Cyfoeth Naturiol Cymru
Natural Resources Wales

Saltmarsh restoration using sedimentation polders at Rumney Great Wharf, Severn Estuary

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ARUP

University of Reading

Introduction

- **Saltmarsh:**
  - Biodiversity
  - Natural flood defence
  - Blue carbon
  - Human wellbeing / recreation

Climate

On BBC homepage 30/05/2025

UK's muddy saltmarshes vital to tackle climate change, report finds

Saltmarshes are buffer zones between the land and the sea and act as natural flood defences

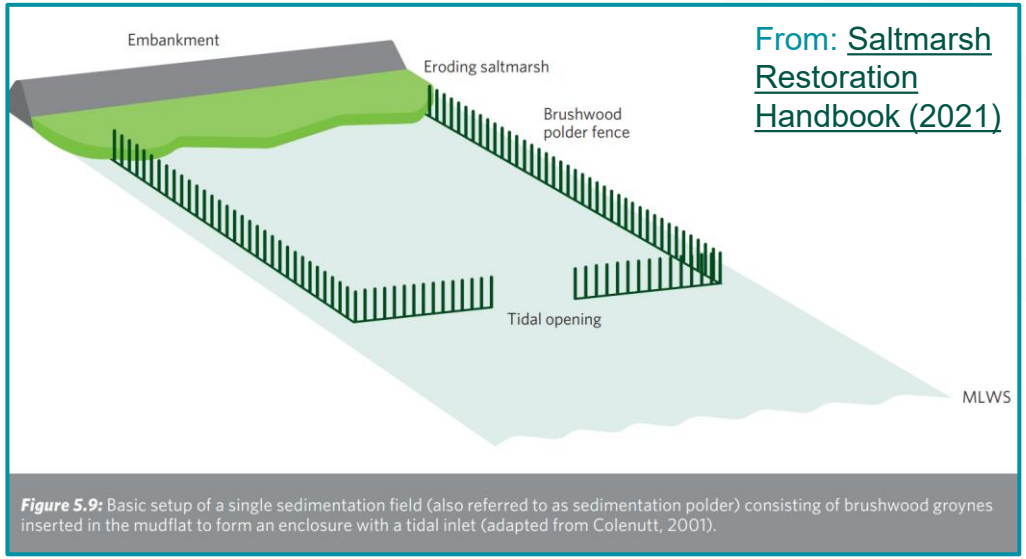
- **Nature Networks Programme:**
  - Funded by Welsh Government
  - Aims to address the nature emergency in Wales through increasing biodiversity, improving the condition of protected sites and enhancing the resilience and connectivity of our habitats and species.
  - Rumney Great Wharf Polders was 1 of 9 marine projects run by NRW 2022-2025.

Introduction to polders / sedimentation fields

Enclosures made of permeable fencing (brushwood) installed in intertidal

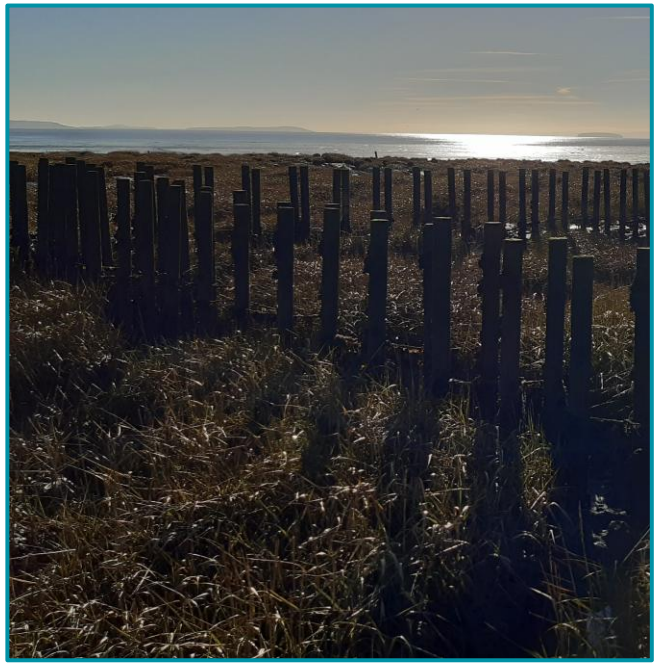
Basic concept is that fencing:

