sabellaria</i> present, relatively low numbers found in grab (123).
ECC_43	NO	NO	No <i>Sabellaria</i> present or in grab.
ECC_48a_S1	NO	NO	No <i>Sabellaria</i> present, relatively low numbers found in grab (191).
ECC_48a_S2	YES	YES	Patches of <i>Sabellaria</i> throughout.
ECC_49	YES	YES	<i>Sabellaria</i> present, high numbers in grab sample over the 375 threshold (563).
ECC_55	NO	NO	No <i>Sabellaria</i> present or in grab.
ECC_56	NO	NO	No <i>Sabellaria</i> present, relatively low numbers found in grab (47).
ECC_57	YES	YES	Clumps of <i>Sabellaria</i> throughout, high numbers in grab sample over the 375 threshold (755).

STATION	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
ECC_59	YES	YES	Clumps of <i>Sabellaria</i> throughout.
ECC_61	NO	NO	No <i>Sabellaria</i> present.
ECC_62	YES	YES	Clumps of <i>Sabellaria</i> throughout.
ECC_63	NO	NO	No <i>Sabellaria</i> present.
ECC_64_S1	NO	NO	No <i>Sabellaria</i> present.
ECC_64_S2	YES	YES	Clumps of <i>Sabellaria</i> throughout.
ECC_65	YES	YES	Clumps of <i>Sabellaria</i> throughout.
ECC_66	YES	YES	Clumps of <i>Sabellaria</i> throughout.

The 12 stations that were assigned for full *S. spinulosa* reef assessment were ECC_VID_29b, ECC_VID_34, ECC_VID_35, ECC_VID_37, ECC_VID_48a, ECC_VID_49, ECC_VID_57, ECC_VID_59, ECC_VID_62, ECC_VID_64, ECC_VID_65 and ECC_VID_66. The number of individuals of *S. spinulosa* from the benthic grab samples were also reviewed for these stations, ranging from 96 individuals to 755 individuals (Table 3).

Table 3.

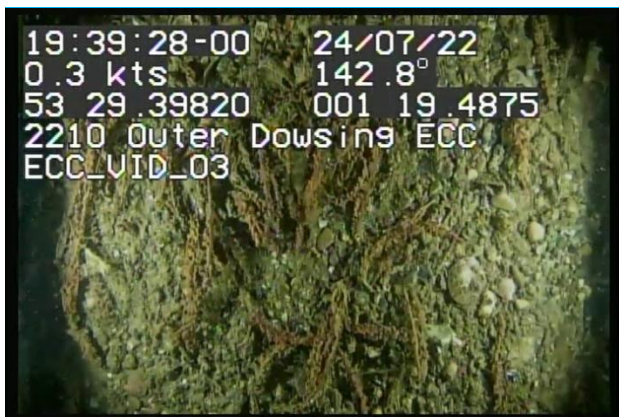
Numbers of individuals of Sabellaria spinulosa identified within the benthic grab sample of the twelve stations that recorded presence of Sabellaria spinulosa and were assigned for full assessment.

STATION	NUMBER OF SABELLARIA SPINULOSA INDIVIDUALS
ECC_29b	NO GRAB COLLECTED
ECC_34	147
ECC_35	96
ECC_37	493
ECC_38	0
ECC_48a_S2	191
ECC_49	563
ECC_57	755
ECC_59	195
ECC_62	NO GRAB COLLECTED
ECC_64_S2	NO GRAB COLLECTED

Seven stations were identified as having *S. spinulosa* present in small patches, which were less than 1m² and were recorded as dead, empty tubes, these stations were ECC_VID_03, ECC_VID_08, ECC_VID_12, ECC_VID_15, ECC_VID_18, ECC_VID_21 and ECC_VID_28. The instances of *S. spinulosa* observed were not assigned for reef assessment due to the distinct lack of elevation, area and percentage cover, which were all well below the thresholds described in Gubbay (2007^{iv}). The review of the video footage for stations ECC_VID_21 and ECC_VID_28 did not record *S. spinulosa* as present, however, the still images for these stations had very small patches, less than 0.5 m². Therefore, these stations were recorded as having *S. spinulosa* present but were not assigned for reef assessment. Example images taken from each of the seven stations are shown in Table 4.

Table 4.

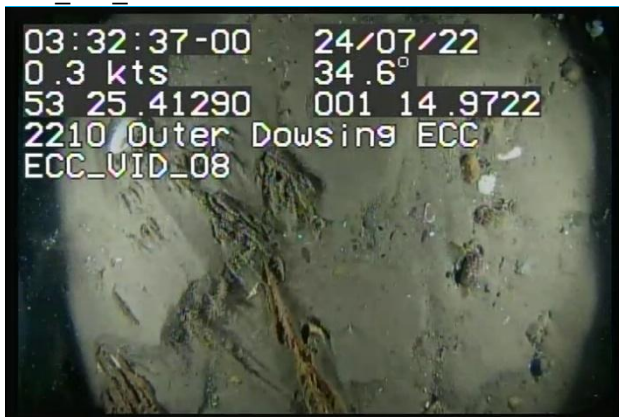
Screen capture images and still imagery taken from video stations that recorded Sabellaria spinulosa as present in small amounts (<1m² patches) and were not assigned for further reef assessment.



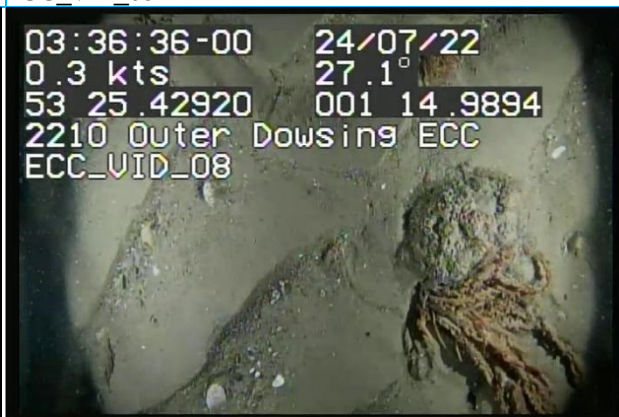
ECC_VID_03



ECC_VID_03



ECC_VID_08



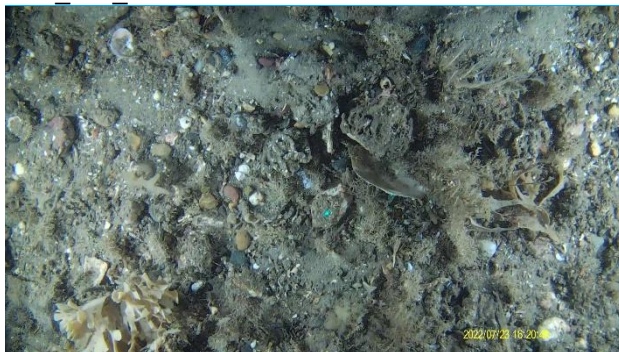
ECC_VID_08



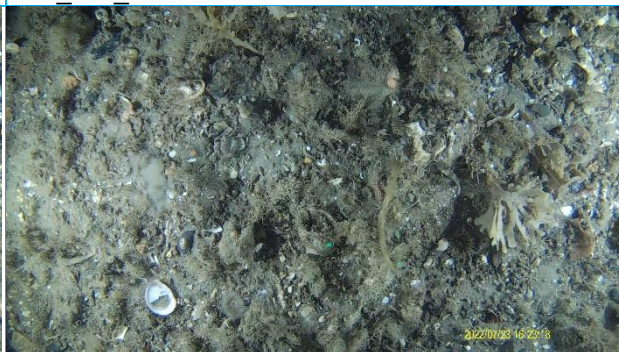
ECC_VID_12



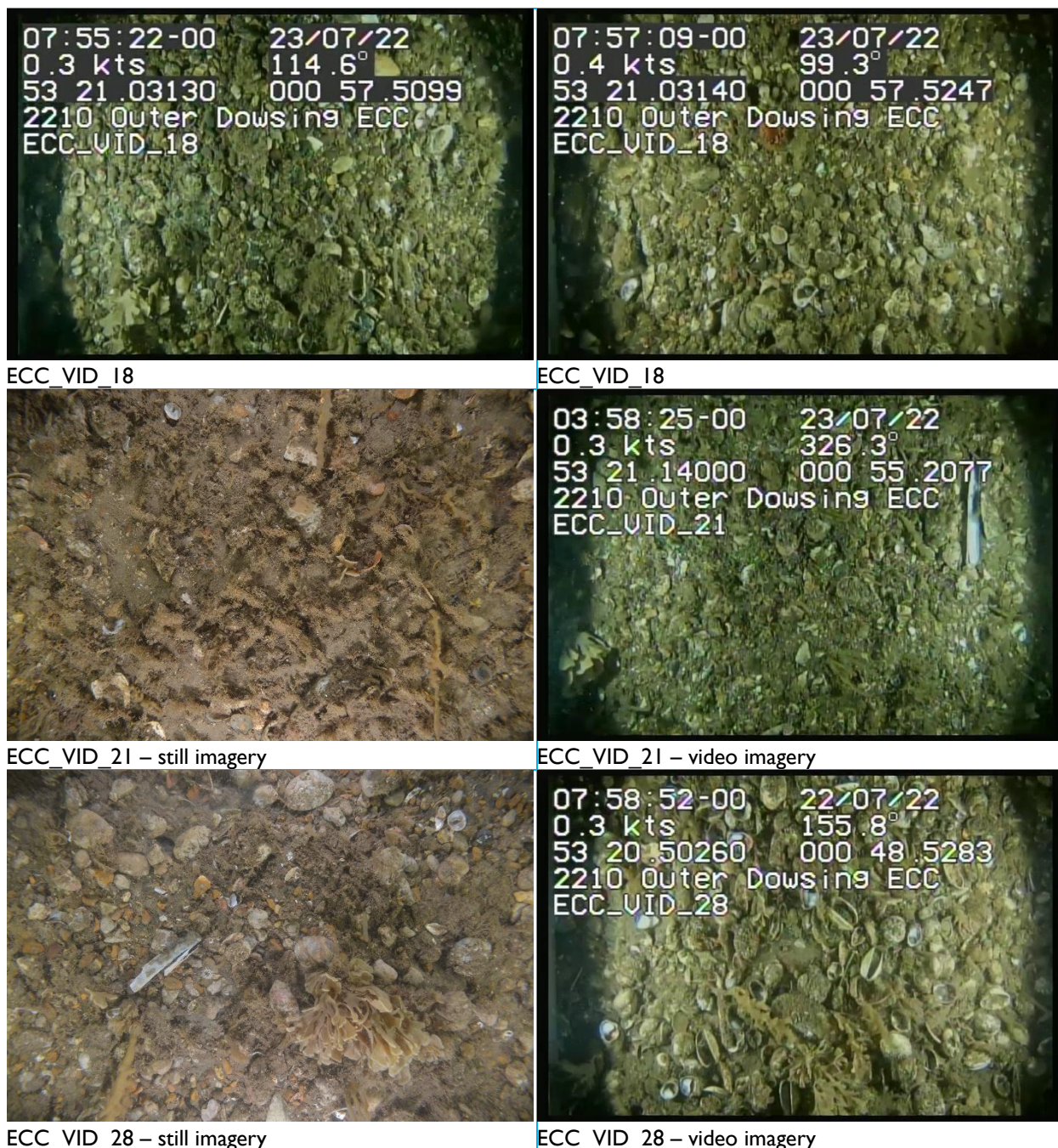
ECC_VID_12



ECC_VID_15



ECC_VID_15



The number of individuals of *S. spinulosa* identified from the benthic grab samples were reviewed for these seven stations and all stations were found to be below the 375 individuals threshold (Limpenny *et al.*, 2010ⁱⁱⁱ), ranging from one individual to 236 individuals (Table 5).

Table 5.

Numbers of individuals of Sabellaria spinulosa identified within the benthic grab sample of the four stations that recorded presence of Sabellaria spinulosa but were not assigned for full assessment.

STATION	NUMBER OF SABELLARIA SPINULOSA INDIVIDUALS
ECC_03	236
ECC_08	NO GRAB COLLECTED
ECC_12	24

STATION	NUMBER OF SABELLARIA SPINULOSA INDIVIDUALS
ECC_15	50
ECC_18	1
ECC_21	96
ECC_28	NO GRAB COLLECTED

The remaining 14 stations were found to not have any *S. spinulosa* recorded through the screening process, the benthic grab samples for these stations were reviewed and numbers of individuals of *S. spinulosa* ranged from zero individuals to 147 individuals, all below the 375 individuals threshold (Limpenny *et al.*, 2010ⁱⁱⁱ) (Table 6).

Table 6.

Numbers of individuals of Sabellaria spinulosa identified within the benthic grab sample of the 14 stations that did not record any presence of Sabellaria spinulosa throughout the video for each station, and the two stations that were segmented, ECC_VID_48a and ECC_VID_64.

STATION	NUMBER OF SABELLARIA SPINULOSA INDIVIDUALS
ECC_06	9
ECC_11	0
ECC_17	12
ECC_25	0
ECC_30	NO GRAB COLLECTED
ECC_31	0
ECC_33	0
ECC_38	493
ECC_42a	123
ECC_43	0
ECC_48a_S1	191
ECC_55	0
ECC_56	47
ECC_61	NO GRAB COLLECTED
ECC_63	NO GRAB COLLECTED
ECC_64_S1	NO GRAB COLLECTED

Out of the 59 benthic grab stations, 32 stations did not include underwater imagery sampling, with 12 of these stations recording *S. spinulosa* presence through infaunal analysis. Numbers of individuals of *S. spinulosa* ranged from 18 to 857 (Table 7). One station, ECC_36, had counts over the 375 individuals threshold (Limpenny *et al.*, 2010ⁱⁱⁱ) (Figure 5).

Table 7.

Numbers of individuals of Sabellaria spinulosa identified within the benthic grab sample of the 32 stations that did not have underwater imagery collected at.

STATION	NUMBER OF SABELLARIA SPINULOSA INDIVIDUALS
ECC_01	0
ECC_02	0
ECC_04	27
ECC_05	0

STATION	NUMBER OF SABELLARIA SPINULOSA INDIVIDUALS
ECC_07	0
ECC_09	0
ECC_10	0
ECC_13	0
ECC_14	0
ECC_16	0
ECC_19	0
ECC_20	143
ECC_23	0
ECC_24	0
ECC_26	0
ECC_27	0
ECC_32	0
ECC_36	857
ECC_39	41
ECC_40	171
ECC_41	18
ECC_44	21
ECC_45	0
ECC_46	0
ECC_47	26
ECC_50	171
ECC_51	35
ECC_52	0
ECC_53	0
ECC_54	40
ECC_58	0
ECC_60	260

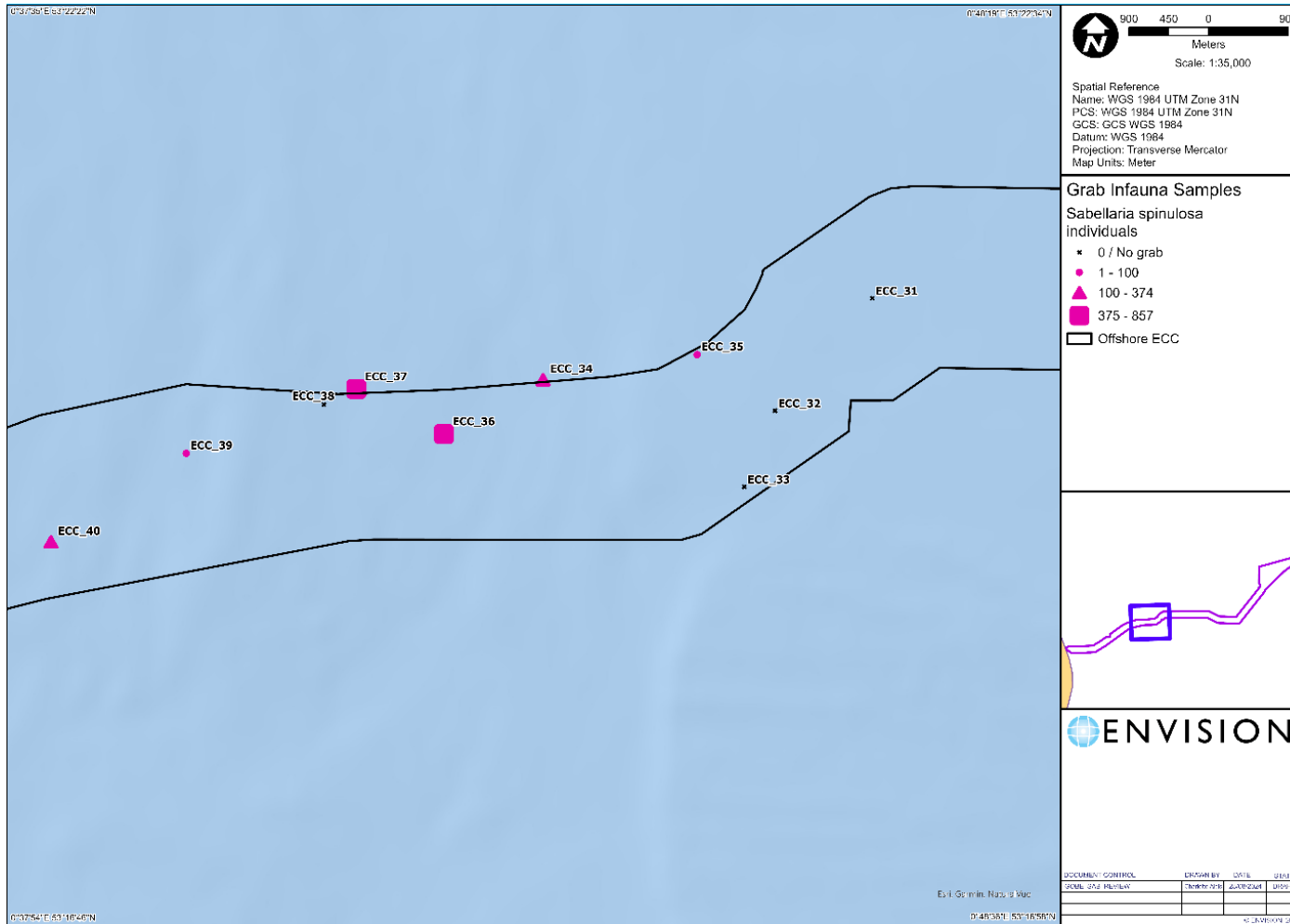


Figure 5.
 Location of station ECC_36, which recorded 857 individuals of Sabellaria spinulosa in the benthic grab sample.

