



# Annual Environmental Review Report 2021/2022

**Environmental Licence No. 10180/1**

**East of Yellow Bluff**

**Marine Farming Lease no. 281**

September 2022

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## Contents

<b>1. INTRODUCTION</b> .....	4
<b>2. FAR FIELD ENVIRONMENTAL MONITORING</b> .....	8
<b>a. Benthic surveys – monitoring results</b> .....	8
<b>b. Water Quality – monitoring results and performance against trigger levels</b> .....	8
<b>c. Water Current – ADCP data</b> .....	11
<b>d. Reef – inshore and deep reef survey results</b> .....	13
<b>e. Seagrass – survey results</b> .....	13
<b>3. Modelling</b> .....	14
<b>a. Water Quality Dispersion – being undertaken by CSIRO</b> .....	14
<b>b. Sediment Dispersion - DEPOMOD</b> .....	14
<b>4. Near Field/Lease Environmental Monitoring</b> .....	16
<b>a. Video Sediment Survey – compliance annual video surveys undertaken by Huon Aquaculture</b> .....	16
<b>b. Benthic Sediment Survey – Baseline compliance points and control sites undertaken by IMAS</b> .....	16
Figure 1: Map of monitoring sites, Yellow Bluff lease (MF281) and the Storm Bay area .....	4
Figure 2: Water currents (speed and direction) for surface, midwater and bottom at Yellow Bluff. ....	12
Figure 3: Deposition rate for peak production period in 2020.....	15
Table 1: Information requirements of the Annual Environmental Report.....	6
Table 2: Water quality investigative trigger levels.....	10
Table 3: Current data taken from AWAC located in northwest section of Yellow Bluff. ....	11

### 1. INTRODUCTION

Environmental monitoring is undertaken in the waters of Storm Bay as part of Environmental Licence No. 10180/1 (EL 10180/1) issued to Huon Aquaculture Company PTY LTD on 14 May 2019. The licence is for finfish farming in State Waters East of Yellow Bluff within Marine Farming Lease 281. The various environmental monitoring sites are shown in Figure 1.

