Report to: Tetra Tech Coffey

Project Marinus

Nearshore Marine Benthic Characterisation of Tasmanian and Victorian Landfall Options

Technical Report

June 2021

Executive Summary

Marinus Link Pty Ltd (MLPL) is investigating options for a second electricity interconnector between Tasmania and Victoria. The proposed nearshore cable routes are located near the Blythe River mount on the northwest coast of Tasmania, and at Waratah Bay in Victoria.

Coffey is leading environmental and heritage investigations to inform the assessment of project options and future referrals to government agencies. CEE was contracted by Coffey to survey and characterise nearshore marine benthic habitats using towed underwater video techniques at each of the subsea cable route options.

The nearshore marine benthic characterisation study objectives were to validate existing habitat maps where available, characterise benthic habitats where no existing habitat maps were available and to identify possible project environmental constraints and sensitivities.

Survey sites were initially planned within areas of previously documented habitat categories or on seabed at select depths along the route corridors in areas not previously surveyed. The planned site positions and direct interpretation of the colour depth sounder were used by scientists during the surveys to guide video tows toward representative portions of marine benthic habitats or to identify seabed features in the route corridors.

Thirty-three sites were surveyed at Blythe River mouth, Tasmania over three days in January 2019. Twenty-eight sites were surveyed in Waratah Bay in February 2019. These surveys investigated now-superseded cable routes; and in 2021 this report was updated to reflect amended subsea cable routes. The 2019 survey sites (and discussion of findings) still adequately cover the current subsea cable routes, which are broadly within the 2019 survey area. Sites at Blythe River mouth and Waratah Bay locations were distributed along and within 1 km either side of the (then) cable route between the 40 m depth contour and the nearest accessible subtidal habitats to the coastline.

The towed underwater video records, GPS and depth sounder records were analysed to classify the benthic substrates and biological assemblages following the SeaMap Australia classification system (Butler et al, 2017). Imagery was further examined to compile a list of visible macroalgae, seagrass, macroinvertebrates and fish. Biota were identified to the lowest practical taxonomic and/or morphological level.

The nearshore Tasmanian subsea cable route option crosses a range of benthic habitat types including sand, cobble, boulder and rocky reef habitats. In many cases, habitats comprise mixed substrates, such as sand and cobble, cobble and reef and other combinations. Some correlation of habitats and depth were noted in northwest Tasmania: soft substrates (sand, shell) characterised most sites beyond 35 m depth; unconsolidated hard substrate (cobble) was common between 15 and 30 m depth and; consolidated hard substrate (reef, boulder) was common between the coastline and 20 m depth. However, each of these broad habitat types or mixtures of them occurred over a wide range of depths

The Victorian nearshore cable route in Waratah Bay also crosses several benthic habitat types. Sand was the most common habitat, though areas of cobble seabed and some small reef patches were also identified. Sandy seabed occurred from the shoreline to 40 m depth to the east of the proposed route. Cobble and patches of reef occurred between 15 and 20 m depth along the proposed route, and over a large area between 10 and 20 m depth to the west of the proposed route.

The biological assemblages associated with the habitats at Blythe River mouth are known to occur widely along the northwest coast of Tasmania. The species characteristic of the biological assemblages in Waratah Bay are also widely distributed. Biological assemblages associated with the deeper sandy habitats in both Tasmania and Victoria are distributed widely around Bass Strait.

Unconsolidated hard substrates (cobble) at the Tasmanian and Victorian routes have a range of invertebrate and macroalgae cover. In depths less than 20 m the cobble is periodically mobilised by storm waves, resulting in attached biological assemblages that are ephemeral or relatively young (generally 1 year or less). Consolidated hard substrates (reef, boulder) in water less than 20 m depth have more permanent, established biological assemblages dominated by macroalgae; in particular a wide range of brown seaweeds, species of *Caulerpa* (green algae), encrusting coralline red algae as well as seasonally abundant (ephemeral) red algae species. There is a range of invertebrate fauna beneath the algal canopy on hard substrates in shallower water, and a variety of fish species.

Hard substrates in deeper water occur near the Blythe River mouth route (but not at Waratah Bay in Victoria) and have lower light availability. They tend to be dominated by invertebrates (sponges, ascidians, scallops) with a range of macroalgae that are adapted to low light conditions including encrusting coralline red algae (forming rhodoliths in some cases), *Caulerpa* spp. and frondose red algae. A range of fish species are associated with these habitats.

Soft substrates in shallow water at the Tasmanian site tended not to have visible biota but are known to contain a range of infauna species. In Waratah Bay, the seagrass *Zostera tasmanica* formed sparse cover in the fine sandy seabed.

In deeper water at the Tasmanian sites where wave disturbance is lower, soft substrates had a range of sessile and mobile invertebrates including sponges (attached to shell or sparsely distributed hard substrate), commercial and doughboy scallops, seastars and ascidians. Some macroalgae including frondose red algae and *Caulerpa* spp. are present where light levels are sufficient. Some fish, such as stingarees and flathead, are associated with these habitats. Macroalgae attached to shell and pebbles was common on sandy seabed even in depths of 40 m in Waratah Bay indicating water clarity is typically higher than the northwest coast of Tasmania. No live scallops were sighted in Waratah Bay, with correspondingly low numbers of scallop predators such as seastars.

Unconsolidated hard substrates (cobble) were identified along and either side of the Tasmanian route to 30-35 m depth at Blythe River mouth. Cobble comprises various size classes and has an unknown thickness. It is possible that the cobble overlies consolidated bedrock. Areas of consolidated hard substrate including rocky reef and boulder substrate were also visible and particularly common at Blythe River mouth.

Images from transects across the disused outfall from the former Tioxide processing facility near Blythe River mouth indicated that the disused pipeline route follows sand over much of its length and may indicate a soft-seabed route through adjacent rocky reef for a subsea cable at this location.

An extensive area of cobble seabed with small patches of reef (bedrock) was identified between 15 and 18 m depth along the Waratah Bay route in Victoria. Sandy seabed was identified at these depths to the east of the proposed route.

This study found that the existing SeaMap Australia habitat maps for Tasmania were accurate. Minor differences were identified where visual observation of the seabed from the towed video provided accurate identification of habitats in the 2019 surveys compared to the

interpretation of satellite imagery in the previous documents. This study has provided more detail on the biological assemblages associated with each habitat at the surveyed locations than that presented in the broader-scale SeaMap Australia habitat maps for Tasmania.

The broad-scale SeaMap Australia habitat maps for Victoria indicated that most of Waratah Bay had no visible biota, with small patches of seabed with mixed biota (macroalgae, seagrass, invertebrates). The SeaMap Australia data indicated there were nearshore seagrass and algae habitats in less than 5 m water depth, however the 2019 survey found these were likely to have been (temporary) drifts of seagrass/algae identified from aerial imagery. The 2019 survey found that while seabed less than 5 m depth lacked visible biota, most seabed beyond 5 m depth supported some biological growth – including seagrass, macroalgae and invertebrates. Transects across the charted alignment of the Bass Strait 1 telecommunications cable to the east of the Waratah Bay route found no evidence of the telecommunications cable on the seabed surface.

No biological assemblages or species that could be considered particularly sensitive to the proposed project due to having a restricted range or restricted habitat availability, particular sensitivity to project activities and/or special conservation significance were identified in either the Tasmanian or Victorian nearshore survey areas.

Future environmental assessments to inform project referrals and impact assessments will need to account for the wide range of habitats documented along the routes. Further surveys should be planned based on the outcomes of the 2019 surveys and the outputs from the side-scan sonar and multibeam components of the planned geophysical surveys.

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Report to:
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Cover Image: Marine biological community (sponges, gorgonian, coralline algae and ephemeral algae) on rocky reef at site C08 (Cam River heads route), January 2019.

1 Introduction

Marinus Link Pty Ltd (MLPL) is assessing the feasibility of a second Bass Strait electricity interconnector, “Marinus Link”, between northwest Tasmania and Hazelwood in Victoria and is and developing a business case for its installation and operation. Tetra Tech Coffey Pty Ltd (Coffey) has been engaged by MLPL to provide advice on environmental, land use planning and heritage considerations for project. CEE Pty Ltd (Environmental Scientists and Engineers) was sub-contracted by Tetra Tech Coffey to characterise the marine benthic environment of the proposed nearshore interconnector routes. These are proposed in northwest Tasmania and Victoria (Figure 1.1). This technical report provides the results of the surveys in northwest Tasmania and one in Victoria, at:

- Blythe River mouth (Heybridge, east of Burnie)
- Waratah Bay (west of Sandy Point)

1.1 Survey Objectives

The objectives of the survey were to:

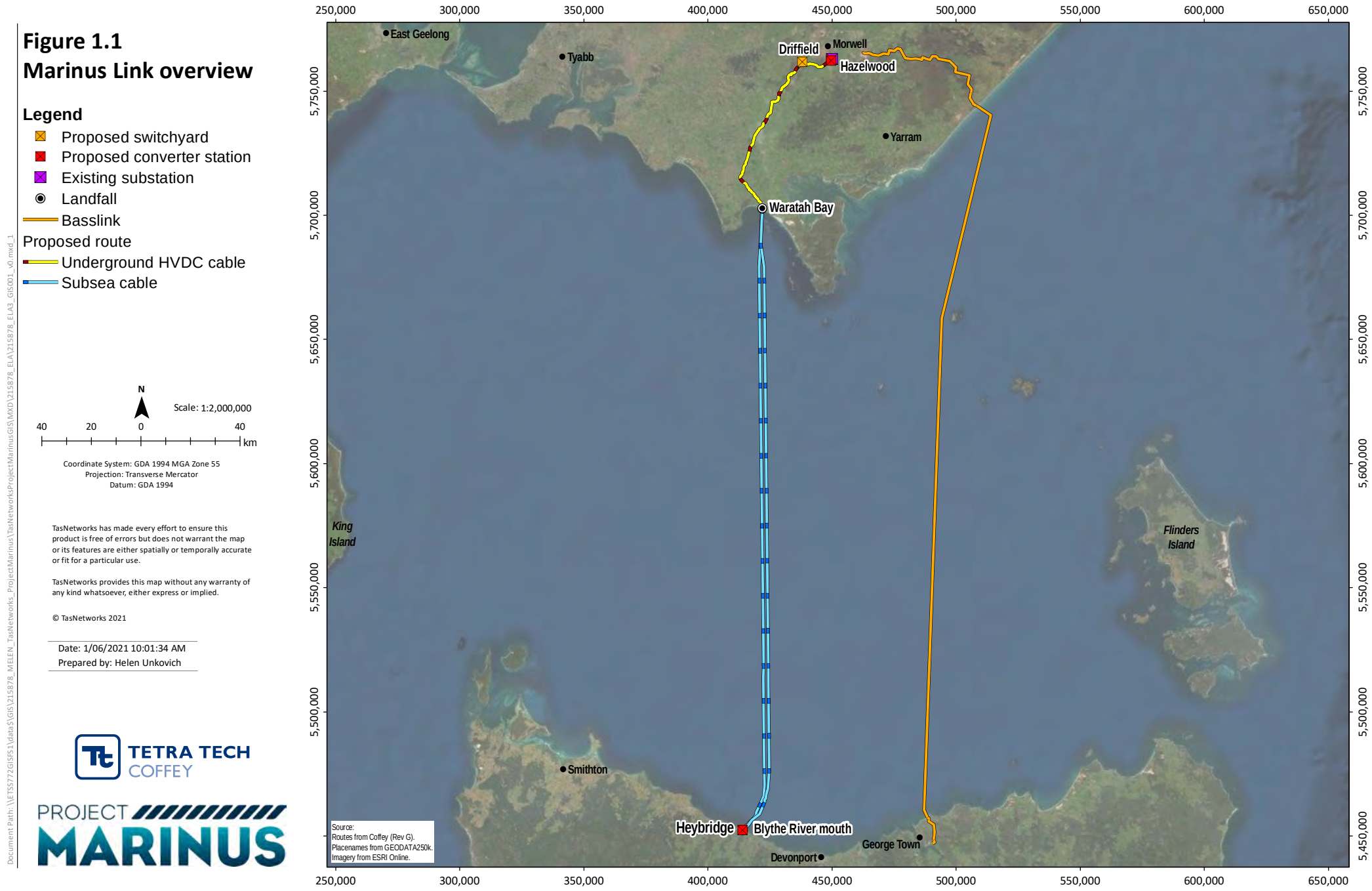
- Validate available seabed substrate mapping of the nearshore zones at and adjacent to the shore crossings.
- Identify nearshore marine environmental sensitivities that may be impacted by construction of the subsea cable including benthic habitat, exposed reef, and marine archaeology sites (the underwater video records have been provided to specialist maritime archaeologists for detailed examination).
- Identify marine environmental constraints on subsea cable routes in the nearshore marine zones.
- Provide information that will inform referrals under Tasmanian, Victorian and Commonwealth legislation.

This study was designed to identify and describe environmental values and constraints. A detailed baseline study will be completed once broad scale, spatially continuous high-resolution bathymetric and geophysical data is collected.

The nearshore marine benthic characteristics of at Blythe River mouth were surveyed from 14 to 16 January 2019. The nearshore marine benthic characteristics of the interconnector route at Waratah Bay, Victoria were surveyed on 17 February 2019. These surveys investigated now-superseded cable routes; and in 2021 this report was updated to reflect amended subsea cable routes. The 2019 survey sites (and discussion of findings) still adequately cover the now-preferred, nearshore subsea cable routes, which are within the 2019 survey area.

This report presents the assessment of the towed underwater video and depth sounder data collected during the surveys.

Figure 1.1
Marinus Link overview



1.2 Scope of Work

The scope of work for the nearshore marine benthic characterisation tasks was to:

- Review existing habitat mapping literature
- Plan the surveys to document benthic conditions in representative locations within a 1 km 'buffer' either side of the interconnector route options, from the shoreline to the 40 m depth contour
- Survey selected (representative) sites at each route option using towed underwater video.
- Use a single-beam depth sounder to record bathymetric data along each route and each of the towed video transects
- Use the chirp and side-scan features of the depth sounder to identify and inspect seabed features
- Use towed video to survey seabed around features identified by the echo-sounder that appear to be reefs, rocky outcrops or heritage features (eg. shipwrecks).
- Provide a report on the distribution of seabed habitats and associated marine biological assemblages along the proposed cable alignments and adjacent seabed.

Towed video records, still images and associated position data were provided to Tetra Tech Coffey for separate evaluation of heritage values. Maritime heritage values are not considered in this report.

2 Method

2.1 Survey Planning - review of existing habitat mapping

Tetra Tech Coffey provided CEE with GIS layers delineating each proposed cable route centreline under consideration at the time, the investigation corridor either side of the centreline and any restrictions to the survey area. CEE planned the survey using available GIS layers showing the coastline, 5 m interval depth contours and habitat maps produced by SeaMap Australia (Lucieer et al, 2017) which were based on earlier Tasmanian habitat mapping to 1.5 km from the coast (Lucieer et al, 2007) and Victorian habitat mapping to several kilometres from the coast (DELWP, 2018).

Approximately 30 sites were identified for survey along each of the routes based on the GIS data, using the following criteria:

- 10 to 13 sites were positioned at intervals along each route option centreline from the 40 m depth contour to the nearest accessible subtidal seabed to the shoreline
- A similar number of sites were positioned east and west of the centreline within the survey corridor. The corridor wide ranged from 500 m either side of the centreline (close to shore) to and 1000 m either side of centreline (further from shore until 40 m depth, as shown in Figures 2.1 to 2.4).
- Sites were positioned to provide representative samples of:
    - The full range of depths along each route
    - All the habitats shown in pre-existing habitat mapping
    - The boundaries of existing habitat mapping

Allowance was made for additional sites to be included in the survey along each route option to document seabed features identified from the depth sounder, such as uncharted rocky reefs and potential marine archaeology sites. The video footage was reviewed for potential marine archaeology sites under a separate scope.

2.1.1 Planned Survey Sites

The planned survey sites for the Blythe River option are shown in Figure 2.1. Some western sites were positioned along the Port of Burnie eastern boundary. Pre-existing habitat maps showed subtidal habitats including cobble, reef and sand within the survey corridor.

The planned survey sites for the Waratah Bay option are shown in Figure 2.2. Existing habitat maps only show the presence of 'soft substrates' within the survey corridor.

The planned sites provided guidance for locating the vessel for the video tows during the surveys. The actual positions of the video-tows were determined by scientists on the vessel at the time of the survey and took into account: the scope and strategy of the survey; prevailing wind and wave conditions; interpretation of depth sounder outputs and; observations at other sites in the survey area as the survey progressed. Hence, the survey proceeded in the following sequence:

- All planned sites along each cable alignment option were surveyed to establish general habitat boundaries
- Planned sites either side of the alignment were surveyed from nearshore to offshore until consistent soft sediment seabed was demonstrated

This process allowed additional survey sites to be included where surveyed sites indicated habitat patterns of interest beyond the planned array of sites.
The actual positions of each site are shown and discussed in Section 4.

