

Yachthaven Eelgrass Survey

A report for Alpine Homes

10 DECEMBER 2021



**YACHTHAVEN
EELGRASS SURVEY**

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DOCUMENT RELEASE AND AUTHORISATION RECORD	
Proposal Number	P2021_056_EAS_Eelgrass
Client Name	Alpine Homes Limited
Client Contact	Ian Fields
Date Draft Issued	08/12/2021
Status	
Date Final Issued	10/12/2021

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1. Introduction

The Yachthaven development has proposed the installation of a pontoon on the intertidal habitat of Gutner Creek, Mill Rythe, eastern Hayling Island. Approximately 270 m² of intertidal habitat will be affected by the pontoon installation and up to a further 380 m² of intertidal habitat will be lost or shaded when vessels are moored alongside.

Mapping of the seagrass beds at Mill Rythe carried out by Hampshire and the Isle of Wight Wildlife Trust (HIWWT) in 2008 showed eelgrass to be present in beds to the east of the proposed pontoon location, and in smaller fragmented beds to the west of the site. As such, eelgrass monitoring is a condition of the Planning Permission set out in a Section 106 agreement from Havant County Council for the proposed development of the Yachthaven.

The objective of the monitoring work is to detect trends and changes in the distribution, abundance and health of the eelgrass over time with regard to the proposed development and the associated factors which have the potential to influence the eelgrass at the site. The monitoring also allows management intervention should it be required.

1.1. Eelgrass conservation status and importance

Eelgrasses are marine flowering plants found in shallow, coastal habitats. Within the UK there are five recorded species of eelgrass: common eelgrass, *Zostera marina*; dwarf eelgrass, *Z. noltii*; narrow leaved eelgrass, *Z. angustifolia*; beaked tasselweed *Ruppia maritima*; and spiral tasselweed *R. cirrhosa*.

Numerous papers have outlined the importance of eelgrass to marine systems and these are usefully summarised in Marsden and Chesworth (2014) and Cullen-Unsworth et al (2018). Eelgrass is an important food source for grazing bird species (Tubbs and Tubbs, 1982) including Brent Geese which are a feature of Chichester and Langstone Harbours Special Protected Area. Eelgrasses supply decaying nutrient material to associated marine communities and stands are habitat for related epi-benthic species and communities, plus sediments are aerated and consolidated through their roots, which can enhance infaunal invertebrate communities.

Eelgrasses are subjected to intense levels of anthropogenic disturbance because of the shallow nearshore waters they inhabit (Bertelli et al., 2020). Amongst many factors associated with anthropogenic activities, they have suffered from “wasting disease” (nutrient associated fungal infection on *Z. marina*), eutrophication causing smothering by green algae, have been impacted by biocides associated with antifoul (Chesworth et al., 2004), and are sensitive to physical removal and/or burial of vegetation and effects of increased turbidity and sedimentation (Erftemeijer & Lewis 2006).

Importantly in the report Inventory of Eelgrass Beds in Hampshire and the Isle of Wight, 2014 (Marsden and Chesworth, 2014) the presence of eelgrass at Mill Rythe was noted, with regard to dwarf eelgrass *Z. noltii* on the upper and mid intertidal. Further, the comment was made that the presence of eelgrass in Chichester Harbour is “vastly reduced” and now thought to occur at only a handful of sites within the harbour (Figure1).