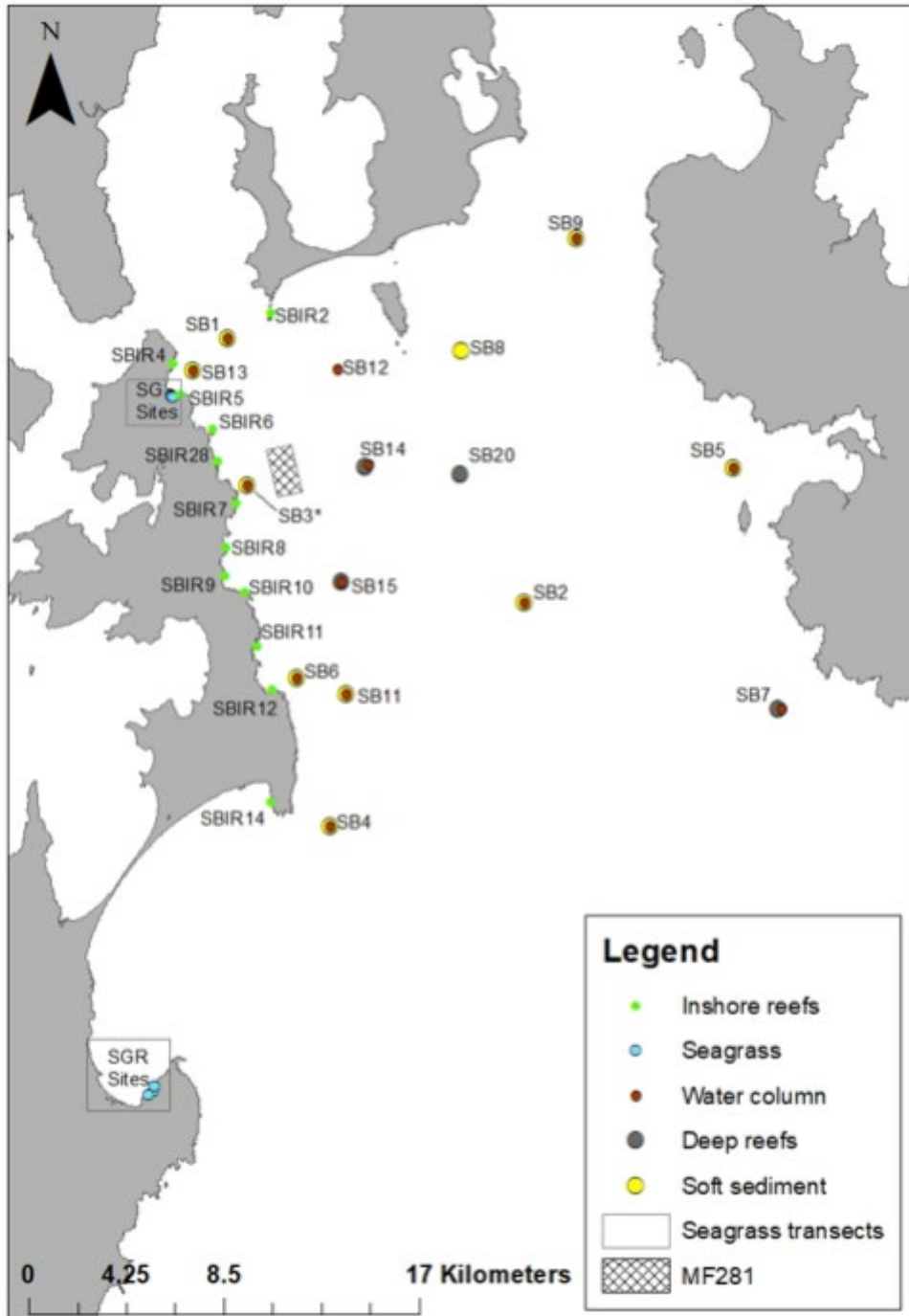


Figure 1: Map of monitoring sites, Yellow Bluff lease (MF281) and the Storm Bay area

As part of the conditions of the environmental licence, an Annual Environmental Review Report must be submitted to the Director of the EPA each calendar year. The report must cover a 12-month period up to and including April of each year. The licence came into effect in May 2019, the first stocking of finfish occurred in July 2019, and official monitoring subsequently began in August 2019. This is the Third Annual Environmental Review Report for Environmental Licence 10180/1.

The Annual Environmental Review Report summarises environmental parameters monitored between May 2021 and April 2022. The report includes a summary of water quality performance, benthic surveys, water quality measurements, water currents (hydrodynamics), reef and seagrass monitoring, modeling – dispersion water quality, & sediment dispersion, video surveys, and benthic surveys (Table 1).

All fieldwork for this report (other than the video sediment survey) was undertaken by the Institute of Marine & Antarctic Studies (IMAS) and Aquenal. All requirements for frequency and timing of sampling events were met with respect to EL 10180/1.

This report iteratively steps through each of the requirements outlined in the Environmental Licence 10180/1 (replicated in Table 1). Information requirements are detailed in this report with short summaries of each being provided to illustrate the main findings. Detailed results can be found in full detail in the Storm Bay Annual Broadscale Environmental Monitoring Program Report 2021/22 (BEMP); and the MF281 Water Quality Performance Report 2021/22 (WQPR). The type of information for each requirement was generally unique and compiled concurrently by the Institute for Marine and Antarctic Studies (IMAS), Aquenal, and Huon Aquaculture staff (video sediment survey only).

**Table 1: Information requirements of the Annual Environmental Review Report.**

Adapted from Attachment 2 and 3 to Environmental Licence 10180/1

Type of information	Information Requirements	Frequency/Timing	Notes
Water quality performance report	<ul style="list-style-type: none"> <li>• Comparison of water quality results recorded at the compliance site against investigation trigger limits specified in Table 1.</li> <li>• Use rolling annual mean as compliance metric.</li> <li>• Box and whisker plots should be utilised to illustrate monitoring results and to provide a comparison with investigation trigger values.</li> <li>• Analysis of performance in the context of stocking cycles and feed inputs to be provided.</li> <li>• Summary of adaptive management measures implemented in response to trigger value exceedances.</li> </ul>	Data for 12-month period, up to and including April of each year, to be analysed.	<i>For first annual report data available at the time to be utilised and median values to be calculated on that basis</i>
Benthic surveys (broad-scale monitoring)	<i>Results of benthic infauna and sediment surveys undertaken at BEMP monitoring sites.</i>	<i>Results relating to surveys undertaken in Spring of the reporting year.</i>	
Water quality measurements	Results of water quality monitoring, including nutrients, field parameters and phytoplankton to be summarise and analysed.	Data recorded for 12-month period, up to and including April of each year, to be summarised and analysed, with consideration to be given to illustrating seasonal and other relevant effects.	Refers to Attachments 11 and 12 for guidance on data presentation and analysis. For the first annual report, data available at that time to be reported.
Water currents (hydrodynamics)	Summary of real-time, in situ ADCP measurements. Interpretation of hydrodynamic patterns and associated adaptive management decisions.	Data recorded for a 6-month period to be summarised and analysed.	Refer to attachment 11 and 12 for guidance on data presentation and analysis.

