

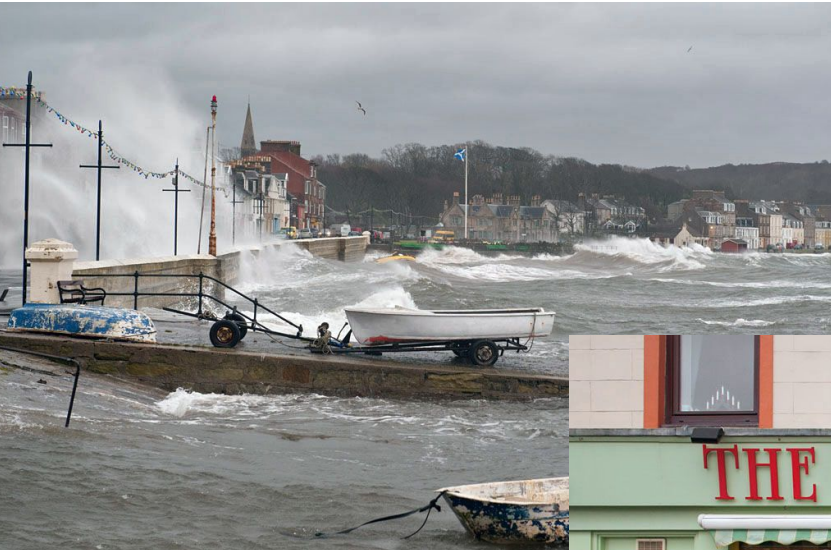
How to protect Stuart Street

What is the hazard?

- During heavy storms waves break over the top of the vertical sea wall along Stuart Street.

What is at risk?

- Wave overtopping is dangerous for people and vehicles, and causes regular flooding of seafront properties, including local businesses.



Legend

1yr Flood Extent

2yr Flood Extent

5yr Flood Extent

10yr Flood Extent

25yr Flood Extent

50yr Flood Extent

100yr Flood Extent

200yr Flood Extent

Flood Wall

Breakwater

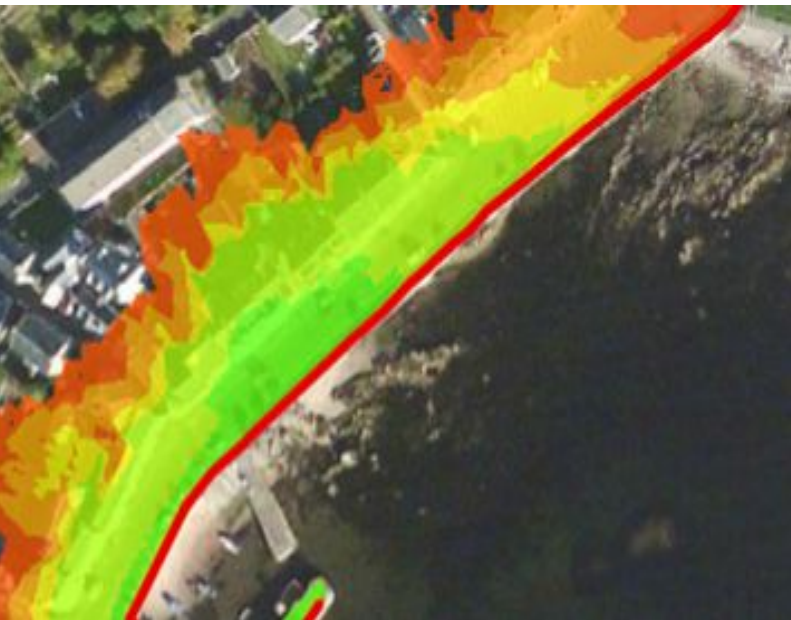
Revetment

Offshore Breakwater

Harbour Breakwater

We have assessed four different potential flood mitigation solutions that could provide protection against flooding to the Stuart Street area.