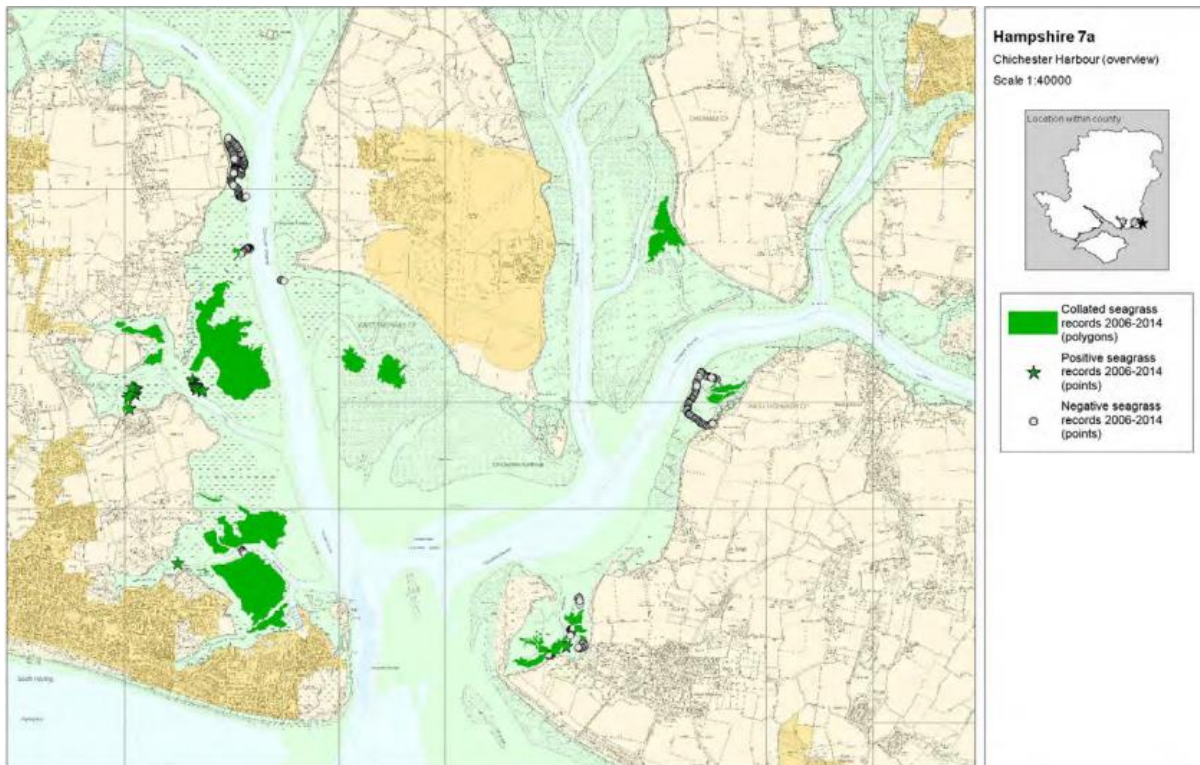


Figure 1. Eelgrass distribution in Chichester Harbour (from Marsden & Scott 2015)

1.2. Survey scope and context

1.2.1 Site Description

The Yacht Haven and the survey area are located on the northern bank of Mill Rythe, a saltwater creek on the east coast of Hayling Island, Hampshire. Mill Rythe creek is situated approximately halfway down Hayling island some 2.5 km from the entrance to Chichester Harbour.

The intertidal area of the site shows some evidence of the area's past as a boatyard, with mooring structures and anthropogenic debris, typical within Chichester Harbour. The exposed sediments consist of flint pebbles and cobbles, plus brick rip rap towards the upper shore, descending to mixed mud over gravelly sediments towards the mid shore and soft muds towards the lower shore.

The proposed development at the Yacht Haven is located within Chichester Harbour which has a range of local, national and international designations demonstrating that the area is sensitive to changes in landscape and land use, particularly with regard to natural resources, habitats and biodiversity. The Site lies within the following sites designated for nature conservation:

- [Chichester Harbour Ramsar](#) site (Wetland of International Importance);
- [Solent and Dorset Coast potential Special Protection Area](#);
- [Chichester and Langstone Harbours Special Protection Area](#);
- [Chichester Harbour Site of Special Scientific Interest \(SSSI\)](#)
- The area also falls within a Nitrate Vulnerable Zone classified as Eutrophic Waters (Estuaries and Coastal waters).

Fathom Ecology Limited (Fathom) was commissioned by Alpine Homes Limited to undertake a survey to assess the eelgrass at Gutner Creek, Mill Rythe (the Site), on the east coast of Hayling Island. The work was commissioned late in 2021 and as such made use of three separate survey events to map the dwarf eelgrass (*Z. noltii*) and common eelgrass (*Z. marina*) at the site. The purpose of this work was to achieve a broad scale overview of eelgrass presence/absence within Gutner Creek in relation to the pontoon that has been proposed for installation at the site in order to give homeowners better access to recreational boating at the site.

The overall purpose of the study was to establish intertidal distribution of eelgrass; to record the position and photograph such locations as may exist. The significance of this survey and report is to place any eelgrass noted at the Site in context to the proposed development works at the Yachthaven, and the associated possibility of disturbance to, or loss of eelgrass beds.

It is not the intention of this report to reiterate data on the conservation status (i.e., rarity and associated legislation rather than spatial distribution) of eelgrass at the Site, as it is notable that previous work has given this information in suitable detail (Marsden and Chesworth, 2014, Marsden and Scott 2015). Instead, this report provides detail on the outcome of the current survey and a general overview of the spatial extent of eelgrass beds recorded at Mill Rythe, plus aspects related to habitat and sensitivities of these beds.

2. Methodologies

A total of three survey events contributed to mapping the distribution of the eelgrass at Gutner Creek:

1. Mill Rythe tidal inlet were surveyed by experienced marine ecologists wearing mud patterns during low tide on the 14th and 15th of November 2020.
2. Gutner Creek was surveyed by drone during August 2021
3. The site was visited on the 19th of November 2021 at low water between 14.00-16.00 and eelgrass was observed using binoculars.

2.1 Sampling and Analysis

2.1.1 Tide and Weather Conditions

November 2020

Sampling at the Site was undertaken during daylight hours at low tide during the 14th and 15th of November 2020; the survey site was reached via a point of entry at the Yacht Haven (Figure 2). The survey area broadly comprised the intertidal and subtidal in the vicinity of the potential impact zone (Figure 2). A specific delineated survey area was not defined in order to allow broader flexibility of approach in the walkover survey requested, which covered the indicated impact zone area. Arrival on Site was *circa* 1330 GMT and departure was *circa* 1730 GMT. The tide was optimal, conducted during Mean Low Water (MLW) with a height of 0.5 m on both days.

August 2021

The drone survey was undertaken at low water on the 10th of August at low tide, during sunny calm conditions.

November 2021

A brief recce of the site was undertaken on the 19th of November between 14:00 and 16:45 during low water with the tide 1.0 m above Mean Lower Low Water (MLLW). The day was overcast with light south-westerly winds.