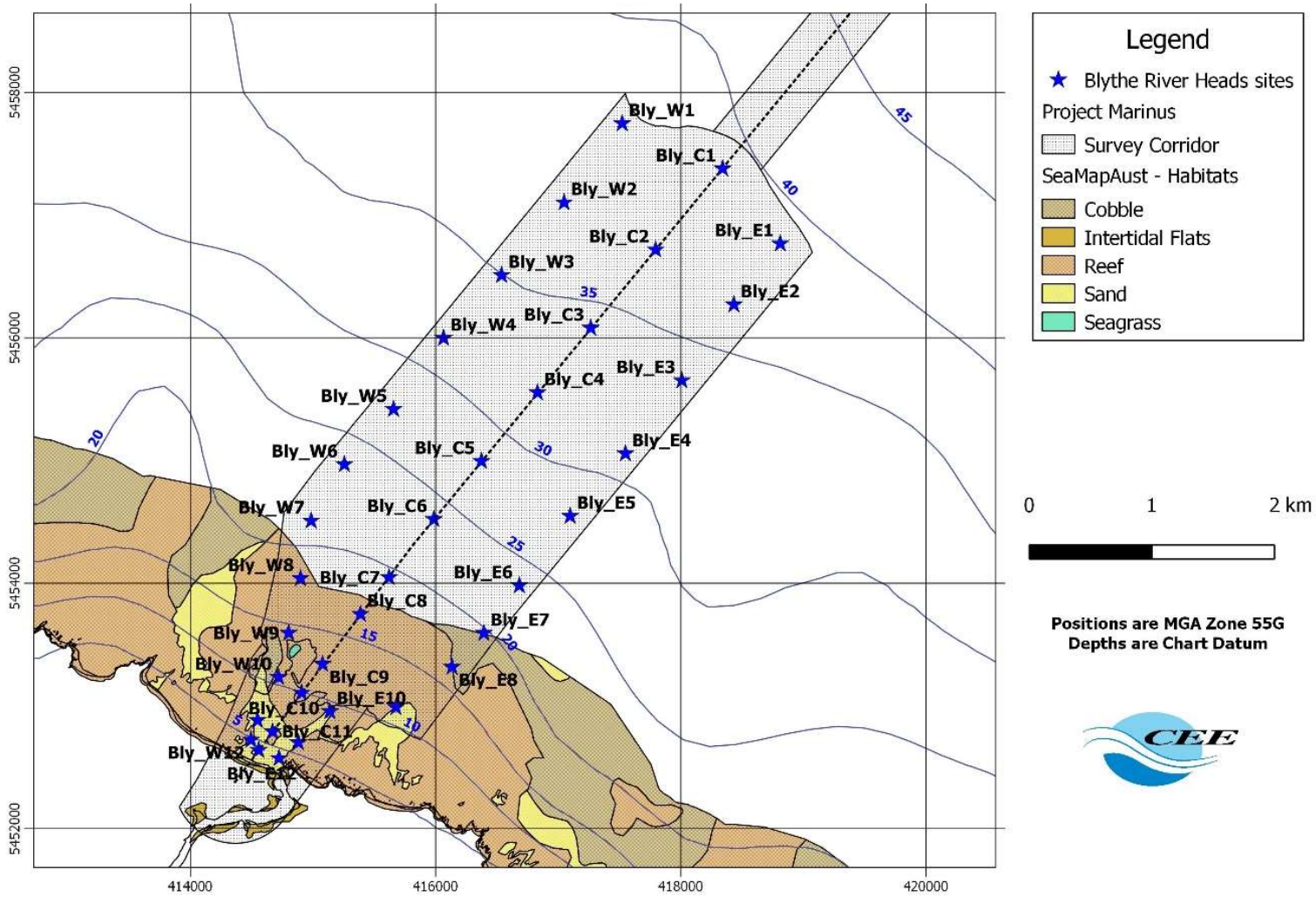


Figure 2.1: Planned survey sites for the Blythe River mouth

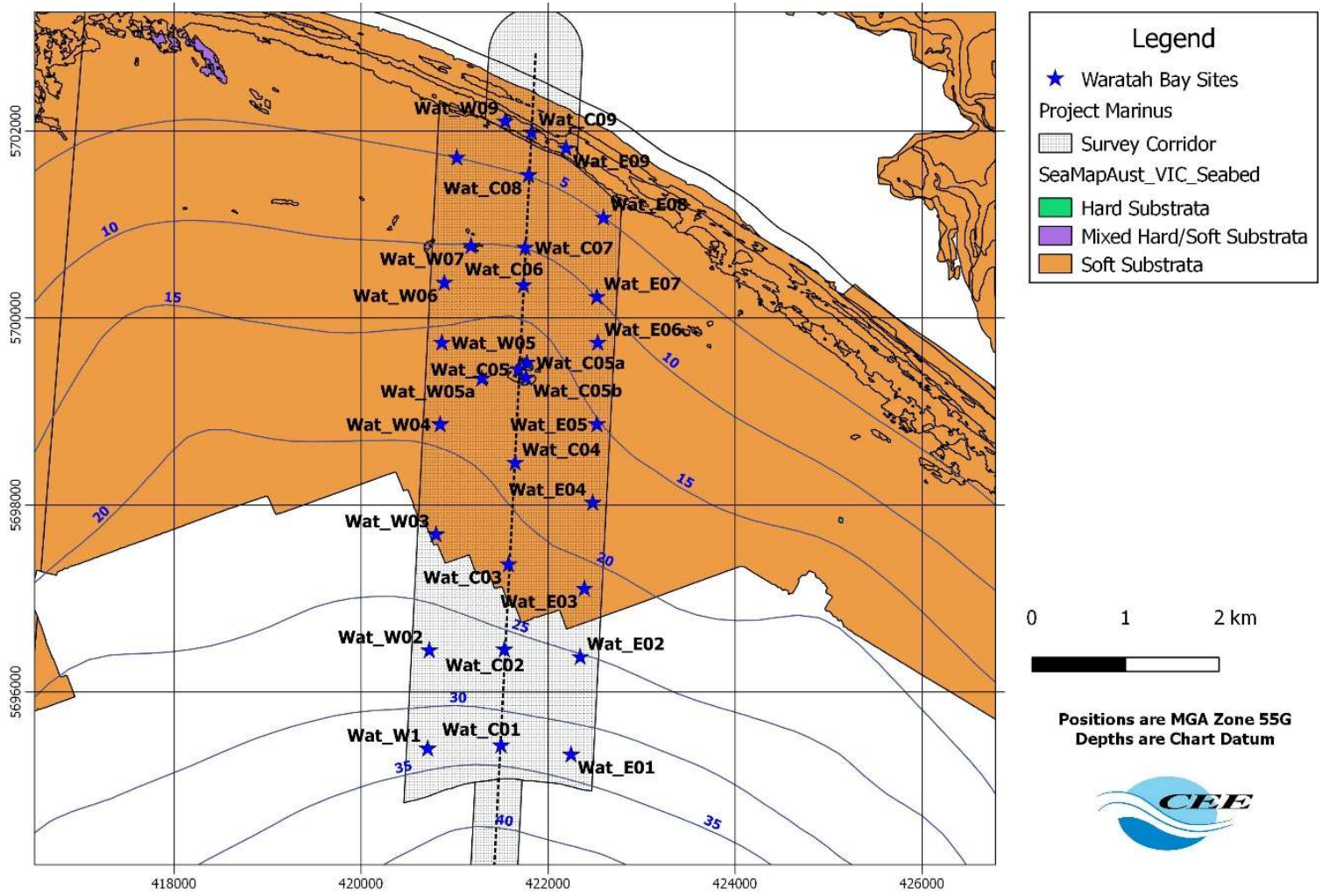


Figure 2.2: Planned survey sites for the Waratah Bay

2.2 Towed Underwater Video Method

The survey used CEE's towed underwater video equipment. The equipment is purpose built for marine environmental surveys and comprised:

- A ballasted tow-fish fitted with two cameras: a high-definition CCTV camera linked to the surface via a tether and communication cable; and, an independent 4K resolution camera with a wide-angle lens.
- A surface unit consisting of a screen to view the seabed in real-time and a digital video recorder.

The CCTV camera mounted on the tow-fish with real-time transmission of images to the survey vessel was used to maintain the tow-fish between 10 to 30 cm above the seabed. The CCTV video was recorded to hard-disk on board the vessel. The CCTV record was started when the camera reached the bottom and stopped when the camera was retrieved from the bottom. The CCTV record provided a continuous record of conditions along the transects. The CCTV video live footage was used for navigation and making observations but the video records were not used for the analysis.

The independent 4K camera was set to take a still image every 2 seconds. Recording was started at the surface upon deployment and stopped at the surface upon retrieval. The high definition images from this camera provide detail required for analysis of seabed composition and identification of associated biota. The still images were used for the analysis of seabed habitat.

The survey recorded both video and still-images using this equipment along 50 to 100 m transects at each site.

The survey vessel navigated to each site using GPS waypoints and/or the vessel depth sounder. Once in position, the camera equipment was lowered to the seabed. The survey vessel was allowed to drift with prevailing currents and wind to cover a 50 to 100 m transect. Minimal propulsion was used to maintain the speed of the camera above the seabed at or below 1 km/h. Where a site aimed to document a habitat boundary, the vessel was positioned and navigated to ensure the transect crossed the boundary.

Electronic and hard-copy data were recorded for each video transect including:

- HD video from the CCTV camera
- High resolution still images from the 11 megapixel, 4K camera
- A waypoint for the position and time of the start of each transect (hand-held GPS, accuracy ±5 m, WGS 84)
- Trackpoints giving a position every 10 seconds along each transect (hand-held GPS, accuracy ±5 m, WGS 84)
- Depth directly from vessel sounder (unadjusted for tide or waves) at 30 second intervals along each transect (vessel GPS, WGS 84)
- Start/stop times
- Descriptions of habitats and biota on the seabed and other seabed features.

2.3 Analysis Method

The still images provided the best resolution imagery of the seabed and were used to describe the seabed and biota at each site. The timestamps for the images were matched with each 10 second trackpoint record – there were around 5 images per track point. The video record was used to validate/check general observations (constant motion of the video impedes detailed analysis).

The trackpoint records for each transect were extracted from the hand-held GPS records (WGS 84) and used as points for characterisation/classification of habitats using GIS.

Each point was assigned a seabed and biological classification based on the SeaMap Australia classification system (Butler et al., 2017). Classifications were determined from the still images recorded at and near that point during the survey. General definition of substrate classification is provided in Table 2.1. Combinations of terms may be used to describe mixed seabed classifications. Reef refers to rocky reef rather than biotic reefs such as coral or other biotic-based reefs. Differences between Seamap and Marinus descriptors may occur due to finer spatial resolution and video coverage of Marinus survey at project sites. Seamap descriptors on maps in this report are directly from Seamap database. Legend may include some Seamap descriptors not present on the section of coastline shown in the particular area presented in the report.

Table 2.1: Seabed physical descriptors

Seabed physical classifications	
Sand: grain size 0.0625 to 2.0 mm	Soft substrate
Shell: broken shell visible in sand	Soft substrate
Granule: 2 mm to 4 mm	(Intermediate)
Pebble: 4 mm to 64 mm	(Intermediate)
Cobble: 64 mm to 256 mm	Hard substrate
Boulder: 256 mm to 4000 mm	Hard substrate
Reef (rocky reef): broken rock and bedrock	Hard substrate

A detailed list of the biota identified at each site was also prepared. Biota were identified to the lowest practical taxonomic level.. For some groups this was phylum and class, and for groups such as the macroalgae, (Phaeophyta, Rhodophyta, Chlorophyta), sponges (Porifera) and ascidians (Tunicata), lower level classifications were based on morphological or generic categories.

Comparison with existing seabed and biological classifications has been made for sites where SeaMap Australia data were available. SeaMap Australia classification data were compiled for each site using GIS.

2.4 Bathymetric Records

The depth sounder on the survey vessel recorded depth-soundings with corresponding positions every thirty seconds during the survey. These records have been used to plot depth-profiles along each subsea cable route option and to estimate average depths and depth ranges for each site. Depths are in metres below the surface as recorded by the vessels single-beam depth sounder.

During the survey, scientists monitored the continuous colour sounder output for notable changes in depth that may indicate a significant seabed feature (eg. reef outcrop) and to identify changes in bottom type (eg. Sand-Cobble-Reef).

3 Quality Control

3.1 Field

The position of the tow-fish above the seabed was monitored by both the camera operator and the observer (recording GPS data and notes) to ensure the tow-fish was kept at the optimum position. The cameras use wide angle lenses and best imagery was obtained when the camera was just above the seabed. If the camera was too far above the seabed the resolution of the imagery was reduced by interference from particles in the water.

Images from the camera recording still images were reviewed regularly when the camera was at the surface to ensure quality imagery was being obtained.

The accuracy of the GPS fix was monitored during use and consistently showed that the accuracy was ±5 m.

3.2 Analysis

GPS data were saved as GPX files for use in GIS. Extracted trackpoint data for each transect were cross checked between the handheld and vessel GPS, and with planned survey sites. Depth records were cross-checked with existing bathymetry data. Adjustment of depth records for tide or waves is beyond the scope of this study. As an indication of the influence of tides, the tidal range in northwest Tasmania during the surveys was 2.4 m. The tidal range in Waratah Bay during the survey was 2.2 m.

Habitat types identified from imagery were classified using the system of Butler et al (2017) and cross-checked against SeaMap Australia data where possible. Where changes from existing habitat classifications have been made for a site, they were noted.

Species and taxonomic identifications were made based on analyst training and experience. Reference materials were used to identify some species and check whether identified species were within their known geographic distribution and habitat.

4 Results

This section provides an overview of the characterisation of nearshore marine benthic environments at Blythe River mouth and Waratah Bay. More detailed data is provided in GIS-ready and Excel formats (see Appendix 8-1).

Text in this section and the appendices refers 2019 ‘cable routes’ or ‘centrelines’. The cable routes that were subsequently adopted are nearby the 2019 routes and within the survey area, but were refined subsequent to the 2019 towed video surveys and additional geophysical surveys. For example, the presently adopted Blythe River mouth route alignments follow sandy paleochannels to about 2 km offshore, rather than the straight-line routes of 2019. These routes were refined based on geophysical surveys subsequent to the 2019 towed video surveys. They are within the 2019 survey area, but avoid rock outcrops documented in the 2019 towed video surveys. The adopted Waratah alignments are similar to those of the 2019 survey.

4.1 Blythe River mouth

4.1.1 Seabed and Habitats

Figure 4.1 shows the seabed profile along the Blythe River mouth cable route option. The horizontal (X) axis is the distance along the route from landfall (0 m depth). Depths are in metres below the surface as recorded by the towed video survey vessels single-beam depth sounder. They have not been corrected for tide or waves. The route is approximately northeast along the entire section of the route surveyed (Figure 4.2).

There was only slight wave action during the survey at Blythe River so noise due to waves is minimal. The vessel was able to survey to 130 m from shore at around 2 m depth.

The seabed sloped at a slowly decreasing gradient from the coastline to the 40 m depth contour. Sharp changes in depth occurred at intervals from the coastline to 3 km offshore that indicate the presence of high relief reef habitat. Beyond 32 m depth and 3.5 km offshore the profile is relatively smooth and flat, reaching 40 m depth at approximately 6.5 km offshore.

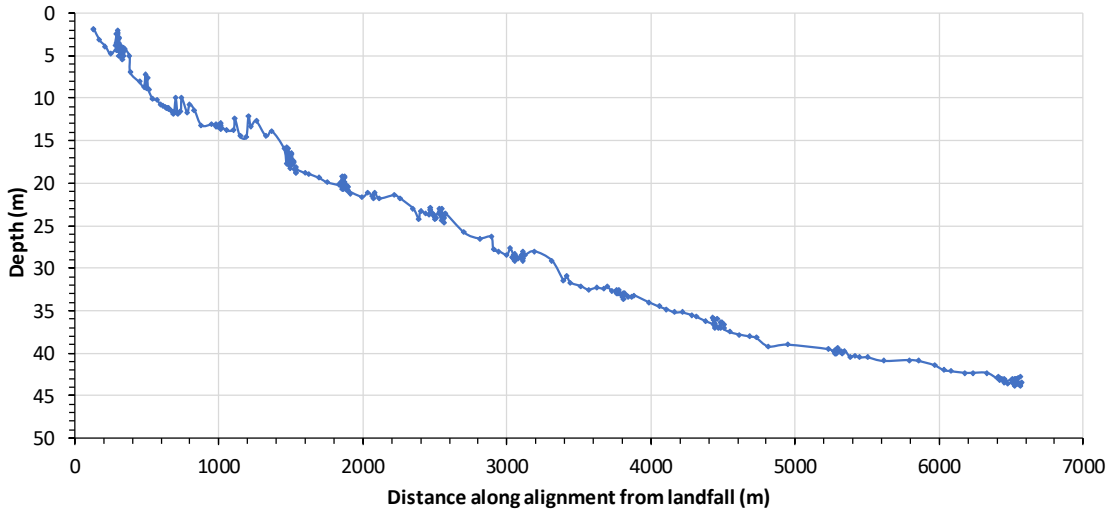


Figure 4.1: Depth profile along the Blythe River route, 2019

Seabed condition was recorded by the towed video at 33 sites at the Blythe River mouth route. Figure 4.2 shows a map of seabed survey sites and corresponding seabed composition. Table 4.1 summarises data for each site, including the average depth and the range in depths recorded to provide an indication of seabed relief.