- Slows flow of water (particularly on ebb)
- Reduces wave heights within enclosures
- Promotes accretion



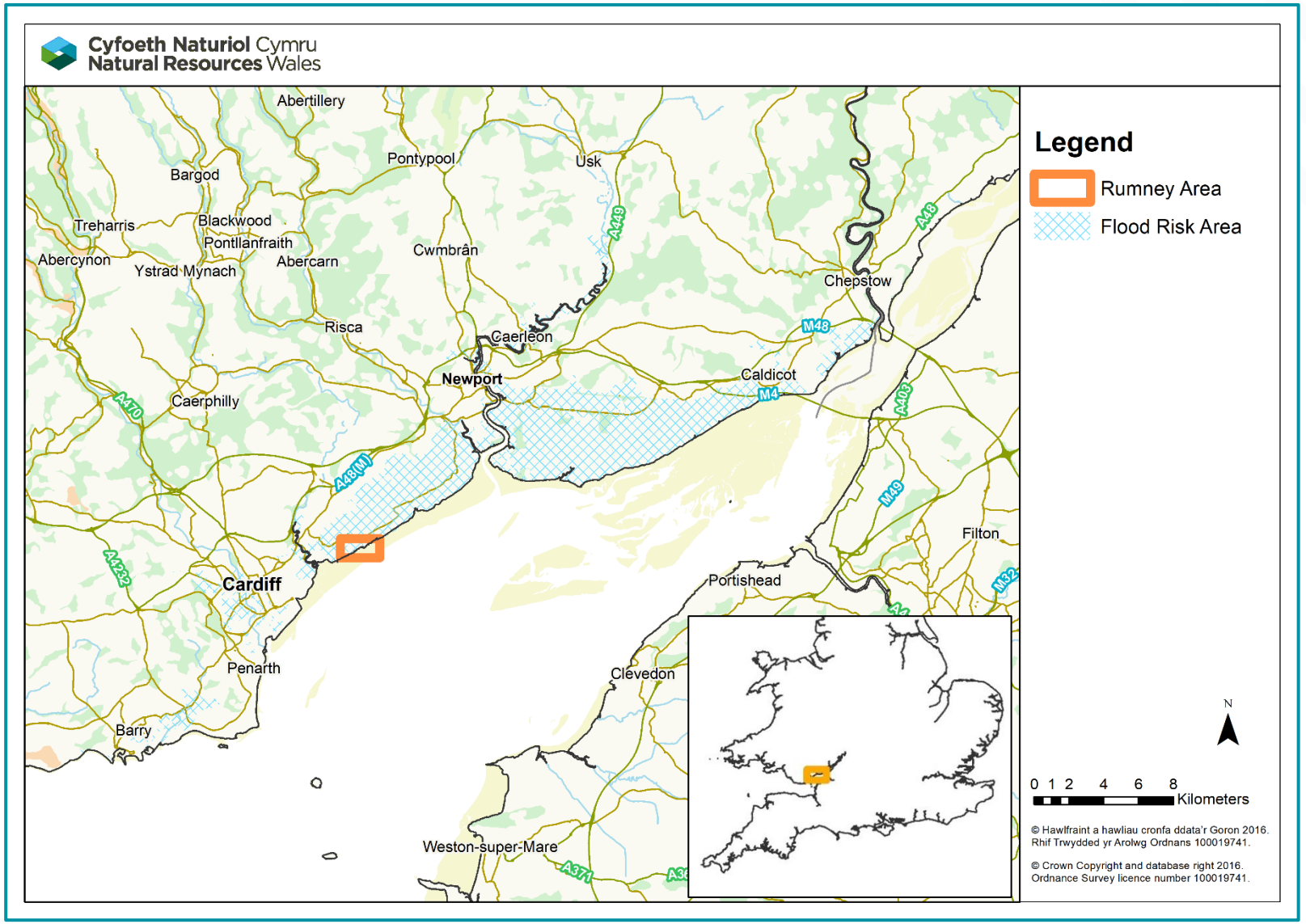
From: Saltmarsh Restoration Handbook (2021)

Figure 5.9: Basic setup of a single sedimentation field (also referred to as sedimentation polder) consisting of brushwood groynes inserted in the mudflat to form an enclosure with a tidal inlet (adapted from Colenutt, 2001).