<p>Ecology - reef &amp; seagrass monitoring</p>	<p>Findings of reef and seagrass surveys to be analysed. Interpretation of observed changes against background conditions to be provided.</p>	<p>Rapid Visual Assessment reef surveys are to be undertaken bi-annually (late Winter and in late Summer). Edgar-Barret reef surveys are to be conducted every 5 years. Seagrass surveys to be undertaken annually in late Spring.</p>	
<p>Modelling - dispersion water quality</p>	<p>Outputs from water quality dispersion modelling to be included.</p>	<p>Model to incorporate at least 6 months ADCP data.</p>	<p>Guidelines outlining specific modelling requirements to be issued by Director, EPA.</p>
<p>Modelling - sediment dispersion</p>	<p>Outputs from DEPOMOD sediment modelling to be included.</p>	<p>Model to incorporate at least 6 months ADCP data.</p>	<p>Guidelines outlining specific modelling requirements to be issued by Director, EPA.</p>
<p>Video surveys (compliance sites)</p>	<p>Summary of main findings of video surveys undertaken in reporting period.</p>	<p>Surveys undertaken every 12 months or in accordance with stocking and fallowing regime. Surveys must be conducted within 30 days of peak production.</p>	<p>Detailed video survey reporting not required for Annual Environmental Report, as submission is already a requirement under 3V9.</p>
<p>Benthic surveys (compliance &amp; control sites)</p>	<p>Results of benthic infauna and sediment surveys undertaken at compliance and control sites including those shown in Table 6.</p>	<p>Survey undertaken every 12 months or in accordance with stocking and fallowing regime. Surveys must be conducted within 30 days of peak production.</p>	<p>Sampling and reporting to occur on an annual basis.</p>

## 2. FAR FIELD ENVIRONMENTAL MONITORING

### a. Benthic surveys – monitoring results

#### Information Requirement

**Relevant section in EL10180/1:** 3F2

**Information Requirements:** Results of benthic infauna and sediment surveys undertaken at BEMP monitoring sites.

**Frequency:** Results relating to surveys undertaken in Spring of the reporting year.

#### Location of information requirements

The information to satisfy the requirements for the Benthic surveys (broad-scale monitoring) is presented in detail in the most recent BEMP report. Key findings are summarised briefly below.

#### Summary of Information

##### *Soft Sediments: Visual Assessment and Sediment Chemistry*

The visual descriptions of the sediment cores from the current survey showed the dominant colour was either brown, olive grey, or a mixture of colours. Sand was the most common sediment type at most sites ranging from fine to coarse with shell grit. No odour or gas bubbles were detected from any core.

The mean redox potential of all sites was >100 mV and similarly mean sulphide concentrations were consistent with healthy and unimpacted sediments.

##### *Soft sediments: Benthic Infauna Abundances and Communities*

The benthic communities were again dominated by arthropod, annelid, molluscan, and echinoderm families, as was the case in 2020 and 2019. The overall abundance of annelids (an indicator of organic enrichment) in the sediments decreased in 2021 relative to prior surveys.

All faunal metrics remained indicative of healthy infauna communities across the region.

### b. Water Quality – monitoring results and performance against trigger levels

#### i) Monitoring Results

#### Information Requirement

**Relevant section in EL10180/1:** 3F3

**Information Requirements:** Results of water quality monitoring, including nutrients, field parameters and phytoplankton to be summarised and analysed.

**Frequency:** Data recorded for 12-month period, up to and including April of each year, to be summarised and analysed, with consideration to be given to illustrating seasonal and other relevant effects.

**Notes:** Refers to EL 10180/1 attachments 11 and 12 for guidance on data presentation and analysis.

#### Location of Information Requirements

The information to satisfy the requirements for the Water Quality Measurements is presented in detail in the BEMP 2021 report. Key findings are summarised below.