3.2. Image Quality

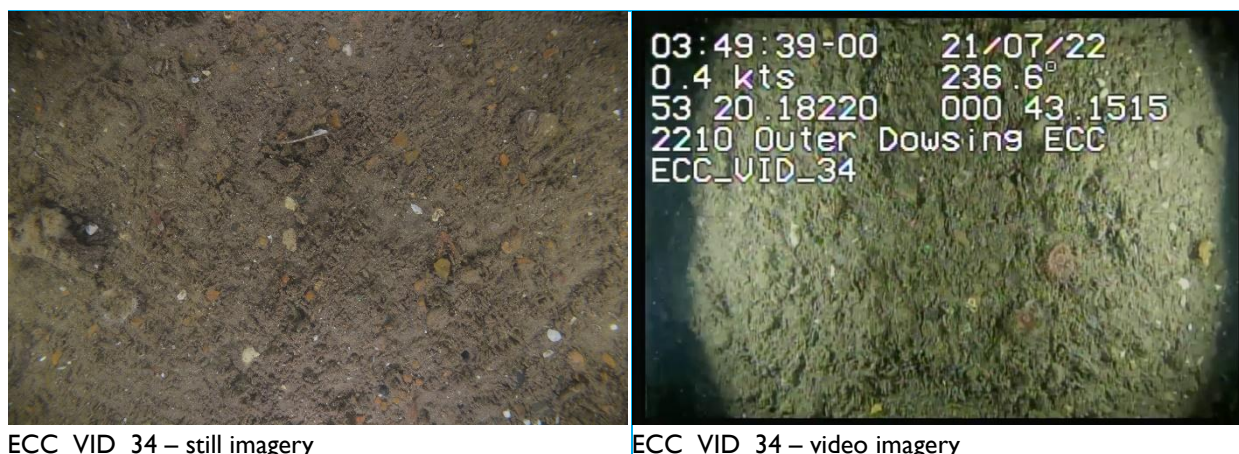
Two camera systems were used to collect underwater imagery, a Full HD (high definition) (1080 x 1920 pixel) system and a SD (standard definition) (720 x 480 pixel) system, which resulted in a variation in quality due to the differences in resolution of the imagery collected.

Ten stations (ECC_VID_12, ECC_VID_15, ECC_VID_17, ECC_VID_33, ECC_VID_37, ECC_VID_38, ECC_VID_48a, ECC_VID_64 and ECC_VID_66) had videos available from both the Full HD and SD camera systems. For these ten stations the videos from both camera systems were screened for the presence or absence of *S. spinulosa* and for those stations assigned for full assessment of *S. spinulosa* reef the videos captured with the Full HD camera system were used, due to the high resolution of the camera system.

One station, ECC_VID_34, was only sampled with the SD camera system, which resulted in lower quality imagery for analysis. For this station it was not possible to confidently identify the presence and absence of *S. spinulosa* through the video imagery. Therefore, the still images captured at this station were used to review the presence or absence of *S. spinulosa* and subsequently used for full 'reefiness' assessment. Example imagery from this station is shown in Table 8.

Table 8.

Still imagery and screen capture image taken from video station ECC_VID_34.



All videos that were assessed for *S. spinulosa* 'reefiness' were allocated an image quality category from the NMBAQC image quality categories (Table 9).

Table 9.

Summary of NMBAQC image quality categories (Turner et al., 2016ⁱⁱ).

Quality Category	Proportion of Tow Negatively Affected	Organism Enumeration	Biotopes
Excellent	<5%	Quantitative	Level 5
Good	5-20%	Quantitative	Level 5
Poor	20-50%	Qualitative	Level 3
Very Poor	50-80%	Not recommended	Level 2/3
Zero	>80%	Data not usable	Data not usable

Seven videos were allocated 'Good' (ECC_VID_35, ECC_VID_37, ECC_VID_49, ECC_VID_62, ECC_VID_64, ECC_VID_65 and ECC_VID_66), these were all collected with the Full HD camera system, with the footage at a high resolution, and epifauna clearly visible for the majority of the footage. Six videos were allocated 'Poor', with one of these videos collected from the Full HD camera system (ECC_VID_48a) given 'Poor' due to suspended sediment throughout the length of the video. The remaining three videos (ECC_VID_29b, ECC_VID_57 and ECC_VID_59) were collected by the SD camera system and were low resolution.

A total of 42 images were captured at station ECC_VID_34 and were all allocated an image quality category from the NMBAQC image qualities categories. One image was allocated 'Very Poor' due to lighting and suspended sediment, seven images were allocated 'Poor' due to lighting and the remaining still images were all allocated 'Good'.

3.3. Sabellaria spinulosa Reef Assessment

The results from 'reefiness' assessment for the stations assigned are outlined below, with 'reefiness' assessment shown in tables in line with Gubbay (2007^{iv}) and sidescan sonar (SSS) data reviewed and presented for each station.

3.3.1. ECC_VID_29b

Video station ECC_VID_29b has been assessed as 'NOT a REEF' (Figure 6).

From the video footage the station was allocated 2-5 cm elevation and area between 25-10,000 m² which are both categorised as 'LOW' reef. However, the patchiness (% cover) of the *S. spinulosa* within the video was below 10%, which is categorised as 'NOT a REEF'. These are shown in Table 10.

Table 10.

Measure of 'reefiness' allocated to ECC_VID_29b from Sabellaria spinulosa reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

The seabed around the video sample is relatively homogenous from the sidescan sonar data (Figure 6) with an indication of variable ground but no distinct reef features are evident.

Example images taken from the video footage for the station are shown in Table 11.

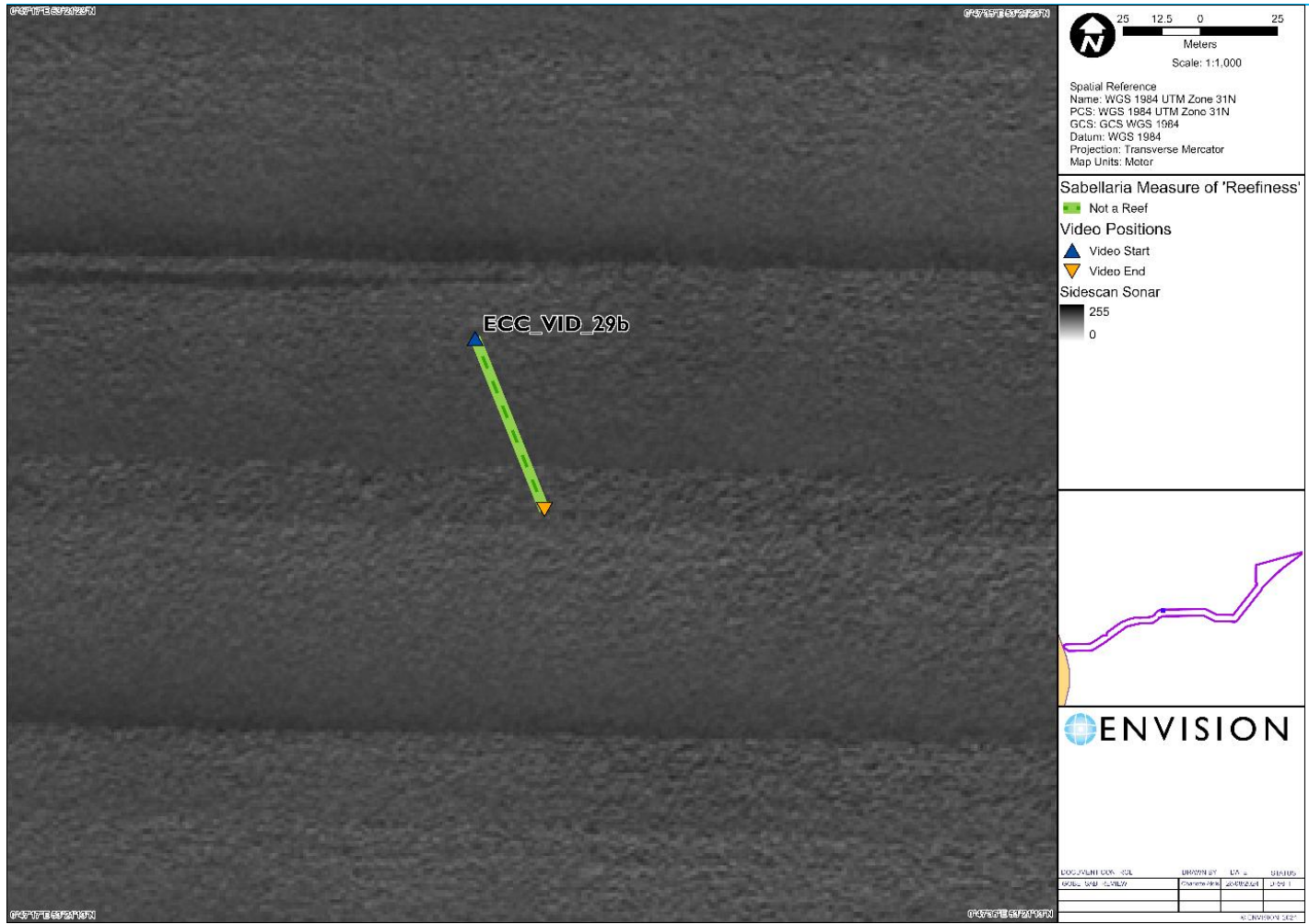
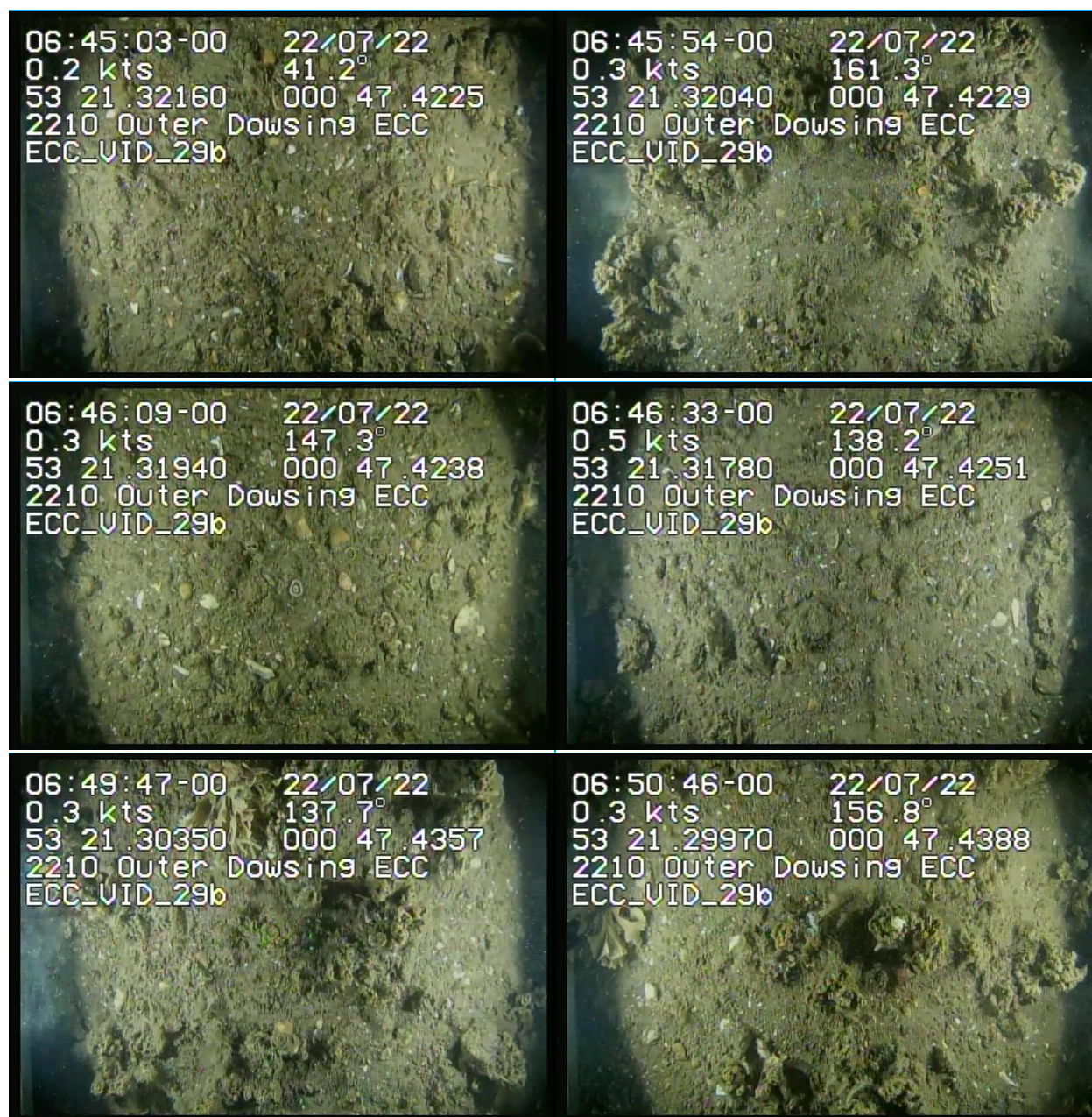


Figure 6. 'Reefiness' allocated to ECC_VID_29b, from Sabellaria spinulosa reef assessment (Gubbay, 2007^{iv}).

Table II.

Screen capture images taken from ECC_VID_29b, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.2. ECC VID 34

Station ECC VID 34 was assessed as 'NOT a REEF' (Figure 7).

Due to the poor quality of the video footage at this station, still images were individually assessed. A total of 42 stills were analysed, with all assessed as <25 m² for area, which is categorised as 'NOT a REEF'. Six still images were assessed as 10-20 patchiness (% cover), which is 'LOW' reef, with the remaining 36 images assessed as <10%, categorised as 'NOT a REEF'. For elevation, 13 images were assessed as 2-5 cm which is 'LOW' reef, with the remaining 29 images assessed as <2 cm, categorised as 'NOT a REEF'. All still images were assessed as 'NOT a REEF' (Table 12), with a summary shown in Table 13 and full results presented in Appendix 5.3: ECC VID 34 Still Image *Sabellaria spinulosa* Reef Assessment Results.

Table 12.

Overall measure of 'reefiness' allocated to ECC VID 34 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of still imagery.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

Table 13.

Summary of the *Sabellaria spinulosa* reef assessment of 42 still images collected at ECC VID 34 (Gubbay, 2007^{iv}).

'REEFINESS'	ELEVATION	AREA	PATCHINESS
NOT a REEF	29 images - <2 cm	42 images - <25 m ²	36 images - <10%
LOW REEF	13 images – 2-5 cm	0 images	6 images – 10-20%

Sidescan sonar data (Figure 7) shows the video transect to be located on an area of seabed with low variability and texture, to the west the seabed is more heterogeneous with signs of seabed variability, although this has not been sampled. The geophysical data does not indicate any distinct reef features for the transect sampled.

Numbers of individuals of *S. spinulosa* from the benthic grab sample collected at this station were 147, which is below the 375 threshold (Limpenny *et al.*, 2010ⁱⁱⁱ).

Example images taken from the video footage for the station are shown in Table 18.

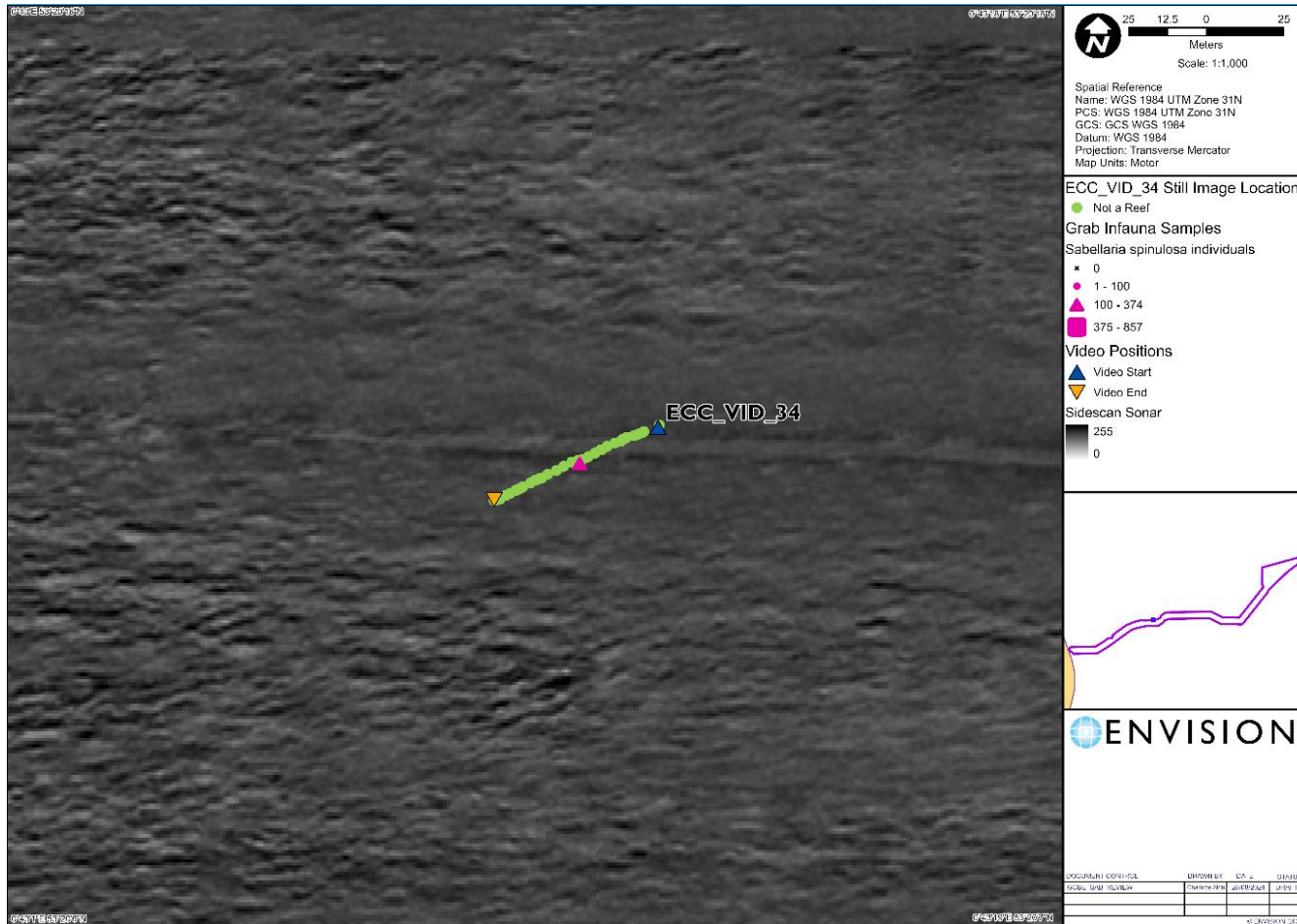
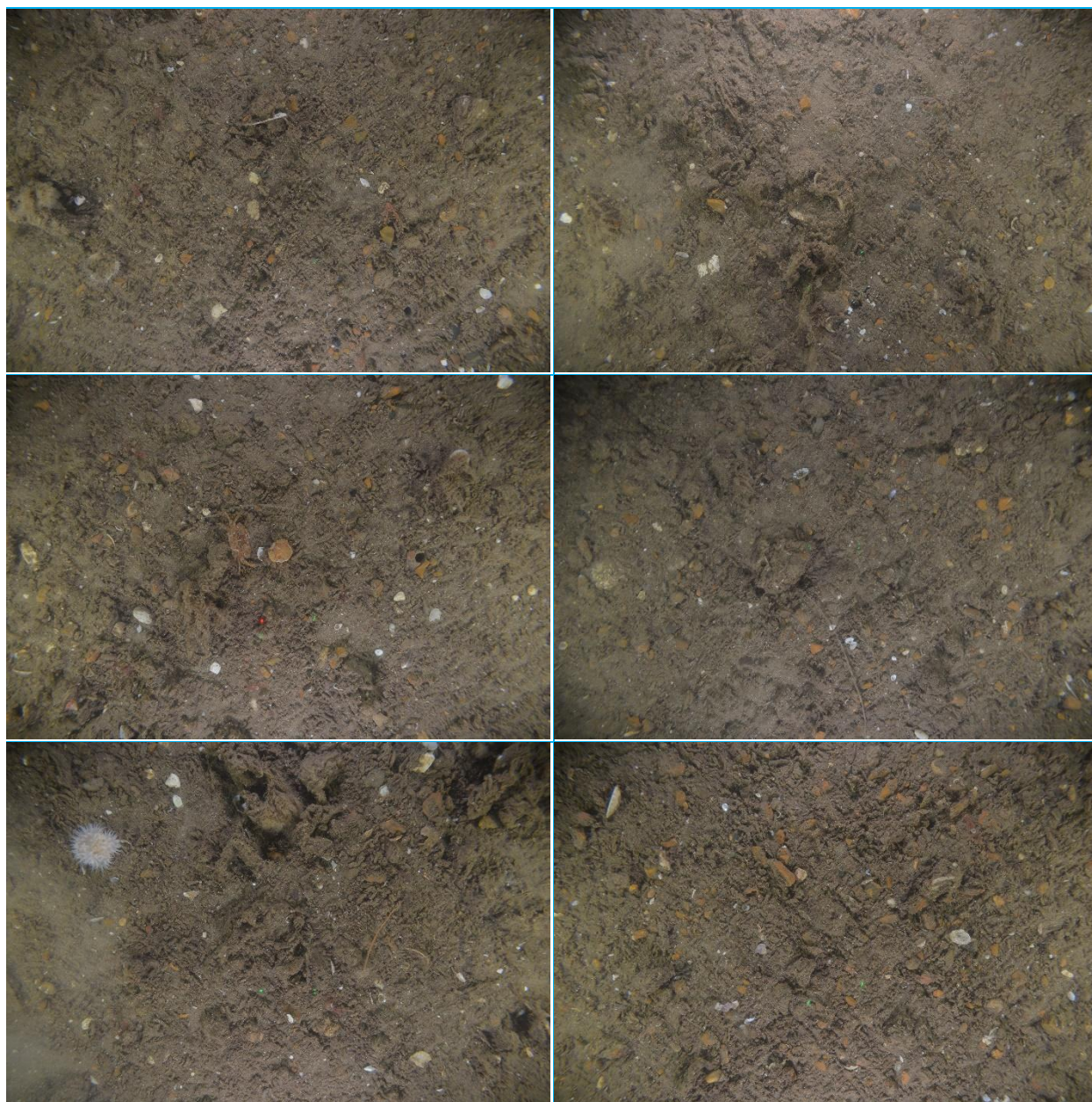