Figure 2: Gutner Creek showing extent of eelgrass in red and Mooring scars are highlighted in blue (Aerial image from Coastal Channel Observatory 2016).

The survey was undertaken in overcast and windy conditions, waves were slight, the low tide level was low as described above (0.5 m CD at 15.43, Saturday 14th and 0.5 m CD at 16.27, Sunday 15th November 2020, compared to the 0.4 m CD at 1712 (GMT) Monday 16th). The Monday 16th tide was not used as it occurred during the hours of darkness. Suspended sediment was low with in water visibility making an alternately red and white painted ranging pole visible at depths of 50 cm depth. This was the maximum depth of water encountered in the creeks during the survey.

It should be noted that the annual period for maximum blade density and coverage in temperate systems is between May and September, and since then the onset of senescence starts to occur (see Orth *et al.*, 2012). The survey was therefore conducted at a suboptimal time and no effort was spent recording blade density or leaf area index.

2.1.2 Survey Timing, Data Capture and Output

Surveys were undertaken following JNCC Common Standards Monitoring (CSM) guidelines for littoral and sublittoral sediment (JNCC, 2004^a; JNCC, 2004^b). All CSM methodological guidelines were followed,

although notably the guidelines state that for eelgrass surveys, up to end of July is optimal for survey whilst from August to October is suboptimal. Accordingly, each of the surveys contributing to the findings within this report were collected outside of the recommended period for eelgrass surveys. For the intertidal surveys conducted on foot, both were done in November as this was when the work was commissioned. The drone survey was undertaken in August as per the section 106 agreement and recommendations set out in the Ecological Mitigation Plan for the Yachthaven Development (EAS Ltd, 2017). Despite the suboptimal times of the surveys, the August drone survey likely shows the current extent of eelgrass at the site. Both surveys in November were carried out at the lowest tide available and prior to the first substantial storms of the year such as Storm Arwen on the 26th November 2021. As such, it was felt that the eelgrass beds would not yet have experienced significant damage, dieback nor of been heavily grazed by Brent Geese and other wildfowl which had only recently returned from their Arctic breeding grounds.

The surveys conducted on foot in November 2020 and November 2021 were carried out through cross- and up-shore walking to record the presence of eelgrass stands. An un-delineated approach was used to optimise survey time, incidental encounter with eelgrass in the intertidal was also useful and visual changes in sediment mounding (noted from distance) proved a usable indicator of intertidal eelgrass bed presence. As the work was tidally/temporally limited, the intertidal survey followed the ebb tide out, then as the tidal inundation reduced survey area, the surveyors moved further up the shore until the eelgrass habitat area was no longer visible. Survey was then concluded, and field notes collated.

