

Case Study – Invergordon PAM Mitigation

Background: Compliance – Real-time mitigation – Cromarty Firth – Queens Dock extension

Client: Cromarty Firth Port Authority, United Kingdom

Context: SMRU Consulting Europe, in partnership with SA Instrumentation Ltd provided underwater noise and marine mammal monitoring and mitigation at the site of the Queens Dock expansion, near Invergordon, Scotland.

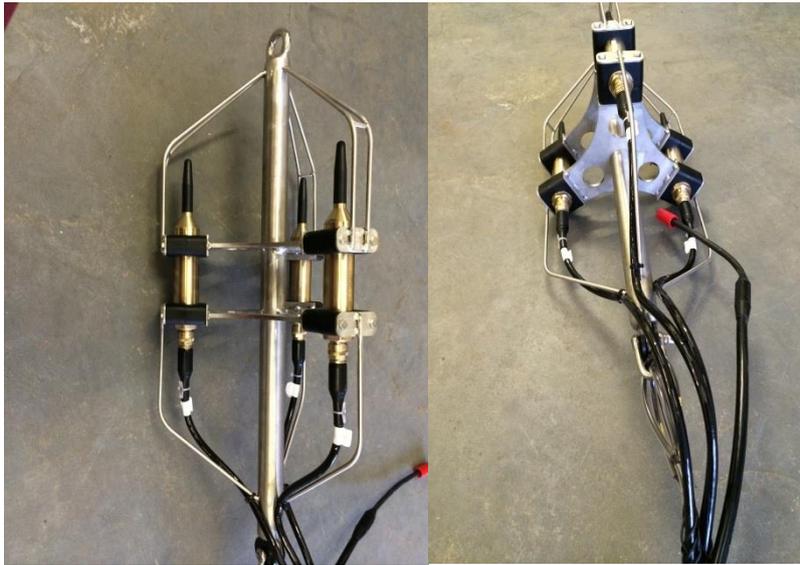
The purpose of this project was to provide the client with real-time Passive Acoustic Monitoring (PAM) mitigation for harbour porpoises and bottlenose dolphins. Specifically, the regulator determined the requirement for monitoring of underwater noise levels and the presence of cetaceans whilst construction activities were underway (due to the protected state of the cetacean populations in the region). Standard visual MMO mitigation was considered challenging in this area due to the proposed 24/7 operations, autumn/winter daylight conditions at high latitudes and limited weather windows (i.e. sea state, fog, rain/snow, etc.). Therefore, here the combination of visual and acoustic methods was critical to the marine works being completed efficiently. The importance of reliable, proven PAM systems here was greater than in other locations and situations.



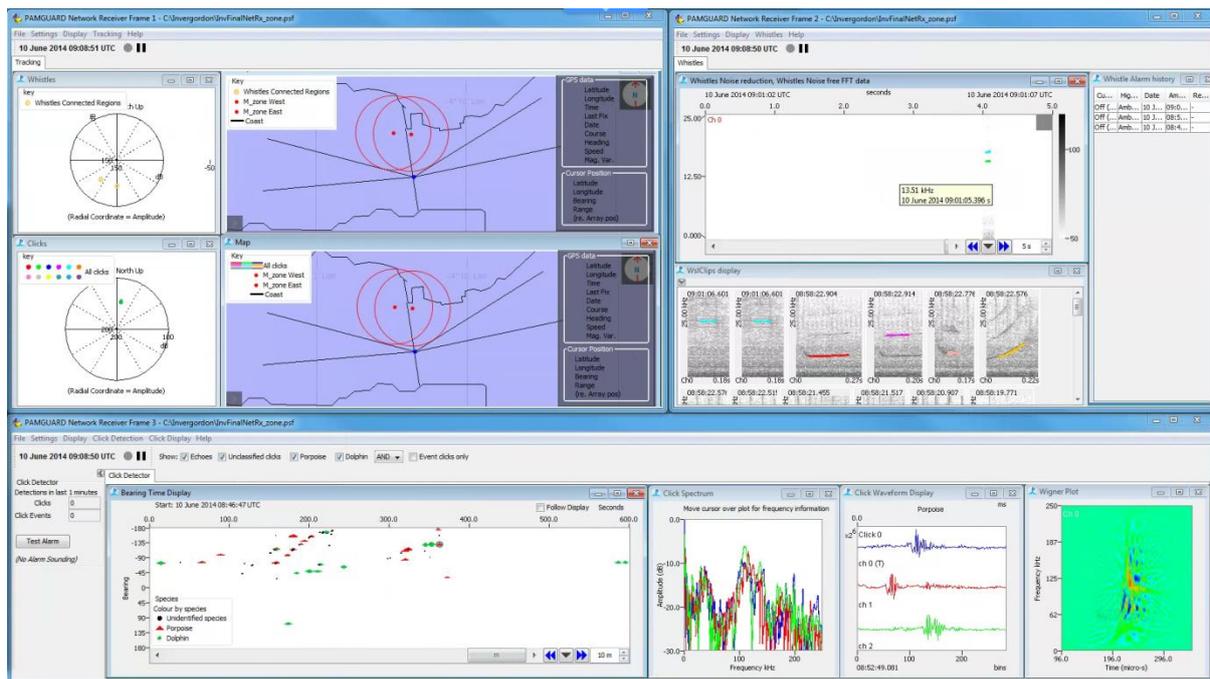
A single buoyed PAM unit (with Decimus installed) was deployed on the site with a 3-hydrophone array suspended in mid-water column. The unit detected cetaceans (bottlenose dolphins and harbour porpoises) in real-time on the system deployed 1 km offshore. The 3-hydrophone array deployed beneath the buoy (fitted with a specialised custom digital compass) provided bearings to the vocalising animals to allow mitigation operators – based on shore – to determine where the animals were and ensure animals were not harmed. The PAM system had integrated alarm triggers to notify the PAM operator of the presence of vocalising animals. In addition the PAM unit measured underwater noise levels and streamed those to land, providing confidence that the marine works were within regulatory limits. All the data were also stored on land and online for later audit and quality control.

The PAM unit with Decimus® installed deployed on the site at Invergordon. The 3-hydrophone array was hanging freely suspended below the buoy in the middle of the water column. Water depth at site was 18 m.

Solution: SMRU Consulting and SA Instrumentation delivered a comprehensive training package to mitigation operators. This taught the on-site team about marine mammal acoustics and how it related to the mitigation effort. It also covered how to use and maintain the buoy (e.g. charging batteries on board), interpret the data and make robust mitigation decisions. This system was a world-first and is a one of a kind. It is the first system to be delivered in a commercial setting delivering a previously unheard of level of mitigation in the United Kingdom. **This system allowed the developer to carry on with their development in the most cost-effective manner possible (by reducing delays whilst providing top-notch environmental protections).**



An example of the Decimus three hydrophone array configuration which allows the directionality of cetacean vocalisations to be determined. Please note: the Invergordon buoy used a freely suspended array with a digital compass which was suspended beneath the buoy.



An example screengrab from the bespoke PAMGuard software installed on the PAM station on land using the information streamed from the 3-hydrophone directional array during bottlenose dolphin detections events. The top left panel shows the bearings to detections and two different levels of mitigation trigger/alarm used.