Figure 7.

'Reefiness' allocated to still images collected at ECC_VID_34, from Sabellaria spinulosa reef assessment (Gubbay, 2007^{iv}).

Table I4.

Still images captured at ECC_VID_34, showing examples of the level of Sabellaria spinulosa present.



3.3.3. ECC_VID_35

Video station ECC_VID_35 was assessed as 'NOT a REEF' (Figure 8).

From the video footage the station was allocated <2 cm elevation, area <25 m² and patchiness (% cover) of *S. spinulosa* within the video <10%. All these measures of 'reefiness' are categorised as 'NOT a REEF', as shown in Table 15.

Table 15.

Measure of 'reefiness' allocated to ECC_VID_35 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

The seabed around the video sample is relatively homogenous from the sidescan sonar data (Figure 8) with an indication of variable ground but no distinct reef features are evident.

Numbers of individuals of *S. spinulosa* from the benthic grab sample collected at this station was 96, which is below the 375 threshold (Limpenny *et al.*, 2010ⁱⁱⁱ).

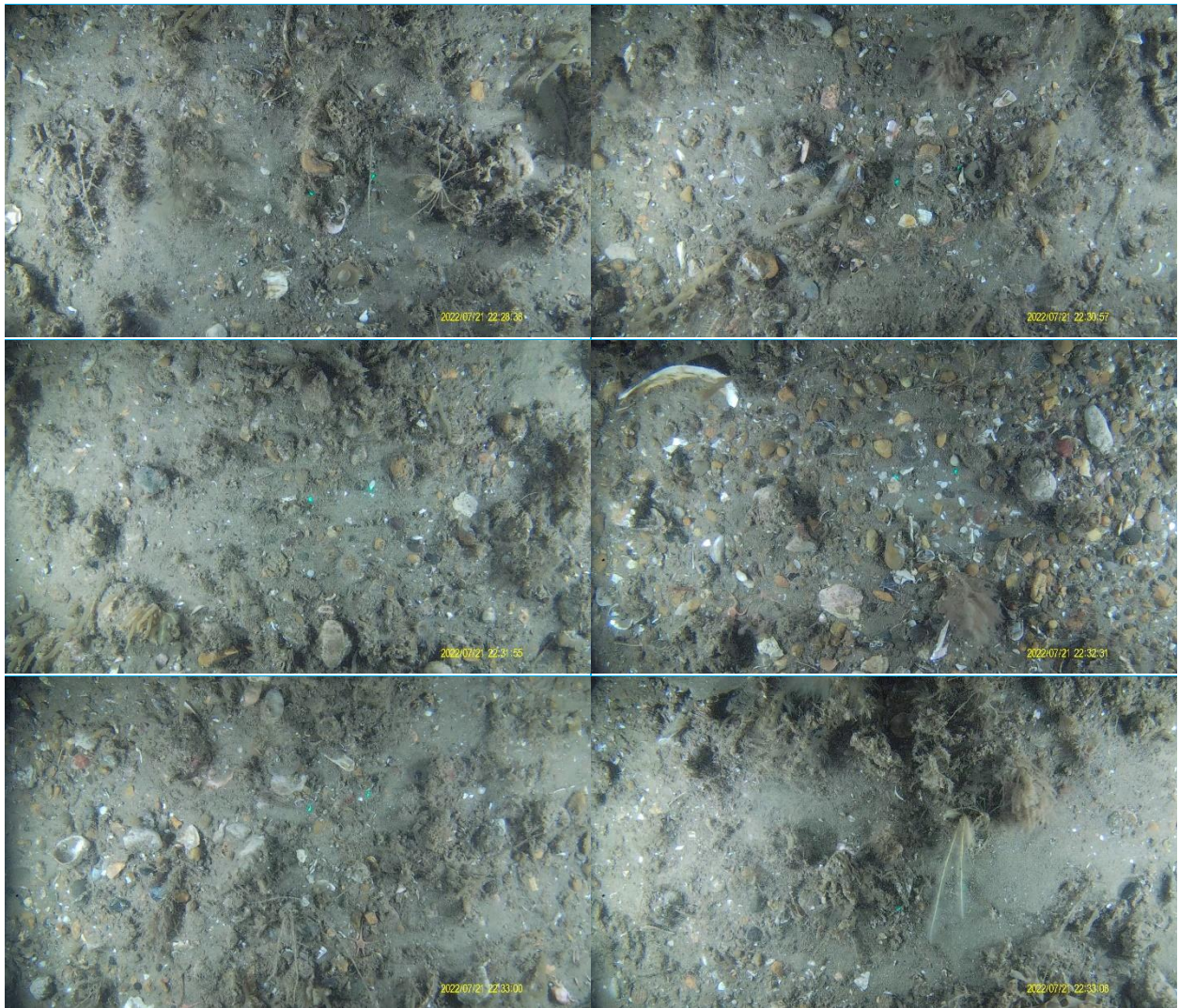
Example images taken from the video footage for the station are shown in Table 18.



Figure 8. 'Reefiness' allocated to ECC_VID_35, from Sabellaria spinulosa reef assessment (Gubbay, 2007^{iv}).

Table 16.

Screen capture images taken from ECC_VID_35, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.4. ECC_VID_37

Video station ECC_VID_37 was assessed as 'NOT a REEF' (Figure 9).

From the video footage the station was allocated <2 cm elevation, area <25 m² and patchiness (% cover) of *S. spinulosa* within the video <10%. All these measures of 'reefiness' are categorised as 'NOT a REEF', as shown in Table 17.

Table 17.

Measure of 'reefiness' allocated to ECC_VID_37 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

Sidescan sonar data (Figure 9) does not indicate any features distinct from the surrounding seabed or any elevated features.

Numbers of individuals of *S. spinulosa* from the benthic grab sample collected at this station was 493, which is above the density of individuals for reef as detailed by Limpenny *et al.*, (2010ⁱⁱⁱ). However, underwater imagery and data from sidescan sonar confirm this station is 'NOT a REEF'.

Example images taken from the video footage for the station are shown in Table 18.

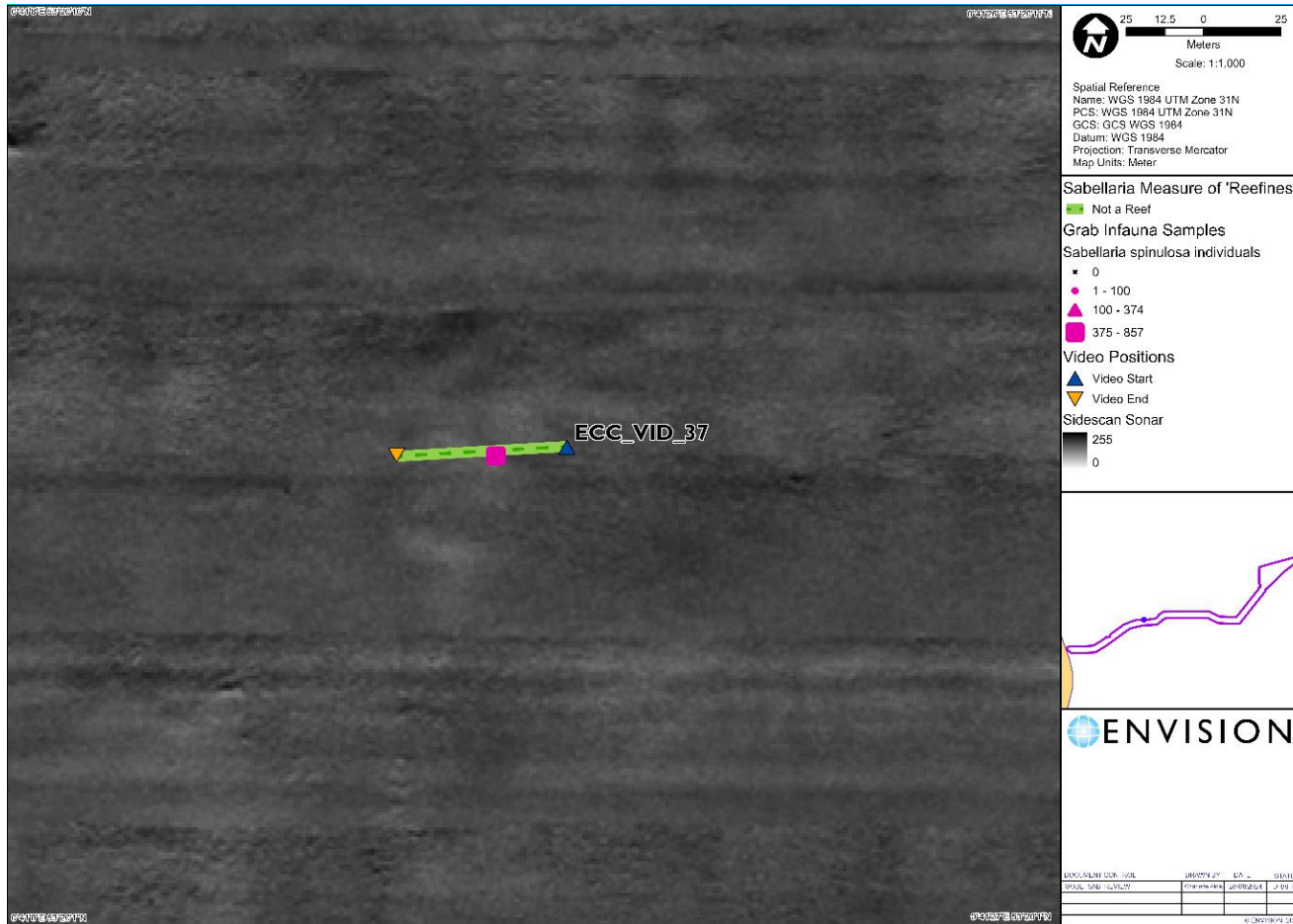
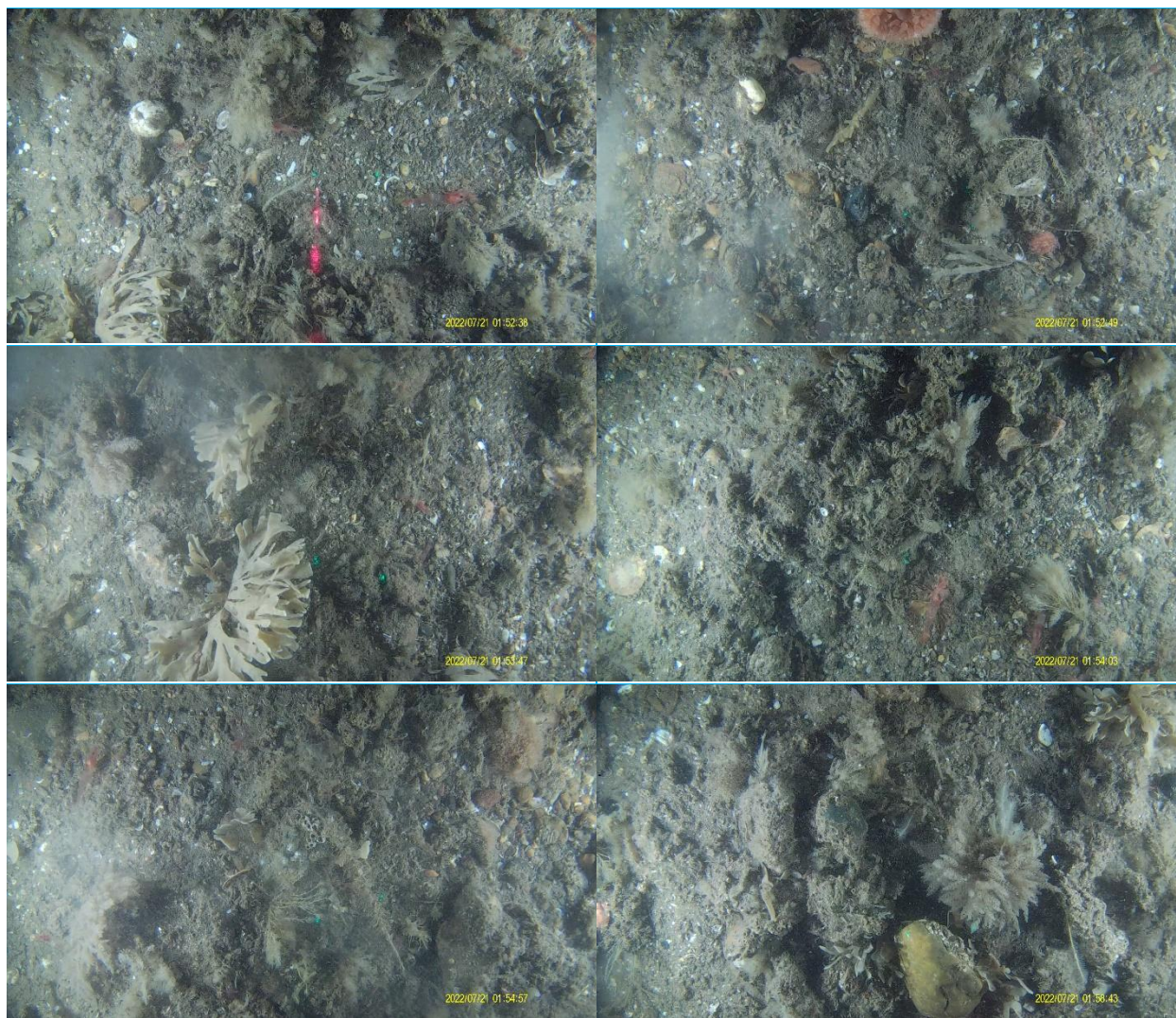


Figure 9.
'Reefiness' allocated to ECC_VID_37, from Sabellaria spinulosa reef assessment (Gubbay, 2007^{iv}).

Table 18.

Screen capture images taken from ECC_VID_37, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.5. ECC_VID_48a

Video station ECC_VID_48a was assessed as 'NOT a REEF' (Figure 10).

From the video footage the station was allocated <2 cm elevation, area <25 m² and patchiness (% cover) of *S. spinulosa* within the video <10%. All these measures of 'reefiness' are categorised as 'NOT a REEF', as shown in Table 19.

Table 19.

Measure of 'reefiness' allocated to ECC_VID_48a from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

Sidescan sonar data (Figure 10) shows the video transect to be located on an area of seabed with low variability and texture, there is indication of some elevation to the east of the sample but this is indistinct.

Numbers of individuals of *S. spinulosa* from the benthic grab sample collected at this station was 191, which is below the 375 threshold (Limpenny *et al.*, 2010ⁱⁱⁱ).

Example images taken from the video footage for the station are shown in Table 20.