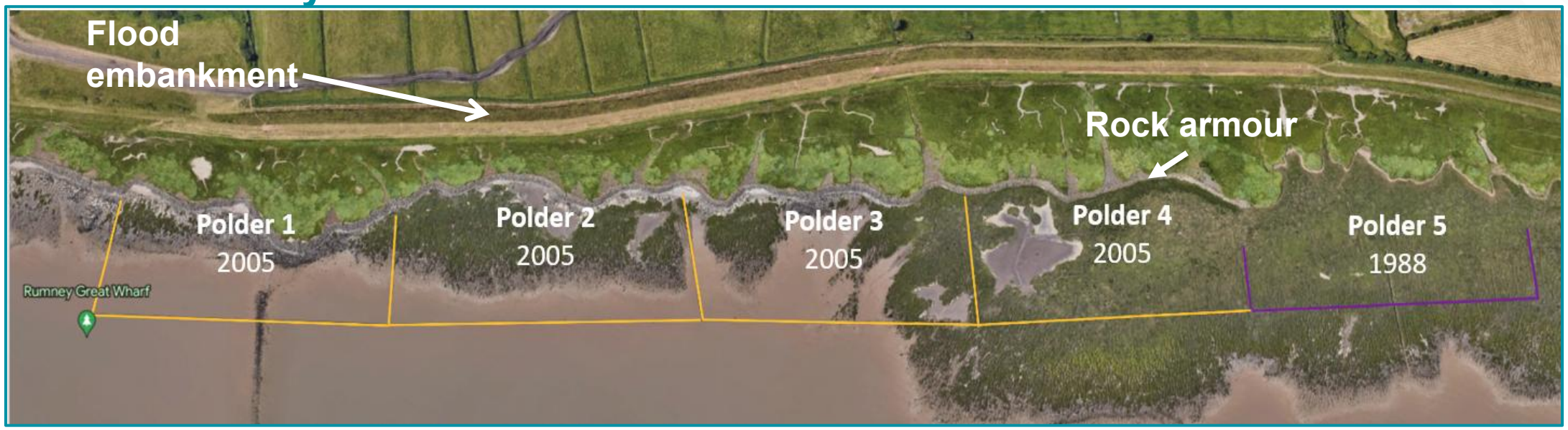


Project site: Rumney Great Wharf

- **Severn Estuary ecologically important**
  - Lots of designations (SAC, SPA, SSSI, Ramsar)
- **Centuries of human intervention**
  - WFD heavily modified waterbody
- **Mega-tidal (~12m range)**
- **Limited swell exposure**
- **40km local fetch from SSW**
- **Long term erosive trend**
- **Significant flood risk - Gwent Levels**
- **Shoreline Management Plan policy- hold the line**
- **Previous polder installation at site**