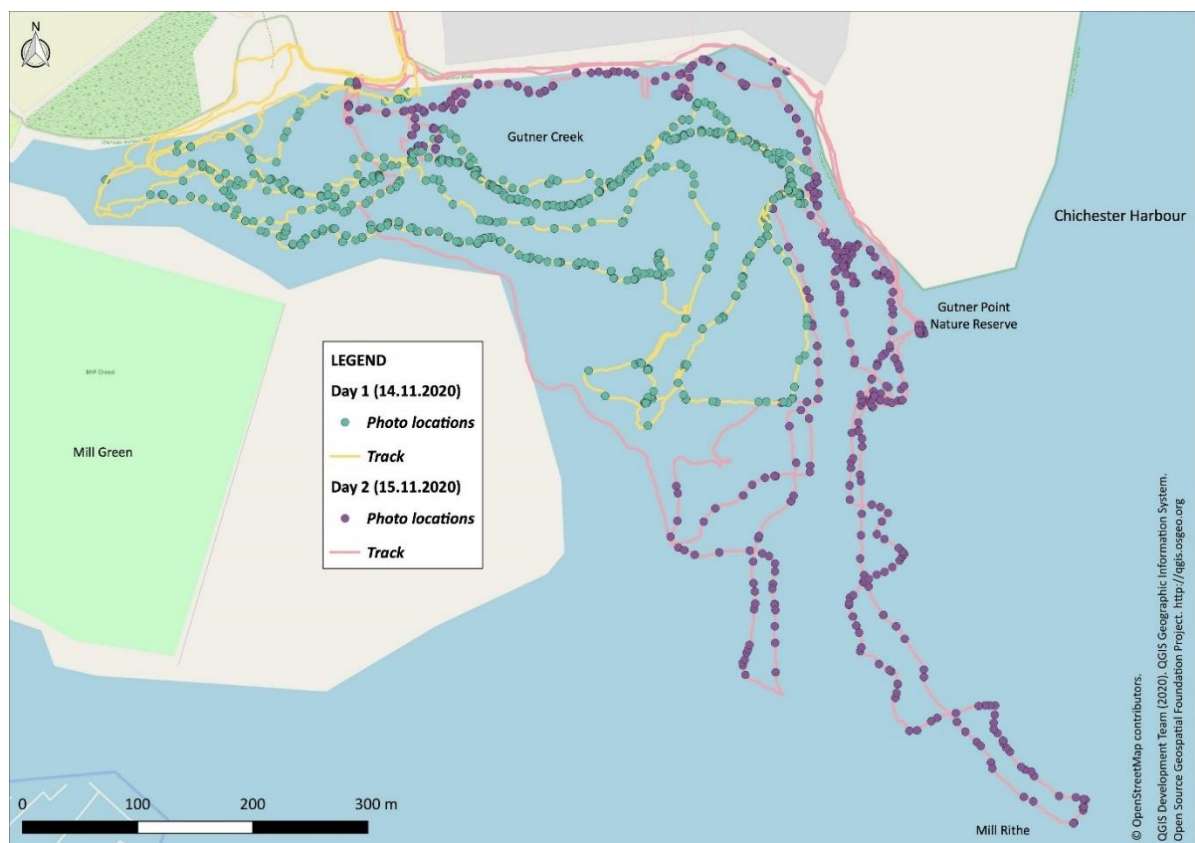


Figure 3: Track and photo locations at Gutner Creek, Mill Rythe 2020.

Where eelgrass was encountered in the intertidal, photographs were used to capture Site detail (Figure 3). Two handheld Garmin GPSMap 66S Global Positioning System (GPS) units were used to capture coordinates for later plotting in a Geographical Information System (GIS). The manufacturer states the

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accuracy of this unit to be less than 10 m for GPS and between 3-5 m for DGPS. Routine use of this unit has shown accuracy to be within 3 m. GIS imagery was produced in QGIS 2.18.20. Pictures of eelgrass were captured with an Olympus Tough and an iphone 12S.

3. Results

2.2. Intertidal Eelgrass Beds

The tide was receding from flood to slack allowing maximum giving a maximum time for the rapid walkover. Stands of *Zostera* beds were noted through the grid walkover and through incidental noting of changes in bed form (seen from distance) causing mild “hummocking” (where fine sediment is trapped or bound by eelgrass fronds and rhizomes) as well as by the presence of feeding Dark-bellied Brent Geese *Branta bernicla*. **Figure 4** below shows examples of intertidal eelgrass at the time of survey.



POLYGON 1 – IMG4807



POLYGON 2 – IMG4841



POLYGON 3 – PB150237



POLYGON 4 - PB150236

Figure 4: Montage of intertidal eelgrass photos from polygons 1-4 at Gutner Creek, Mill Rythe Shore.



POLYGON 5 – IMG4879



POLYGON 6- PB150041



POLYGON 7-IMG5186



POLYGON 8-IMG5315



POLYGON 9 – IMG5309



POLYGON 10 – IMG5307

Figure 5: Continued; Montage of intertidal eelgrass photos from polygons 5-10 at Gutner Creek, Mill Rythe Shore.

Note that polygons 5-8 and 10 in Figure 5 above show the dwarf eelgrass *Zostera noltii*, whilst Polygon 9, image 5309 shows one of the few examples of *Z. marina* at the site, in its intertidal form, known in the UK as *Z. angustifolia*. *Zostera marina* (var. *angustifolia*) was generally found in the drainage channels, whilst *Z. noltii* predominantly occurred on the mudflats.

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POLYGON 11 – IMG4986



POLYGON 12 – IMG4989



POLYGON 13 – IMG5008



POLYGON 14 - 5079



POLYGON 15 - 5086

SEE FIGURE 7 BELOW FOR PHOTO LOCATIONS

Figure 6: Continued; Montage of intertidal eelgrass photos from polygons 11-15 at Gutner Creek, Mill Rythe Shore.