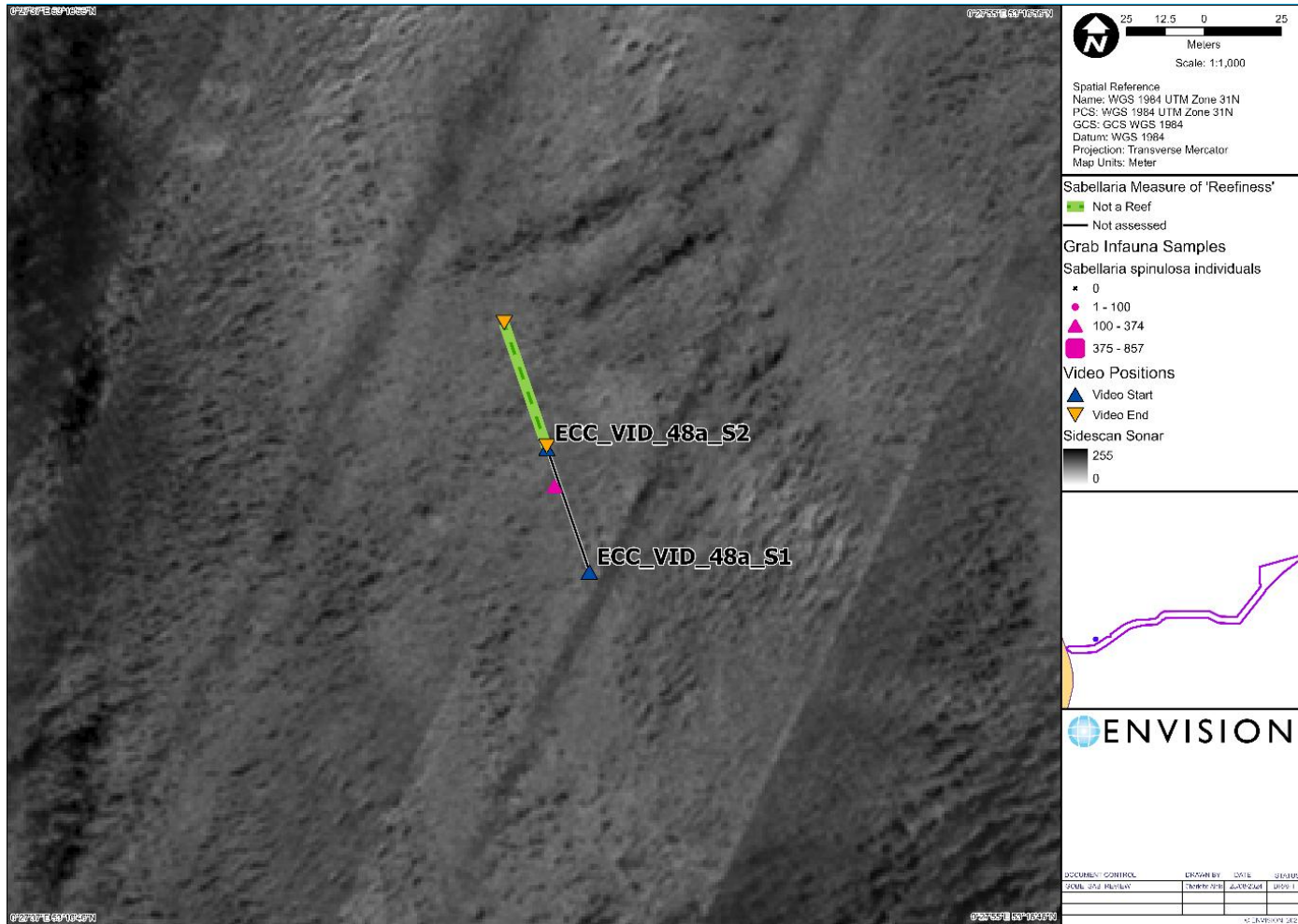
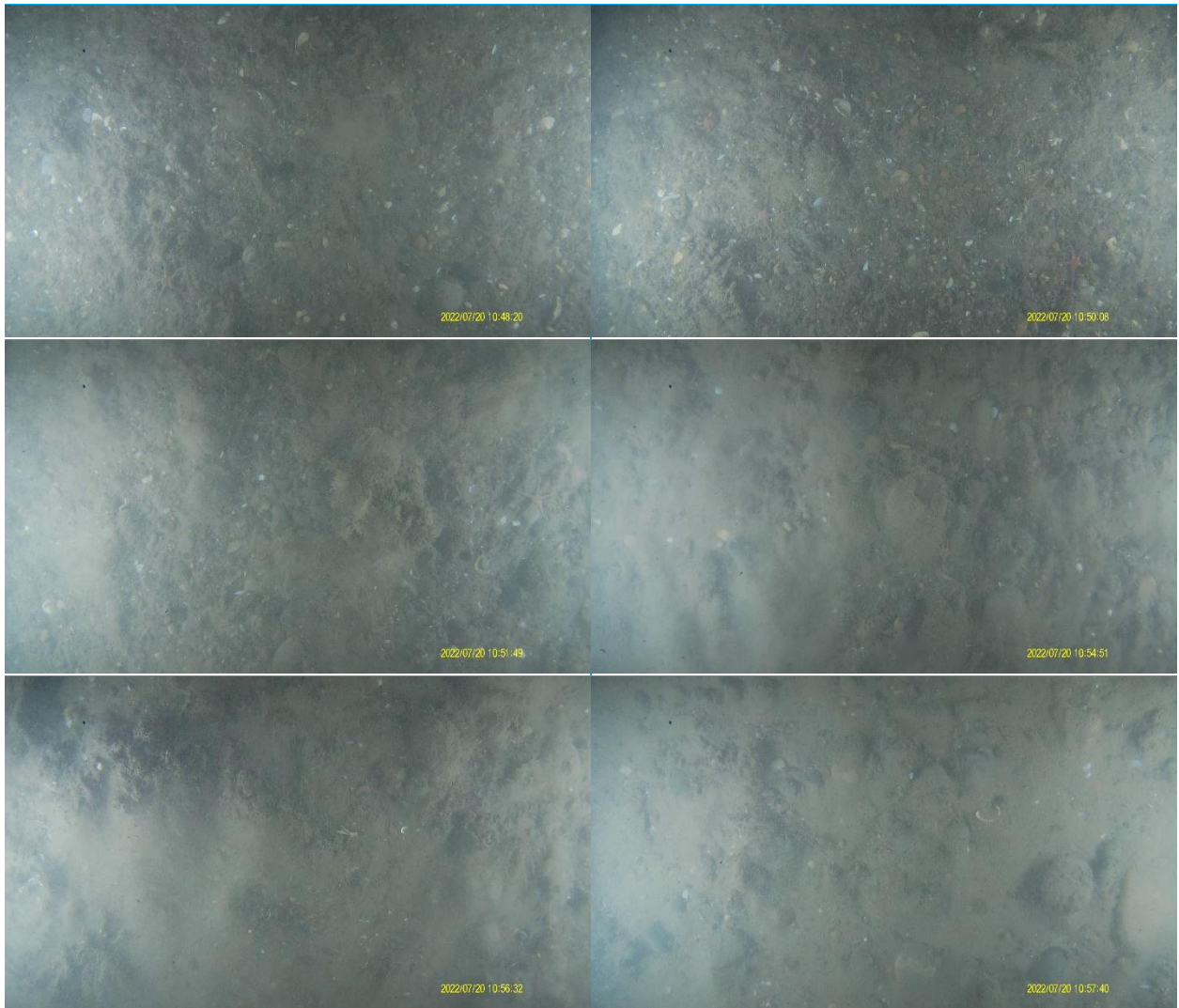


Figure 10.
'Reefiness' allocated to ECC_VID_48a, from Sabellaria spinulosa reef assessment (Gubbay, 2007").

Table 20.

Screen capture images taken from ECC_VID_48a, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.6. ECC_VID_49

Video station ECC_VID_49 was assessed as 'NOT a REEF' (Figure 11).

The station was allocated <2 cm elevation, area <25 m² and patchiness (% cover) of *S. spinulosa* within the video <10%. All these measures of 'reefiness' are categorised as 'NOT a REEF', as shown in Table 21.

Table 21.

Measure of 'reefiness' allocated to ECC_VID_49 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

The seabed around the video sample is relatively consistent with an indication of variable ground but no distinct reef features are evident from the sidescan sonar data (Figure 11).

Numbers of individuals of *S. spinulosa* from the benthic grab sample collected at this station was 563, which is above the density of individuals for reef as detailed by Limpenny *et al.*, (2010ⁱⁱⁱ). However, underwater imagery and data from sidescan sonar confirm this station is 'NOT a REEF'.

Example images taken from the video footage for the station are shown in Table 22.

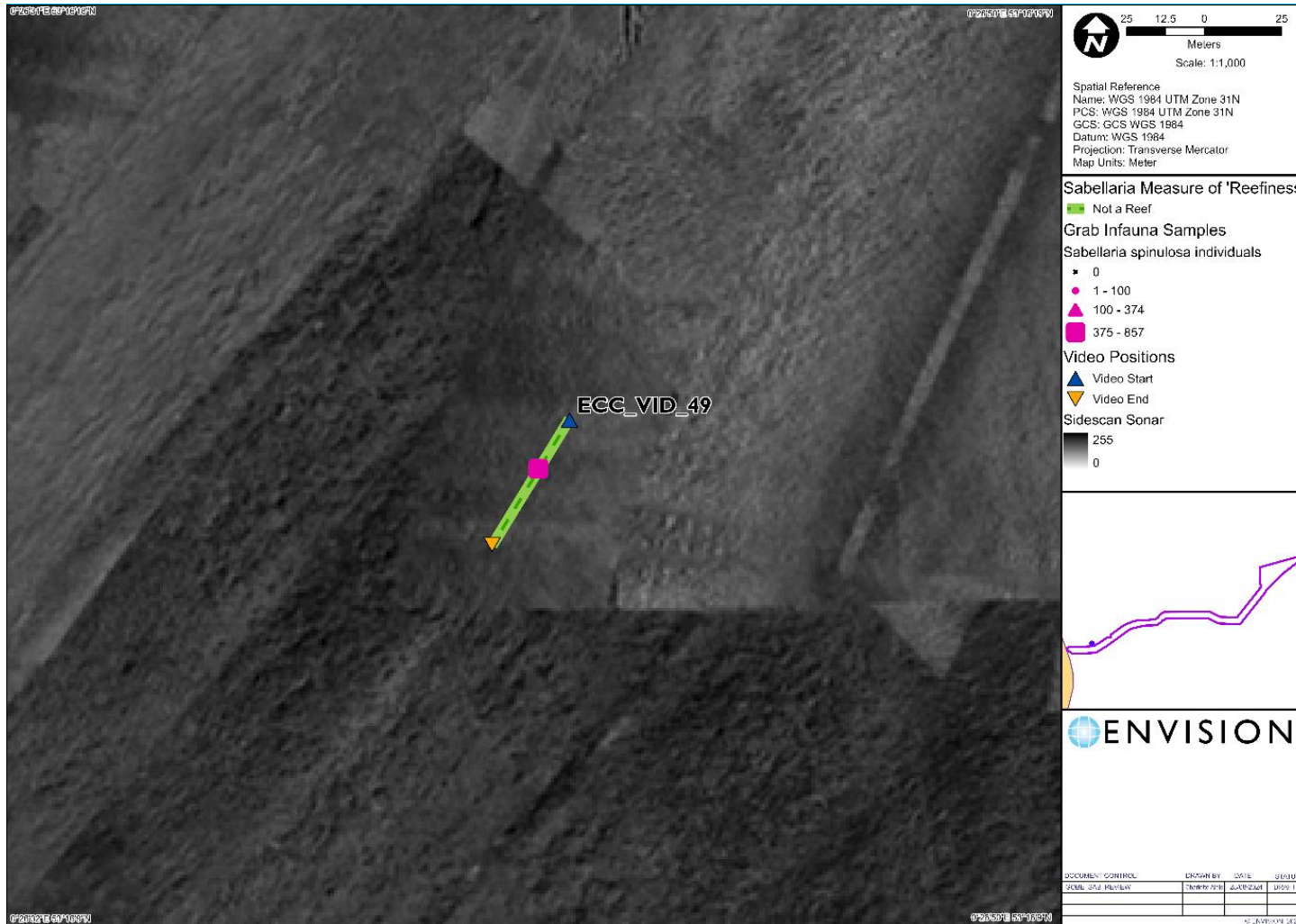
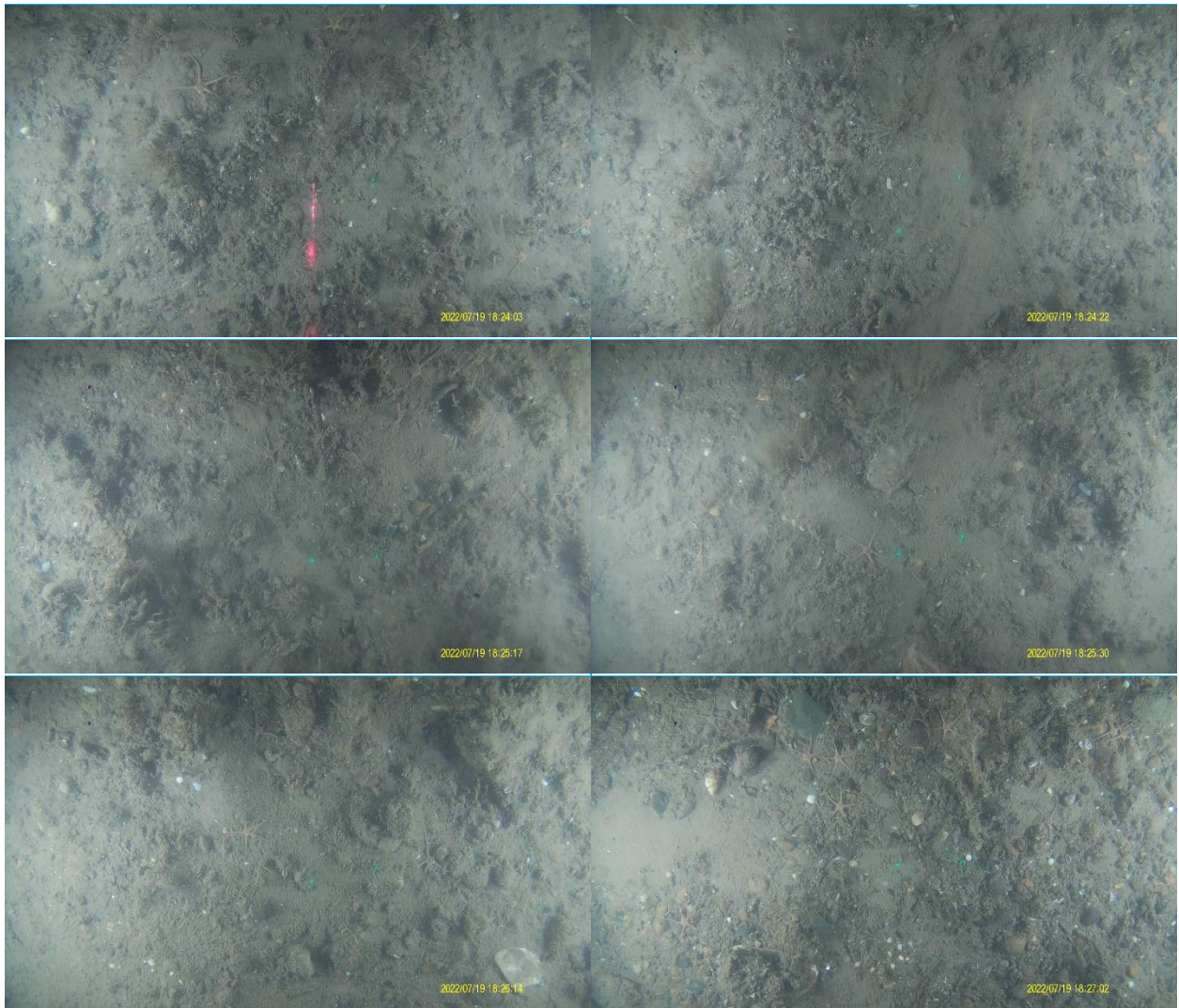


Figure 11. 'Reefiness' allocated to ECC_VID_49, from Sabellaria spinulosa reef assessment (Gubbay, 2007^{iv}).

Table 22.

Screen capture images taken from ECC_VID_49, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.7. ECC_VID_57

Video station ECC_VID_57 was assessed as 'NOT a REEF' (Figure 12).

The station was allocated 2-5 cm elevation and area between 25-10,000 m² which are both categorised as 'LOW' reef. However, the patchiness (% cover) of the *S. spinulosa* within the video was below 10%, which is categorised as 'NOT a REEF'. These are shown in Table 23.

Table 23.

Measure of 'reefiness' allocated to ECC_VID_57 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

Sidescan sonar data (Figure 12) shows there is indication of variable ground but no distinct reef features are evident from the surrounding seabed.

Numbers of individuals of *S. spinulosa* from the benthic grab sample collected at this station was 755, which is above the density of individuals for reef as detailed by Limpenny *et al.*, (2010ⁱⁱⁱ). However, underwater imagery and data from sidescan sonar confirm this station is 'NOT a REEF'.

Example images taken from the video footage for the station are shown in Table 24.