Higher sea wall

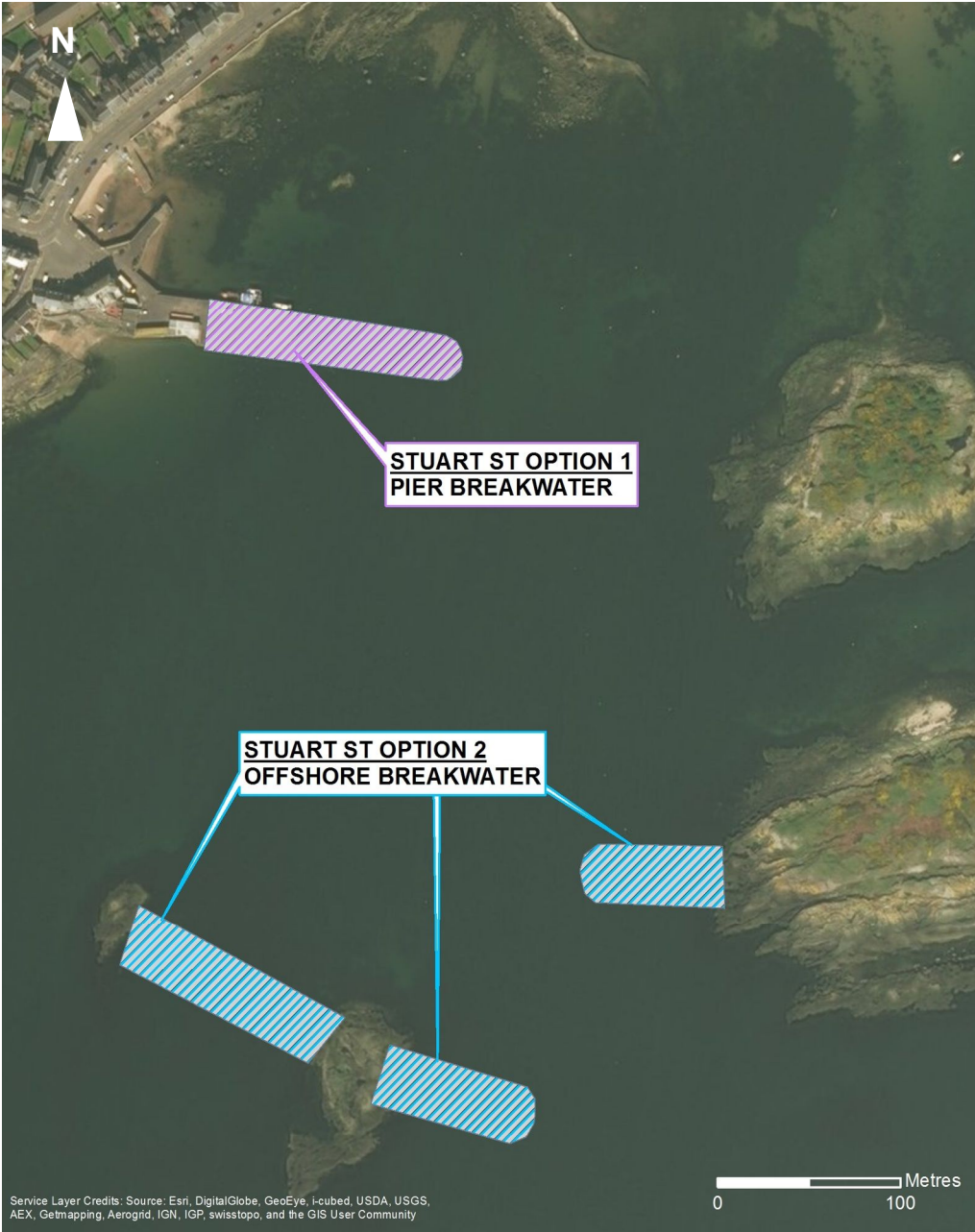
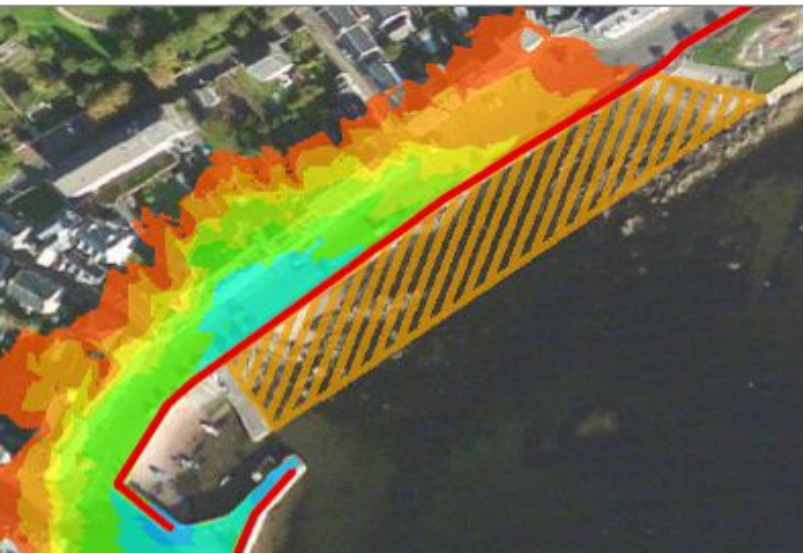