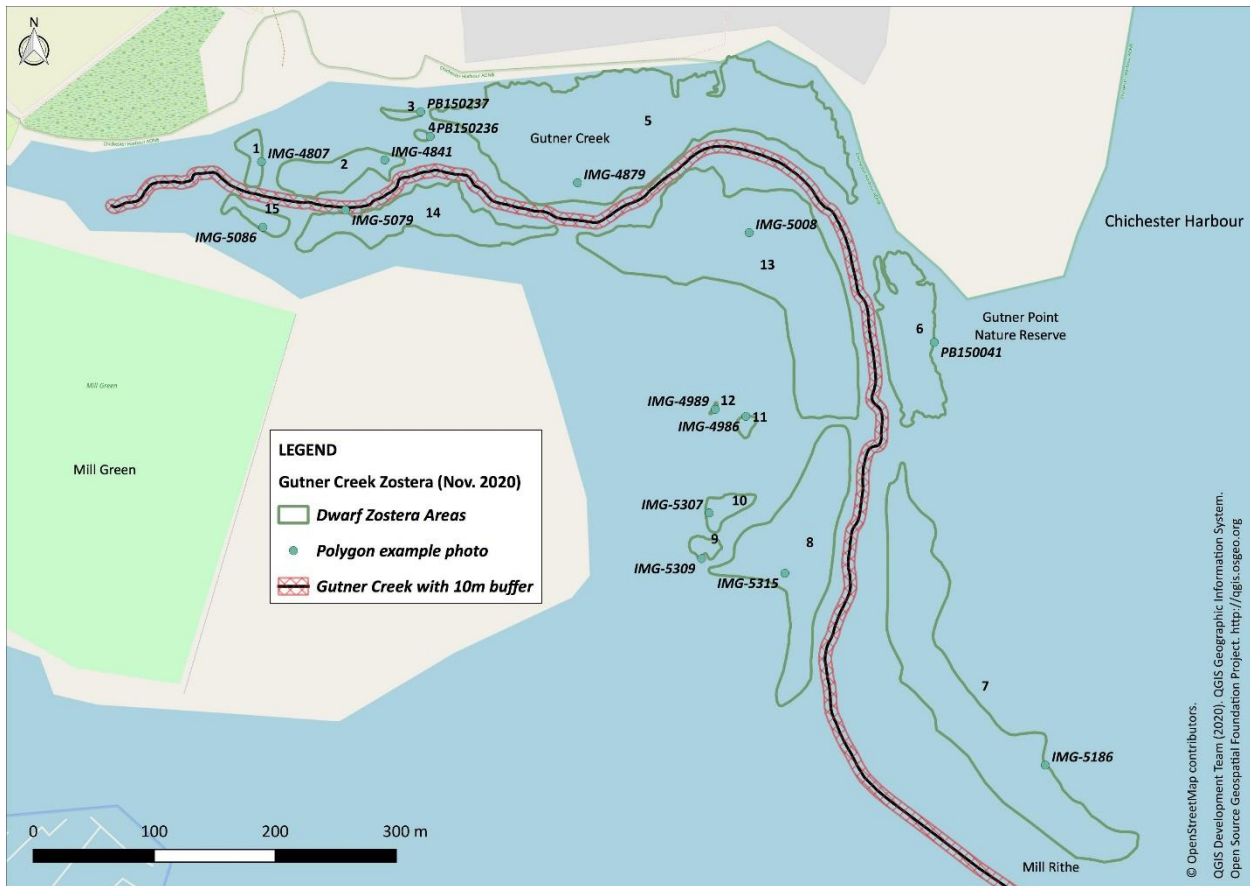


Figure 7: Location of eelgrass features surveyed at Gutner Creek, Mill Rythe.

Figure 5 shows the 15 eelgrass locations or polygons observed during the walkover. These polygons outline areas within which eelgrass was observed and photographed.

The boundaries were drawn using a combination of GPS Track data and photographic evidence.

Where the recorded track linked groundtruth photos showed no evidence of *Zostera*, or only loose decaying leaves, or washed up lumps this area was excluded from the final mapped locations presented here.

Note the distribution / density of *Zostera* within each polygon was by no means continual / uniform across the area outlined. Also, and as might be expected, often there was a patchwork mosaic of *Zostera*, sediment, *Fucus spiralis* and *Ulva* mats.

Brent geese were observed feeding on the eelgrass throughout the two-day survey period in November 2020 and during the single days survey in 2021.

Table 3.1: Eelgrass polygon locations* and detail (*latitude and longitude positions are centroids).

Eelgrass Locations (Sites)	Lat*	Long*	Notes
Polygon 1	50.810525°	-0.967845°	<i>Zostera</i> spp. Small patch. ~12 m length x 4 m width
Polygon 2	50.810460°	-0.967033°	Large mosaic of <i>Z. noltii</i> , <i>Fucus spiralis</i> , <i>Ulva</i> spp. and sediment. ~95 m length by 5 m width

Eelgrass Locations (Sites)	Lat*	Long*	Notes
Polygon 3	50.810762°	-0.965332°	<i>Zostera</i> spp. ~30 length x 10m width
Polygon 4	50.810618°	-0.965087°	Small patch <i>Z. noltii</i> . ~10m diameter
Polygon 5	50.810679°	-0.962466°	<i>Zostera noltii</i> ~350m length x 100 m width at widest point. Mosaic of eelgrass, fucioids and ephemeral green alga.
Polygon 6	50.809074°	-0.959338°	<i>Zostera noltii</i> extending high up foreshore on shingle with fucioids.
Polygon 7	50.806162°	-0.958465°	<i>Zostera noltii</i> . large patchy bed 360 m length x 40 m width. Many brent geese.
Polygon 8	50.807512°	-0.960702°	<i>Zostera noltii</i> . ~230m length x 95 m width. Sparser on lower shore.
Polygon 9	50.807570°	-0.961757°	<i>Zostera noltii</i> . Small patch ~20 m diameter
Polygon 10	50.807857°	-0.961548°	<i>Zostera noltii</i> . Small patch 9 , #35 m length by 20 m width
Polygon 11	50.808479°	-0.961284°	<i>Zostera</i> spp. small patch high up foreshore interspersed with <i>Spartina</i> sp. colonising mudflat.
Polygon 12	50.808606°	-0.961660°	<i>Zostera</i> spp. growing in creek bed a previous identification feature for <i>Z. angustifolia</i> (see Discussion). L ~10 m x 3 m width.
Polygon 13	50.809700°	-0.960862°	<i>Zostera noltii</i> . Large patch ~250 m length x 85 m width
Polygon 14	50.810055°	-0.965067°	<i>Zostera noltii</i> mosaic with fucioids and ephemeral greens. ~200 m length x 40 m width
Polygon 15	50.810030°	-0.967033°	<i>Zostera noltii</i> . Small patch ~50m length x 15 m width

The furthest extent recorded possibly represented the lowest extent in distribution of intertidal eelgrass (likely *Z. noltii*, dwarf eelgrass) down the shore, at least as could be reliably assessed on foot in the lowest shore surveyed during the walkover survey.