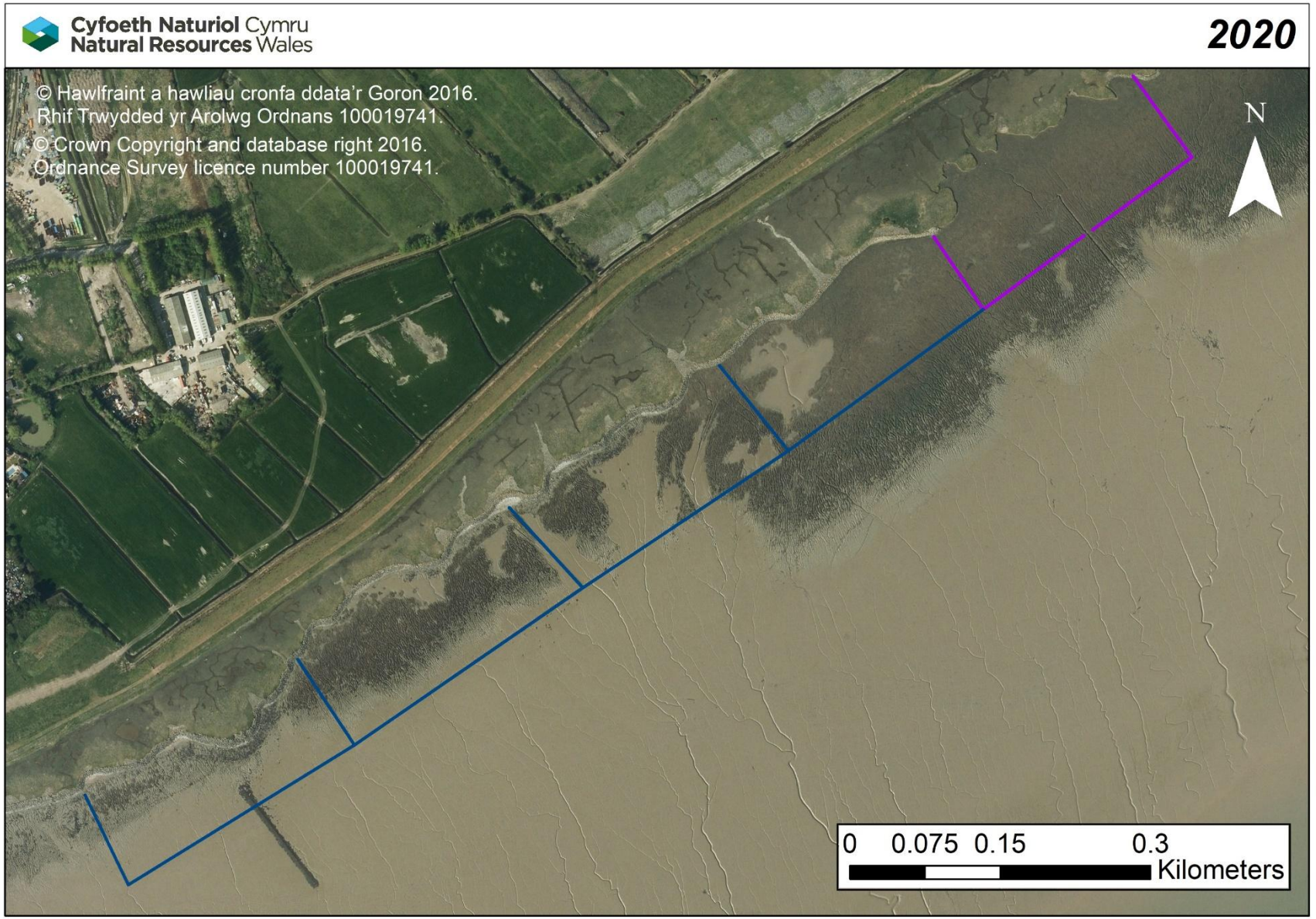


Polders at Rumney Great Wharf



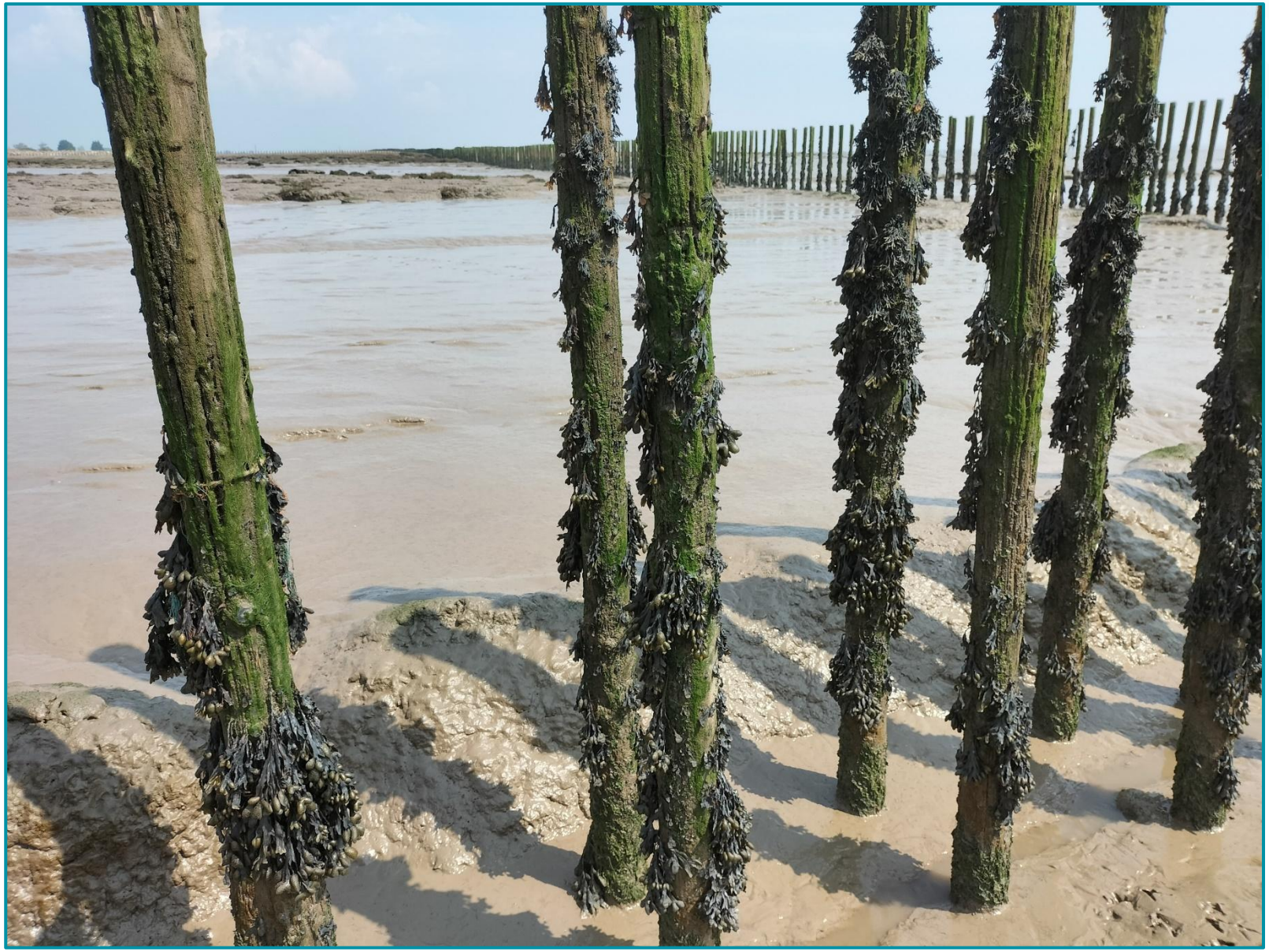
- The oldest polder was constructed in 1988 by the Welsh Water Authority
- In 2005, the fencing was extended >1km across the frontage, constructing 4 more polders
- Rock armouring protecting upper 'wharf'

Saltmarsh development from aerial photography



Polders at Rumney Great Wharf

- No monitoring or maintenance plan in 1988 or 2005 (some repairs in 2010)
- Brushwood bundles disappeared
- Scour around fencing posts



ABPMer feasibility study

(NRW evidence report 528, 2021, available from Natural Resources Wales / Marine and coastal evidence reports)