## Summary of Information

The Annual Environmental Review Report requires information that summarises results of water quality monitoring including nutrients, field parameters and phytoplankton. Data was recorded monthly up to and including April each year. Results are summarised with consideration to be given to illustrating seasonal and other relevant effects.

### *Water Column: Physico-chemical Parameters and Nutrients*

Throughout the sampling, the water temperature, nitrate, dissolved reactive phosphorus showed seasonal trends, with elevated concentrations of nutrients and lower temperatures from May – September and lower levels of nutrients and higher temperatures from October – April. The increase in nutrients during spring and winter coincides with the strengthening of the sub-Antarctic current which is rich in nitrogen and/or increased inputs via river flow and runoff from land. During late spring and summer, the remaining nitrogen is rapidly absorbed from the surrounding environment by phytoplankton. Dissolved oxygen concentrations also continued to follow a seasonal pattern with concentrations increasing through autumn -winter due to greater solubility with the cooling temperatures and increased weather driven atmospheric inputs and vertical mixing. Although the seasonal trend is not as clear, both salinity and silica concentrations in surface waters are on average higher in the winter months, particularly at sites in closer proximity to the major freshwater inputs (i.e. the Derwent Estuary). By contrast, there were only weak or no clear seasonal patterns for the concentrations of TAN, total nitrogen, total phosphorus, and silica. Notably, the TAN concentrations in the surface, 10 m and bottom waters which were elevated in 2020 had returned to concentrations more comparable to previous reporting periods.

### *Water Column: Phytoplankton Biomass and Communities*

The biomass of chlorophyll a showed a weak seasonal trend with higher values recorded in late winter – spring and autumn of some years. Like TAN concentrations the biomass of chlorophyll a was elevated in 2020, but in the current reporting period, the biomass in winter-spring 2021 was lower and more similar to the preceding years. The phytoplankton communities, as described from cell counts, were dominated by diatoms. A very small proportion of the cell counts, or species recorded were harmful algae species.

## ii) Performance against trigger levels

### Information Requirement

*Relevant sections in EL10180/1: G2, 1 & 2*

**Information Requirements:** (a) Comparison of water quality results recorded at the compliance site against investigation trigger limits specified in Table 2; (b) Use rolling annual mean as compliance metric; (c) Box and whisker plots should be utilised to illustrate monitoring results and to provide a comparison with investigation trigger values; (d) Analysis of performance in the context of stocking cycles and feed inputs to be provided; and (e) summary of adaptive management measures implemented in response to trigger value exceedances.

**Frequency:** Data for 12-month period, up to and including April of each year, to be analysed.

**Note:** The EPA identified an error when calculating the chlorophyll a annual rolling median trigger level for SB3. The level specified in EL10180/1 is 1.1 mg/m<sup>3</sup> which is the median (50<sup>th</sup> percentile), and the correct value should be the 80<sup>th</sup> percentile which is 1.5 mg/m<sup>3</sup>. Until this variation to the EL is formally approved both values are shown in Table 2, however comparisons in this report will be against the corrected value.

**Table 2: Water quality investigative trigger levels**

Parameter	Level
Ammonia (surface)	6.0 µg/L
Ammonia (bottom)	10.0 µg/L
Total Nitrogen (surface)	308.0 µg/L
Total Nitrogen (bottom)	330.0 µg/L
Nitrite & Nitrate (surface)	38.6 µg/L
Nitrite & Nitrate (bottom)	41.8 µg/L
Total Phosphorus (surface)	48.0 µg/L
Total Phosphorus (bottom)	40.0 µg/L
Dissolved Reactive Phosphate (surface)	12.8 µg/L
Dissolved Reactive Phosphate (bottom)	14.0 µg/L
Oxygen (surface)	7.7 mg/L (lower limit)
Oxygen (bottom)	7.1 mg/L (lower limit)
Chlorophyll a	1.1 mg/m <sup>3</sup> and 1.5 mg/m <sup>3</sup>

#### Location of Information Requirements

The information to satisfy the requirements for the Water Quality Performance is presented in detail in the Water Quality performance Report 2021/2022 and Annual BEMP 2021/2022 report, which include indicative rolling annual medians for each analyte in relation to their respective investigation trigger levels (Table 2), and a series of box and whisker plots that illustrate the central tendency and variance of each analyte for the reporting period.