With regard to species, eelgrass recorded during this survey followed the morphology and preferred inter to shallow subtidal habitat of the UK species dwarf eelgrass *Z. noltii*. However, some caution is necessary as another UK species *Z. angustifolia* can be mistaken for *Z. noltii* during survey (see Marsden and Chesworth, 2015), however recent genetic work has reached the consensus that *Z. angustifolia* is a taxonomic synonym of *Z. marina* exhibiting differences in terms of morphology and life history as adaptations to different habitats (D'Avack et al 2019).

The invasive species *Z. japonica* was not apparent, though as it can bear the same number of rhizomes that UK *Zostera* species can, again this can be problematic for in-field identification. To identify between some *Zostera* species, research has shown that taxonomic in-field differentiation is not recommended with DNA analysis now being the preferred method.

2.3. Drone survey

A DJI Mini II Combo Drone with 12 MP camera was used to gather footage of the eel grass at Gutner Creek, Mill Rythe in August 2021 (Figure 8).



Figure 8. DJI Mini II Combo Drone used for the survey at the Yachthaven.

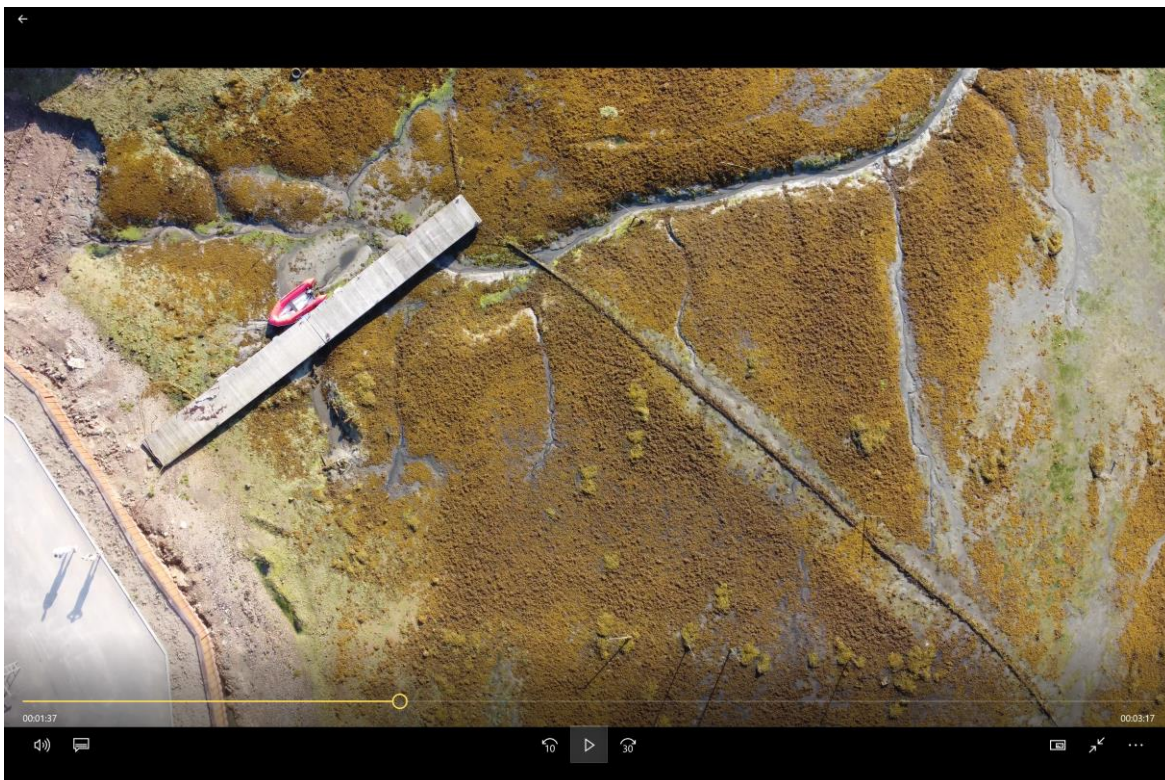


Figure 9. A stills image taken from the August drone footage showing the position of the existing pontoon and eelgrass to the south-east (top right of the picture).