Thirteen sites were surveyed along the cable route documenting sand, cobble, reef and boulder habitats. The seabed was uniformly soft substrate (sand) towards shore from 40 m depth (Bly_001) to 29 m depth (Bly C05). Hard substrate (cobble and reef) occurred in depths less than 29 m (Bly_C06).

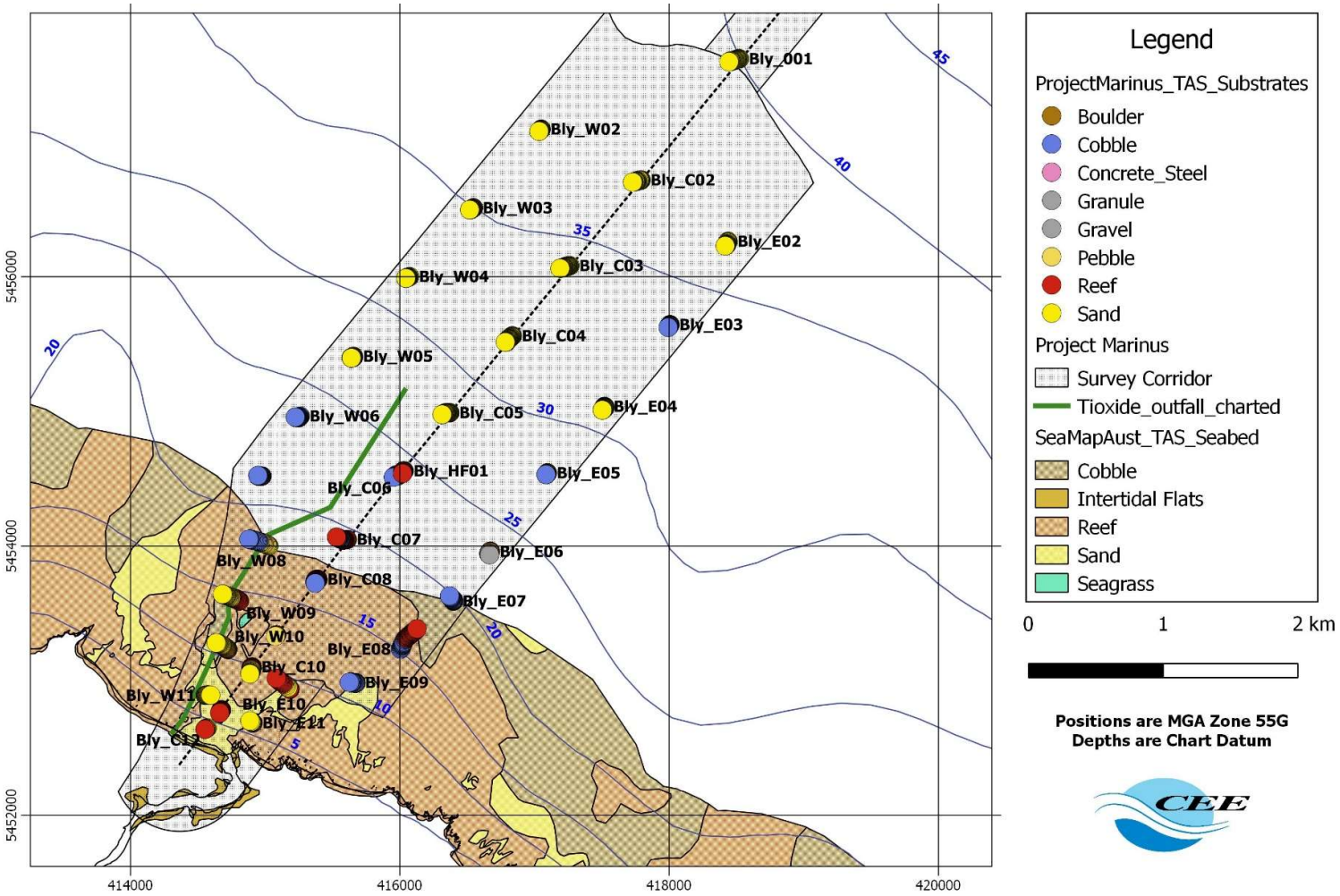


Figure 4.2: Seabed and habitats along the Blythe River mouth route, 2019

The deepest occurrence of reef with relief of over 1 m was 24 m (Bly_HF01) at approximately 2.3 km offshore and reef and boulder habitat occurred patchily between 24 m and the coastline, alternating with cobble and sand habitat.

The transition from soft to hard substrates occurred at between 25 and 30 m depth to the east and west of the Blythe River mouth route centreline, and a patch of boulder/cobble habitat was identified at 32 m depth to the east. Similar constraints to trenching and cable routing appear to occur either side of the Blythe River mouth 2019 route centreline.

Table 4.1: Seabed (habitat) characteristics at Blythe River mouth sites

	WGS84 55H		Depth data (metres)				
Transect	Easting	Northing	Average	Min	Max	Range	Habitats
Bly_001	418483	5457608	43	43	43.6	0.6	Sand
Bly_C02	417760	5456710	40	39.7	40.1	0.4	Sand, Shell
Bly_C03	417226	5456073	37	36	37.5	1.5	Sand, Shell
Bly_C04	416808	5455536	33	32.9	33.4	0.5	Sand, Shell
Bly_C05	416343	5454987	29	28.1	29.1	1	Sand, Shell
Bly_C06	416024	5454551	24	23	24.6	1.6	Sand, Cobble
Bly_HF01	416024	5454551	24	23	24.6	1.6	Reef
Bly_C07	415568	5454052	20	19.2	20.7	1.5	Reef, Sand, Shell
Bly_C08	415377	5453744	18	16.5	18.8	2.3	Cobble, Reef
Bly_C09	415081	5453339	13	12.9	13.2	0.3	Cobble, Pebble, Shell
Bly_C10	414894	5453081	11	10	11.9	1.9	Reef, Boulder, Sand, Shell
Bly_C11	414670	5452775	4	3	5.1	2.1	Reef
Bly_C12	414562	5452645	2	1.8	2.5	0.7	Sand, Reef
Bly_E02	418425	5456241	38	37.6	38.1	0.5	Sand, Shell
Bly_E03	418000	5455635	32	31.9	32.2	0.3	Boulder, Cobble
Bly_E04	417516	5455023	29	29	29.8	0.8	Sand, Shell
Bly_E05	417091	5454537	28	27.4	27.9	0.5	Sand, Cobble
Bly_E06	416667	5453953	23	22.3	23.3	1	Cobble, Granule, Boulder
Bly_E07	416388	5453607	20	19.6	20.9	1.3	Cobble, Sand
Bly_E08	416058	5453316	15	14.2	16.4	2.2	Cobble, Reef
Bly_E09	415659	5452985	12	11.9	12.3	0.4	Cobble, Sand
Bly_E10	415137	5452975	9	8	10.2	2.2	Reef, Sand
Bly_E11	414901	5452691	5	3.8	6.1	2.3	Reef, Cobble, Sand
Bly_W02	417041	5457088	39	38.7	38.8	0.1	Sand, Shell
Bly_W03	416533	5456503	35	34.5	35.3	0.8	Sand, Shell, Cobble
Bly_W04	416055	5455994	31	31.4	31.5	0.1	Sand, Shell
Bly_W05	415646	5455400	28	27.9	28.2	0.3	Sand, Shell
Bly_W06	415240	5454956	24	24.1	24.4	0.3	Cobble, Sand, Shell
Bly_W07	414959	5454520	19	17.8	19.6	1.8	Cobble, Gravel, Shell, Sand
Bly_W08	414949	5454031	15	13.2	17.7	4.5	Sand, Cobble, Pipeline
Bly_W09	414743	5453620	13	10.4	15	4.6	Reef, Cobble
Bly_W10	414684	5453258	9	7.6	11.1	3.5	Boulder, Cobble, Sand
Bly_W11	414572	5452894	7	6	7	1	Sand

The dis-used Tioxide plant steel outfall pipeline at Blythe River was positioned predominantly over sandy seabed using concrete block anchors, as shown by towed video at sites Bly_W09 and Bly_W08 (Figure 4.5, Figure 4.4). This dis-used route along sandy seabed may be feasible for a transmission cable in the nearshore zone. The pipeline is around 10 m west of its charted position and two pipelines were identified near W08 (the pipeline had to be replaced during its lifetime).

The video and photographic records of the seabed along the disused Tioxide outfall pipeline showed unconsolidated medium to coarse sands with shell grit (Figure 4.4). Sand waves were clearly visible indicating episodic mobilisation of the sediments by storm waves.

The outfall pipeline discharged wastewater containing iron-based, orange coloured particulates until closure of the Tioxide Plant in 1996. Sites C05, C06, W05 and W06 are 500 m to 1000 m from the discharge point from the old outfall. Representative images of the seabed at each of these sites are shown in Figure 4.3. The video and images from these sites show no evidence of residual material on the seabed. The seabed at each of these sites showed evidence of frequent mobilisation by waves and currents and comprised sand, shell and cobble substrates.

More than 20 years of oceanographic processes appear to have dissolved or dispersed the particles over a wide area of southern Bass Strait.

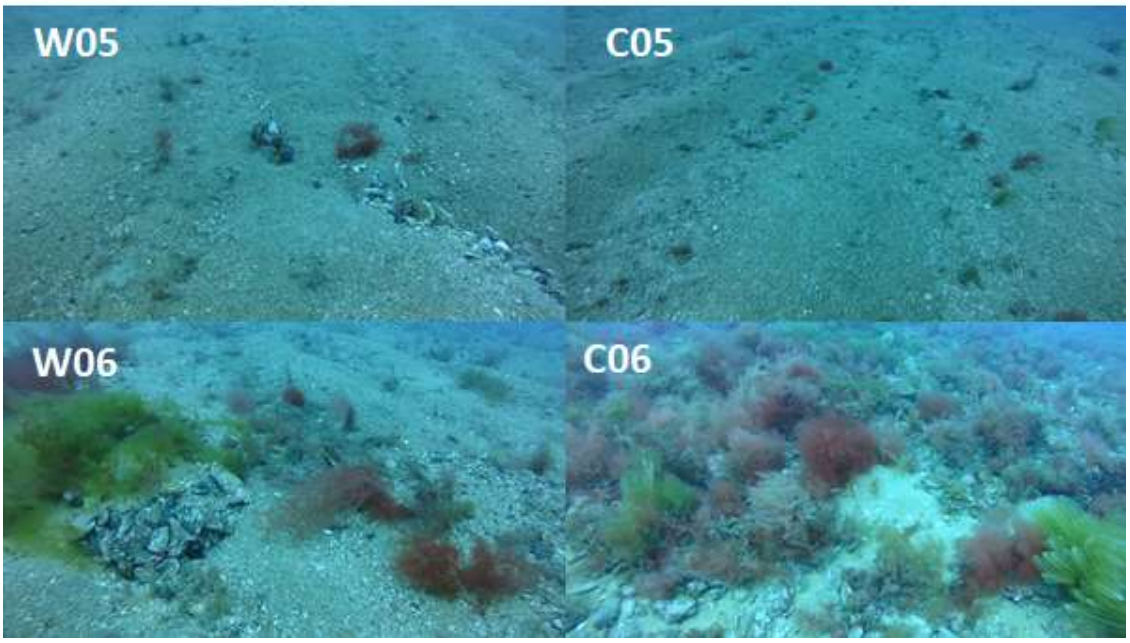


Figure 4.3: Images of seabed at sites nearest the old Tioxide discharge outfall

Figure 4.4: Dis-used Tioxide outfall pipeline at Blythe River
Top: at site W09, (12-13 m depth), bottom: at site W08 (15-16 m depth)

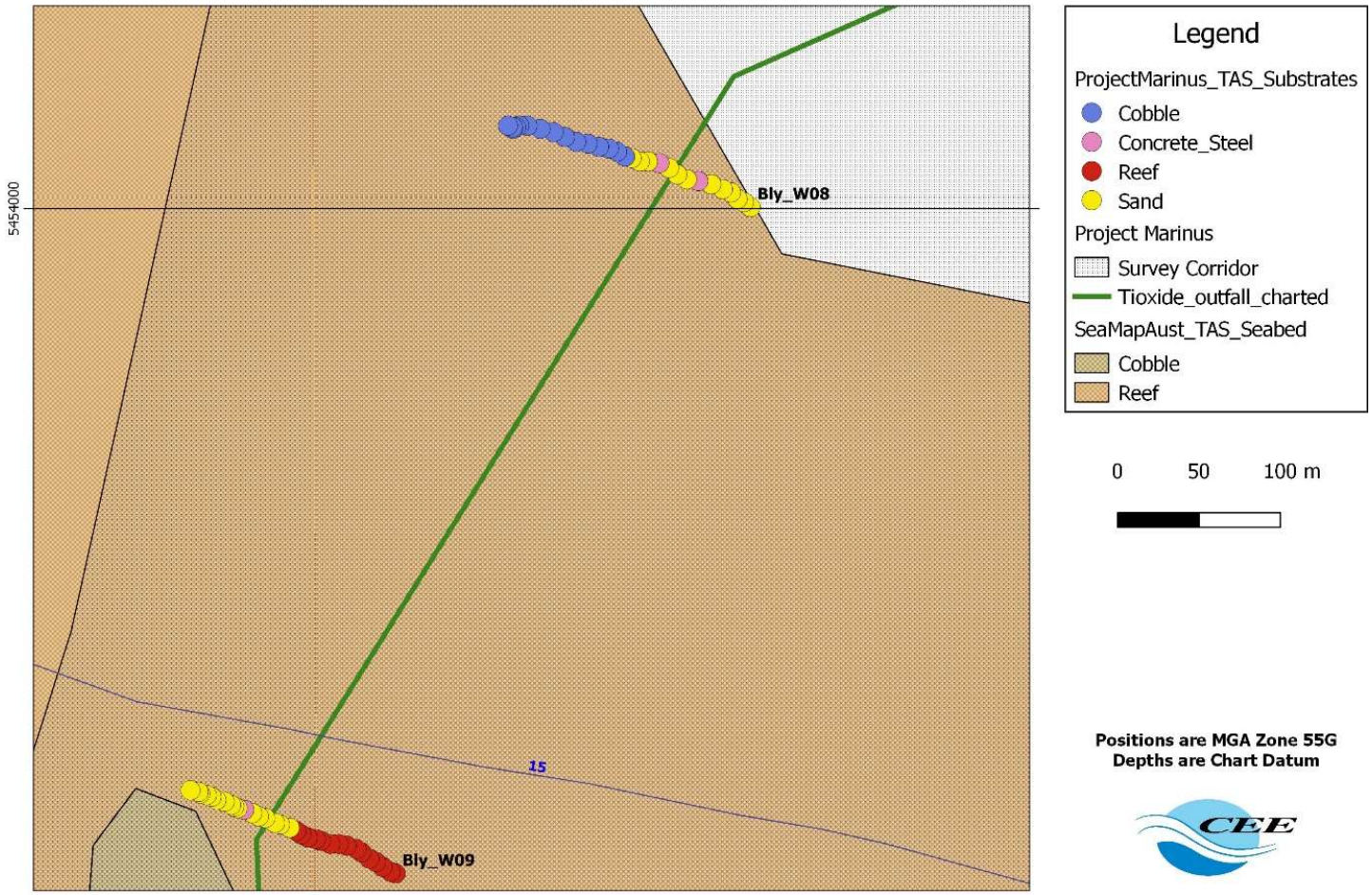


Figure 4.5: Substrates near the dis-used Tioxide outfall pipelines

4.1.2 Biological Characteristics

A map representing the biological characteristics of each site at Blythe River mouth is shown below in Figure 4.7 and Figure 4.8 and the data is summarised for each site in Table 4.2. Images representative of the seabed and biological assemblage at each site are provided in Appendix 8-2.

Assemblages at Blythe River mouth supported a range of invertebrates and macroalgae. Invertebrates were more abundant in images from sites over 20 m deep while macroalgae were more abundant in images from sites less than 20 m deep. Shallow sites with sandy substrate generally had little visible biota (occasionally unattached macroalgae). These sandy habitats would support infauna: communities of burrowing invertebrates in the sand just below the seabed surface.

The sandy seabed sites over 35 m deep supported scallops, with the doughboy scallop *Mimachlamys asperrima* more common than the commercial scallop *Pecten fumatus*. These sites also had sponges, attached to shell or buried cobble where present, as well as an unidentified (and likely undescribed) stalked colonial ascidian. There were few macroalgae at the deep sandy seabed sites at the Blythe River mouth sites.