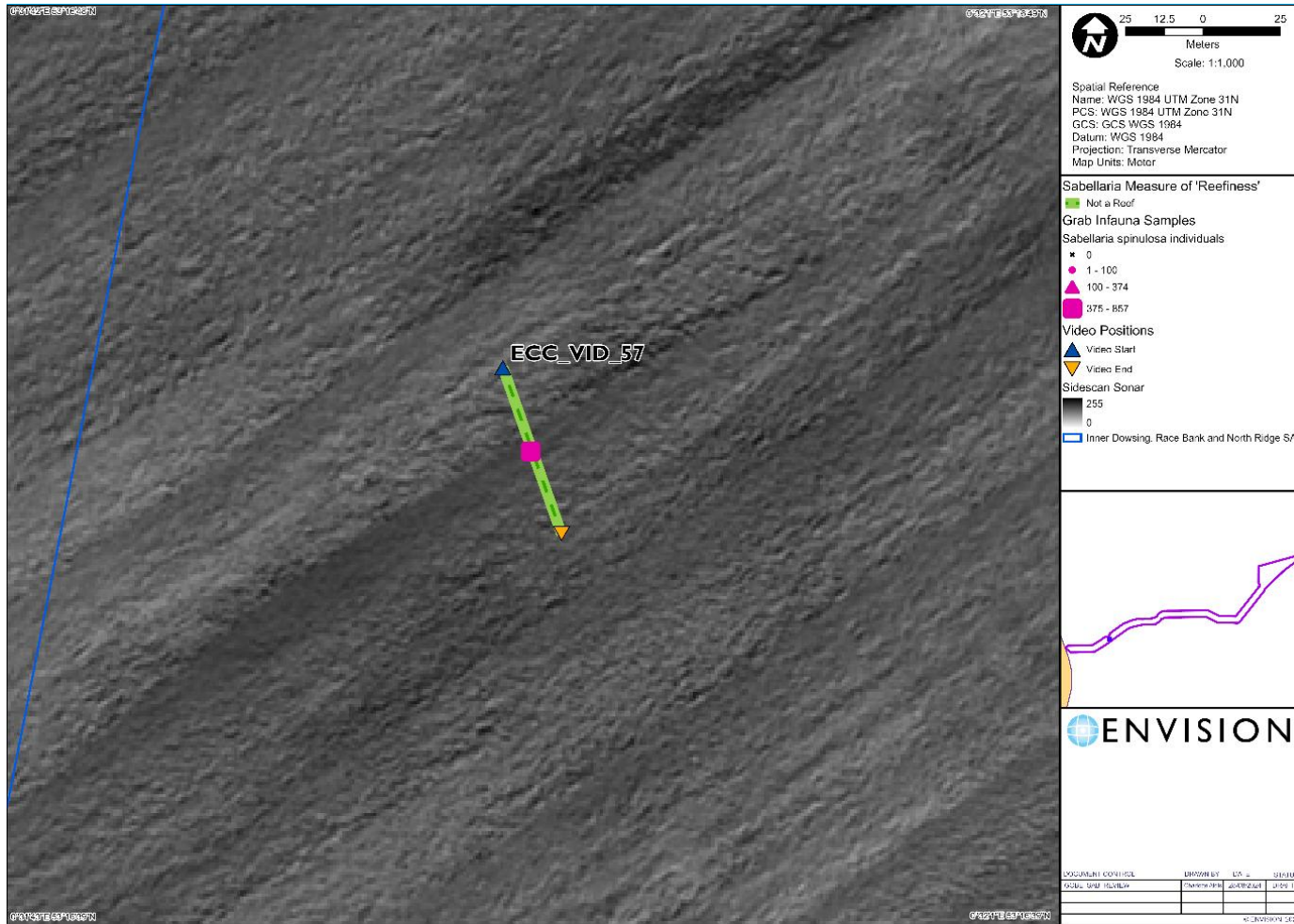
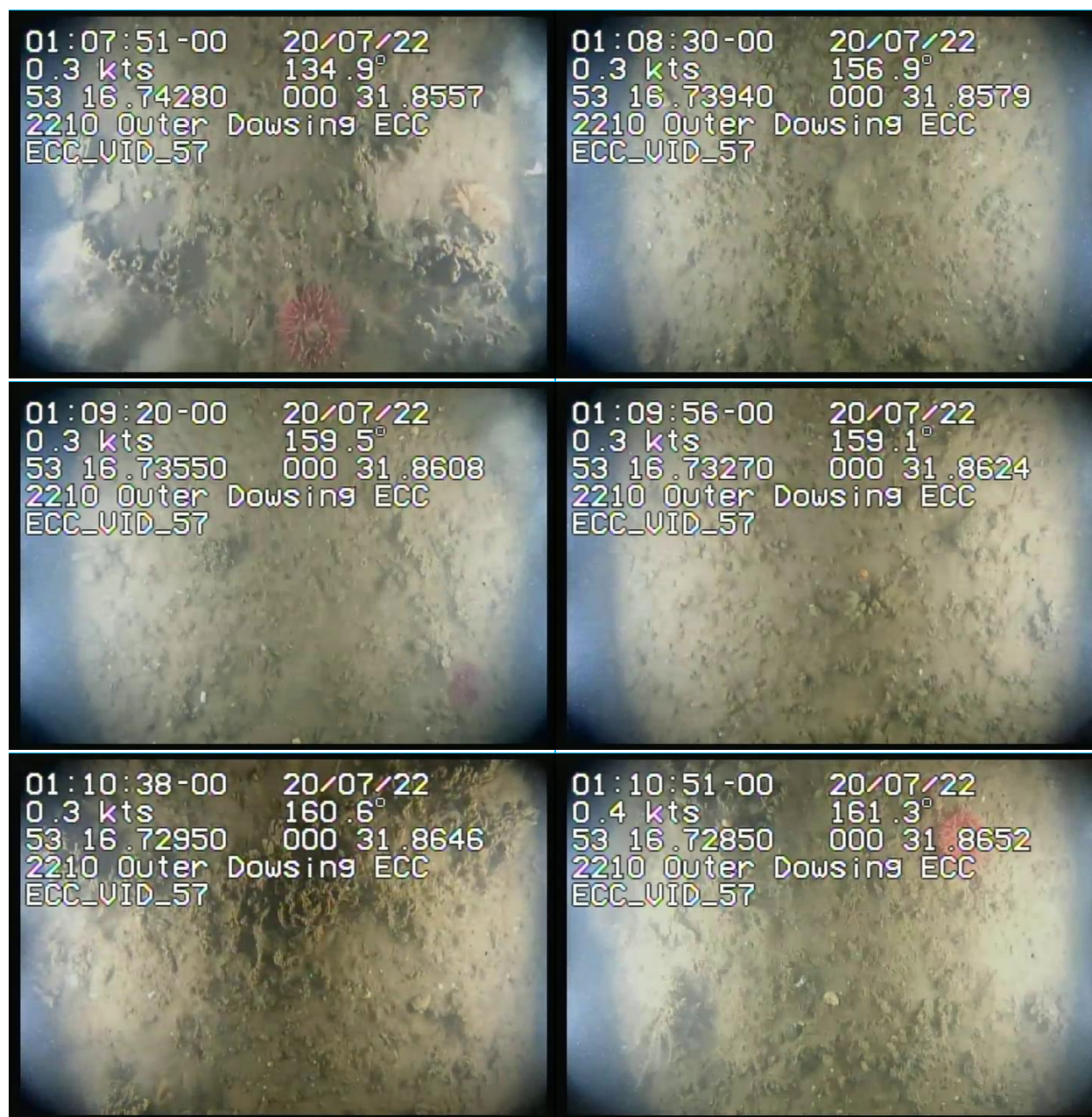


Figure 12. 'Reefiness' allocated to ECC_VID_57, from Sabellaria spinulosa reef assessment (Gubbay, 2007^{iv}).

Table 24.

Screen capture images taken from ECC_VID_57, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.8. ECC_VID_59

Video station ECC_VID_59 was assessed as 'NOT a REEF' (Figure 13).

The station was allocated 2-5 cm elevation which is categorised as 'LOW' reef. However, the area is <25 m² and the patchiness (% cover) of the *S. spinulosa* within the video was below 10%, which is categorised as 'NOT a REEF'. These are shown in Table 25.

Table 25.

Measure of 'reefiness' allocated to ECC_VID_59 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

The seabed along the video sample and adjacent to it, shows some indication of variable ground with this area being approximately 500 – 5000 square metres in size, these could be considered 'LOW REEF'. However, with assessment of video footage allocating patchiness (% cover) as below 10%, station ECC_VID_59 is 'NOT a REEF'.

Numbers of individuals of *S. spinulosa* from the benthic grab sample collected at this station was 195, which is below the 375 threshold (Limpenny *et al.*, 2010ⁱⁱⁱ).

Example images taken from the video footage for the station are shown in Table 26.

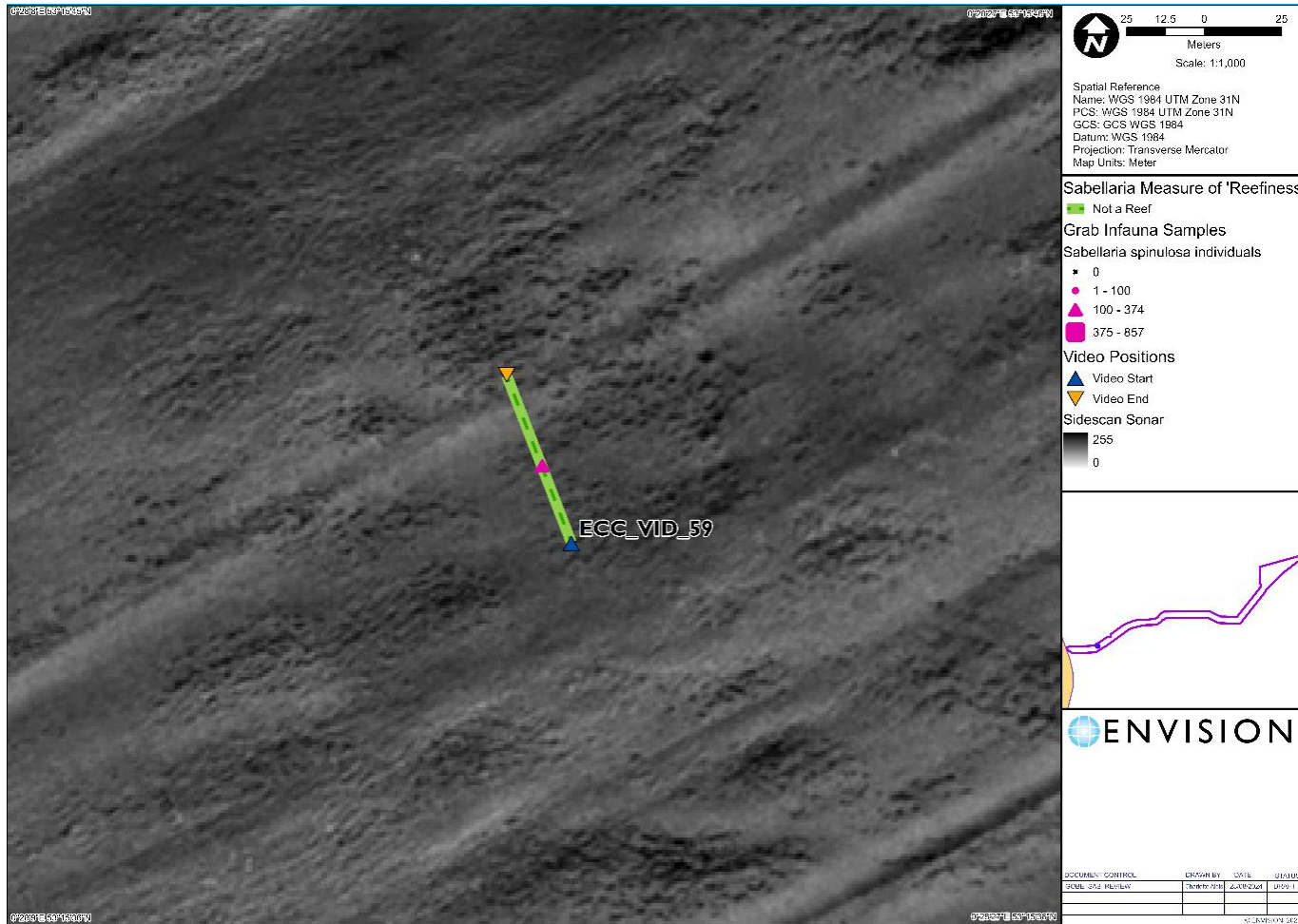
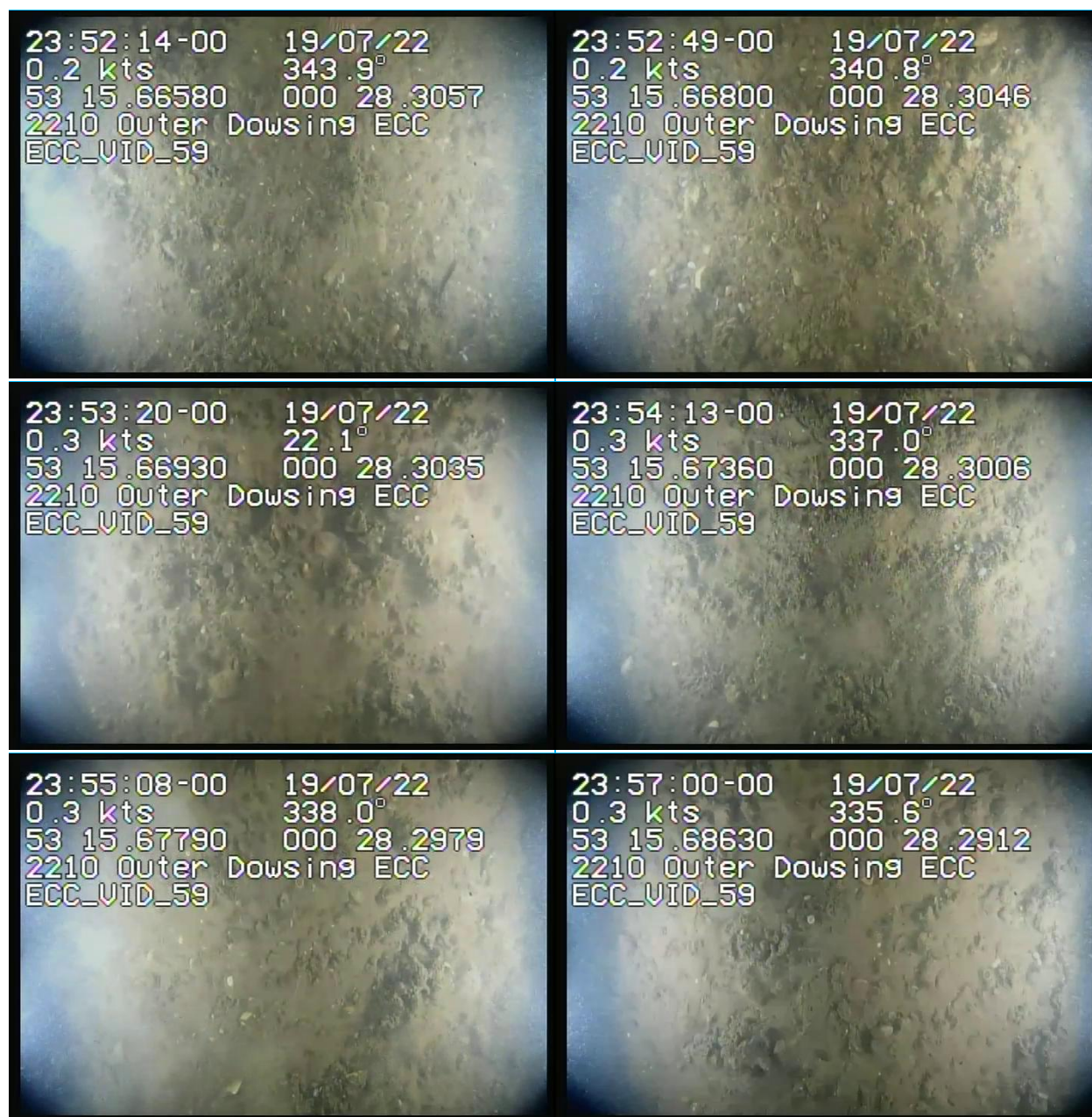


Figure 13. 'Reefiness' allocated to ECC_VID_59, from Sabellaria spinulosa reef assessment (Gubbay, 2007^m).

Table 26.

Screen capture images taken from ECC_VID_59, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.9. ECC_VID_62

Video station ECC_VID_62 was assessed as 'NOT a REEF' (Figure 14).

The station was allocated area between 25-10,000 m² and the patchiness (% cover) of the *S. spinulosa* within the video was between 10-20%, which are both categorised as 'LOW' reef. However, the video was allocated <2 cm elevation, which is categorised as 'NOT a REEF'. These are shown in Table 27.

Table 27.

Measure of 'reefiness' allocated to ECC_VID_62 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

Sidescan sonar data (Figure 14) does not indicate any features distinct from the surrounding seabed or any elevated features.

Example images taken from the video footage for the station are shown in Table 28.