Our modelling shows that if seawalls were raised along Stuart Street the homes and businesses would still be at significant risk of flooding. This option would also affect views out to

sea. This option is not considered further as it does not provide enough protection.

Rock revetment & higher sea wall

If rock armour protection was to be added in front of the sea wall the flood risk reduces. But the height of the sea wall would still need to be increased, and there would continue to be flooding on severe storms. This option is not considered further as it does not provide enough protection.



Extend the pier

Extending Millport Pier using rock armour to create a breakwater will reduce flood risks along Stuart Street. We have modelled the performance of this solution and assessed the expected costs .

Offshore breakwater

Building a breakwater from rock (between the Leug and the Spoig) would reduce the amount of wave energy that could reach the Stuart Street sea wall. We have modelled the performance of this solution and assessed the expected costs. This option does not perform as well as an extension to the pier, and the costs are much higher.

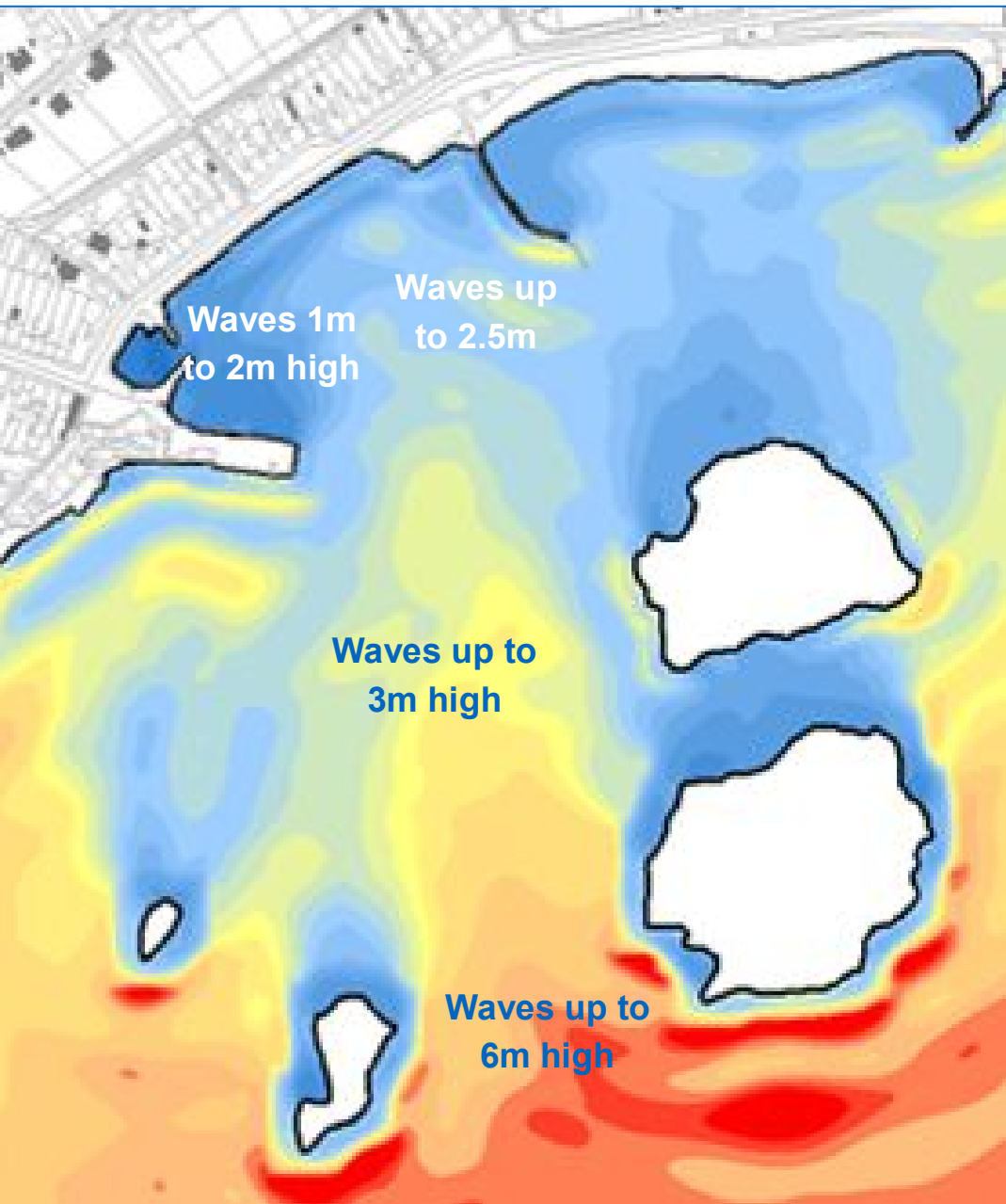
Extending Millport Pier

This solution comprises an extension to the pier constructed from large rocks (rock armour). The existing masonry section of the pier would also be repaired and reinforced with a rock armour toe.