Sites over 20 m deep with cobble seabed supported a wide range of encrusting invertebrates including sponges, gorgonian corals, bryozoans, colonial and solitary ascidians and the doughboy scallop. Encrusting coralline red algae, red macroalgae and *Caulerpa* spp. were also common in these habitats.

As depth decreased and light availability increased the abundance of macroalgae increased and the types of macroalgae changed. Invertebrates remained a major component of the biological assemblage. Ephemeral red macroalgae had the highest cover on cobble at depths less than 20 m (Figure 4.6 - right) – these comprise a range of species that are seasonally abundant along the north west coast of Tasmania during spring and summer (as described in CEE 2015 and 2016 unpublished reports on Pardoe and Burnie wastewater outfalls).

More stable boulder and reef habitat support a wide range of larger, more long-lived invertebrates and macroalgae. Large sponges and ascidians are abundant in these habitats at greater than 20 m depth (Figure 4.6 - right), while large brown algae are abundant in waters less than 20 m deep (Figure 4.6 - left).

Figure 4.6: Biota on shallow reef (left, C11) and mid-depth cobble (right, C06) at Blythe River mouth

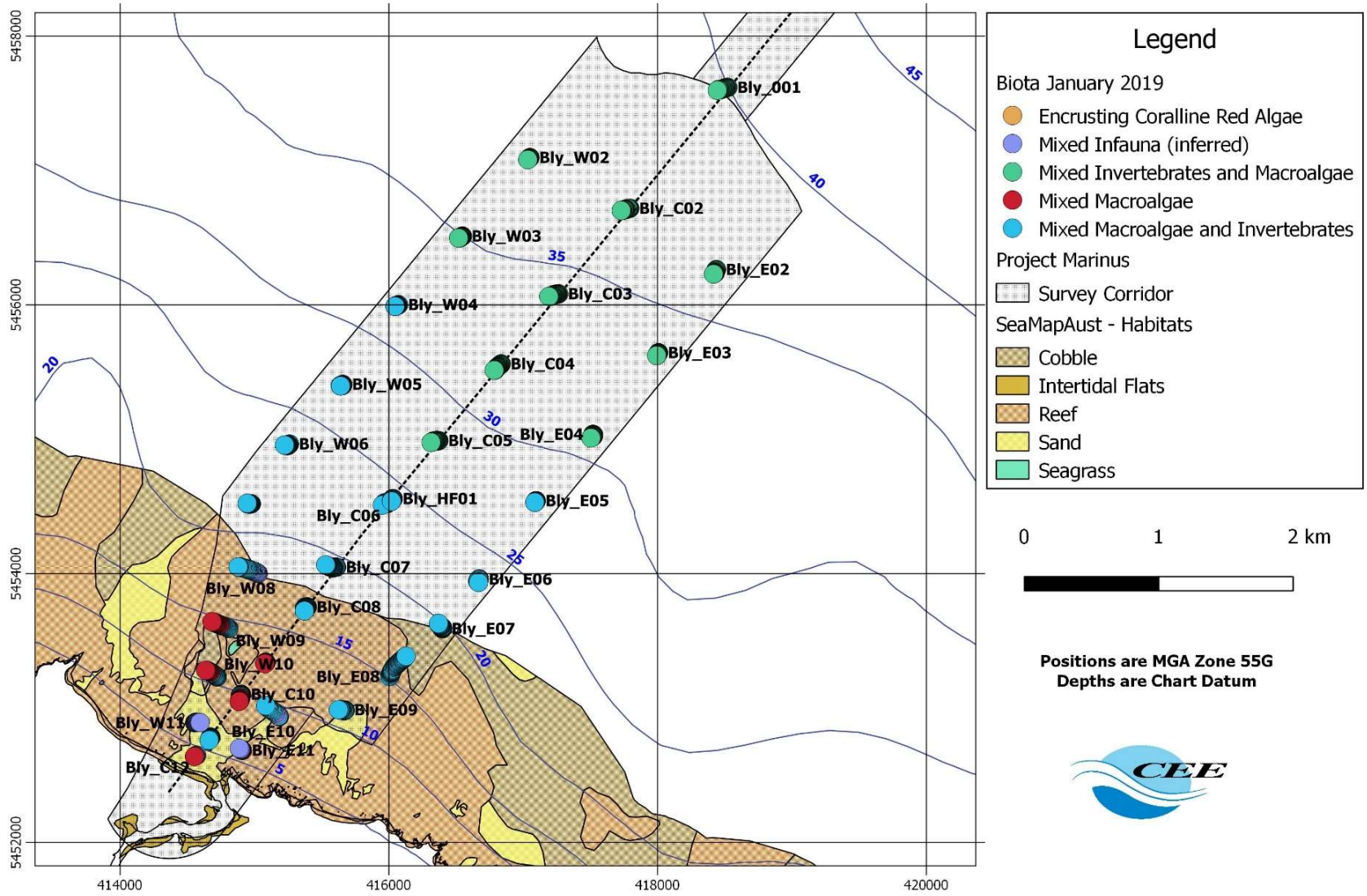


Figure 4.7: Biological characteristics along the Blythe River mouth route, 2019

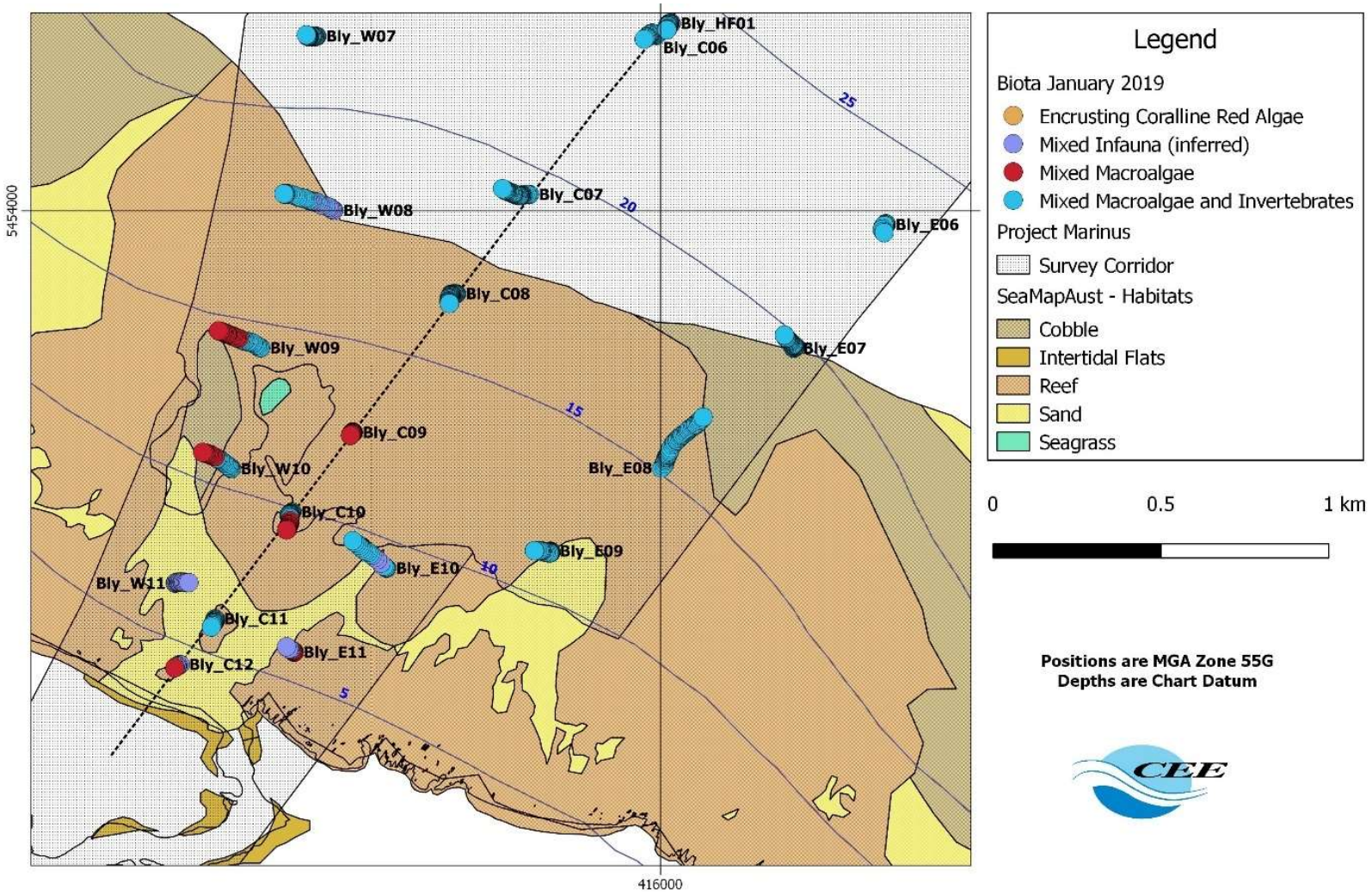


Figure 4.8: Nearshore biological characteristics along Blythe River mouth route, 2019

There was no seagrass at any of the Blythe River mouth survey sites including W09, C09 and W10, which were located around a small area of seabed that was mapped as seagrass in SeaMaps.

The biological assemblage on the disused outfall (Figure 4.4) provides an indication of the nature of marine biological growth that may colonise the external iron casing of a transmission cable laid across the seabed.

Table 4.2: Biological characteristics of Blythe River mouth sites

Transect	Easting	Northing	Average Depth (m)	Biological Category	Seabed (habitat)
Bly_001	418483	5457608	43	Mixed Invertebrates and Macroalgae	Sand
Bly_C02	417760	5456710	40	Mixed Invertebrates and Macroalgae	Sand, Shell
Bly_C03	417226	5456073	37	Mixed Invertebrates and Macroalgae	Sand, Shell
Bly_C04	416808	5455536	33	Mixed Invertebrates and Macroalgae	Sand, Shell
Bly_C05	416343	5454987	29	Mixed Invertebrates and Macroalgae	Sand, Shell
Bly_C06	415969	5454522	24	Mixed Macroalgae and Invertebrates	Sand, Cobble
Bly_HF01	416024	5454551	24	Mixed Infauna (inferred)	Reef
Bly_C07	415568	5454052	20	Mixed Macroalgae and Invertebrates	Reef, Sand, Shell
Bly_C08	415377	5453744	18	Mixed Macroalgae and Invertebrates	Cobble, Reef
Bly_C09	415081	5453339	13	Mixed Macroalgae	Cobble, Pebble, Shell
Bly_C10	414894	5453081	11	Mixed Macroalgae and Invertebrates	Reef, Boulder, Sand, Shell
Bly_C11	414670	5452775	4	Mixed Macroalgae and Invertebrates	Reef
Bly_C12	414562	5452645	2	Mixed Infauna (inferred)	Sand, Reef
Bly_E02	418425	5456241	38	Mixed Invertebrates and Macroalgae	Sand, Shell
Bly_E03	418000	5455635	32	Mixed Invertebrates and Macroalgae	Boulder, Cobble
Bly_E04	417516	5455023	29	Mixed Invertebrates and Macroalgae	Sand, Shell
Bly_E05	417091	5454537	28	Mixed Macroalgae and Invertebrates	Sand, Cobble
Bly_E06	416667	5453953	23	Mixed Macroalgae and Invertebrates	Cobble, Granule, Boulder
Bly_E07	416388	5453607	20	Mixed Macroalgae and Invertebrates	Cobble, Sand
Bly_E08	416058	5453316	15	Mixed Macroalgae and Invertebrates	Cobble, Reef

Transect	Easting	Northing	Average Depth (m)	Biological Category	Seabed (habitat)
Bly_E09	415659	5452985	12	Mixed Macroalgae and Invertebrates	Cobble, Sand
Bly_E10	415137	5452975	9	Mixed Macroalgae and Invertebrates	Reef, Sand
Bly_E11	414901	5452691	5	Mixed Macroalgae	Reef, Cobble, Sand
Bly_W02	417041	5457088	39	Mixed Invertebrates and Macroalgae	Sand, Shell
Bly_W03	416533	5456503	35	Mixed Invertebrates and Macroalgae	Sand, Shell, Cobble
Bly_W04	416055	5455994	31	Mixed Macroalgae and Invertebrates	Sand, Shell
Bly_W05	415646	5455400	28	Mixed Macroalgae and Invertebrates	Sand, Shell
Bly_W06	415240	5454956	24	Mixed Macroalgae and Invertebrates	Cobble, Sand, Shell
Bly_W07	414959	5454520	19	Mixed Macroalgae and Invertebrates	Cobble, Gravel, Shell, Sand
Bly_W08	414949	5454031	15	Mixed Infauna (inferred)	Sand, Cobble, Pipeline
Bly_W09	414743	5453620	13	Mixed Macroalgae and Invertebrates	Reef, Cobble
Bly_W10	414684	5453258	9	Mixed Macroalgae and Invertebrates	Boulder, Cobble, Sand
Bly_W11	414572	5452894	7	Mixed Infauna (inferred)	Sand

4.2 Waratah Bay

4.2.1 Seabed and Habitats

Figure 4.9 shows the seabed profile along the Waratah cable route option. The x-axis is the distance along the route from landfall (0 m depth). Depths are in metres below the surface as recorded by the depth sounder. The depths have not been corrected for tide or waves. The route is approximately due south along its entire length (Figure 4.10).

There was a small 1 m swell and no wind waves during the survey at Waratah Bay so noise due to waves is minimal. The vessel surveyed from 7,500 m from shore at approximately 42 m depth to 560 m from shore at approximately 7 m depth.

The depth profile shows an initial steep increase in depth from 7 m to 15 m over the first 500 to 600 m of the section (gradient 1:70), followed by gently-sloping, flat seabed from 15 m to 25 m over approximately 4 km (gradient of 1 in 400), a longshore trough 5.8 to 5.9 km offshore followed by a relatively steep increase in depth from 30 m to 42 m over the last offshore 1000 m of the section (gradient of 1 in 80).

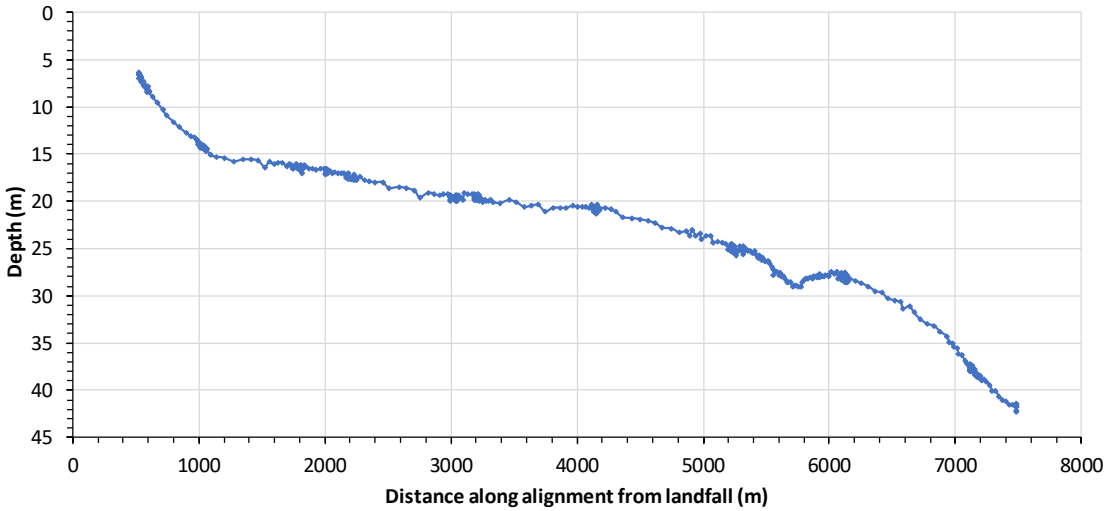


Figure 4.9: Seabed profile along Waratah Bay route, April 2019

The survey of the Waratah Bay route included 28 sites. A map of the sites and seabed types is shown in Figure 4.10 while Table 4.3 summarises data for each site, including the average depth and the range in depths recorded to provide an indication of seabed relief.

Additional sites were also surveyed in an area of “Mixed Macroalgae and Invertebrate” habitat identified from SeaMap Australia data near Wat_C05 (Figure 4.11). A 1 km long east-west transect (Wat_E-W) covered most of the width of this habitat.