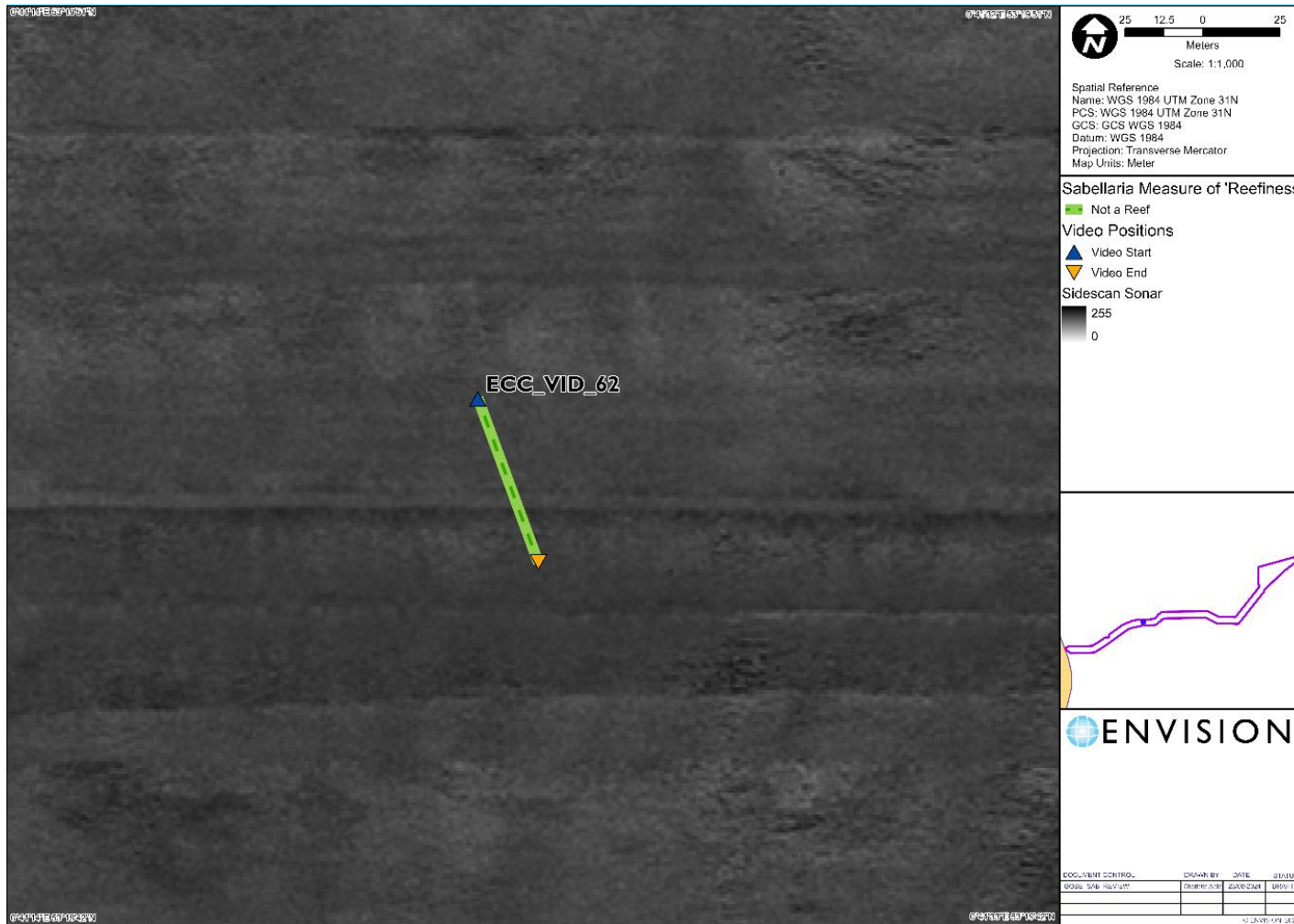
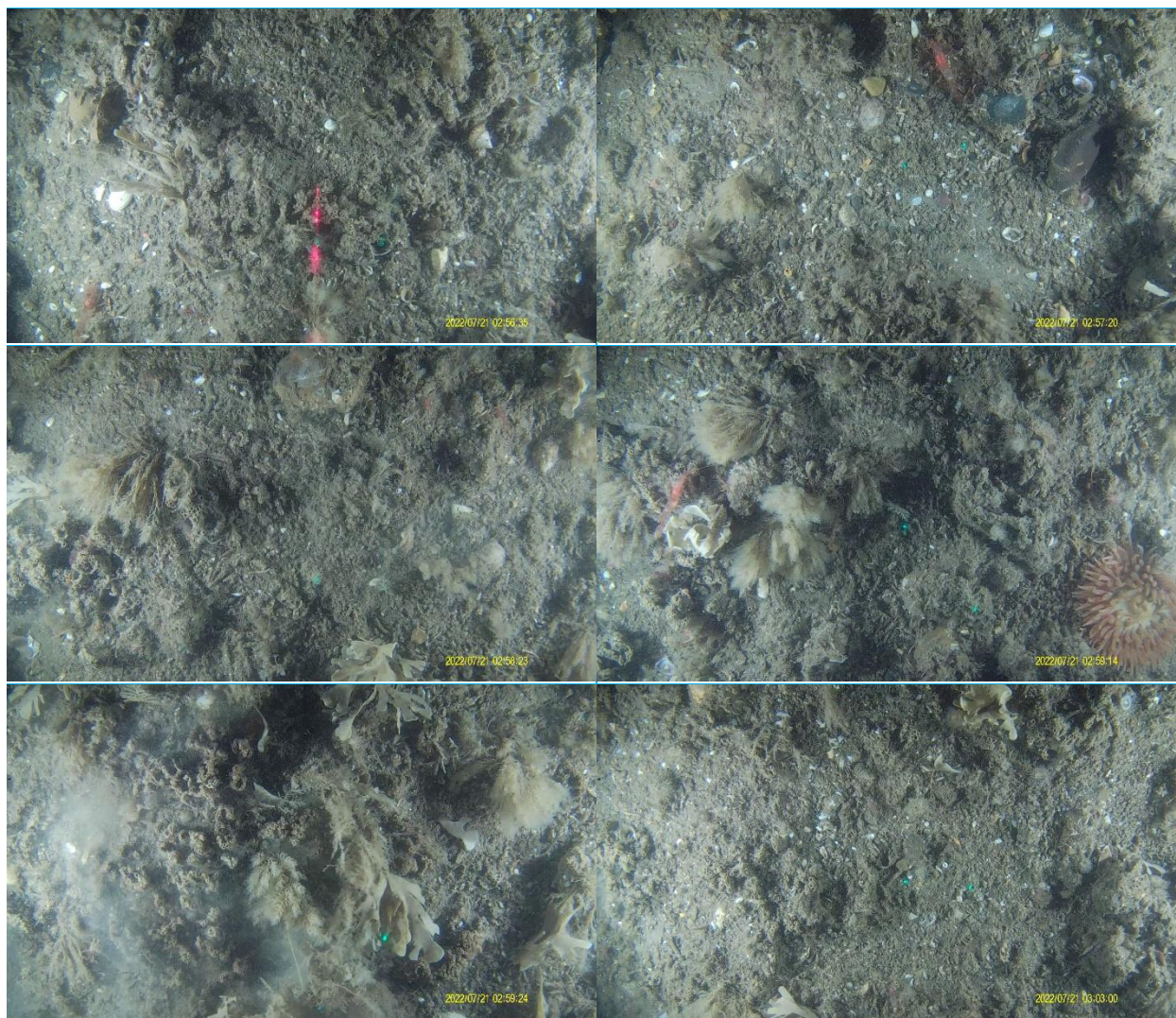


Figure 14.
 'Reefiness' allocated to ECC_VID_62, from Sabellaria spinulosa reef assessment (Gubbay, 2007TM).

Table 28.

Screen capture images taken from ECC_VID_62, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.10. ECC_VID_64

Video station ECC_VID_64 was assessed as 'NOT a REEF' (Figure 15).

The station was allocated 2-5 cm elevation which is categorised as 'LOW' reef. However, the area is <25 m² and the patchiness (% cover) of the *S. spinulosa* within the video was below 10%, which is categorised as 'NOT a REEF'. These are shown in Table 29.

Table 29.

Measure of 'reefiness' allocated to ECC_VID_64 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

The seabed along the video sample and adjacent to it, shows some indication of variable ground with this area being approximately 30,000 square metres in size. However, with assessment of video footage allocating patchiness (% cover) as below 10% and area of less than 25 m² of *S. spinulosa* cover, station ECC_VID_64 is 'NOT a REEF'.

Example images taken from the video footage for the station are shown in Table 30.

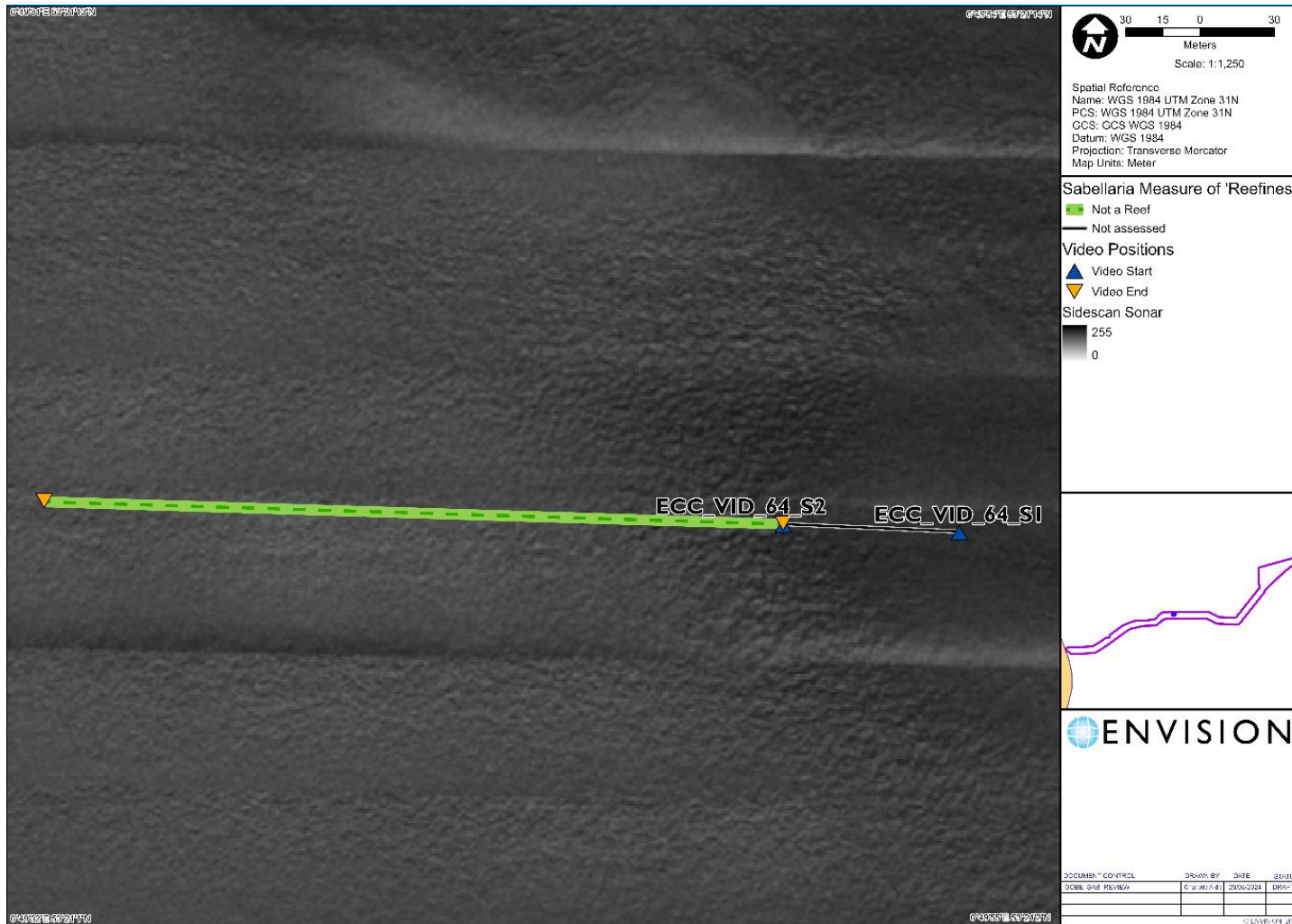
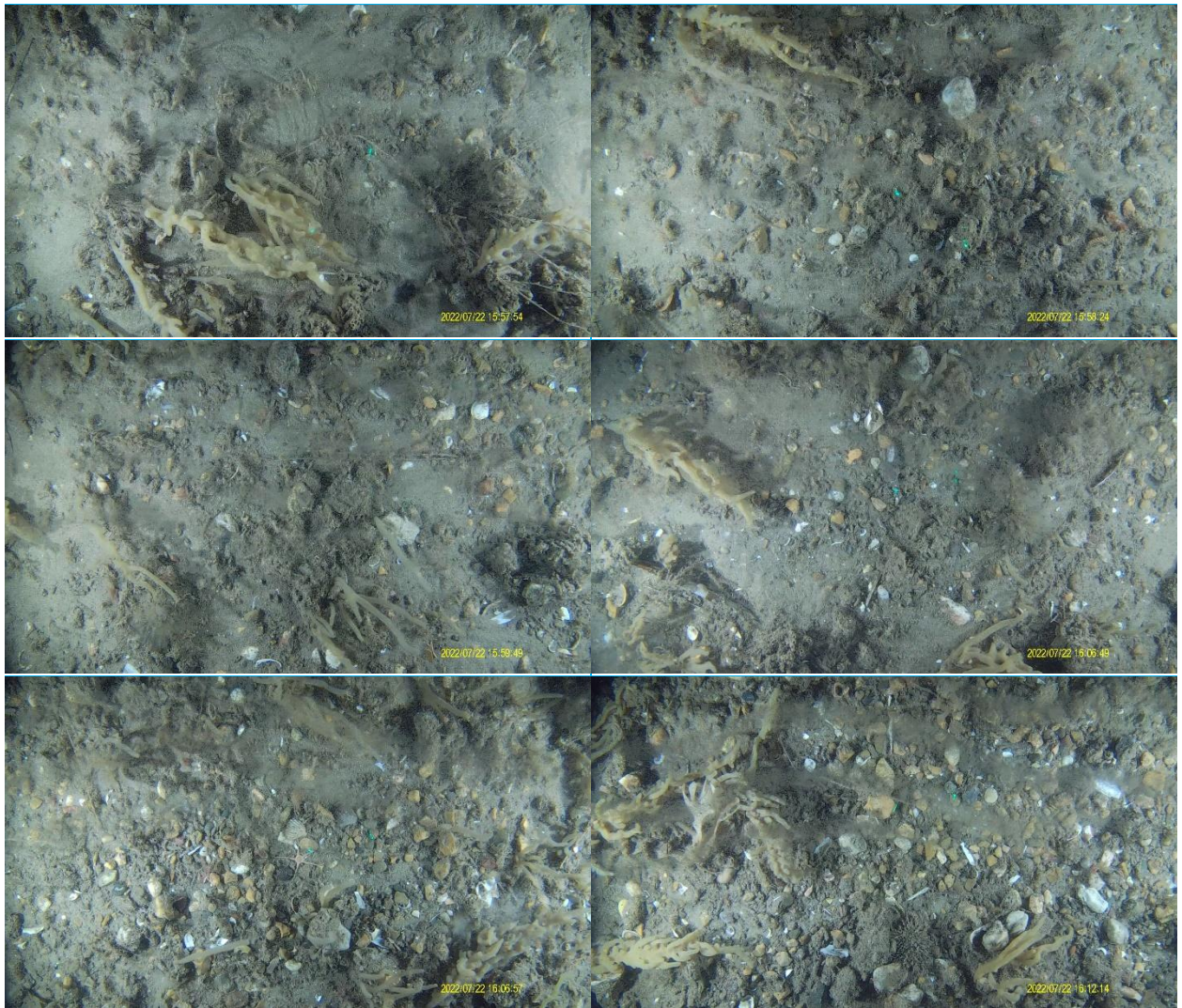


Figure 15.
 'Reefiness' allocated to ECC_VID_64, from Sabellaria spinulosa reef assessment (Gubbay, 2007^{iv}).

Table 30.

Screen capture images taken from ECC_VID_64, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.11. ECC_VID_65

Video station ECC_VID_65 was assessed as 'NOT a REEF' (Figure 16).

The station was allocated 2-5 cm elevation and area between 25-10,000 m² which are both categorised as 'LOW' reef. However, the patchiness (% cover) of the *S. spinulosa* within the video was below 10%, which is categorised as 'NOT a REEF'. These are shown in Table 31.

Table 31.

Measure of 'reefiness' allocated to ECC_VID_65 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

Sidescan sonar data (Figure 16) does not indicate any features distinct from the surrounding seabed or any elevated features.

Example images taken from the video footage for the station are shown in Table 32.

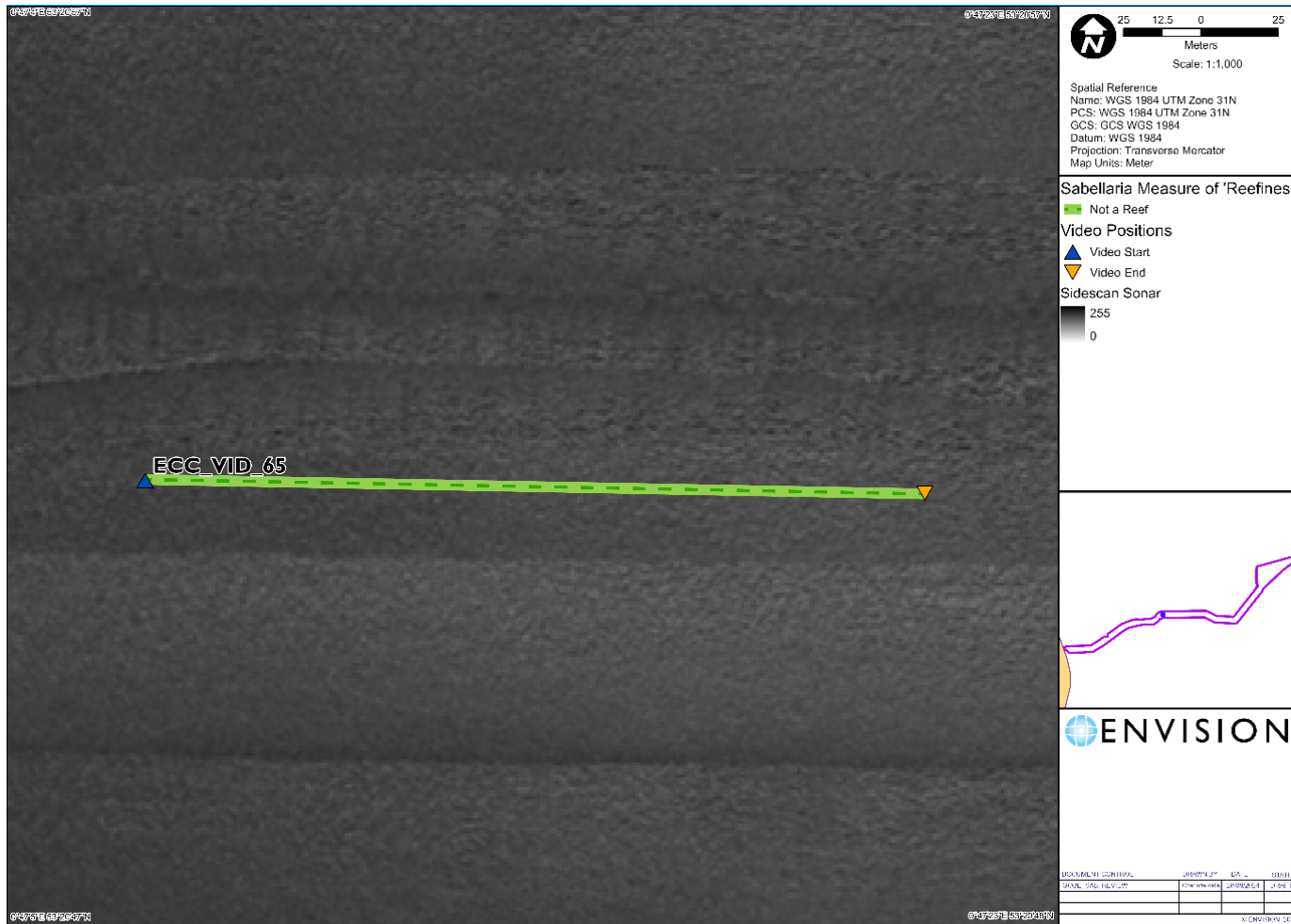
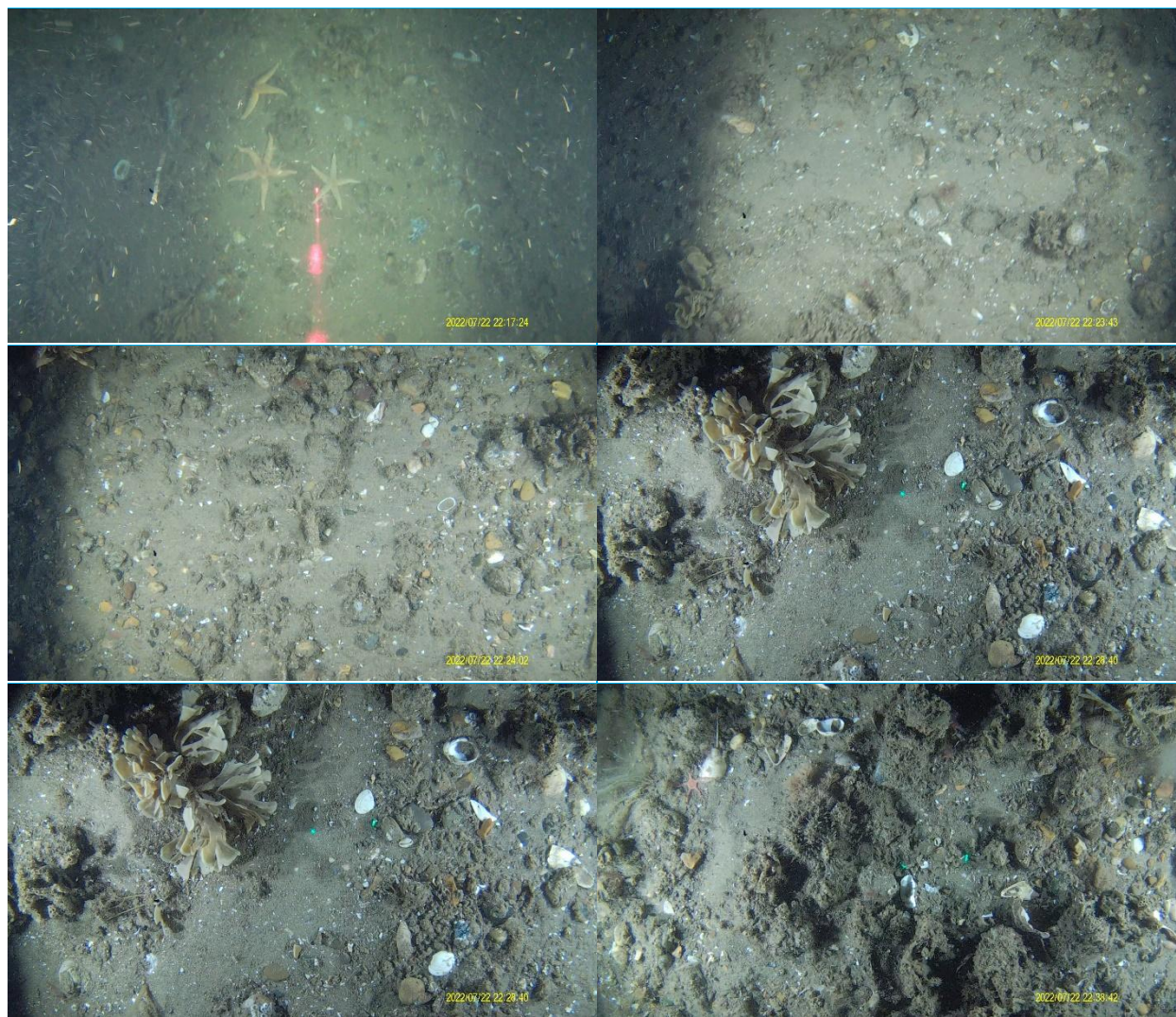


Figure 16. 'Reefiness' allocated to ECC_VID_65, from Sabellaria spinulosa reef assessment (Gubbay, 2007^{iv}).