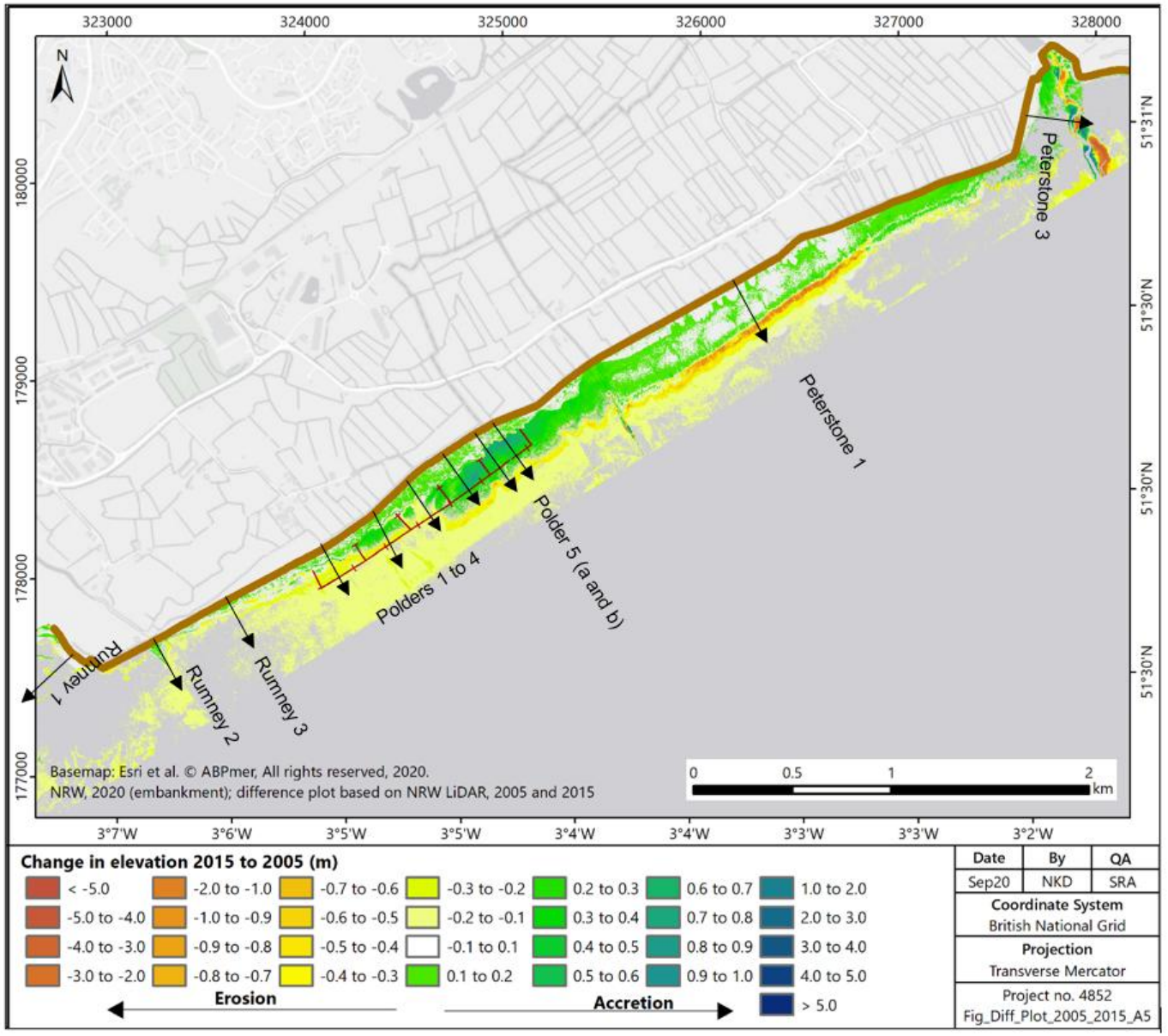
Assessed change up to 2021 and considered options for further protection

Polder area = **150 m^3 ha^{-1} yr^{-1} gained** on average, but…wider study area =

Average net **loss of 44 m^3 ha^{-1} yr^{-1}**

Polders have been successful in trapping sediments and aiding in the retention, and slight expansion, of saltmarsh (mainly from the most easterly polders)

Recommended re-instating existing polders and extending westward



Nature Networks project on polder re-instatement

Four objectives:

1. Protect the frontage of RGW from existing erosive pressures upon mudflat and saltmarsh habitats by promoting sediment deposition in the first instance.
2. Create conditions that will support both mudflat and saltmarsh features to varying extents over time.
3. Have a refined sedimentation polder design
4. Support the flood risk management of the area