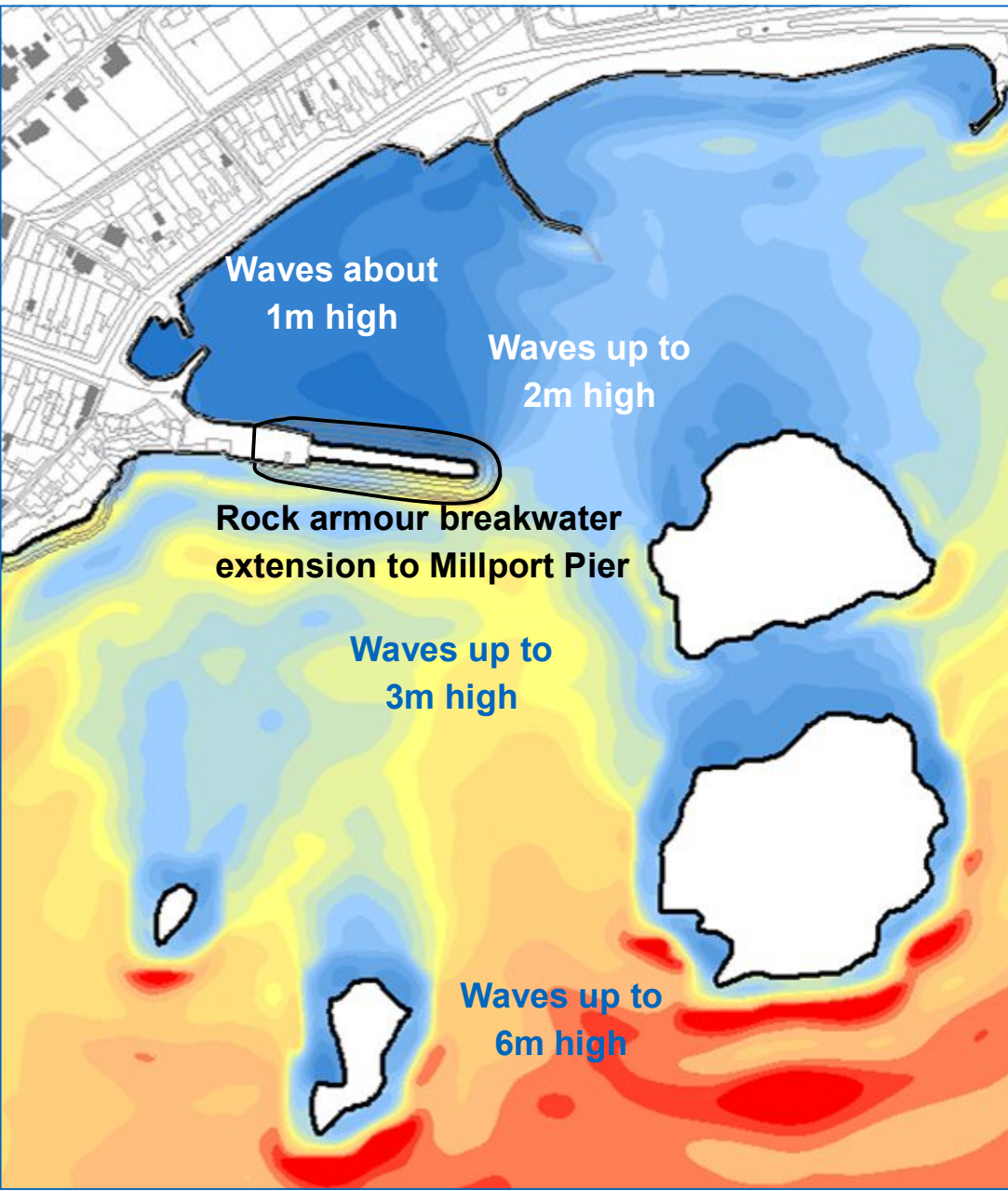
Performance

This solution would reduce wave heights near to the sea wall to about 1m high on the most severe storms. **This would reduce overtopping to a safe level and stop flooding along Stuart Street.** If an extension to Millport pier is decided to be the preferred solution to flooding along Stuart Street then it will be designed so that it does not restrict use of the pier or any future projects for the harbour area.

Wave modelling results for existing conditions
(storms occurring every 200 years on average, 0.5% probability)



Wave modelling results with breakwater extension to pier
(storms occurring every 200 years on average, 0.5% probability)



What are the issues?

- If this solution was to be progressed as a preferred option we will need to:
- Address issues relating to navigation access around the breakwater to confirm its length and alignment.
 - Design the breakwater to maintain access to the pier and to allow its current use to continue.
 - Optimise the shape of the rock armour breakwater in terms of its size and appearance.
 - Confirm a suitable source of rock armour.

This solution would provide flood protection to Stuart Street without needing to raise the sea wall. The structural condition of Millport Pier would be improved. However, access for navigation would be altered and the appearance of the harbour area would change. This solution is achievable within the budget available for the flood protection scheme.