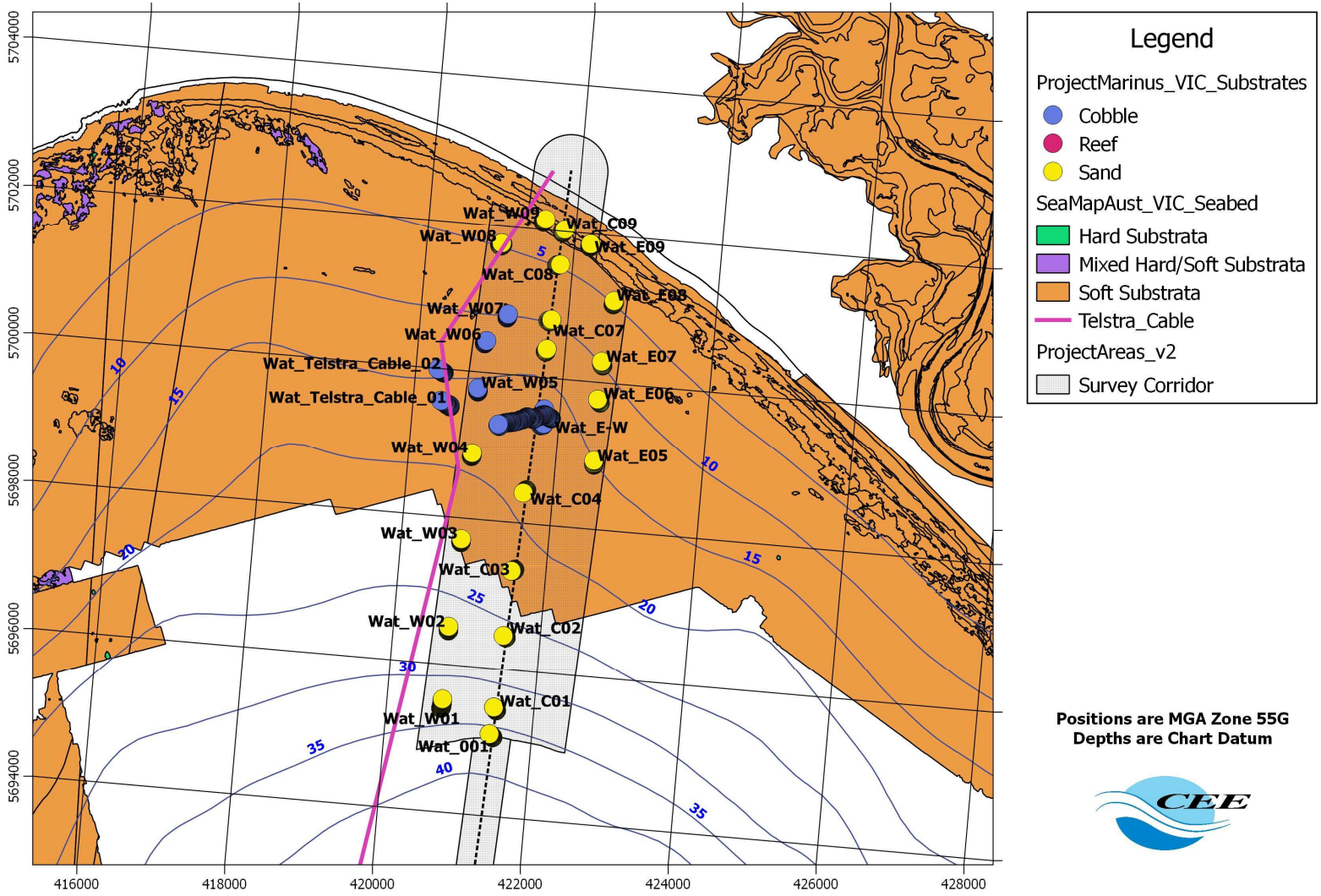


Figure 4.10: **Seabed and Habitats along the Waratah Bay route**

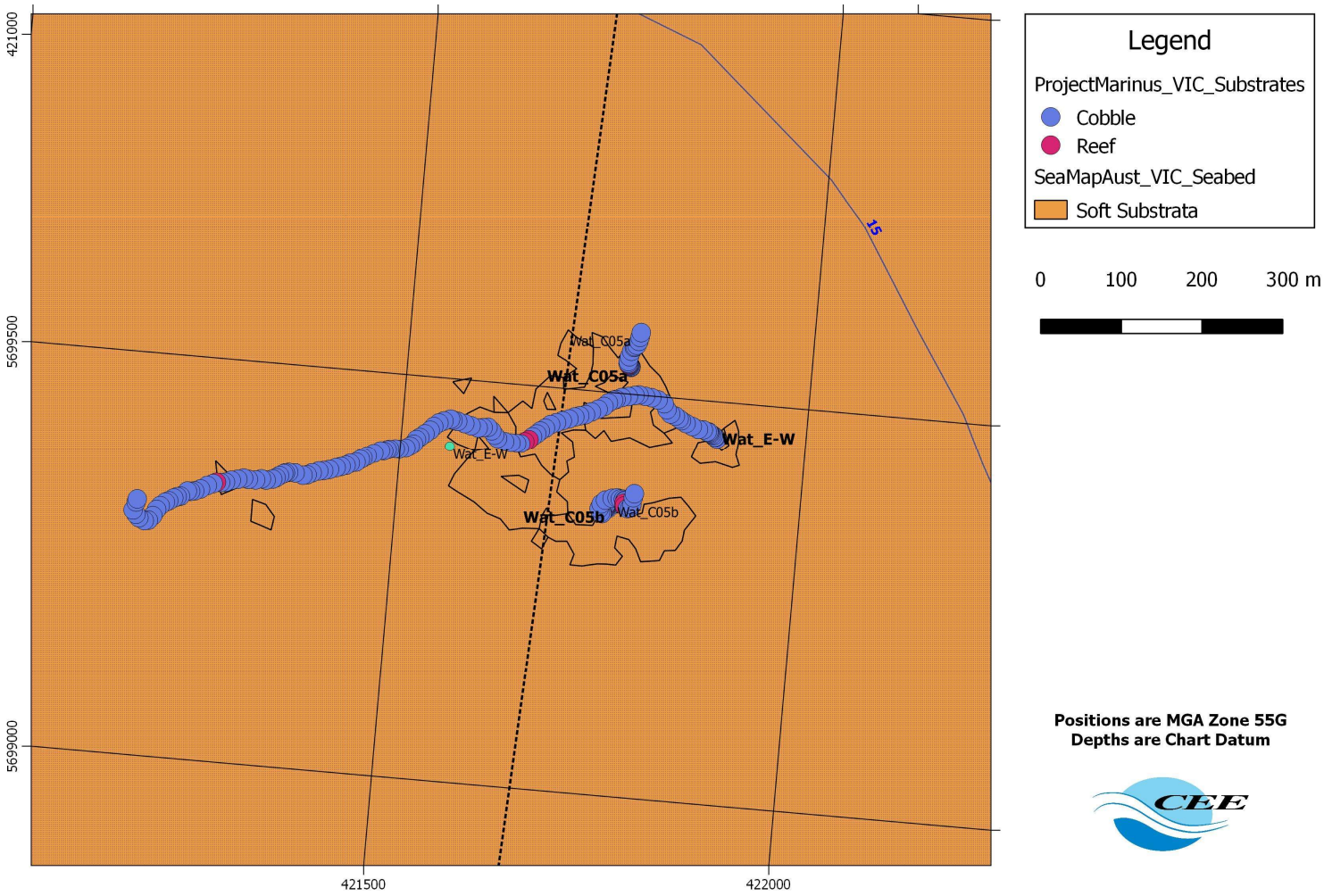


Figure 4.11: Extra sites surveyed across habitat feature on Waratah Bay route, 2019

Figure 4.10 shows that the towed video survey sites were distributed along the central route (Wat-C* sites) and at sites east and west of the central route (Wat-E* sites and Wat-W* sites, respectively). Additional survey sites were included along the existing Bass Strait 1 telecommunications cable route to investigate whether there was any visible evidence of the cable installation in 1995 (Wat_Telstra_Cable_01, 02, Wat_08).

Table 4.3 and Figure 4.10 show that most sites had sandy seabed except for the area between 10 and 18 m depth from the centreline to the west of the study area. These sites had cobble seabed (mostly fine cobble), with occasional small outcrops of flat reef. Seabed to the east of the centreline was uniformly sandy. Most sites had relief of 1 m or less as indicated by the range in depth soundings (Table 4.3), consistent with mostly flat sand or cobble seabed with little reef.

Table 4.3: Seabed (habitat) characteristics at Waratah Bay sites

	WGS84 55H		Depth data (metres)				
Transect	Easting	Northing	Average	Min	Max	Range	Habitats
Wat_001	421449	5695091	42	41	43	1.5	Sand, Shell
Wat_C01	421478	5695455	38	37	38	1.1	Sand, Shell
Wat_C02	421517	5696449	28	28	29	0.7	Sand, Shell
Wat_C03	421543	5697349	25	25	26	1	Sand, Shell, Cobble
Wat_C04	421624	5698437	21	20	21	0.8	Sand, Shell, Cobble
Wat_C05a	421778	5699555	20	19	20	0.6	Cobble, Shell, Sand, Reef
Wat_C05b	421770	5699362	20	19	20	1	Cobble, Shell, Sand, Reef
Wat_C06	421737	5700361	17	17	18	0.8	Sand
Wat_C07	421749	5700769	17	16	17	0.6	Sand
Wat_C08	421798	5701536	14	14	15	0.6	Sand
Wat_C09	421826	5701993	8	7	9	1.1	Sand
Wat_E05	422514	5698920	19	18	19	0.8	Sand
Wat_E06	422514	5699747	19	18	19	1	Sand
Wat_E07	422506	5700266	17	17	18	0.8	Sand
Wat_E08	422599	5701099	13	12	13	0.8	Sand
Wat_E09	422216	5701852	7	6	8	1.8	Sand
Wat_E-W	421561	5699416	19	18	20	1.7	Cobble, Sand, Shell, Reef
Wat_TC_01	420456	5699530	19	19	20	1.1	Cobble, Sand, Shell, Reef
Wat_TC_02	420347	5699964	19	19	20	0.8	Cobble, Sand, Shell
Wat_W01	420748	5695468	36	35	37	1.8	Sand, Shell
Wat_W02	420748	5696485	28	28	29	0.7	Sand, Shell
Wat_W03	420814	5697685	24	24	25	0.8	Sand, Shell
Wat_W04	420860	5698867	20	20	21	1	Sand, Shell
Wat_W05	420863	5699761	19	19	19	0.5	Cobble, Sand, Shell
Wat_W06	420919	5700422	18	18	18	0.5	Cobble, Sand, Shell
Wat_W07	421180	5700792	17	17	18	0.7	Cobble, Sand, Shell
Wat_W08	421007	5701748	14	14	15	0.7	Sand
Wat_W09	421570	5702132	7	6	8	1.9	Sand

4.2.2 Biological Characteristics

Maps representing the biological characteristics of each site at Waratah Bay are shown below in Figure 4.12 and Figure 4.14 and they are summarised for each site in Table 4.4. Images representative of the seabed and biological assemblage at each site are provided in Appendix 8-3.

Despite the mostly sand and cobble seabed, the habitat at these sites supported a sparse to medium distribution of macroalgae and invertebrates. Macroalgae and invertebrates were attached to the small amounts of shell and cobble at sandy sites. Small, (mostly red) macroalgae were common even at the deepest sites (up to 40 m) indicating clear water to allow sufficient light for these plants to survive (Figure 4.15, top left). A wide range of larger red, brown and green macroalgae were identified on sandy seabed with shell and rubble at less than 30 m depth (Figure 4.15 bottom left). Invertebrates including sponges, *Pseudogorgia godeffroyi* (a pseudo-gorgonian) and solitary ascidians were common, though sparsely distributed, at depths over 10 m. No live scallops were identified at any sites, though some dead shell was present. The generally sparse abundance of invertebrates indicates the area has relatively low productivity.

The seagrass *Zostera tasmanica* was present in the sandy seabed at most sites to 25 m depth. Its cover was sparse, which is typical for this species (Figure 4.15, bottom right). The seagrass *Amphibolis antarctica* was also present at some sites where it was very patchy.

There was very little reef habitat, though the small patches identified provided habitat for some larger macroalgae and invertebrates (Figure 4.15, top right).

Two notable areas of difference between the SeaMap Australia maps and the 2019 survey observations were observed:

1. The extensive strip of seagrass and macroalgae recorded on SeaMap Australia maps along the nearshore area of Waratah Bay was observed to be relatively bare sand with some drift algae in the 2019 survey (Figure 4.13). Much of the strip of seagrass and macroalgae shown on SeaMap Australia map is in the surf zone, which was observed to be bare sand at the time of the 2019 survey. It is likely that the seagrass and macroalgae shown on SeaMap Australia was interpreted from a heavy accumulation drift macroalgae and seagrass at the time the remote image was taken.
2. A patch of mixed macroalgae, seagrass and invertebrate habitat recorded on SeaMap Australia maps corresponds with the route centreline at around 16 m depth (Figure 4.14). The area, while mapped as soft substrata, was found to comprise cobble seabed with small patches of reef. Mixed macroalgae and invertebrates were observed during the 2019 survey to be more widely distributed at and beyond the patches mapped previously.