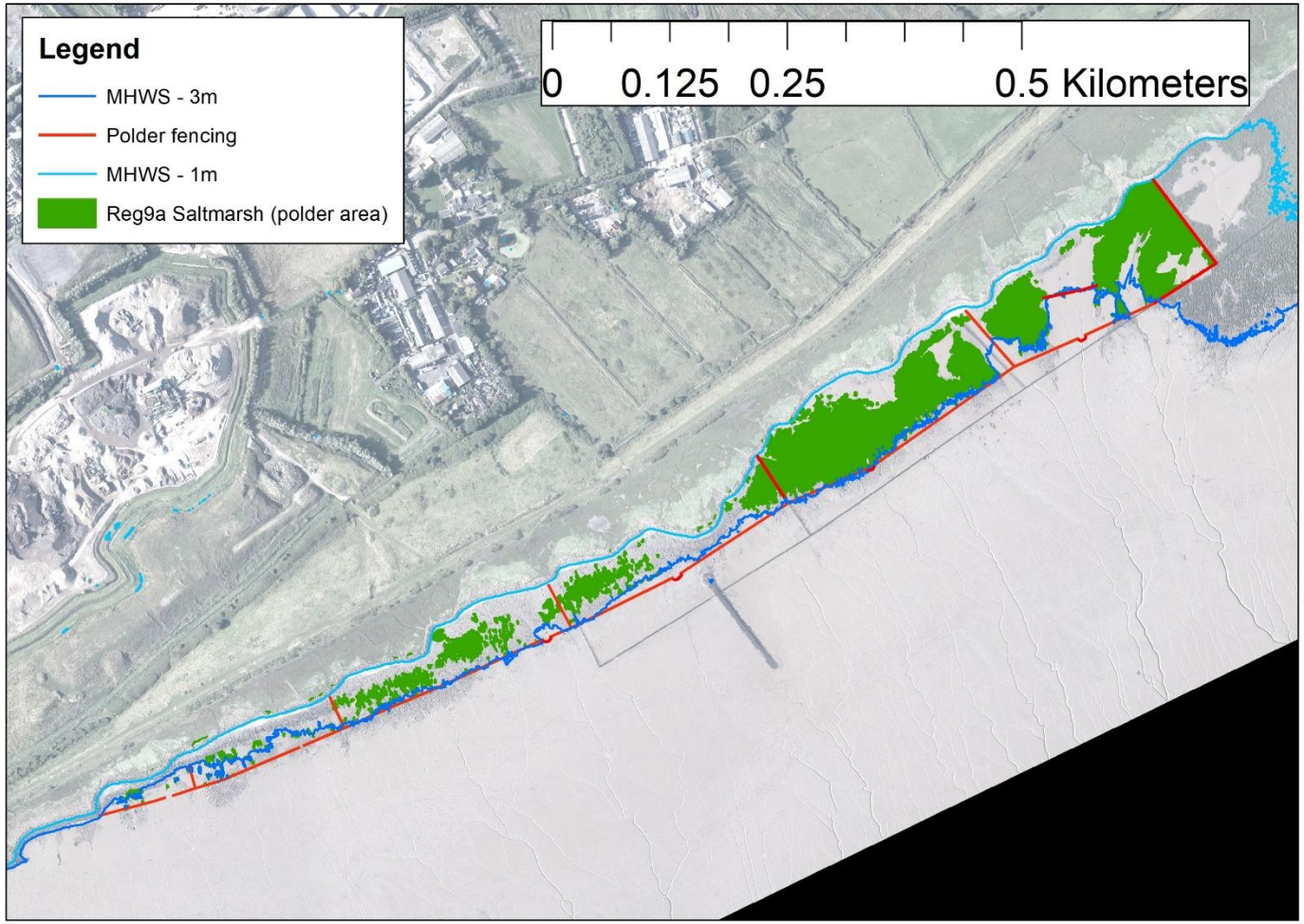
Design Development (supported by ABPMer)

- Learned from other UK and European projects>> tidal range at RGW will be a challenge
- Looked in more detail at why the more easterly polders were more successful than the westerly ones>>related to intertidal gradient – steeper in the west
- Looked at whether tidal currents would support success>> determined to be ok, suggested installation of baffles to slow the flow as the tide leaves the polders through the opening
- Looked at whether the wave climate would support success>> determined that even quite small waves could be sufficient to re-suspend sediments that had settled out – this was a key concern
- Looked at whether there was sufficient sediment available to support accretion>> high suspended sediment in the Severn Estuary – this was not a concern
- Several design options proposed.

Figure 49. Polder alignment options two to five

Final design

- **Balance between height of polders in tidal frame and sufficient restoration area**
- **Consideration given to location of existing salt marsh**
- **Design encloses 8.7ha of intertidal**
  - 3.3ha saltmarsh
  - 5.4ha mudflat
- **To be considered a pilot study and learning experience**