#### Summary of Information

##### *Water Column: Performance against Investigative Trigger levels – Water Column*

During the 12 months of sampling, the annual median rolling values for TAN, and total nitrogen, nitrate + nitrite, total phosphorus, and dissolved reactive phosphorous in the surface and bottom waters have been below the water quality investigative trigger levels at the compliance site. The annual median values of dissolved oxygen in the surface and bottom waters were above the lower limit trigger levels.

The annual rolling median values for chlorophyll a was above the investigative trigger level at the compliance site in May 2021. This result was likely driven by higher values recorded in the prior reporting period (June – December 2020). During that period, higher values were also recorded at some intermediate and farfield sites (<5km, and >5km from the lease respectively) and other monitoring sites located in the lower Derwent Estuary. Additionally, there was no clear relationships evident between feed inputs, TAN concentration in surface waters or chlorophyll a biomass at the monitoring sites.

### c. Water Current – ADCP data

#### Information Requirement

**Relevant section in EL10180/1:** 3F4

**Information Requirements:** Summary of real-time, in situ ADCP measurements. Interpretation of hydrodynamic patterns and associated adaptive management decisions.

**Frequency:** Data recorded for 6-month period to be summarised and analysed.

**Notes:** Refer to attachment 11 and 12 for guidance on data presentation and analysis.

#### Location of Information Requirements

The information to satisfy the requirements for the Water currents (hydrodynamics) is presented in detail the MF281 Yellow Bluff Depositional Modelling Report 2020.

#### Summary of Information

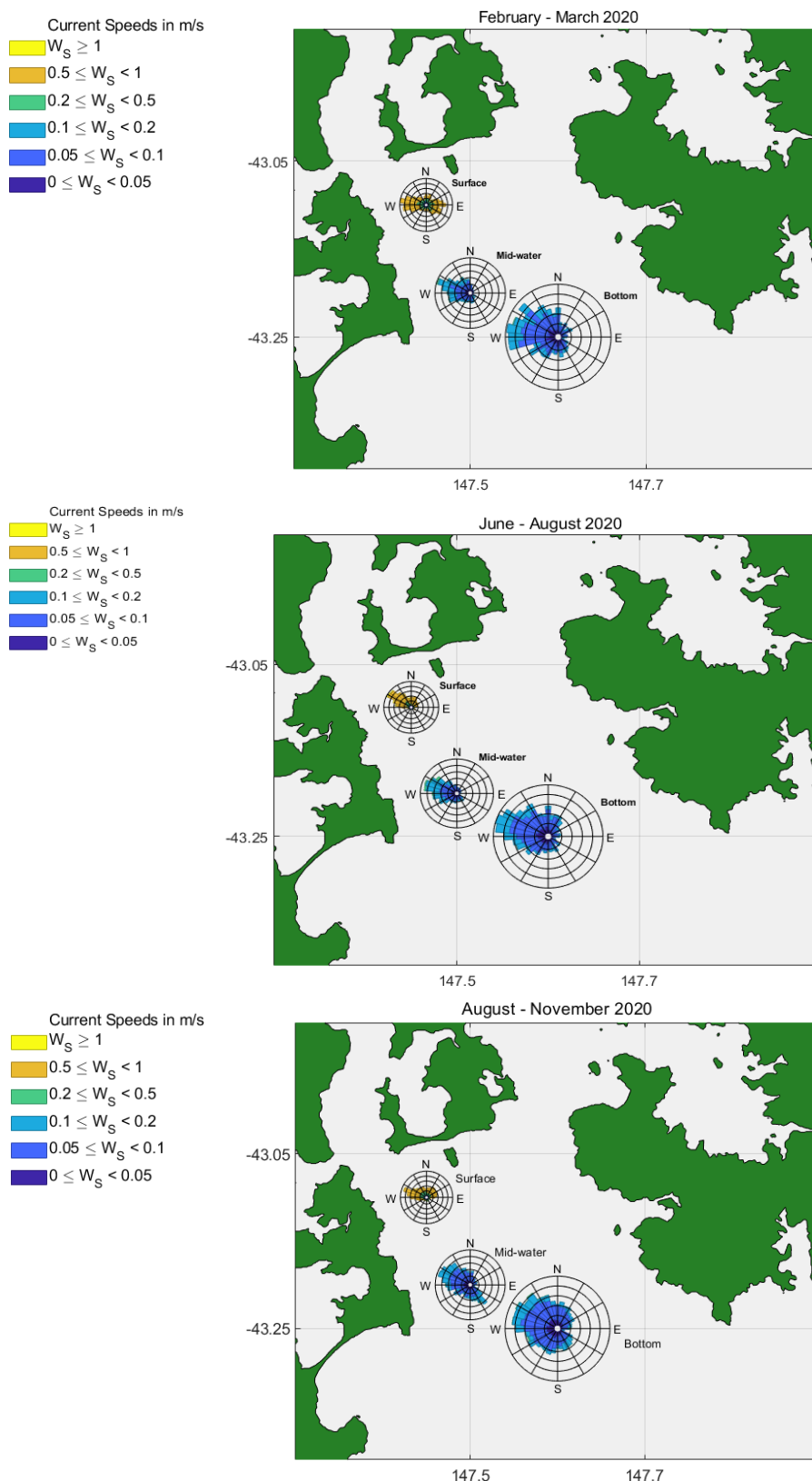
Both the EPA and IMAS were consulted prior to deployment of the Acoustic Doppler Current profiler (ADCP) to ensure data captured would include the period of first annual peak production. In accordance with this, the ADCP was deployed at the East of Yellow Bluff lease for the period shown in Table 3. The analysis showed that flow at Yellow Bluff was largely driven by factors (wind, river flow) other than tidal forces.