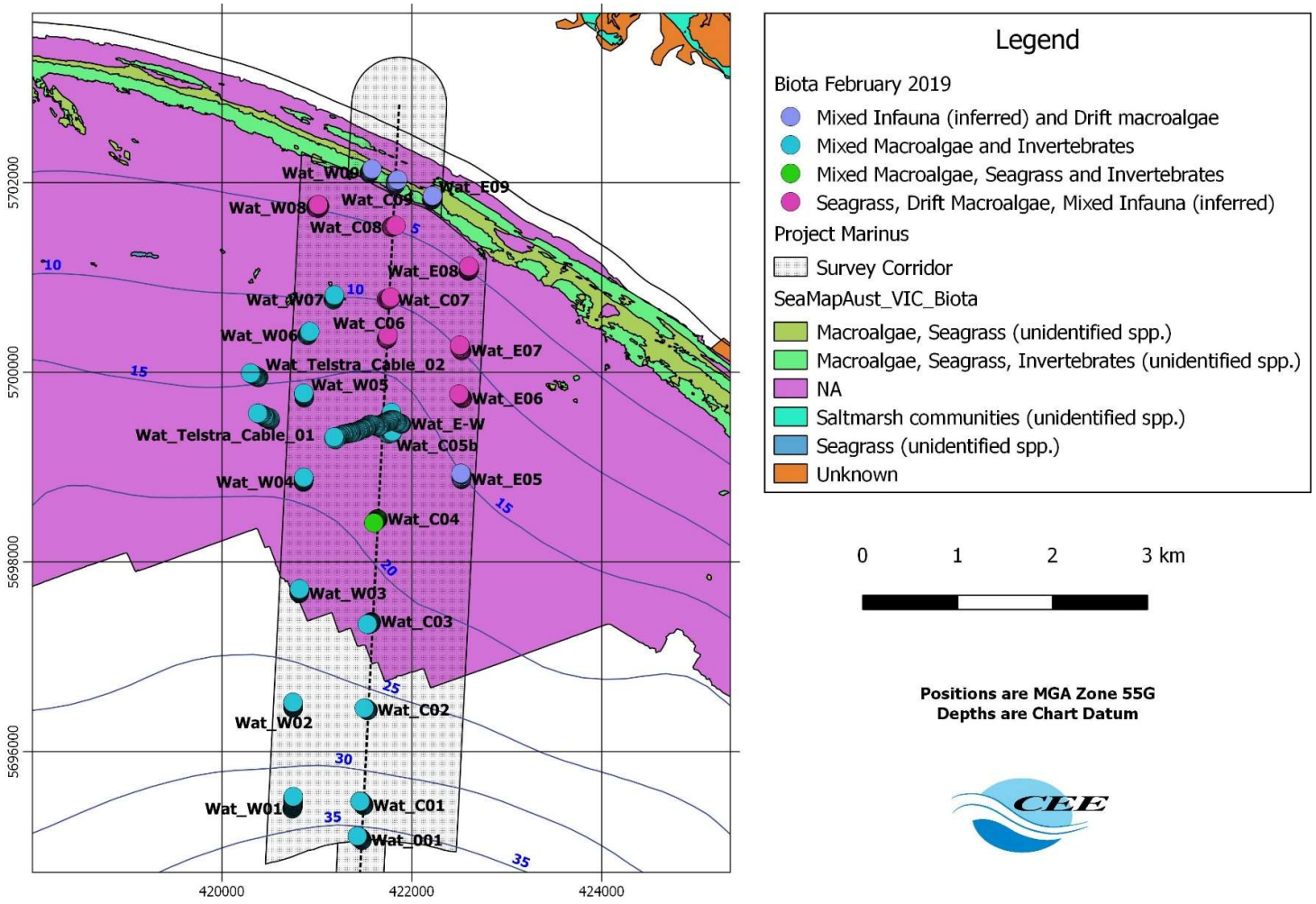


Figure 4.12: Biological characteristics at Waratah Bay sites

(NA = Not Assessed. Seamaps did not assess this area of the map

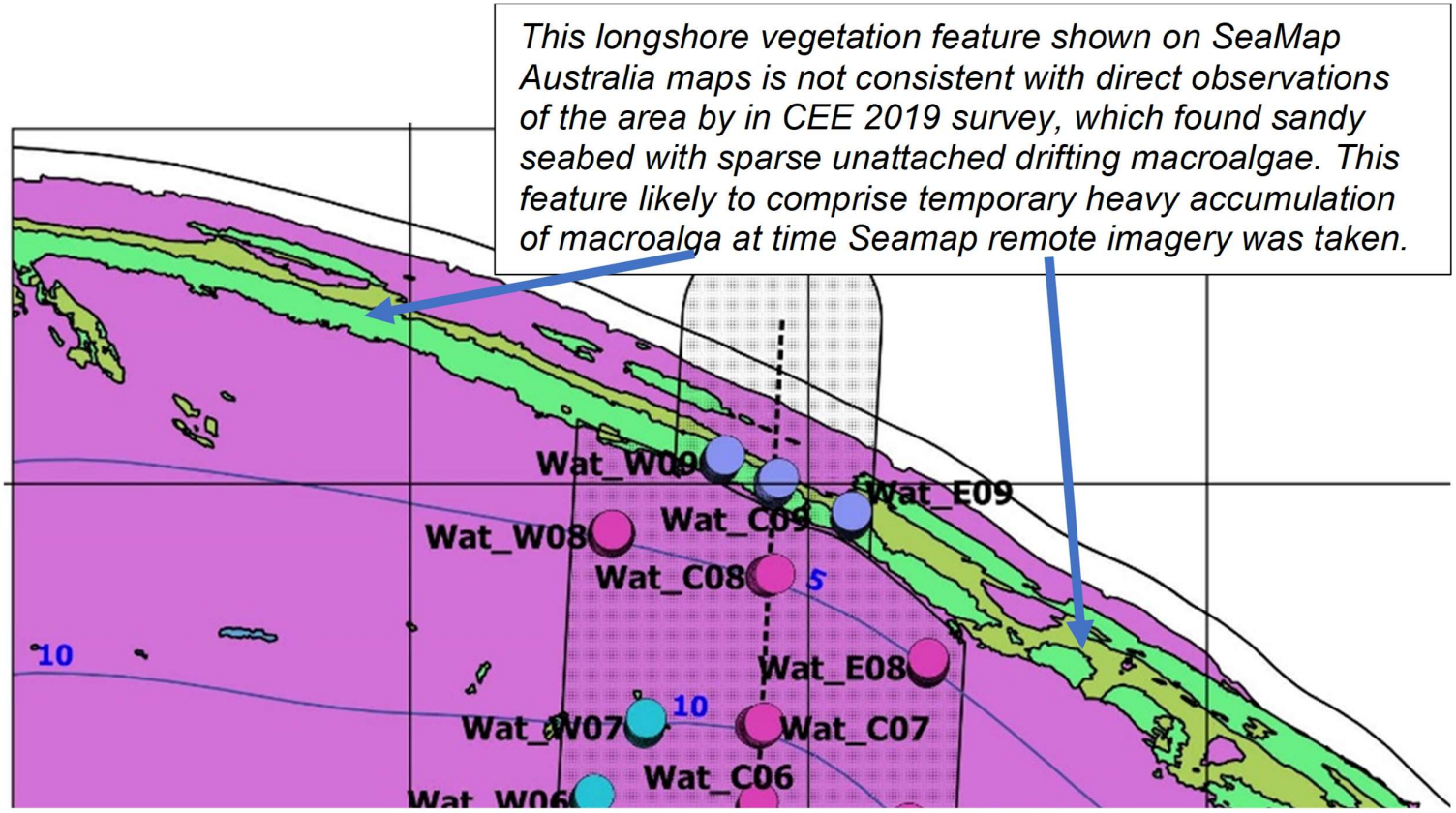


Figure 4.13**: Unlikely surf zone vegetation**

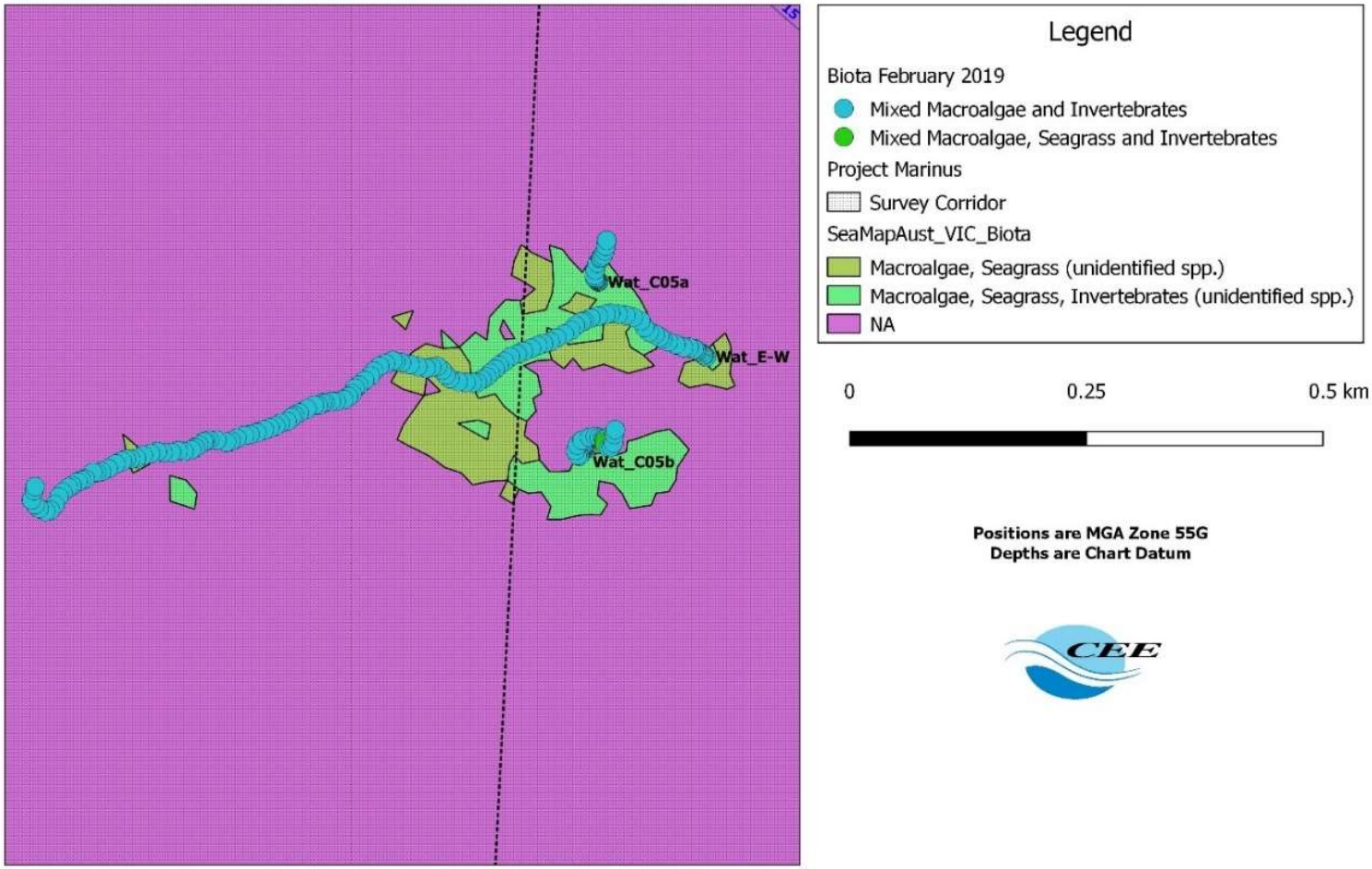


Figure 4.14: Biological characteristics of habitat feature at Waratah Bay

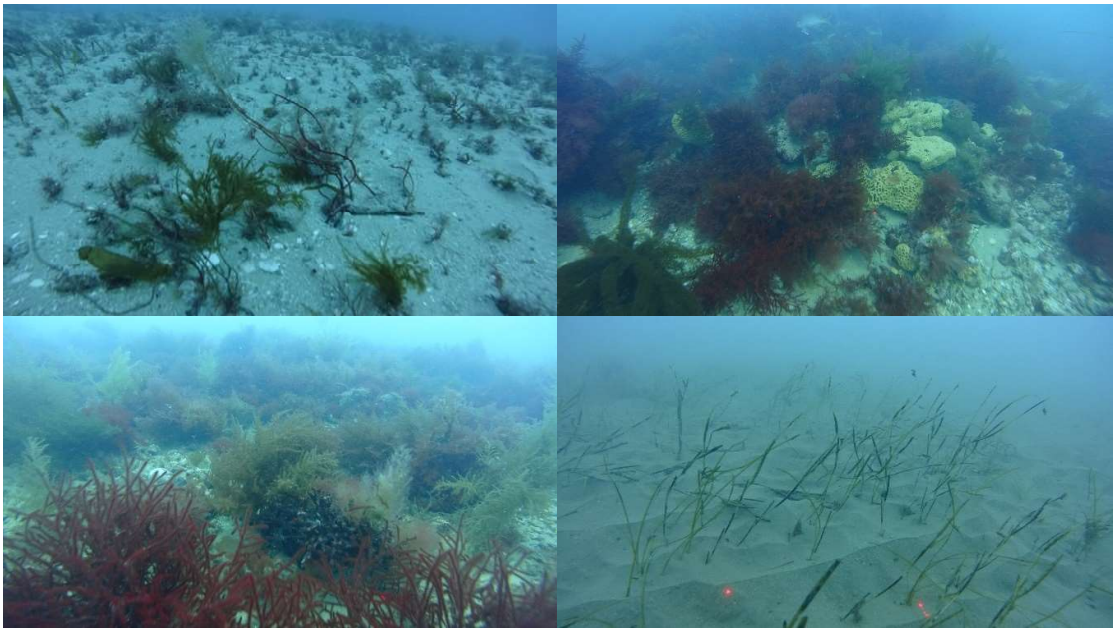


Figure 4.15: Representative biological assemblages in Waratah Bay

Top left: Macroalgae on sand/shell at Wat_C03
Top right: Macroalgae and sponges on reef along Wat_E-W transect
Bottom left: macroalgae on Cobble at Wat_W07
Bottom right: *Zostera tasmanica* at Wat_C08

Table 4.4: Biological characteristics of Waratah Bay sites

Transect	Easting	Northing	Average Depth (m)	Biological Category	Seabed
Wat_001	421449	5695091	42	Mixed Macroalgae and Invertebrates	Sand, Shell
Wat_C01	421478	5695455	38	Mixed Macroalgae and Invertebrates	Sand, Shell
Wat_C02	421517	5696449	28	Mixed Macroalgae and Invertebrates	Sand, Shell
Wat_C03	421543	5697349	25	Mixed Macroalgae and Invertebrates	Sand, Shell, Cobble
Wat_C04	421624	5698437	21	Mixed Macroalgae, Seagrass and Invertebrates	Sand, Shell, Cobble
Wat_C05a	421778	5699555	20	Mixed Macroalgae and Invertebrates	Cobble, Shell, Sand, Reef
Wat_C05b	421770	5699362	20	Mixed Macroalgae and Invertebrates	Cobble, Shell, Sand, Reef
Wat_C06	421737	5700361	17	Seagrass, Drift Macroalgae, Mixed Infauna (inferred)	Fine Sand
Wat_C07	421749	5700769	17	Seagrass, Drift Macroalgae, Mixed Infauna (inferred)	Fine Sand

Transect	Easting	Northing	Average Depth (m)	Biological Category	Seabed
Wat_C08	421798	5701536	14	Seagrass, Drift Macroalgae, Mixed Infauna (inferred)	Fine Sand
Wat_C09	421826	5701993	8	Mixed Infauna (inferred) and Drift macroalgae	Fine Sand
Wat_E05	422514	5698920	19	Mixed Macroalgae and Invertebrates	Cobble, Sand, Shell
Wat_E06	422514	5699747	19	Mixed Infauna (inferred) and Drift macroalgae	Sand
Wat_E07	422506	5700266	17	Seagrass, Drift Macroalgae, Mixed Infauna (inferred)	Sand
Wat_E08	422599	5701099	13	Seagrass, Drift Macroalgae, Mixed Infauna (inferred)	Sand
Wat_E09	422216	5701852	7	Seagrass, Drift Macroalgae, Mixed Infauna (inferred)	Sand
Wat_E-W	421561	5699416	19	Mixed Infauna (inferred) and Drift macroalgae	Sand
Wat_TC_01	420456	5699530	19	Mixed Macroalgae and Invertebrates	Cobble, Sand, Shell, Reef
Wat_TC_02	420347	5699964	19	Mixed Macroalgae and Invertebrates	Cobble, Sand, Shell
Wat_W01	420748	5695468	36	Mixed Macroalgae and Invertebrates	Sand, Shell
Wat_W02	420748	5696485	28	Mixed Macroalgae and Invertebrates	Sand, Shell
Wat_W03	420814	5697685	24	Mixed Macroalgae and Invertebrates	Sand, Shell
Wat_W04	420860	5698867	20	Mixed Macroalgae and Invertebrates	Sand, Shell
Wat_W05	420863	5699761	19	Mixed Macroalgae and Invertebrates	Cobble, Sand, Shell, Reef
Wat_W06	420919	5700422	18	Mixed Macroalgae and Invertebrates	Cobble, Sand, Shell
Wat_W07	421180	5700792	17	Mixed Macroalgae and Invertebrates	Cobble, Sand, Shell
Wat_W08	421007	5701748	14	Seagrass, Drift Macroalgae, Mixed Infauna (inferred)	Sand
Wat_W09	421570	5702132	7	Mixed Infauna (inferred) and Drift macroalgae	Sand

5 Discussion

5.1 Comparison with existing records

Existing habitat maps for northwest Tasmania are based on Lucieer et al. (2007) and extend from the coastline to 1.5 km offshore. These maps have been incorporated into the SeaMap Australia classification system and GIS layers. The data of Lucieer et al (2007) was based on towed video and depth sounder datasets as well as examination of aerial imagery. With relatively few exceptions, these maps were confirmed to be accurate by the field surveys. The present study compiled a more detailed picture of the biological assemblages at the sites surveyed in January 2019 due to improvements in digital camera technology and the finer spatial scale focus of the 2019 survey.

Table 5.1 and Table 5.2 list the six and 24 sites respectively where this study documented habitat that is different or a refinement of those described in the SeaMap Australia GIS layers. These differences are minor and appear to relate to difficulty interpreting aerial imagery and or/sounder records in the 2007 work. Most differences were at sites that had been previously mapped as reef, where this survey documented cobble seabed.

Table 5.1: Changes to SeaMap Australia habitat characterisations - Tasmania

Route Option	Site	SeaMap Australia Classification		CEE Classification
		General	Specific	Specific
Blythe River mouth	C08	Consolidated Hard Substrata	unknown	Cobble and Reef
Blythe River mouth	C09	Consolidated Hard Substrata	unknown	Pebble
Blythe River mouth	C10	Consolidated Hard Substrata	unknown	Boulder, Coarse Sand
Blythe River mouth	E11	Consolidated Hard Substrata	Reef	Reef and Sand
Blythe River mouth	W08	Consolidated Hard Substrata	Reef	Sand, Coarse Cobble
Blythe River mouth	W09	Consolidated Hard Substrata	Reef	Reef, Boulder, Sand, Cobble

xisting habitat maps for Waratah Bay are based on work by DELWP and extend from the coastline to several kilometres offshore (the distance varies depending on the availability of data). These maps have been incorporated into the SeaMap Australia classification system and GIS layers. The entire survey corridor was previously mapped as soft substrate with unknown composition in the SeaMap Australia data.

This survey confirmed that most of the area was soft substrate (specifically fine sand), but a substantial area in the central west portion of the survey corridor was small cobble (unconsolidated hard substrate) with patches of reef. This includes an area in the middle of the route option (around Wat_C05). Soft and hard substrates are quite different in the habitat they provide for biological assemblages. While sandy substrate is generally considered to support little epibiota (occasionally seagrass where conditions are suitable), cobble provides attachment for a wide range of macroalgae and invertebrate epibiota.

This survey also found that an extensive nearshore strip mapped in SeaMaps as mixed macroalgae, seagrass and invertebrates was likely to be a misinterpretation of a temporary accumulation of unattached, drifting macroalgae (possibly dislodged kelp from rocky reefs at Cape Liptrap). Unattached, drifting accumulations of kelp and other macroalgae can appear as attached vegetation in remote images. The 2019 survey observed that the seabed in the nearshore area was bare sand with sparse drifting macroalgae. This correction of marine ecosystem characteristics from “macroalgae and seagrasses” to “bare sand with drift algae”

would result in a reduction in the potential impacts of shoreline crossings on marine ecosystem values in this area.