Table 32.

Screen capture images taken from ECC_VID_65, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.3.12. ECC_VID_66

Video station ECC_VID_66 was assessed as 'NOT a REEF' (Figure 17).

The station was allocated 2-5 cm elevation which is categorised as 'LOW' reef. However, patchiness (% cover) of the *S. spinulosa* was between <10%, and the area was below 25 m² which are categorised as 'NOT a REEF'. These are shown in Table 33.

Table 33.

Measure of 'reefiness' allocated to ECC_VID_66 from *Sabellaria spinulosa* reef assessment (Gubbay, 2007^{iv}) of video footage.

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm) (average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000 - 1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

Sidescan sonar data (Figure 17) shows some variability in seabed texture but no features which are distinct from the surrounding seabed or any elevated features.

Example images taken from the video footage for the station are shown in Table 34.

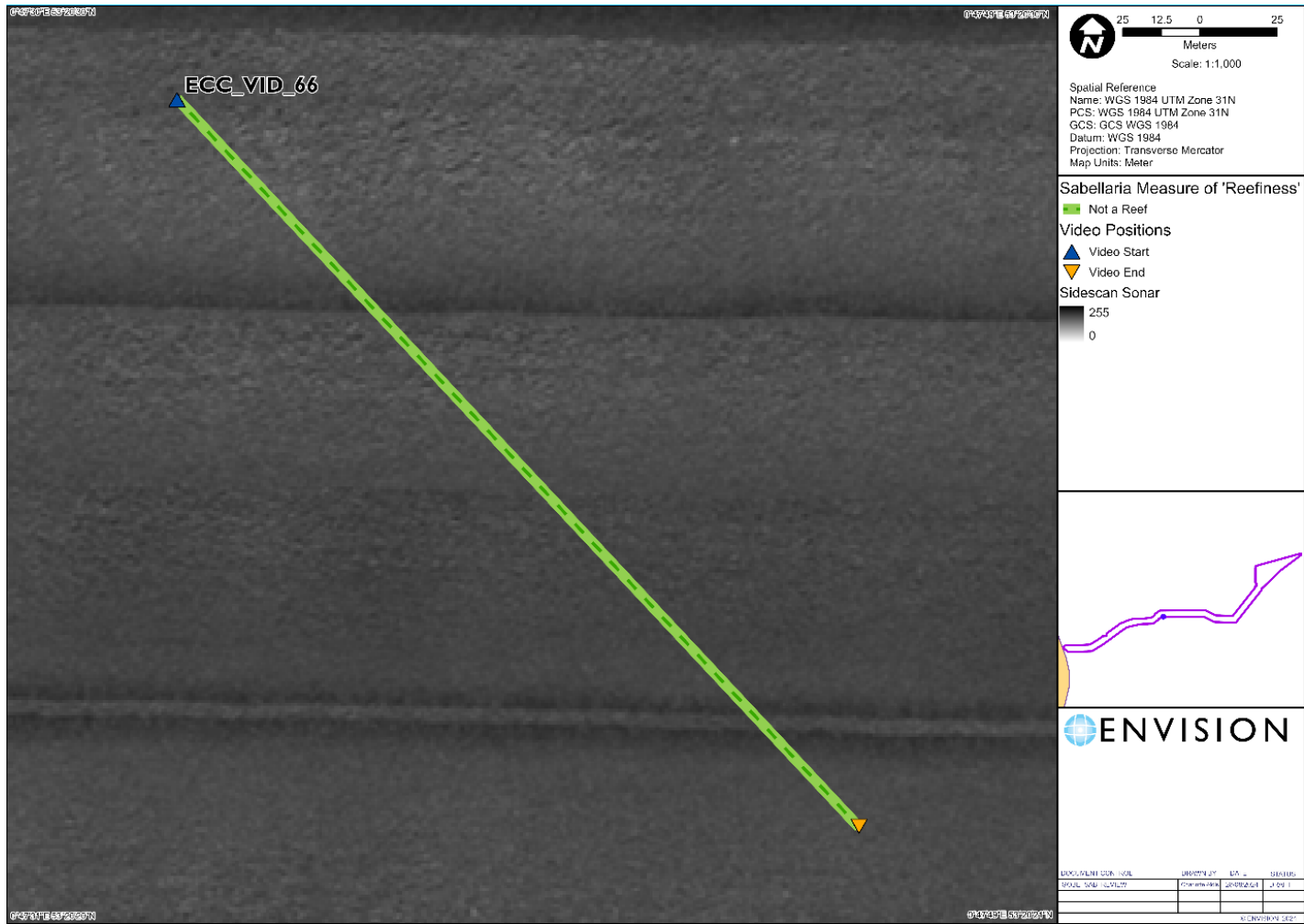
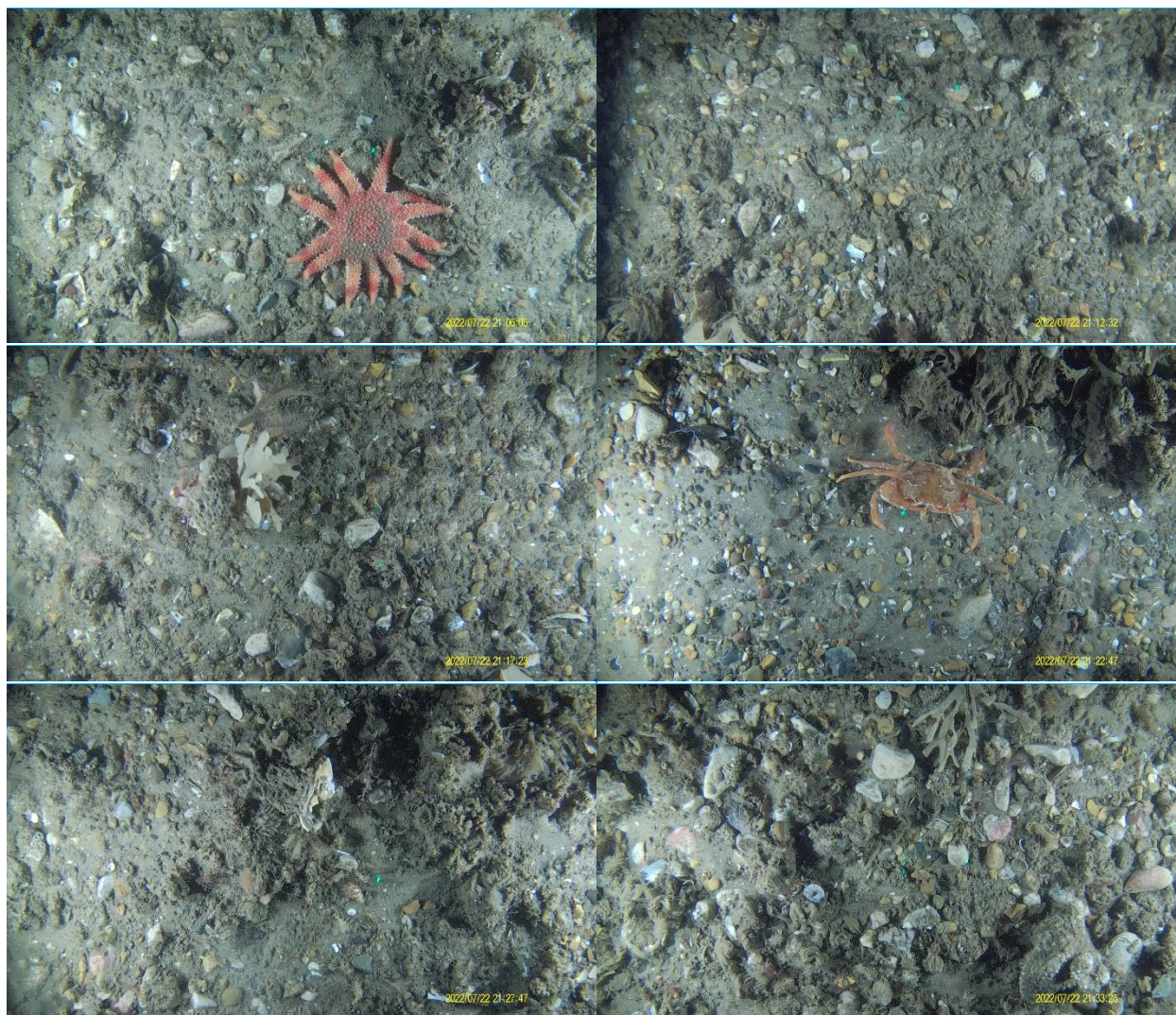


Figure 17. 'Reefiness' allocated to ECC_VID_66, from Sabellaria spinulosa reef assessment (Gubby, 2007TM).

Table 34.

Screen capture images taken from ECC_VID_66, showing examples of the level of Sabellaria spinulosa present throughout video footage.



3.4. Quality Control

Quality control (QC) was carried out on approximately 10% of the videos that were assessed for *S. spinulosa* reef, and the results compared and reviewed by both analysts. The quality control process showed a good degree of consistency in the results between the original analysers and the QC analyst and reflects a confidence in the quality of the analysis.

Where there were discrepancies between the conclusions of the original analyst and the QC analyst, the issues were explored and checked with a third analyst. The analysis of videos for *S. spinulosa* reef assessment saw very minor differences such as one difference in quality ('Poor' vs 'Very Poor') and one difference in elevation category assigned to a video.

4. Summary

The screening process identified 19 video stations with presence of *S. spinulosa*, with 12 of these stations selected for detailed reef assessment. The remaining seven stations had small patches of *S. spinulosa* that did not qualify for reef assessment due to insufficient elevation, area, and coverage.

All stations that were assessed for *S. spinulosa* reef were assigned as 'NOT a REEF' according to the criteria detailed by Gubbay (2007^{iv}). The primary factors that disqualified these stations were low elevation, limited area coverage, and low patchiness of *S. spinulosa*. Despite some stations showing high numbers of *S. spinulosa* in grab samples, this was not reflected within the video and sidescan sonar data, and therefore did not indicate biogenic reef throughout the export cable corridor.

Overall, while *S. spinulosa* was present in several stations, 'reefiness' assessment results show all stations to be 'NOT A REEF' throughout the export cable corridor.

5. Appendix

5.1. Screening Process Results

Table 35.

Results of the screening process of videos collected from the Offshore ECC.

VIDEO FILENAME	SAMPLE STATION	ANALYST	GRAB SABELLARIA COUNT	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
2022_GX_076733_ECC-SI_ECC_VID_03.mp4	ECC_VID_03	CA	236	YES	NO	No elevation, dead empty tubes, less than 1% of <i>Sabellaria</i> present in video, counts of <i>Sabellaria</i> from grab under 375 threshold.
2022_GX_076733_ECC-SI_ECC_VID_06.mp4	ECC_VID_06	CA	9	NO	NO	No <i>Sabellaria</i> present, relatively low counts of <i>Sabellaria</i> found in grab.
2022_GX_076733_ECC-SI_ECC_VID_08.mp4	ECC_VID_08	CA	NO GRAB	YES	NO	No elevation, one very small clump of dead tubes, less than 1% of <i>Sabellaria</i> present in video.
2022_GX_076733_ECC-SI_ECC_VID_11.mp4	ECC_VID_11	CA	0	NO	NO	No <i>Sabellaria</i> present or in grab
2022_GX_076733_ECC-SI_ECC_VID_12.mp4	ECC_VID_12	CA	24	YES	NO	No elevation, less than 1% of <i>Sabellaria</i> present in video, one very small clump of dead tubes, relatively low numbers found in grab. Two

VIDEO FILENAME	SAMPLE STATION	ANALYST	GRAB SABELLARIA COUNT	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
						camera systems used at this station.
ECC_VID_12 - VIDO0073.MOV	ECC_VID_12	CA	24	YES	NO	No elevation, less than 1% of <i>Sabellaria</i> present in video, one very small clump of dead tubes, relatively low numbers found in grab. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_15.mp4	ECC_VID_15	CA	50	NO	NO	No <i>Sabellaria</i> present, relatively low numbers found in grab. Two camera systems used at this station.
ECC_VID_15 - VIDO0072.MOV	ECC_VID_15	CA	50	YES	NO	No elevation, less than 1% of <i>Sabellaria</i> present in video, relatively low numbers found in grab. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_17.mp4	ECC_VID_17	CA	12	NO	NO	No <i>Sabellaria</i> present, relatively low numbers found in grab. Two camera systems used at this station.
ECC_VID_17 - VIDO0071.MOV	ECC_VID_17	CA	12	NO	NO	No <i>Sabellaria</i> present, relatively low numbers found in grab. Two camera systems used at this station.

VIDEO FILENAME	SAMPLE STATION	ANALYST	GRAB SABELLARIA COUNT	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
2022_GX_076733_ECC-SI_ECC_VID_18.mp4	ECC_VID_18	CA	1	YES	NO	No elevation, one very small clump of dead tubes, less than 1% of <i>Sabellaria</i> present in video, relatively low numbers found in grab.
2022_GX_076733_ECC-SI_ECC_VID_21.mp4	ECC_VID_21	CA	96	YES	NO	No <i>Sabellaria</i> present in video (SD camera system) still images reviewed alongside show some small areas of <i>Sabellaria</i> (<1m ²), less than 1% present throughout still imagery, relatively low numbers found in grab.
2022_GX_076733_ECC-SI_ECC_VID_25.mp4	ECC_VID_25	CA	0	NO	NO	No <i>Sabellaria</i> present or in grab.
2022_GX_076733_ECC-SI_ECC_VID_28.mp4	ECC_VID_28	CA	NO GRAB	YES	NO	No <i>Sabellaria</i> present in video (SD camera system) still images reviewed alongside show some small areas of <i>Sabellaria</i> (<1m ²), less than 1% present throughout still imagery
2022_GX_076733_ECC-SI_ECC_VID_29b.mp4	ECC_VID_29b	CA	NO GRAB	YES	YES	Some patches of <i>Sabellaria</i> throughout - with some elevation.
2022_GX_076733_ECC-SI_ECC_VID_30.mp4	ECC_VID_30	CA	NO GRAB	NO	NO	No <i>Sabellaria</i> present.