Figure 2 below provides a more detailed description of the range of speeds and directions at three depths (surface, mid-water and bottom) for each period of current data. The currents were similar in speed and direction for each of the sampling periods, with most of the stronger currents in the mid-water and bottom flow going towards the coast of Bruny Island. However, mean directions for the residual flow is generally south to southeast for all depths.

**Table 3: Current data taken from AWAC located in northwest section of Yellow Bluff.**

*Tidal components were estimated using t-tide (Matlab 2019a). The current data from February-March was used for validating NewDEPOMOD against benthic indices. The June – August and August – November current data were used to calculate depositional footprints for a range of production scenarios.*

Date	Mean flow rate (ms <sup>-1</sup> )	Mean Direction (°)	Mean Residual flow (ms <sup>-1</sup> )	Mean Residual Direction (°)	Tidal component (%)
6/2/2020 – 10/3/2020	Bottom 0.08	Bottom 233			
	Mid-water 0.09	Mid-water 247	–	–	–
	Surface 0.52	Surface 186			
1/6/2020 – 10/8/2020	Bottom 0.078	Bottom 222	Bottom 0.075	Bottom 164	Bottom 6.7
	Mid-water 0.094	Midwater 244	Mid-water 0.089	Midwater 179	Mid-water 20.2
	Surface 0.668	Surface 223	Surface 0.662	Surface 124	Surface 3.2
11/8/2020 – 13/11/2020	Bottom 0.08	Bottom 214	Bottom 0.08	Bottom 170	Bottom 5
	Mid-water 0.09	Midwater 224	Mid-water 0.08	Midwater 188	Mid-water 14.1
	Surface 0.55	Surface 197	Surface 0.53	Surface 132	



**Figure 2 : Water currents (speed and direction) for surface, midwater and bottom at Yellow Bluff. The figures are for February – March (top), June – August (middle) and August – November (bottom) 2020.**

## d. Reef – inshore and deep reef survey results

### Information Requirement

**Relevant section in EL10180/1:** 3F5

**Information Requirements:** Findings of reef surveys to be analysed. Interpretation of observed changes against background conditions to be provided.

**Frequency:** Rapid Visual Assessment (RVA) reef surveys are to be undertaken bi-annually (late Winter and in late Summer). Edgar-Barret reef surveys are to be conducted every 5 years.

### Location of Information Requirements

The information to satisfy the requirements for the Ecology – reef monitoring is presented in detail in the BEMP report (2022).

### Summary of Information

At all inshore reef sites, the algae community was dominated by canopy-forming species. There was a 'healthy' canopy cover (> 50%) at all reef sites, with limited occurrences of enrichment status species (i.e., epiphytic algae, filamentous algae, nuisance green and nuisance red). Through time there were no distinct seasonal trends in the percentage cover of canopy forming macroalgae at the sites on the western side of Storm Bay; and there were no consistent trends in the percentage cover of epiphytic algae through time.