Table 5.2: Changes to SeaMap Australia habitat characterisations - Victoria

Route Option	Site	SeaMap Australia Classification		CEE Classification
		General	Specific	Specific
Waratah Bay	C03	Soft Substrata	Unknown	Sand, Shell, cobble
Waratah Bay	C04	Soft Substrata	Unknown	Sand, Shell, cobble
Waratah Bay	C05a	Soft Substrata	Unknown	Fine Cobble
Waratah Bay	C05b	Soft Substrata	Unknown	Fine Cobble, patches of reef
Waratah Bay	C06b	Soft Substrata	Unknown	Fine Sand
Waratah Bay	C07	Soft Substrata	Unknown	Fine Sand
Waratah Bay	C08	Soft Substrata	Unknown	Fine Sand
Waratah Bay	C09	Soft Substrata	Unknown	Fine Sand
Waratah Bay	E-W transect	Soft Substrata	Unknown	Fine Cobble
Waratah Bay	E05	Soft Substrata	Unknown	Fine Sand
Waratah Bay	E06	Soft Substrata	Unknown	Fine Sand
Waratah Bay	E07	Soft Substrata	Unknown	Fine Sand
Waratah Bay	E08	Soft Substrata	Unknown	Fine Sand
Waratah Bay	E09	Soft Substrata	Unknown	Fine Sand
Waratah Bay	Telstra cable 01	Soft Substrata	Unknown	Fine Cobble, patches of reef
Waratah Bay	Telstra cable 02	Soft Substrata	Unknown	Fine Cobble, patches of reef
Waratah Bay	W03	Soft Substrata	Unknown	Fine Sand
Waratah Bay	W04	Soft Substrata	Unknown	Fine Sand
Waratah Bay	W05	Soft Substrata	Unknown	Fine Cobble, patches of reef
Waratah Bay	W06	Soft Substrata	Unknown	Fine Cobble and Sand
Waratah Bay	W07	Soft Substrata	Unknown	Fine Cobble and Sand
Waratah Bay	W08	Soft Substrata	Unknown	Fine Sand
Waratah Bay	W09	Soft Substrata	Seagrass	Bare fine Sand

5.2 Environmental Sensitivities

Environmental sensitivities in this study were broadly defined as “nearshore marine environmental sensitivities that may be impacted by construction of the subsea cable including sensitive benthic habitat, exposed reef, and marine archaeology sites”. Underwater video records have been provided to specialist maritime archaeologists for identification of possible maritime heritage or archaeology sites under a separate scope of work.

A formal assessment for species of conservation significance (such as those listed under State and Commonwealth legislation) was beyond the scope of this study. However, no biological assemblages or species were identified from the towed video records that could be considered particularly sensitive to the proposed project due to having a restricted range or restricted habitat availability, particular sensitivity to project activities and/or special conservation significance.

It is expected that engineering and economic constraints will initially influence decisions regarding routing the transmission cable through different habitats. Disturbance to the seabed, particularly reef and seagrass habitats, during installation of the cable should be minimised.

No seabed communities known to have conservation significance in Tasmania or Victoria were identified along the Tasmanian or Victorian routes.

5.2.1 Tasmania

There is exposed reef at the at Blythe River mouth survey area.

The types of reef present (mostly high relief bed-rock and boulders) are distributed widely along the northwest coast of Tasmania from Devonport to Rocky Cape. The biological assemblages associated with these habitats are also widely distributed along the north coast of Tasmania, and many species are found on both sides of Bass Strait and elsewhere in southeast Australia.

The seagrass beds observed comprised the seagrass *Amphibolis antarctica*. This species inhabits cobble and low relief and fractured reef among sand, and is relatively common on semi-exposed oceanic coastlines on both sides of Bass Strait.

The sediment and cobble habitats in the survey corridors support considerable biodiversity and while more extensive, have comparable environmental value to reef or seagrass beds.

5.2.2 Victoria

The majority of the proposed route for the cable through Waratah Bay is unconsolidated sandy seabed. The sandy seabed in water less than 25 m depth supports the seagrass *Zostera tasmanica* as well as a range of macroalgae and invertebrates where sparse shell or cobble is present. Sandy seabed in water over 25 m depth supports a range of macroalgae attached to sparse shell and cobble, with some invertebrates also present.

There is an area of cobble and patchy reef habitat covering at least 1 km^2 in the middle of the Waratah Bay route. This area of habitat has a well-developed biological community with a wide range of macroalgae, seagrasses, invertebrates and some fish. Similar habitat occurs extensively to the west of the route, including along the route of the existing telecommunications cable.

The survey sites positioned on the charted route of the Bass Strait 1 telecommunications cable found no persisting evidence of cable installation (such as seabed disturbance) following installation of the cable in 1995.

5.3 Environmental Constraints

Constraints to the routing of a subsea transmission cable were identified along each of the route options, including:

- Extensive cobble seabed at all sites
    - Cobble occurred at 30 to 35 m depth at Blythe River mouth and between 15 and 20 m depth along the Waratah Bay route
- Areas of reef and boulder along cable route options
    - Outcrops of high-relief reef (as indicated by a seabed depth range of more than 1 m along a video transect, **Error! Reference source not found.**Table 4.1) were present to over 25 m depth at Blythe River mouth
    - The disused Tioxide plant wastewater outfall pipeline at Blythe River mouth may indicate a sandy seabed route for the nearshore section (i.e., the existing pipeline appears to avoid reef and cobble seabed) for the proposed subsea cable.
    - Small patches of low profile reef were identified amongst cobble in Waratah Bay between 15 and 20 m depth near the proposed route.

Detailed bathymetric and geotechnical information would be required to identify optimal routes for the subsea cable that take into account constraints to engineering and construction methods.

5.4 Forward Works Program

The marine benthic characterisation of the offshore transmission cable route across Bass Strait will be planned and scheduled in coming months in consultation with Tetra Tech Coffey and MLPL. Scheduling of the survey will be subject to weather, personnel and survey vessel availability. Similar towed underwater video equipment to that used in this study may be used for the Bass Strait crossing. The study will characterise the benthic habitats along the entire route.

Future environmental assessments to inform project referrals and impact assessments will need to account for the wide range of habitats present along the Blythe River mouth nearshore route option. Survey techniques should be selected or developed that are appropriate to each habitat and consistent with techniques used more generally by the scientific community. Habitat classification should follow the structure of the SeaMap Australia classification scheme, noting that these classification schemes are subject to ongoing development.

6 Glossary

GIS	**Geographic Information System**
GPS	**Global Positioning System**
CCTV	**Closed Circuit Television**
HD	**High-definition**

7 References

Butler, C., Lucieer, V., Walsh, P., Flukes., E and Johnson, C (2017) *Seamap Australia [Version 1.0] the development of a national benthic marine classification scheme for the Australian continental shelf.* Final Report to the Australian National Data Service (ANDS) High Values Collection #19. Institute for Marine and Antarctic Studies, University of Tasmania. 52 pgs.

Lucieer, V., Lawler M, Morffew M and Pender A (2007) *Mapping of Inshore Marine Habitats in the Cradle Coast Region; From West Head to Robbins Passage.* Tasmanian Aquaculture and Fisheries Institute, February 2007.

Lucieer V, Walsh P, Flukes E, Butler C,Proctor R, Johnson C (2017). *Seamap Australia - a national seafloor habitat classification scheme.* Institute for Marine and Antarctic Studies (IMAS), University of Tasmania (UTAS).

CEE (2015) Pardoe Effluent Outfall (Devonport) Marine Biological Monitoring Program, November 2015. CEE Pty Ltd report to TasWater.

CEE (2016) Burnie WWTP Effluent Outfall Marine Biological Monitoring Program, November 2016. CEE Pty Ltd report to TasWater.

8 Appendices

Appendix 8-1: List of GIS-ready and excel format files

ProjectMarinus_TAS_VIC_landfalls_classifications_by_trackpoints_CEE.xlsx Explanation of analysis/classification scheme and data for all trackpoints in SeaMap Australia format, includes list of taxa/species for each site. **Positions are WGS84**
ProjectMarinus_TAS_landfalls_classifications_by_trackpoints_CEE.csv GIS ready comma separated data for all trackpoints, in SeaMap Australia format, includes list of taxa/species for each site. **Positions are WGS84**
ProjectMarinus_VIC_landfall_classifications_by_trackpoints_CEE.csv GIS ready comma separated data for all trackpoints, in SeaMap Australia format, includes list of taxa/species for each site. **Positions are WGS84**
ProjectMarinus_TAS_landfalls_seabed_characterisation.shp ESRI shapefile providing points layer for seabed/habitat types at Cam River heads and Blythe River mouth (using data under “Hab_ORIG” header in ProjectMarinus_TAS_landfalls_classifications_by_trackpoints_CEE.csv) **Positions are GDA94/MGA**
ProjectMarinus_TAS_landfalls_biological_characterisation.shp ESRI shapefile providing points layer for biological categories at Cam River heads and Blythe River mouth (using data under “BC_Level3” header in ProjectMarinus_TAS_landfalls_classifications_by_trackpoints_CEE.csv) **Positions are GDA94/MGA**
ProjectMarinus_VIC_landfall_seabed_characterisation.shp ESRI shapefile providing points layer for seabed/habitat types at Waratah Bay (using data under “Hab_ORIG” header in ProjectMarinus_VIC_landfall_classifications_by_trackpoints_CEE.csv) **Positions are GDA94/MGA**
ProjectMarinus_VIC_landfalls_biological_characterisation.shp ESRI shapefile providing points layer for biological categories at Waratah Bay (using data under “BC_Level3” header in ProjectMarinus_VIC_landfall_classifications_by_trackpoints_CEE.csv) **Positions are GDA94/MGA**
CamRivheads_Tracks_20190115-16_ver02.gpx **Blythe River_Tracks_20190115_ver02.gpx** **Waratah_tracks_20190217_ver02.gpx** GIS ready gpx files with GPS track records for individual sites (no depths) and GPS track records for vessel movements during survey (depths, 30 second inverval). **Positions are WGS84**

Appendix 8-2: Representative images from Blythe River mouth sites

Bly 001

Bly C02

Bly C03

Bly C04

Bly C05


Bly C06


Bly C07


Bly C08


Bly C09


Bly C10

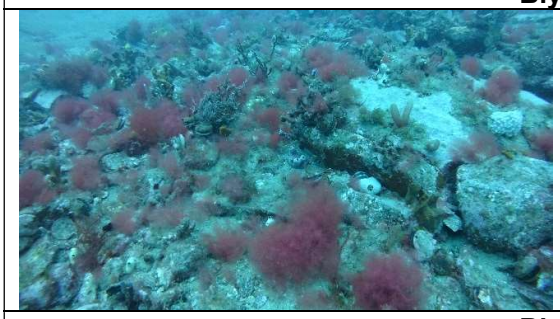

Bly C11


Bly C12


Bly E02


Bly E03


Bly E04



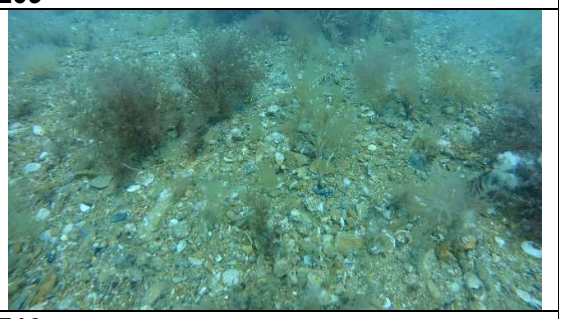

Bly E05


Bly E06


Bly E07


Bly E08


Bly E09

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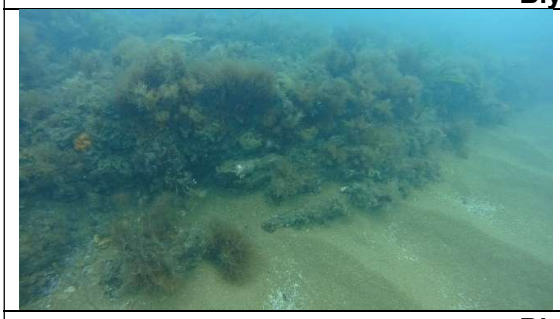


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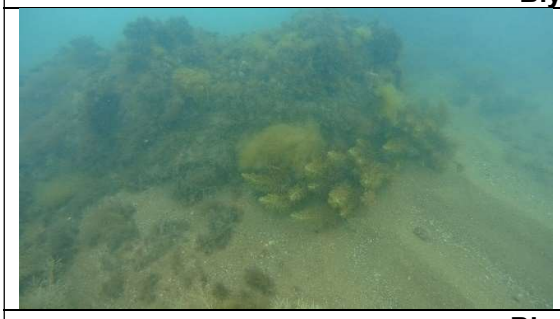


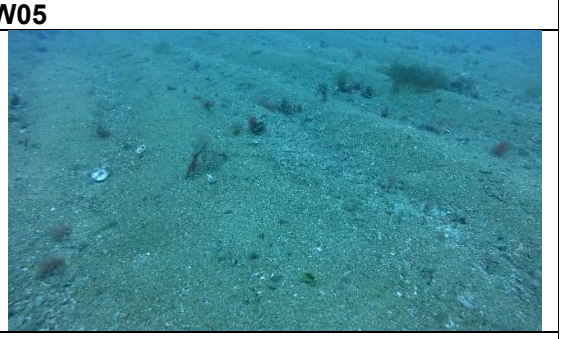

Bly HF01


Bly W02


Bly W03


Bly W04


Bly W05

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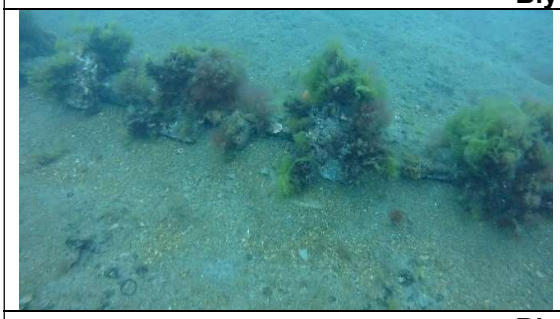


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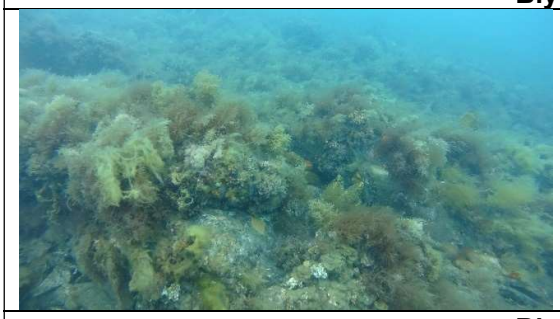


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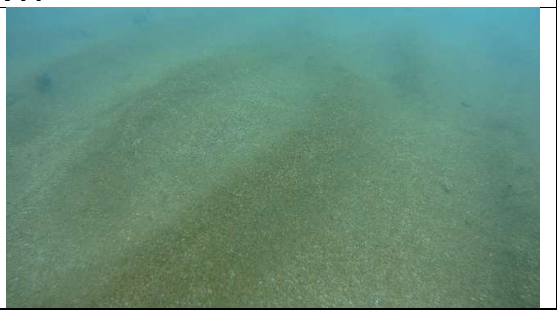
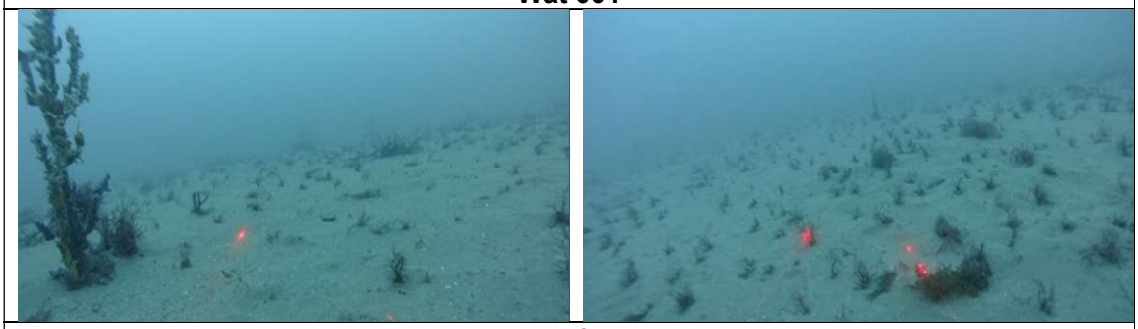
Bly W11

Appendix 8-3: Representative images from Waratah Bay sites

Wat 001



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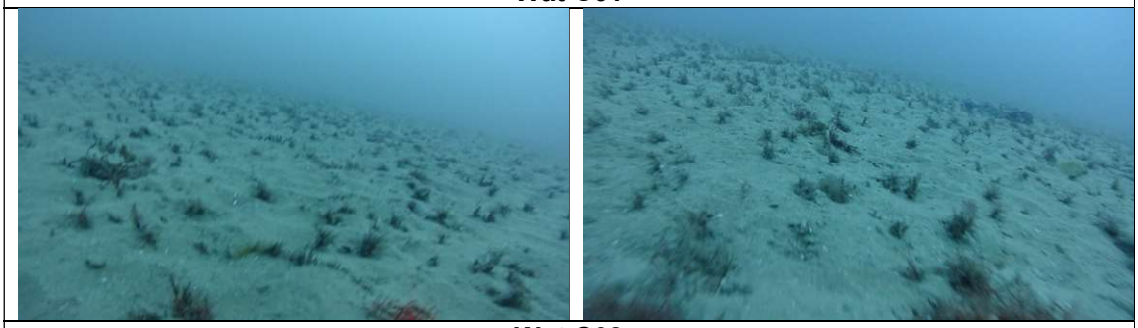