Offshore breakwaters

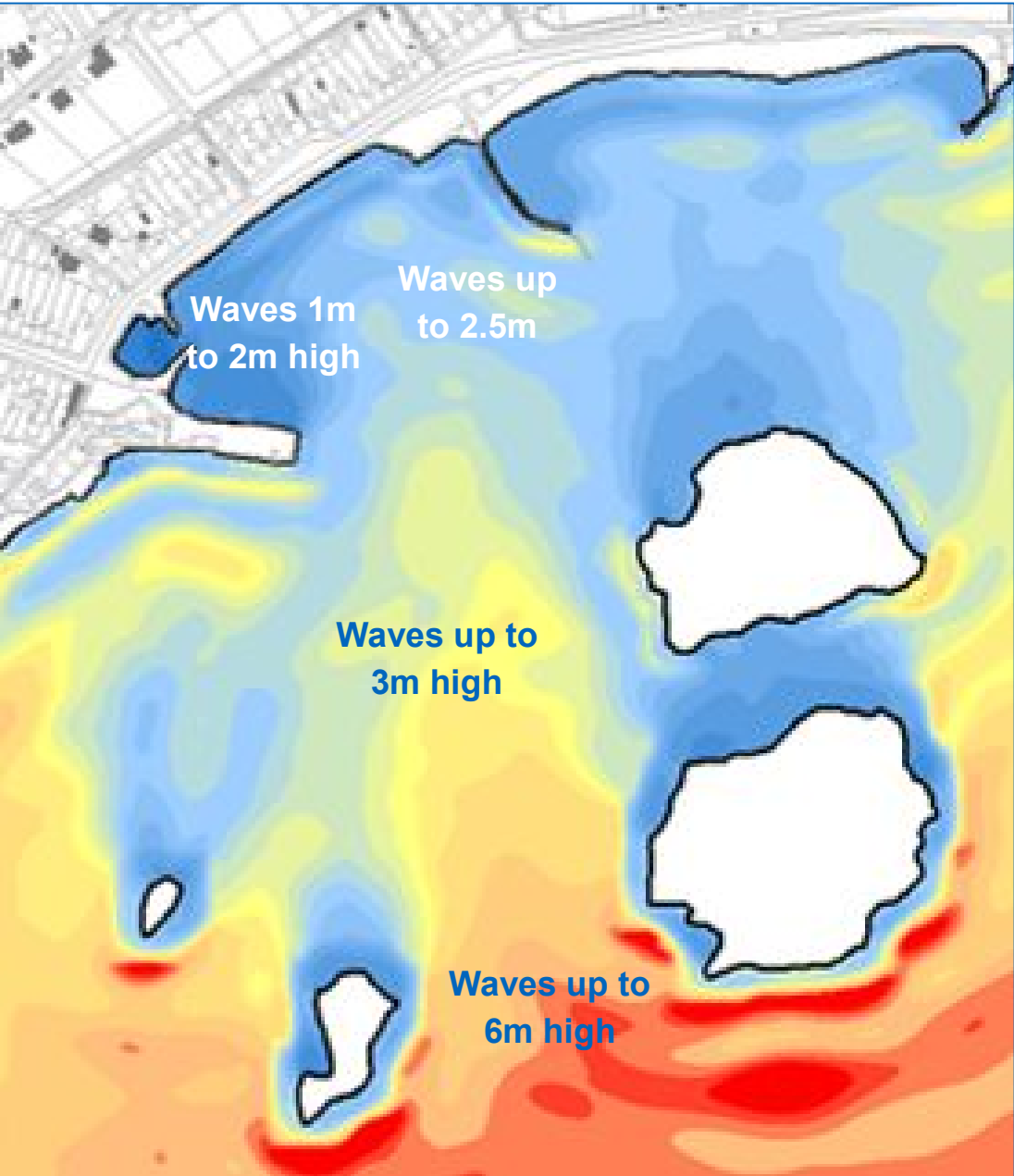
With this solution, a rock armour breakwater would be built between the Leug and the Spoig rock outcrops in Millport Bay. Breakwaters would also extend into the channel between the Leug and the Eileans, whilst maintaining navigation access through this channel.