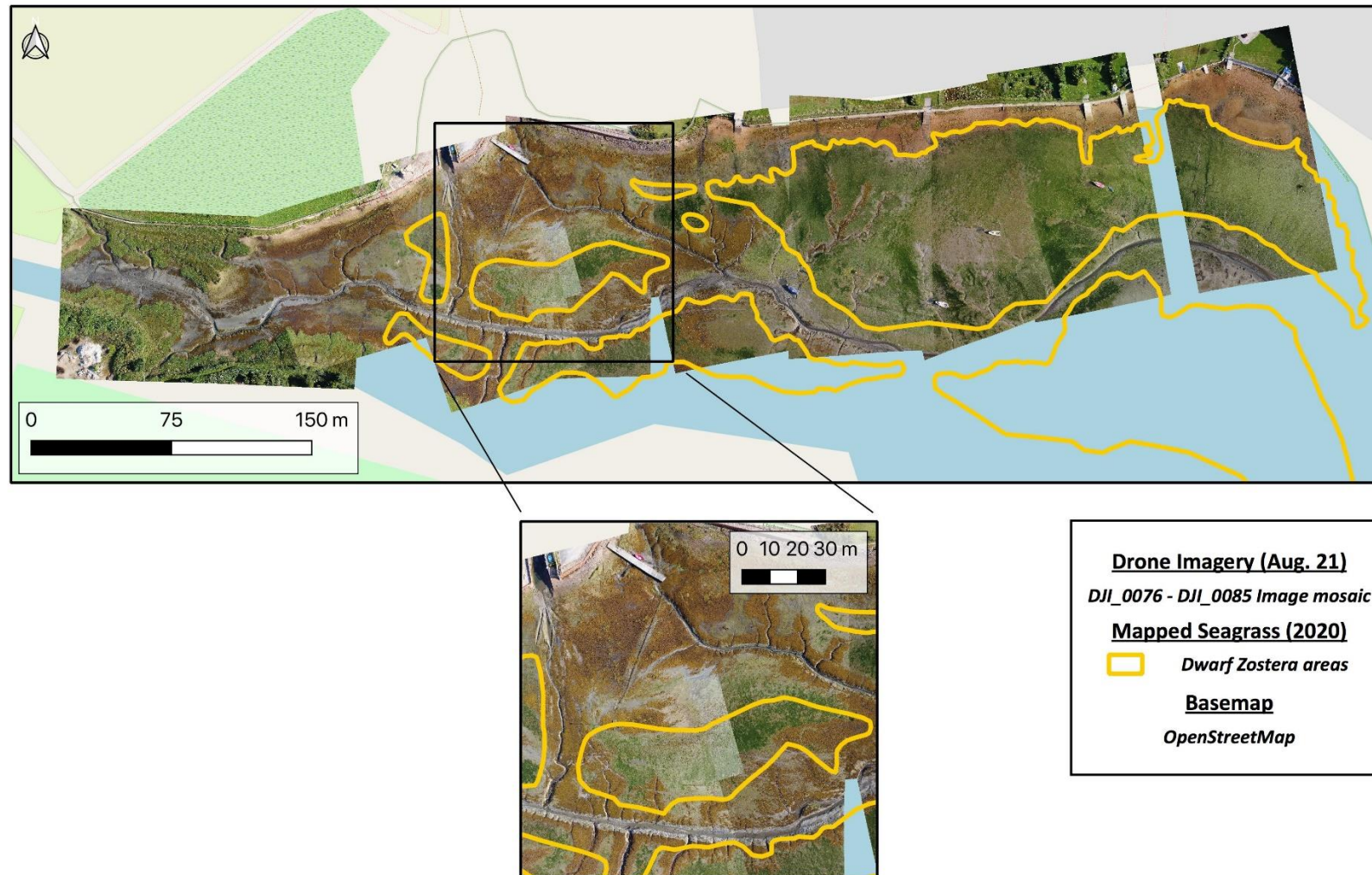
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This August survey was the first aerial drone survey of eelgrass captured at the site. A total of three and a half minutes of video footage was captured during the August drone survey. The eelgrass extent and positions were determined from stills images taken from the video footage and these were compared to the shore observations taken with handheld GPS in 2020. These observations were drawn as polygons over the drone's aerial imagery in QGIS (Figure 10).

In future years, flights on subsequent years will be undertaken so that bed fracturing at the site can be monitored. A grid shall be overlaid on the imagery so that the percentage of fracturing (should it occur) can be calculated resulting in a comparable numeric value.

The data gathered by drone in August 2021 broadly aligned with that of the eelgrass polygons mapped at Mill Rythe in November 2020. Neither survey method recorded eelgrass within the vicinity of the proposed pontoon installation. Most eelgrass beds were located to the south and east of the pontoon, with a few fragmented beds to the west. The area around the current pontoon and of the proposed pontoon location was dominated by the furoids *Fucus vesiculosus* and *Ascophylum nodosum*. These seaweeds are typical of sheltered and extremely sheltered shores.

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© OpenStreetMap contributors.
QGIS Development Team (2021). QGIS Geographic Information System.
Open Source Geospatial Foundation Project. <http://qgis.osgeo.org>.

Figure 10. Drone imagery photomosaic of eelgrass in Gutner Creek, Mill Rythe overlaid with eelgrass polygons from the November 2020 survey.

4. Discussion

Three separate surveys were undertaken at Gutner Creek, Mill Rythe in November 2020, August 2021 and November 2021 in order to map the extent of eelgrass at the site. Eelgrass is best surveyed between April and May and the surveys described here are considered to be suboptimal. As the surveys were conducted outside of the optimal season for surveying eelgrass, no data was gathered on the shoot density, cover and leaf area index at the site. The November surveys are likely to have mapped eelgrass that had begun senescence with the die off of shoots for the winter, potential heavy grazing by wildfowl and with the lack of daylight available. Despite this, considerable stands of the dwarf eelgrass were encountered, during all surveys, predominantly on the mid to upper shore and it is clear that the seagrass beds at the site have increased in size since being mapped by the Hampshire and Isle of Wight Wildlife Trust in 2013 (Chesworth & Marsden 2014).