The deep reef benthos was dominated by erect coarse and fine branching red algae species and sponges of massive, erect branching, erect laminar, cup and barrel forms. The most common fish species were Butterfly perch (*Caesioperca lepidoptera*), Barber perch (*Caesioperca razor*) and Rosy wrasse (*Pseudolabrus rubicundus*). In the baseline and EL surveys, the fish community was consistently dominated by these species.

There was no change in the inshore and deep reef communities of Storm Bay through time.

## e. Seagrass – survey results

### Information Requirement

**Relevant section in EL10180/1:** 3F6

**Information Requirements:** Findings of seagrass survey to be analysed. Interpretation of observed changes against background conditions to be provided.

**Frequency:** Seagrass surveys to be undertaken annually in late Spring.

### Location of Information Requirements

The information to satisfy the requirements for the Ecology – seagrass monitoring is presented in detail in the BEMP report (2022).

### Summary of Information

The cover of *Zostera* spp. was similar at the compliance site (Bull Bay) and the control site (Adventure Bay). Qualitative and quantitative assessments indicated that the percentage cover of epiphytic algae was "moderate" < 30% at both sites.

Through time the percentage cover of epiphytic algae at the compliance site declined from "high" and "very high" to "low" to "medium" values whereas increases from "very low" or "low" to "medium" or "high" were recorded at the control site.

The variation in the epiphytic cover on the seagrass beds between the baseline survey and the EL survey could be linked to a range of factors including natural variability.

### 3. Modelling

#### a. Water Quality Dispersion – being undertaken by CSIRO

##### Information Requirement

**Relevant section in EL10180/1:** 3M2

**Information Requirements:** *Outputs from water quality dispersion modelling to be included.*

**Frequency:** *Model to incorporate at least 6 months ADCP data.*

**Notes:** *Guidelines outlining specific modelling requirements to be issued by Director, EPA.*

##### Location of Information Requirements

The information to satisfy the requirements for the Modelling – dispersion water quality is currently being undertaken by CSIRO. This work is currently being finalised; CSIRO have projected the report being finalised in late 2022 (see section 3M2 of EL10180/1)

##### Summary of Information

See above

#### b. Sediment Dispersion - DEPOMOD

##### Information Requirement

**Relevant section in EL10180/1:** 3M3

**Information Requirements:** *Outputs from DEPOMOD sediment modelling to be included.*

**Frequency:** *Model to incorporate at least 6 months ADCP data.*

**Notes:** *Guidelines outlining specific modelling requirements to be issued by Director, EPA.*

##### Location of Information Requirements

The information to satisfy the requirements for the Water currents (hydrodynamics) is presented in detail the MF281 Yellow Bluff Depositional Modelling Report 2020.