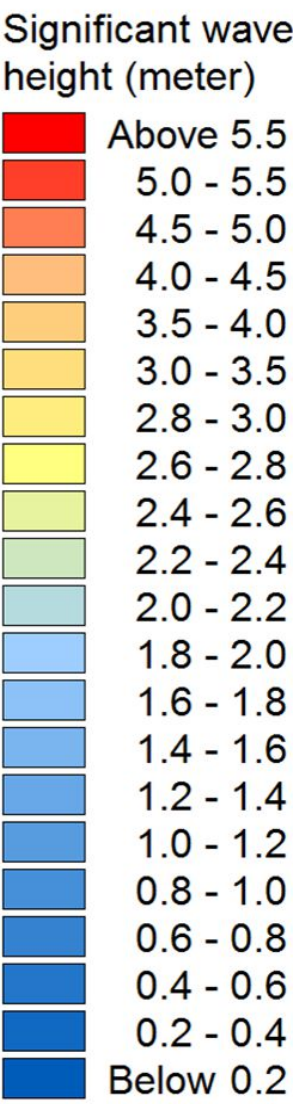
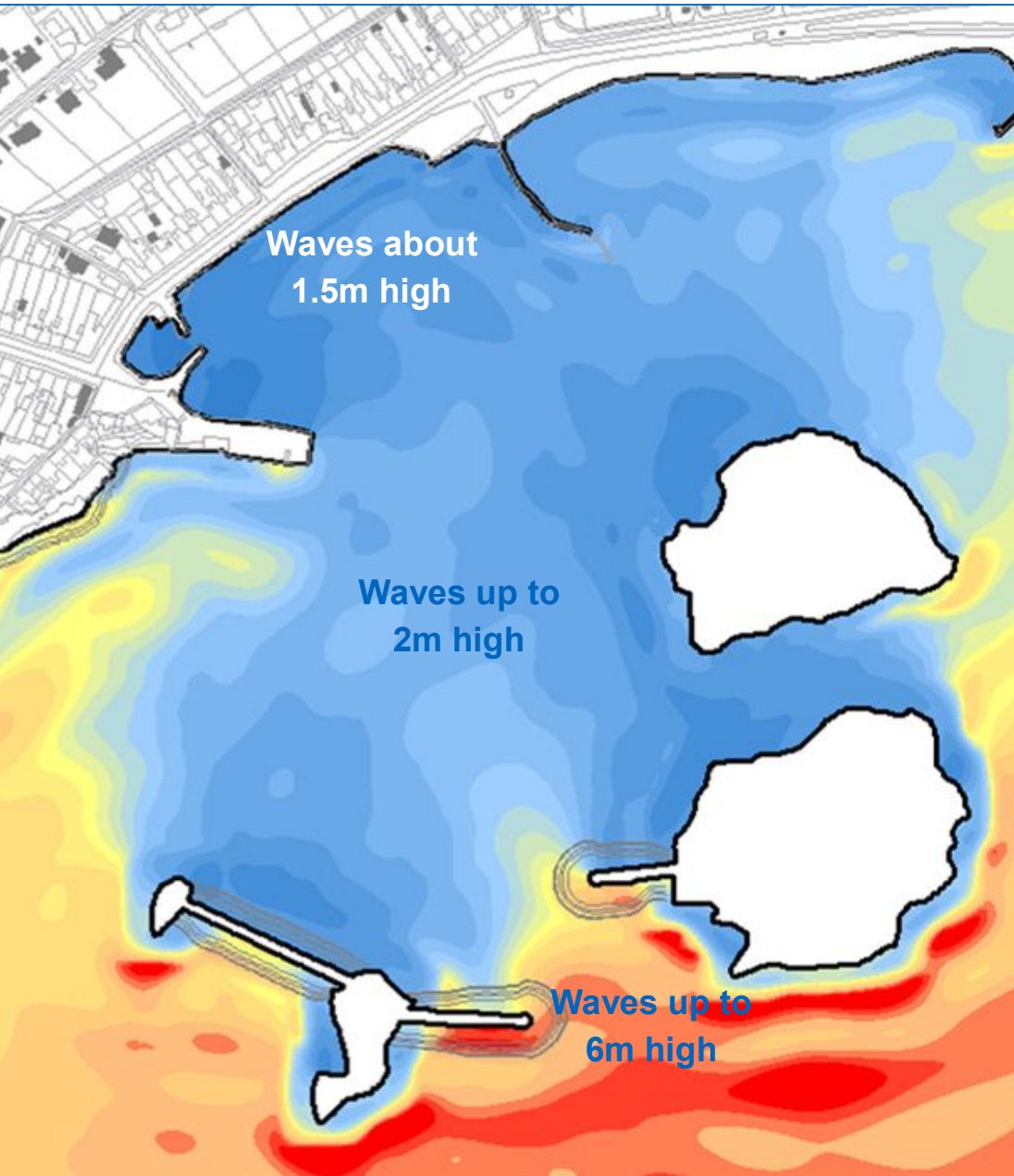
Performance

This option would reduce wave heights at the sea wall to about 1.5m on the most severe storms. There would still be some overtopping and flooding on severe storms unless additional works were undertaken to raise the height of the Stuart Street sea wall.

Wave modelling results for existing conditions
(storms occurring every 200 years on average, 0.5% probability)



Wave modelling results with offshore breakwater
(storms occurring every 200 years on average, 0.5% probability)



What are the issues?

- If this solution was to be progressed as a preferred option we will need to:
- Address issues relating to navigation access through the breakwater to confirm its length and alignment.
 - Review the residual flood risk to Stuart Street and the confirm the height that the wall would need to be raised.
 - Confirm the requirements for repairs to Millport Pier and identify funding for this work, which would not part of the flood protection scheme.
 - Optimise the shape of the rock armour breakwater in terms of its size and appearance.
 - Confirm a suitable source of rock armour.

This solution would not provide a suitable standard of flood protection to Stuart Street without also raising the sea wall. Access for navigation would be altered and the view out into Millport Bay would change. Additional funding would be required for structural improvements to the pier. The cost of this solution is significantly higher than the budget available for the flood protection scheme.