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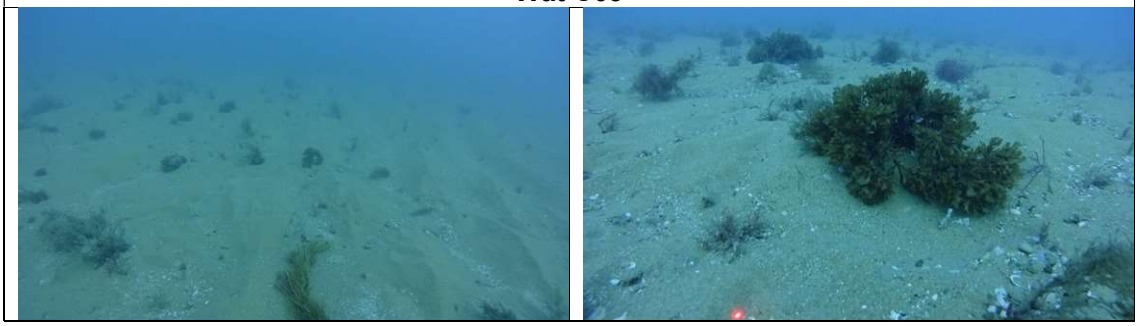

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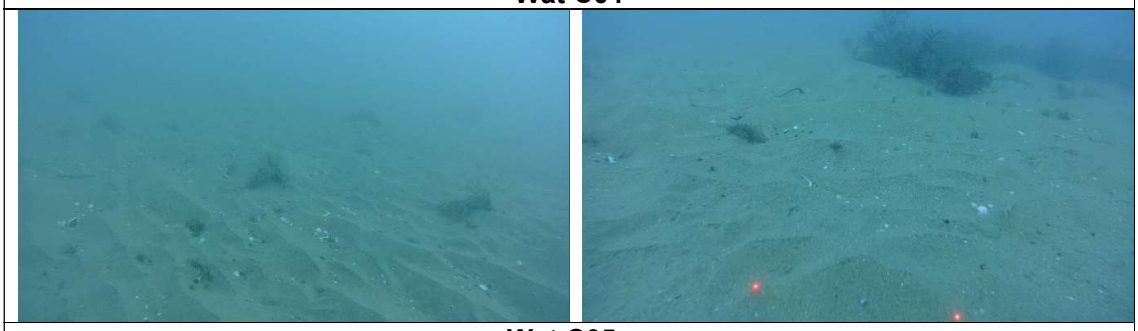

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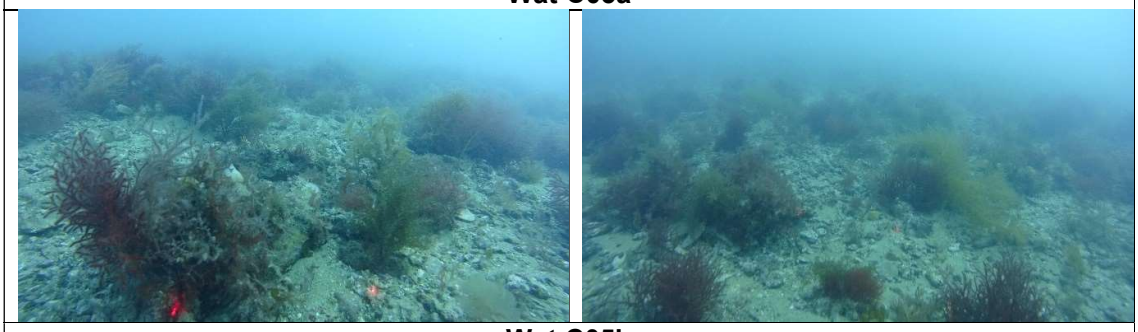

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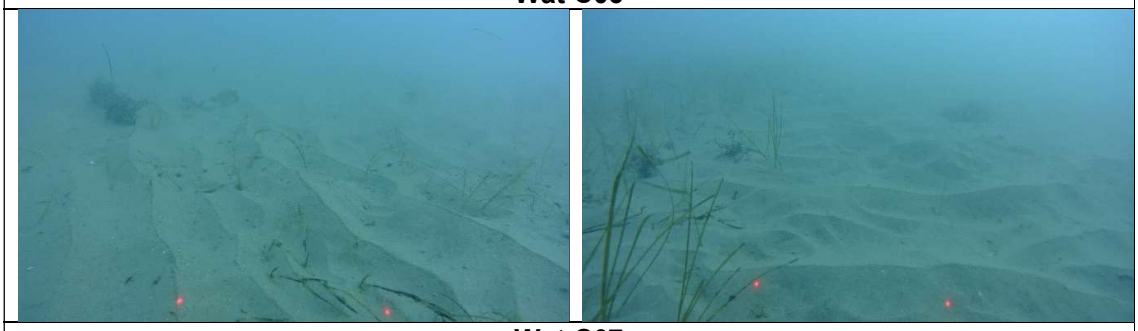

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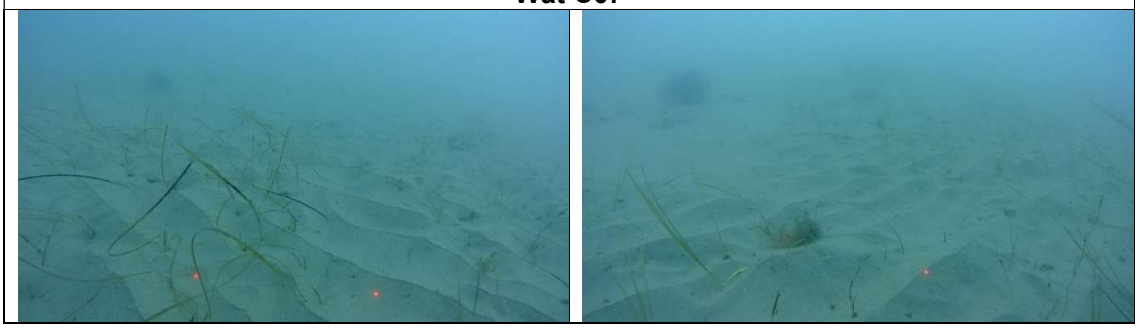

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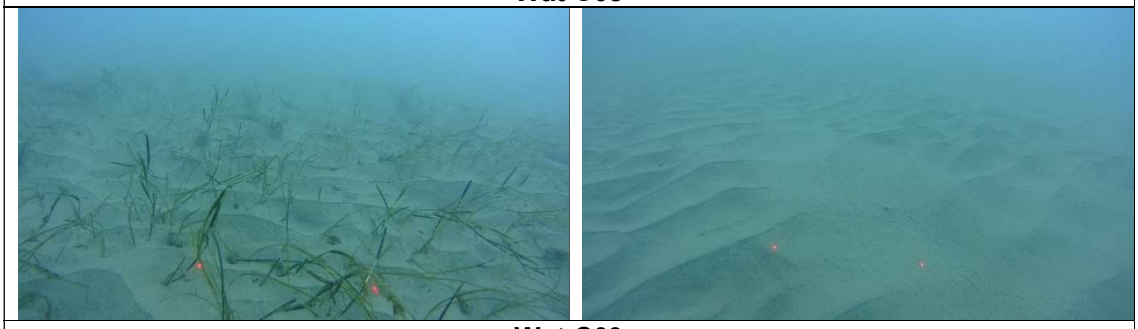

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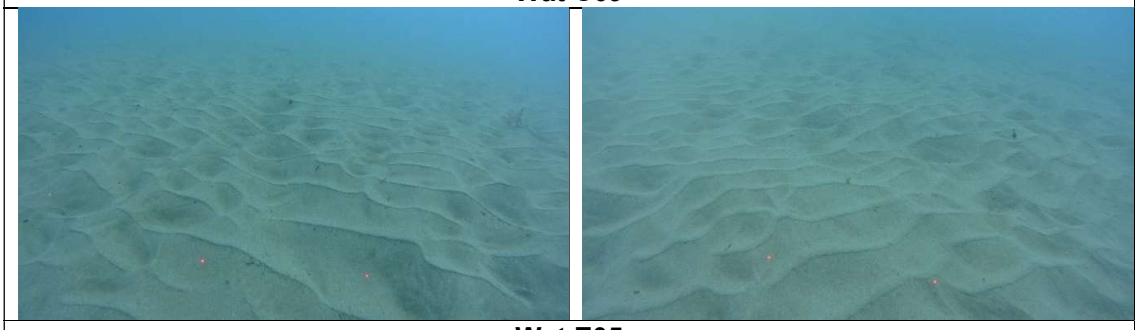

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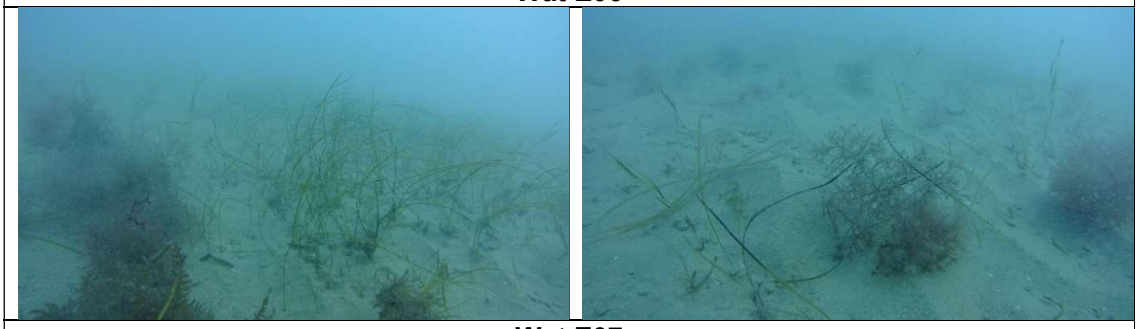

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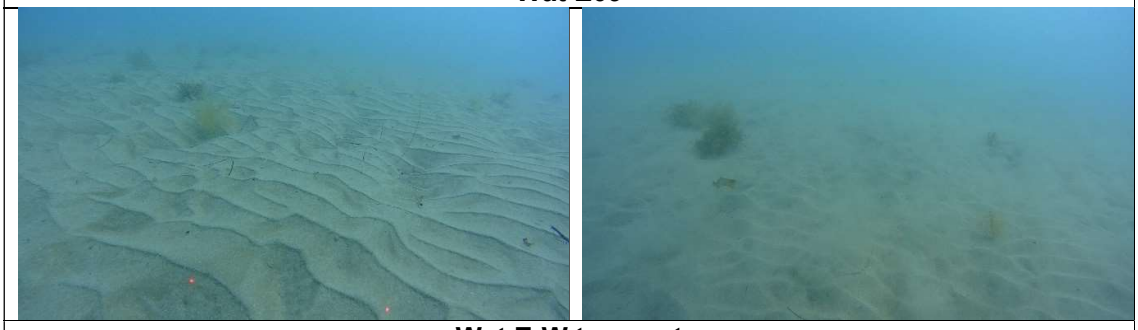
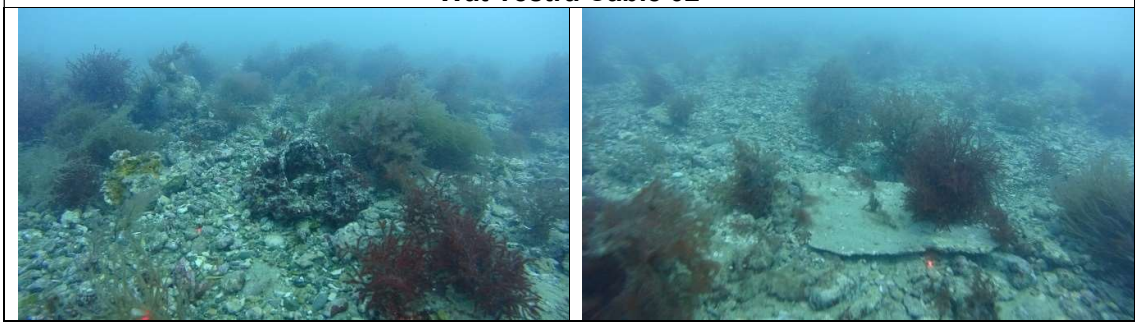


Wat E-W transect

Wat Telstra Cable 01

Wat Testra Cable 02



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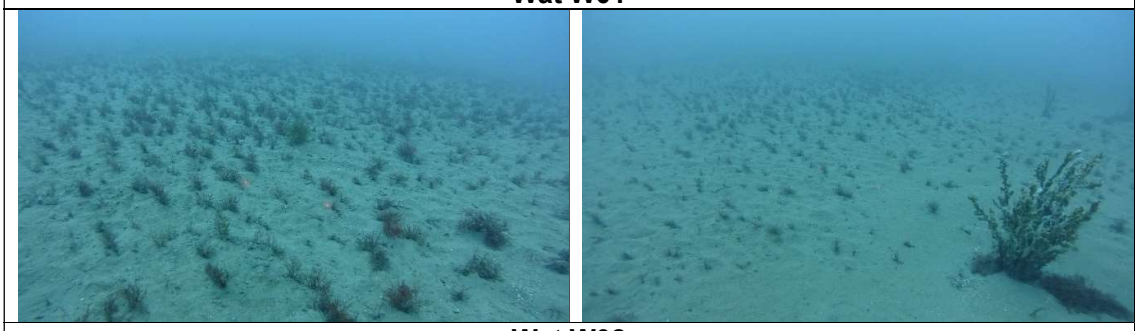

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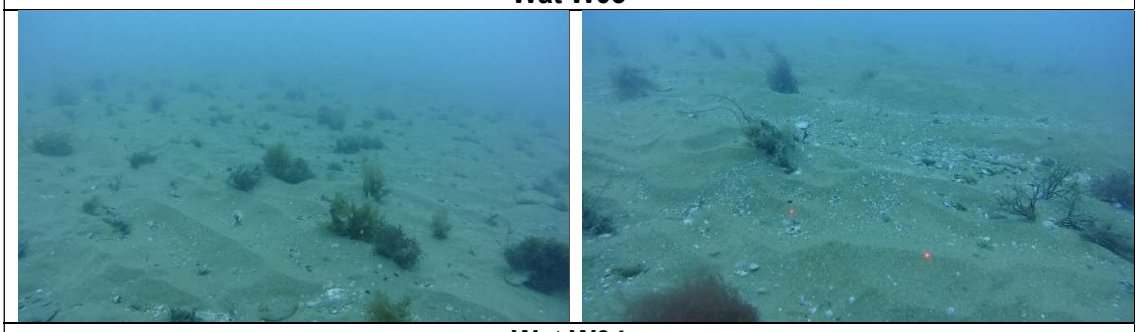

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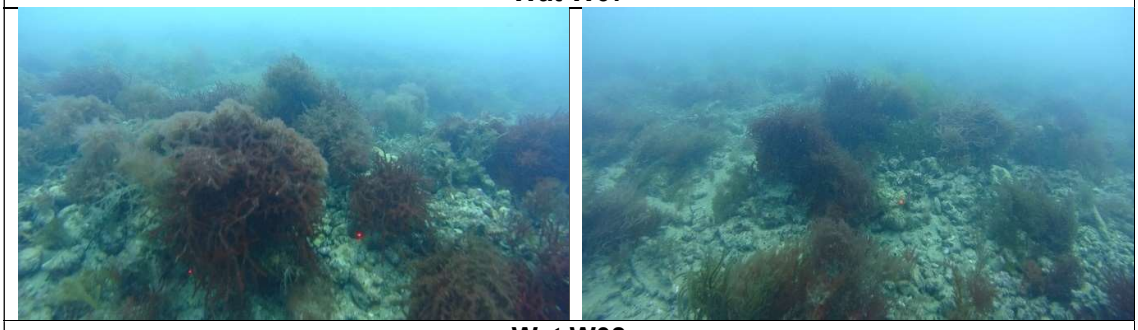

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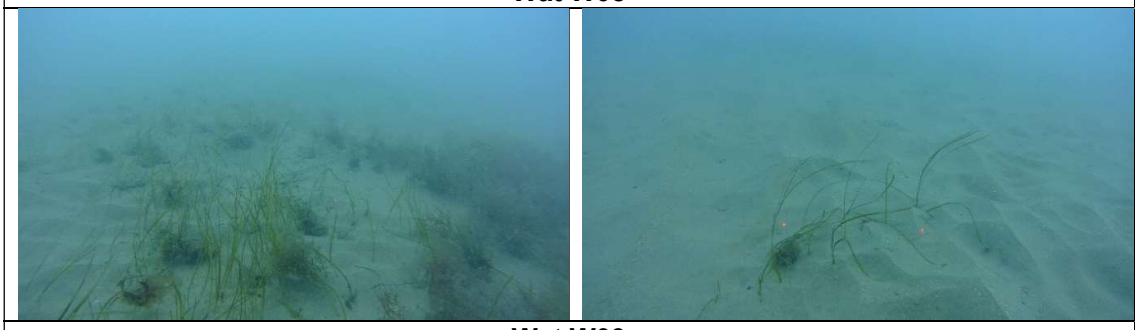

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