Survey of the subtidal eelgrass areas indicated the most prevalent species was the indigenous *Z. noltii* (dwarf eelgrass) which is known to inhabit the eulittoral down to the shallow sublittoral fringe (see MarLIN (2005) for habitat detail) and has been reported at Mill Rythe. However, small pockets of *Z. angustifolia* were also encountered in the small tidal creeks and stranded fronds of this phenotype of *Z. marina* were also noted, indicating its wider presence in the area. Nearshore vessel surveys would be required to reasonably establish if populations of *Z. marina* do exist in the subtidal area outside of Mill Rythe Creek.

The survey undertaken for this work indicates that the known habitat preference for *Z. noltii* (upper to mid intertidal) is apparent at Mill Rythe. The very lowest distribution appeared to follow a linear pattern broadly parallel with the shore. The surveyors could not work further into the sublittoral due to safety aspects, but the furthest distance surveyed in Gutner Creek and Mill Rythe Creek did not identify eelgrass at these low shore positions. The polygons 1, 2, 5, 6, 13, 14 & 15 are likely to mark the low-shore limit of the eelgrass populations at Mill Rythe. These polygons border the creek. The August drone survey broadly matched the findings of the November intertidal surveys. Based on known habitat preference of *Z. noltii* the sites identified here likely represent the intertidal distribution of the beds present at Mill Rythe.

No eelgrass was observed within the subtidal at Gutner Creek or Mill Rythe, with the exception of polygons 9 and 12 on the upper shore where small pockets of *Z. angustifolia*, an intertidal phenotype of the subtidal *Z. marina* occurred within a minor feeder creeks. The lack of eelgrass within the creek beds elsewhere is perhaps as a result of the faster hydrodynamic conditions and coarser substrate on the low shore. This further suggests that the patches of *Z. noltii* observed had potentially reached their lower feasible limit, possibly due to a combination of a lack of light penetration in the water column, enhanced by increased levels of turbidity during storm events.

Overall, the presence of the eelgrass beds at Mill Rythe could be described as abundant and widely distributed in the mid to upper intertidal and occasionally in the shallow sublittoral (polygons 9 & 12). The known tolerance of the species shows that *Z. noltii* is sensitive to increasing turbidity. This may be a limiting factor preventing eelgrass colonisation on the lower shore at Mill Rythe, as suspended sediment can be high (max 100 ppm) inducing shallowing of the high (innermost) creeks (SCOPAC). No further sublittoral patches were found after polygon's 9 and 12, and this may be related to light becoming the limiting factor in eelgrass distribution (see Ochieng *et al.*, 2010).

The Revised Ecological Assessment report for the Yachthaven (Ecosupport 2012) identified a total of 26 swing moorings located within Gutner Creek and concluded that they caused significant damage to the eelgrass beds at the site, potentially leading to their fragmentation. As such Chichester Harbour Conservancy would no longer grant new license applications for swing moorings at the site, so the Yachthaven proposed the introduction of a pontoon on the intertidal habitat at the site to allow recreational boating whilst minimising the impact on the eelgrass beds. During the November 2021 a total of four vessels were present on swinging moorings within Gutner Creek, with some damage to the eelgrass being apparent.

As outlined above, it is widely recognised that eelgrasses are important to marine ecosystems for a variety of facilitating factors. The wide and abundant distribution observed at Mill Rythe suggests a resilient population. Despite this, increased turbidity, amongst others, is one of the key factors affecting eelgrass (Ospar, 2009) thus management of this aspect at Mill Rythe is an imperative should works with the pontoon proceed.

5. Conclusions

- The eelgrass monitoring survey at Gutner Creek, Mill Rythe in relation to the proposed pontoon installation identified considerable beds, larger than those recorded by Marsden and Cheswell (2015) as well as a highly patchy population in the intertidal and shallow sublittoral;
- The dominant species at the site was the dwarf eelgrass *Z. noltii* though small patches of *Z. angustifolia* were found in tidal creeks.
- It is reasonable to assume that the maximum eelgrass extent recorded during the August drone survey may be the limit of *Z. noltii* distribution at Mill Rythe, based on its known preferred habitat and turbidity levels at the site;
- Eelgrass is an Annex 1 habitat under the Habitat Regulations, therefore the eelgrass beds within the zone of influence of the development (i.e. Gutner Creek) are considered to be of national importance being a feature of the Solent Maritime SAC and providing vital supporting habitat for the Brent Geese as well as other species (wigeon and pintail) which are features of the protected wildfowl assemblage for both the SPA and Ramsar sites.
- Eelgrass has declined due to numerous anthropogenic effects. The *Z. noltii* population recorded at Mill Rythe is in good condition for eelgrass within the Solent other than the highly patchy (fragmented) areas affected by the swing moorings.
- It should be possible to avoid all direct impacts to eelgrass during the construction and use of the pontoon, though careful management of impacts and effects from project work, in particular suspended sediment and pollutants from vessels (anti foul/hydrocarbon etc.), should be practiced; and

6. References and selected reading

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