VIDEO FILENAME	SAMPLE STATION	ANALYST	GRAB SABELLARIA COUNT	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
2022_GX_076733_ECC-SI_ECC_VID_31.mp4	ECC_VID_31	CA	0	NO	NO	No <i>Sabellaria</i> present or in grab.
2022_GX_076733_ECC-SI_ECC_VID_33.mp4	ECC_VID_33	CA	0	NO	NO	No <i>Sabellaria</i> present or in grab. Two camera systems used at this station.
ECC_VID_33 - VIDO0046.MOV	ECC_VID_33	CA	0	NO	NO	No <i>Sabellaria</i> present or in grab. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_34.mp4	ECC_VID_34	LT	147	YES	YES	Video quality too poor to see presence or absence of <i>Sabellaria</i> , stills images show presence of <i>Sabellaria</i> throughout.
2022_GX_076733_ECC-SI_ECC_VID_35.mp4	ECC_VID_35	CA	96	NO	NO	Video quality too poor to see presence or absence of <i>Sabellaria</i> , relatively low numbers found in grab. Two camera systems used at this station.
ECC_VID_35 - VIDO0047.MOV	ECC_VID_35	LT	96	YES	YES	Patches of <i>Sabellaria</i> throughout. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_37.MOV	ECC_VID_37	CA	493	YES	YES	<i>Sabellaria</i> present, relatively high numbers of <i>Sabellaria</i> in grab sample over the 375

VIDEO FILENAME	SAMPLE STATION	ANALYST	GRAB SABELLARIA COUNT	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
						threshold. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_37.mp4	ECC_VID_37	CA	493	YES	YES	<i>Sabellaria</i> present, relatively high numbers of <i>Sabellaria</i> in grab sample over the 375 threshold. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_38.mp4	ECC_VID_38	CA	0	NO	NO	No <i>Sabellaria</i> present or in grab. Two camera systems used at this station.
ECC_VID_38 - VIDO0040.MOV	ECC_VID_38	CA	0	NO	NO	No <i>Sabellaria</i> present or in grab. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_42a.MOV	ECC_VID_42a	CA	123	NO	NO	No <i>Sabellaria</i> present, relatively low numbers found in grab.
2022_GX_076733_ECC-SI_ECC_VID_43.MOV	ECC_VID_43	CA	0	NO	NO	No <i>Sabellaria</i> present or in grab.
2022_GX_076733_ECC-SI_ECC_VID_48a.MOV S1	ECC_VID_48a_S1	CA	191	NO	NO	Video segmented, start to 8 mins no <i>Sabellaria</i> present, relatively low numbers found in grab. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_48a.MOV S2	ECC_VID_48a_S2	CA	191	YES	YES	Video segmented, 8 mins to end some patches of

VIDEO FILENAME	SAMPLE STATION	ANALYST	GRAB SABELLARIA COUNT	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
						<i>Sabellaria</i> with elevation. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_48a.mp4 S1	ECC_VID_48a_S1	CA	191	NO	NO	Video segmented, start to 8 mins no <i>Sabellaria</i> present, relatively low numbers found in grab. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_48a.mp4 S2	ECC_VID_48a_S2	CA	191	YES	YES	Video segmented, 8 mins to end some patches of <i>Sabellaria</i> with elevation. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_49.MOV	ECC_VID_49	CA	563	YES	YES	<i>Sabellaria</i> present, high numbers in grab sample over the 375 threshold.
2022_GX_076733_ECC-SI_ECC_VID_55.MOV	ECC_VID_55	LT	0	NO	NO	No <i>Sabellaria</i> present or in grab.
2022_GX_076733_ECC-SI_ECC_VID_56.MOV	ECC_VID_56	LT	47	NO	NO	No <i>Sabellaria</i> present, relatively low numbers found in grab.
2022_GX_076733_ECC-SI_ECC_VID_57.mp4	ECC_VID_57	LT	755	YES	YES	Clumps of <i>Sabellaria</i> throughout, poor video quality, lots of suspended sediment. High numbers in grab sample over the 375 threshold.
2022_GX_076733_ECC-SI_ECC_VID_59.mp4	ECC_VID_59	LT	195	YES	YES	Clumps of <i>Sabellaria</i> throughout, poor video

VIDEO FILENAME	SAMPLE STATION	ANALYST	GRAB SABELLARIA COUNT	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
						quality, lots of suspended sediment.
2022_GX_076733_ECC-SI_ECC_VID_61.MOV	ECC_VID_61	LT	NO GRAB	NO	NO	No <i>Sabellaria</i> present.
2022_GX_076733_ECC-SI_ECC_VID_62.MOV	ECC_VID_62	LT	NO GRAB	YES	YES	Small clumps of <i>Sabellaria</i> , not much elevation, good quality video.
2022_GX_076733_ECC-SI_ECC_VID_63.mp4	ECC_VID_63	LT	NO GRAB	NO	NO	No <i>Sabellaria</i> present.
2022_GX_076733_ECC-SI_ECC_VID_64.mp4 S1	ECC_VID_64_S1	LT	NO GRAB	NO	NO	Segmented due to first 12 minutes of footage sand with no <i>Sabellaria</i> present. Two camera systems used at this station.
2022_GX_076733_ECC-SI_ECC_VID_64.mp4 S2	ECC_VID_64_S2	LT	NO GRAB	YES	YES	Clumps of <i>Sabellaria</i> throughout from 12 minutes onwards, poor video quality. Two camera systems used at this station.
ECC_VID_64.mkv S1	ECC_VID_64_S1	CA	NO GRAB	NO	NO	Segmented due to first 12 minutes of footage sand with no <i>Sabellaria</i> present. Two camera systems used at this station.
ECC_VID_64.mkv S2	ECC_VID_64_S2	CA	NO GRAB	YES	YES	Clumps of <i>Sabellaria</i> throughout from 12 minutes onwards. Two camera systems used at this station.

VIDEO FILENAME	SAMPLE STATION	ANALYST	GRAB SABELLARIA COUNT	SABELLARIA PRESENT	SABELLARIA ASSESSMENT	COMMENTS
2022_GX_076733_ECC-SI_ECC_VID_65.MOV	ECC_VID_65	LT	NO GRAB	YES	YES	Clumps of <i>Sabellaria</i> throughout, abundance of starfish near beginning of video, good video quality.
2022_GX_076733_ECC-SI_ECC_VID_66.mp4	ECC_VID_66	LT	NO GRAB	YES	YES	Clumps of <i>Sabellaria</i> throughout, poor video quality. Two camera systems used at this station.
ECC_VID_66.mkv	ECC_VID_66	CA	NO GRAB	YES	YES	Clumps of <i>Sabellaria</i> throughout. Two camera systems used at this station.

5.2. Sabellaria spinulosa Reef Assessment Results

Table 36.

Results of the *Sabellaria spinulosa* reef assessment of videos collected from the Project ECC.

SAMPLE STATION	ANALYST	SEGMENT	START TIME	END TIME	DURATION	QUALITY	ELEVATION (CM)	AREA (M ²)	PATCHINESS (% COVER)	'REEFINESS'
ECC_VID_29b	CA	SI	00:00:00	00:09:06	00:09:06	Good	2-5	25-10,000	<10	NOT a REEF
ECC_VID_35	LT	SI	00:00:00	00:06:12	00:06:12	Good	<2	<25	<10%	NOT a REEF
ECC_VID_37	LT	SI	00:00:00	00:06:32	00:06:32	Good	<2	<25	<10	NOT a REEF
ECC_VID_48a	CA	S2	00:15:00	00:19:00	00:04:00	Poor	<2	<25	<10	NOT a REEF
ECC_VID_49	LT	SI	00:00:00	00:03:30	00:03:30	Good	<2	<25	<10	NOT a REEF
ECC_VID_57	CA	SI	00:00:00	00:06:50	00:06:50	Poor	2-5	25-10,000	<10	NOT a REEF
ECC_VID_59	LT	SI	00:00:00	00:06:48	00:06:48	Poor	2-5	<25	<10	NOT a REEF

SAMPLE STATION	ANALYST	SEGMENT	START TIME	END TIME	DURATION	QUALITY	ELEVATION (CM)	AREA (M ²)	PATCHINESS (% COVER)	'REEFINESS'
ECC_VID_62	CA	S1	00:00:00	0:06:55	00:06:55	Good	<2	25-10,000	10-20	NOT a REEF
ECC_VID_64	LT	S2	00:11:30	0:39:57	00:28:27	Poor	2-5	<25	<10	NOT a REEF
ECC_VID_65	CA	S1	00:00:00	0:27:12	00:27:12	Good	2-5	25-10,000	<10	NOT a REEF
ECC_VID_66	LT	S1	00:00:00	0:35:26	00:35:26	Poor	2-5	<25	10-20	NOT a REEF

5.3. ECC_VID_34 Still Image Sabellaria spinulosa Reef Assessment Results

Table 37.

Results of the Sabellaria spinulosa reef assessment of still images collected from station ECC_VID_34 in the Project ECC.

IMAGE FILENAME	ANALYST	IMAGE QUALITY	ELEVATION (CM)	AREA (M ²)	PATCHINESS (% COVER)	'REEFINESS'	COMMENTS
ECC_VID_34_0002.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_34_0003.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_34_0004.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_34_0005.jpg	CA	Good	2-5	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_34_0006.jpg	CA	Good	2-5	<25	10-20	NOT a REEF	Lots of dead empty tubes, live Sabellaria present
ECC_VID_34_0007.jpg	CA	Good	2-5	<25	10-20	NOT a REEF	Lots of dead empty tubes, live Sabellaria present
ECC_VID_34_0008.jpg	CA	Good	2-5	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_34_0009.jpg	CA	Poor	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_34_0010.jpg	CA	Good	2-5	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria

IMAGE FILENAME	ANALYST	IMAGE QUALITY	ELEVATION (CM)	AREA (M ²)	PATCHINESS (% COVER)	'REEFINESS'	COMMENTS
ECC_VID_34_0011.jpg	CA	Poor	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_34_0012.jpg	CA	Poor	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_34_0013.jpg	CA	Poor	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_34_0014.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_34_0015.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_34_0016.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_34_0017.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_34_0018.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_34_0019.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_62_0020.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_62_0021.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_62_0022.jpg	CA	Good	2-5	<25	10-20	NOT a REEF	Lots of dead empty tubes, live Sabellaria present
ECC_VID_62_0023.jpg	CA	Poor	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0024.jpg	CA	Good	2-5	<25	10-20	NOT a REEF	Lots of dead empty tubes, live Sabellaria present
ECC_VID_62_0025.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria

IMAGE FILENAME	ANALYST	IMAGE QUALITY	ELEVATION (CM)	AREA (M ²)	PATCHINESS (% COVER)	'REEFINESS'	COMMENTS
ECC_VID_62_0026.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0027.jpg	CA	Good	2-5	<25	10-20	NOT a REEF	Lots of dead empty tubes, live Sabellaria present
ECC_VID_62_0028.jpg	CA	Good	2-5	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0029.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0030.jpg	CA	Poor	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_62_0031.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0032.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0033.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0034.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0035.jpg	CA	Good	2-5	<25	10-20	NOT a REEF	Lots of dead empty tubes, live Sabellaria present
ECC_VID_62_0036.jpg	CA	Very Poor	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0037.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_62_0038.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0039.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, very little live Sabellaria
ECC_VID_62_0040.jpg	CA	Good	<2	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria

IMAGE FILENAME	ANALYST	IMAGE QUALITY	ELEVATION (CM)	AREA (M ²)	PATCHINESS (% COVER)	'REEFINESS'	COMMENTS
ECC_VID_62_0041.jpg	CA	Good	2-5	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_62_0042.jpg	CA	Good	2-5	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria
ECC_VID_62_0043.jpg	CA	Poor	2-5	<25	<10%	NOT a REEF	Lots of dead empty tubes, small amount of live Sabellaria

6. References

- i ENVISION (2024) Outer Dowsing Export Cable Corridor *Sabellaria* Review – Review and interpretation of survey data.
- ii Turner, J.A., Hitchin, R., Verling, E. and Van Rein, H. (2016). Epibiota remote monitoring from digital imagery: Interpretation guidelines.
- iii Limpenny, D.S., Foster-Smith, R.L., Edwards, T.M., Hendrick, V.J., Diesing, M., Eggleton, J.D., Meadows, W.J., Crutchfield, Z., Pfeifer, S., and Reach, I.S. (2010). Best methods for identifying and evaluating *Sabellaria spinulosa* and cobble reef. Aggregate Levy Sustainability Fund Project
- iv Gubbay, S. (2007). Defining and managing *Sabellaria spinulosa* reefs: Report of an inter-agency workshop 1-2 May 2007. JNCC report, 405.
- v Hendrick, V.J. & Foster-Smith, R.L. (2006). *Sabellaria spinulosa* reef: a scoring system for evaluating ‘reefiness’ in the context of the Habitats Directive. J.Mar.Biol.Ass.UK. 86:665-677

1 Appendix A

1. This Appendix has been produced to address a request raised by Natural England within their Deadline 1 response for the Outer Dowsing Offshore Wind Examination (REP1-059).
2. Within the Natural England's Relevant Representation (RR) (RR-045), a number of queries on the methodology and analytical approaches used within Volume 3, Appendix 9.5 Envision Data Analysis (APP-158) were raised. Outer Dowsing Offshore Wind (the Applicant) responded to these queries at the Procedural Deadline on 19th September 2024 (PD1-071).
3. As part of the Natural England's Deadline 1 response (REP1-059), Natural England stated the following:

'We welcome the Applicant's response (PD1-071) to Natural England's concerns raised in our relevant representations (RR-045) in relation to the transparency in methods and analytical techniques used to determine the extent and distribution of Sabellaria spinulosa Annex I reef presented in the Appendix 2 Benthic Ecology Technical Report (ECC) v2 (AS-004) and the Envision ECC Sabellaria imagery analysis report (PD1-095).

However, these clarifications and commitments have not been incorporated into the technical documents and are therefore not sufficient in themselves to be relied upon both during the consenting phase and post consent for this project and any subsequent projects wishing to reference the reports. Natural England, therefore, advises that for the scientific technical reports to be relied upon, the clarifications provided by the Applicant prior to Deadline 1, should be incorporated into the documents, for example as a forward note or appendix, if not within the relevant sections themselves.'

4. As such, the Applicant has incorporated the comments raised by Natural England and the responses to these comments in this Appendix.
5. The Applicant notes that the comments raised by Natural England and the responses contained in this Appendix were applied as appropriate to the methodologies used within Document 15.13 Offshore Export Cable Corridor Sabellaria spinulosa Reanalysis and Report (PD1-095) and as such, this Appendix note solely relates to APP-158.

1.1 Relevant Responses

6. ES Chapter 9 Benthic and Intertidal Ecology Volume 3 Appendices Envision Data Analysis (APP-158) has not previously addressed Natural England's concerns about the adequacy of methods used for determining the presence of Annex I *S. spinulosa* reef. To update, ENVISION have undertaken a reassessment of *S. spinulosa* 'reefiness' of video stations within the Offshore ECC (document 15.16). Videos from 33 stations were initially screened for presence or absence of *S. spinulosa*, with 12 stations identified for further assessment and reviewed for Annex 1 biogenic reef following the appropriate JNCC guidance notes (Gubbay, 2007). Numbers of individual *S. spinulosa* identified in the benthic grab samples from 59 stations were also assessed in line with the density thresholds detailed in Limpenny *et al.*, (2010). ENVISION assessed all 12 stations identified for full assessment as 'NOT a REEF', using underwater imagery, grab sample counts and side scan sonar data to examine extent.
7. The previous analysis (as set out in APP-158) considered both the conclusions of the EBS data, as well as historic data; however any presence of *S. spinulosa* was treated consistently and vintage was not weighted meaning the probability of *S. spinulosa* occurring within that study was increased considerably. Two interpretations were produced, one using project specific data, the other with all available data to allow a consideration of the age of the data to be made by the reader.
8. The conclusion of the reanalysis of the survey data (PD1-095) negates the need to update the previous analysis, as it confirms the lack of any Annex I qualifying reef within the offshore ECC, which would therefore not alter the conclusions of APP-158, which are in fact, reinforced by this new data.
9. There have been previous concerns that in Section 2.2 where it states that "*numbers of S. spinulosa individuals present in infauna grabs*" were "*used to inform the study*", has not provided further information on the approach used or thresholds considered. ENVISION have now undertaken a reassessment of *S. spinulosa* 'reefiness' of video stations within the Offshore ECC. Videos from 33 stations were initially screened for presence or absence of *S. spinulosa*, with 12 stations identified for further assessment and reviewed for Annex 1 biogenic reef following the appropriate JNCC guidance notes (Gubbay, 2007). Numbers of individuals *S. spinulosa* identified in the benthic grab samples from 59 stations were also assessed in line with the density thresholds detailed in Limpenny *et al* (2010).
10. ENVISION assessed all 12 stations identified for full assessment as 'NOT a REEF', using underwater imagery, grab sample counts and side scan sonar data to examine extent. Previous analysis did consider elevated numbers (>375 per m²) but BSL imagery, 'reefiness' assessment and community analysis evidence was contrary to these numbers (e.g. Station ECC_57 had 755 individuals from infaunal analysis, but was given Spi.Mix but was assessed as not a reef from video). The Applicant refers the ExA to the response to comment C19 for how the grab data is considered in the determination of Annex I qualifying reef.

11. It has been noted that there are concerns regarding the transparency of the data within the ES Chapter 9 Benthic and Intertidal Ecology Volume 3 Appendices Envision Data Analysis (APP-158) and the justification of why >20 years old data has been applied to be representative of a current baseline. It should be known that the age of each dataset was not incorporated within the analysis (APP-158) on a precautionary basis, as this provides additional accounts of *S. spinulosa*. Any historic presence of *S. spinulosa* was considered on an equal basis between datasets. The removal, or negative weighting of historic data would result in a lower likelihood of identifying reef as being present as it would have favoured the conclusions from the site-specific data which concluded no reef across the whole dataset.
12. The reanalysis of the DDV dataset (PD1-095) undertaken by ENVISION confirms no *S. spinulosa* reef identified within the Offshore ECC; therefore, previous habitat maps remain the same.
13. Further transparency concerns about the methods applied within the ES Chapter 9 Benthic and Intertidal Ecology Volume 3 Appendices Envision Data Analysis (APP-158) Envision Data Analysis have been raised. As set out above, the Applicant has given equal weighting to all survey data considered within (APP-158) as this gives the greatest potential to identify reef as potentially being present. A negative weighting to older datasets would consequently rely more heavily on the Project site-specific data which concluded no reef.
14. The results of the analysis within APP-158 confirmed the conclusions of the ES characterisation, that there was no reef present within the Offshore ECC; as such, it did not alter the worst-case scenario for Annex I *S. spinulosa* reef within the ECC (i.e. that there was no reef present).
15. It has been stated that Figure 21 confidence map is of limited relevance and is based on invalid analysis. It should be known that the analysis is not invalid.
16. Further detail has been issued to include a map to show the confidence of *S. spinulosa* habitats only (including SS.SBR.PoR (not reef) and SS.SBR.PoR.SspiMx (not reef)) from project specific data L4/5 MNCR habitat map. Confidence of the project specific data L3 and L4/5 MNCR habitat maps has been determined using the MESH confidence assessment scoresheet and a JNCC confidence assessment method (Lillis, 2016).

17. The Applicant notes that the survey scope for the site characterisation surveys were shared with Natural England for consultation in 2021, with no concerns raised by Natural England on the survey effort proposed, with the survey parameters exceeding those set out within the Natural England guidance “Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards – Phase I: Expectations for pre-application baseline data for designated nature conservation and landscape receptors to support offshore wind applications”. The Applicant further notes that the survey effort (i.e. number of data points) for the Project is substantially higher than that on other recent DCO projects (e.g. Five Estuaries and Hornsea Four), thereby giving higher confidence in the conclusions drawn from the data. Notwithstanding the higher data availability for the Project, and the robust nature of the analysis to inform the baseline (see responses to comments above), the Applicant contracted an independent review of the raw DDV data (PD1-095), which confirmed that the conclusions of the original survey were valid in concluding no Annex I qualifying reef is present in the Order Limits and specifically within the section of the IDRBNR SAC which overlaps with the offshore ECC.
18. Previous concerns regarding the data collection and analysis methods in the Envision study in The Wash for data have been raised. It should be made clear that the original ENVISION report did not reassess identification of *S. spinulosa* ‘reefiness’ from the original report, but used original BSL findings. ENVISION have recently undertaken a reassessment of *S. spinulosa* ‘reefiness’ of video stations within the Offshore ECC. Videos from 33 stations were initially screened for presence or absence of *S. spinulosa*, with 12 stations identified for further assessment and reviewed for Annex 1 biogenic reef following the appropriate JNCC guidance notes (Gubbay, 2007). Numbers of individuals *S. spinulosa* identified in the benthic grab samples from 59 stations were also assessed in line with the density thresholds detailed in Limpenny *et al* (2010). ENVISION assessed all 12 stations identified for full assessment as 'NOT a REEF', using underwater imagery, grab sample counts and side scan sonar data to examine extent.