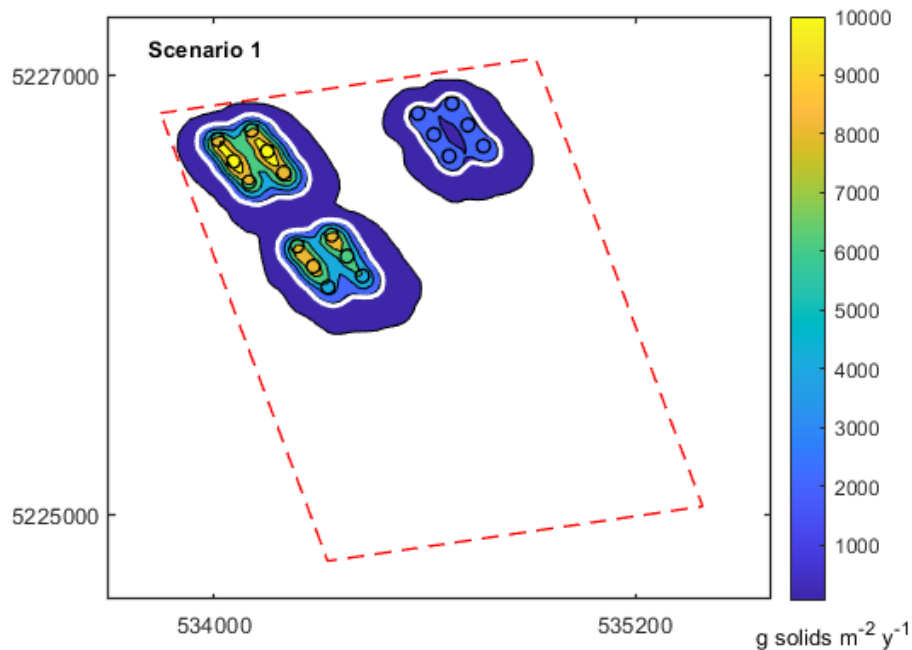
##### Summary of Information

Both the EPA and IMAS were consulted prior to deployment of the Acoustic Doppler Current profiler (ADCP) and sediment traps to ensure data captured would include the period of first annual peak production. In accordance with this consultation, the ADCP was deployed at the East of Yellow Bluff lease for the period shown in Table 3; the sediment trap validation study was conducted in September 2020 and the benthic survey was conducted in March 2020. Additionally, feed data for these periods were also provided to help validate the model.

Visual inspection of the relationship between modelled and observed deposition (sediment trap validation) showed a reasonably good match, and further model validation metrics returned a good fit to observations. The same inspections against the benthic study showed a reasonable match between predicted and observed but with some variation between transects. The results provide confidence that the model reliably predicts deposition.

Mean bottom currents at Yellow Bluff were approximately 0.08 ms<sup>-1</sup> and based on previous work it is reasonable to assume that resuspension is likely at this lease.

Annual deposition rates around pens at the lease was modelled (Figure 3) using actual production data from February – September 2020. The 1500 (g solids m<sup>-2</sup>y<sup>-1</sup>) contour (white line) is provided as a reference and this extends in a relatively uniform pattern approximately 50m from the pens. The outer (dark blue) contour which captures lower deposition ( $\geq 50$  g solids m<sup>-2</sup>y<sup>-1</sup>) is slightly asymmetric extending more to the south - southeast. The difference in deposition seen both between pen groups and between pens within each group, was largely driven by the differences in the feed inputs and biomass.



**Figure 3: Deposition rate for peak production period in 2020.**

Also shown is the lease boundary (red dashed line) and pens (black circles). The contour for 1500 g solids m<sup>-2</sup> y<sup>-1</sup> (white solid line) is also included. The lowest deposition rate shown (dark blue) is  $\geq 50$  g solids m<sup>-2</sup> y<sup>-1</sup>. The production data (feed and biomass) used were actual production values for the period February – September 2020.

#### 4. Near Field/Lease Environmental Monitoring

##### a. Video Sediment Survey – compliance annual video surveys undertaken by Huon Aquaculture

###### Information Requirement

**Relevant section in EL10180/1:** 3V

**Information Requirements:** Summary of main findings of video surveys undertaken in reporting period.

**Frequency:** Surveys undertaken every 12 months or in accordance with stocking and fallowing regime. Surveys must be conducted within 30 days of peak production.

**Notes:** Detailed video survey reporting not required for Annual Environmental Review Report, as submission is already a requirement under 3V9.

###### Location of Information Requirements

The information to satisfy the requirements for the video sediment survey is presented in detail the MF281 Annual Video Survey Report 2022.

###### Summary of Information

The video sediment survey was undertaken in March 2022. This was aligned with the peak stocking period for the lease. There was no visual evidence for any significant physical/biological effects from the fish pens at the compliance sites.

##### b. Benthic Sediment Survey – Baseline compliance points and control sites undertaken by IMAS

###### Information Requirement

**Relevant section in EL10180/1:** 3V12

**Information Requirements:** Results of benthic infauna and sediment surveys undertaken at compliance and control sites including those shown in Table 6.

**Frequency:** Survey undertaken every 12 months or in accordance with stocking and fallowing regime. Surveys must be conducted within 30 days of peak production.

**Note:** Sampling and reporting to occur on an annual basis.

###### Location of Information Requirements

The information to satisfy the requirements for the Benthic Sediment Survey is presented in detail the MF281 Benthic Survey Report 2022.



### Summary of Information

Mean redox and sulphide values were lower and higher, respectively, at the compliance sites compared to the control sites. All site means are above the threshold value for redox (0mV), and below the threshold value for sulphide (250 µM) identified in the Environmental Licence conditions

For the biological criteria, a comparison against the baseline data, does not indicate:

- a 20 times increase in the total abundance of any individual taxonomic family relative to the reference sites,
- an increase at any compliance site of greater than 50-times the total Annelid abundance at reference sites,
- a reduction in the number of families by 50 percent or more relative to reference sites,
- or a complete absence of fauna.