



DHI CASE STORY

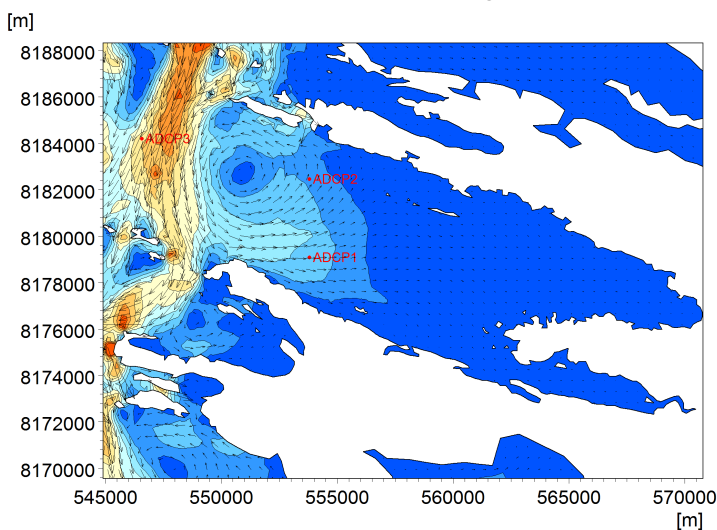
SUPPORTING AQUACULTURE PRODUCTION IN WESTERN AUSTRALIA

Assessing the environmental impact of a planned finfish aquaculture development

Although aquaculture production in Western Australia is fairly limited, the area possesses huge potential as an aquaculture production site. To encourage aquaculture investment in the area, the Department of Fisheries (DoF) planned on developing a finfish aquaculture production zone in Cone Bay – the Kimberley Aquaculture Zone (KAZ). We conducted an Environmental Impact Assessment (EIA) in the KAZ to determine the potential impacts of the planned aquaculture site. Our study showed that finfish aquaculture production can be conducted without significant impacts to marine environmental quality and marine environmental factors in Cone Bay and surrounding waters. This information will help the DoF gain environmental approval, which is required in order to proceed with the development.

DEVELOPING A NEW AQUACULTURE ZONE

Due to its long coastlines and protected bays with good water exchange, Western Australia (WA) is well suited for aquaculture production. Thus far, however, it has been difficult to attract investors. As such, the Department of Fisheries (DoF) decided to encourage development in WA by providing aquaculture production zones with all permissions, licenses and management plans in place.



Snapshot of modelled vertically averaged currents in Cone Bay during flood tide. Time in GMT (local time -8 hours) © DHI

SUMMARY

CLIENT

Department of Fisheries (DoF) of Western Australia in collaboration with BMT Oceanica

CHALLENGE

Need to gain environmental approval for a new large finfish aquaculture production site – the Kimberley Aquaculture Zone (KAZ)

SOLUTION

Using physical and biogeochemical numerical modelling of various proposed finfish production scenarios in the KAZ

VALUE

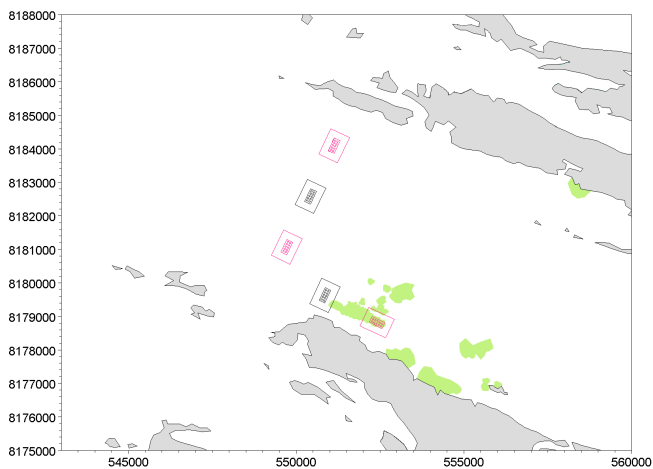
- Ensured no negative environmental impact from the planned KAZ
- Enabled client to gain environmental approval for the KAZ

LOCATION / COUNTRY

Cone Bay, Kimberley Region, Australia

The DoF identified a feasible development site in Cone Bay – which has very good water quality – in Australia’s Kimberley region. Called the Kimberley Aquaculture Zone (KAZ), it is particularly well suited for Barramundi (a type of finfish). Daily exercises where the fish have to swim to compensate for the strong tidal currents produce a meat texture and taste which is highly sought after both in Australia and internationally. In addition, Barramundi is a valuable brand, especially for the high end seafood restaurants in Australia.

Before the KAZ could be developed, the DoF needed to gain approval for this large potential finfish production site in what is considered a pristine marine environment. To ensure that the impacts of the finfish farms would be minimal, we undertook a series of investigations in partnership with BMT Oceanica (who conducted the fieldwork and established the baseline).



Model domain and mesh for the production scenarios © DHI

ASSESSING ENVIRONMENTAL IMPACTS

We carried out an Environmental Impact Assessment (EIA) for different proposed future finfish production scenarios within the KAZ. In addition, we developed thresholds for the important pressures and receptors in the area. The main areas of concerns were the impacts from:

- organic deposition from feed and fish faeces
- increased nutrient concentrations from feed residues and fish excretions

Increased organic deposition on the seabed can cause significant changes in the physical and chemical environment, which can impact the abundance and species composition of fauna. Coral reefs in the area could potentially be impacted by:

- organic deposition, which can smother the reefs
- increased nutrient concentrations, which can lead to regime shift where macroalgae have a competitive advantage over the corals and eventually overgrow and outcompete them

For this project, we utilised our numerical models and our strong understanding of the drivers of oceanographic and benthic processes in the region to conduct the EIA. Using an integrated modelling approach, we coupled physical modelling with biogeochemical numerical modelling of the proposed scenarios. This included developing hydrodynamic, deposition, ecological and habitat models. We utilised the extensive field data collected by BMT Oceanica to describe baseline conditions. This data also provided the required input data for our models.

We then assessed the potential impact from major pressures (nutrients and organic debris) on the most important marine ecological components (including fauna and corals) in Cone Bay. Next, we ran a number of different scenarios with varying production volume feed conversion rates, stocking densities, and positions of production cages. Our package of numerical models gave a quantitative and spatially precise output that was able to predict the severity and extent of the environmental impacts.

HELPING DOF GAIN ENVIRONMENTAL APPROVAL

Cone Bay is dominated by tidal flushing with a tidal range of 9-14 meter. Every 12 hours – at the peak of the flood tide – an eddy is created that vacuum cleans the seabed and sucks out all the pollutants. This includes pollutants from the production zone such as organic debris, fish excretions and feed residuals. Based on this information and the output of our models, we concluded that there would be no expected negative environmental impacts – even with a maximum production of 20,000 tons per year.

Our study confirmed that:

- the site selected by the DoF is suitable for the planned aquaculture development
- the proposed aquaculture zones will have minimal impacts on the surrounding ecosystem

This information will be crucial for the DoF in obtaining environmental approval for their new aquaculture development.

SUPPORTING YOUR AQUACULTURE DEVELOPMENTS

We met this challenge the same way we do for all of our projects: using our cutting edge system of numerical models and the unparalleled expertise of our scientists and engineers. Utilising our accumulated knowledge, we have developed a first-rate system of numerical models able to solve complex oceanographic and benthic processes. The models are supported by our highly skilled project teams and support systems.

We have the aquaculture development experience needed to support you: from [site selection](#) to [planning and optimising farms](#) to operations and maintenance.

Contact: info@dhigroup.com

For more information visit: www.dhigroup.com