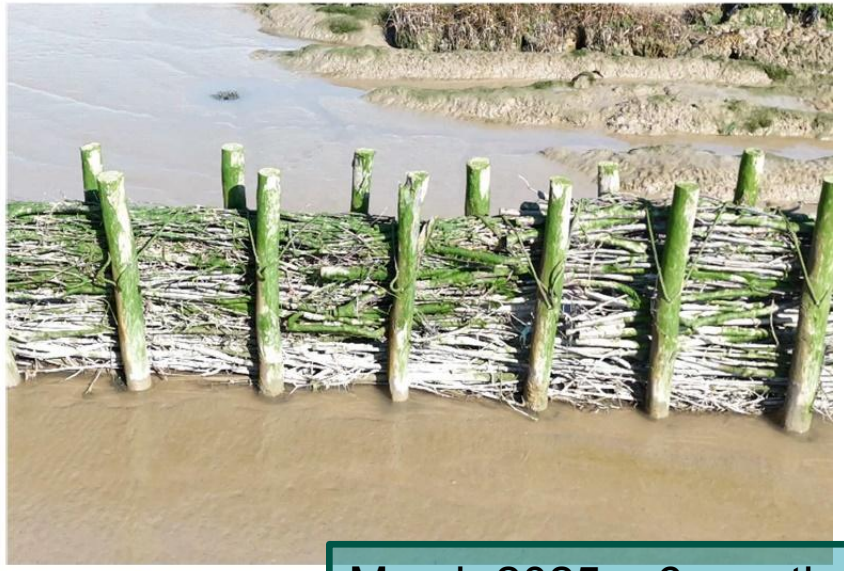
Polders permitting and construction

- **Permissions: Marine Licence Band II, but not Planning Permission (considered under Permitted Development)**
  - Requirement for monitoring as part of conditions (subsequent slide)
- **Habitats Regulations Assessment (multiple designations SAC, SPA, Ramsar): construction and operation**
- **Summer 2024: Restoration of 3 old polders and construction of new polders to the west (10 weeks).**
- **Chestnut fenceposts and willow brushwood**
- **Cost: £707,000 (~£81,000 per Ha protected)**

Construction images

Structural monitoring

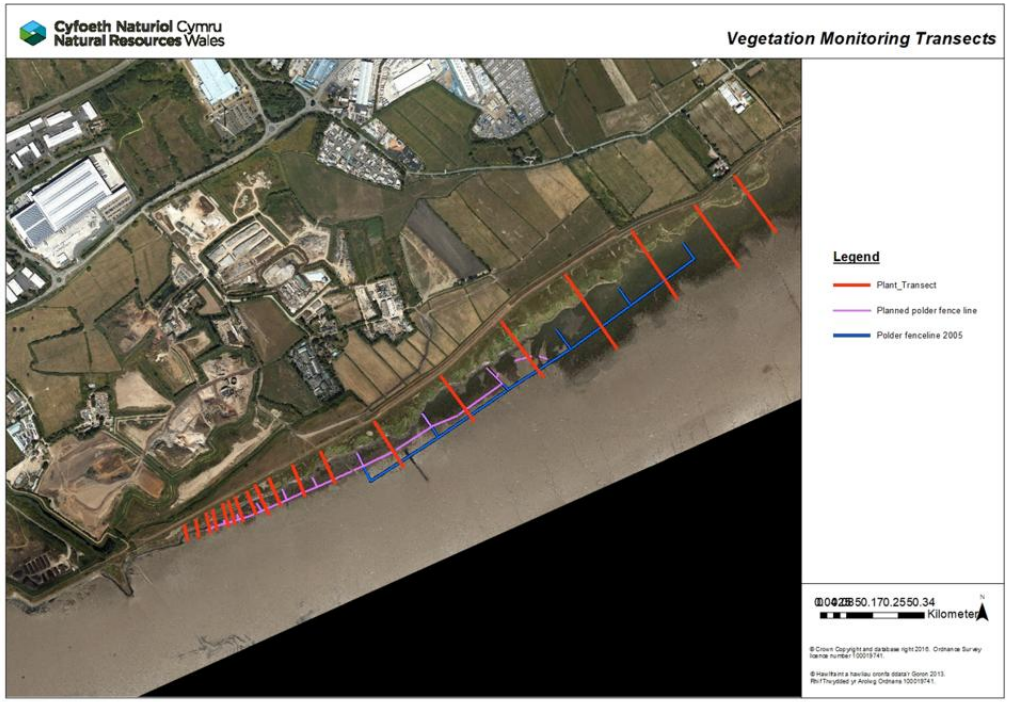
- **Drone based**
  - Health and safety
  - Speed
  - Video record
- **Generally holding up well**
  - Rope loosening
  - Lost brushwood in places
  - Some stakes knocked
- **Maintenance this summer**
  - Minor repairs based on tensioning of rope



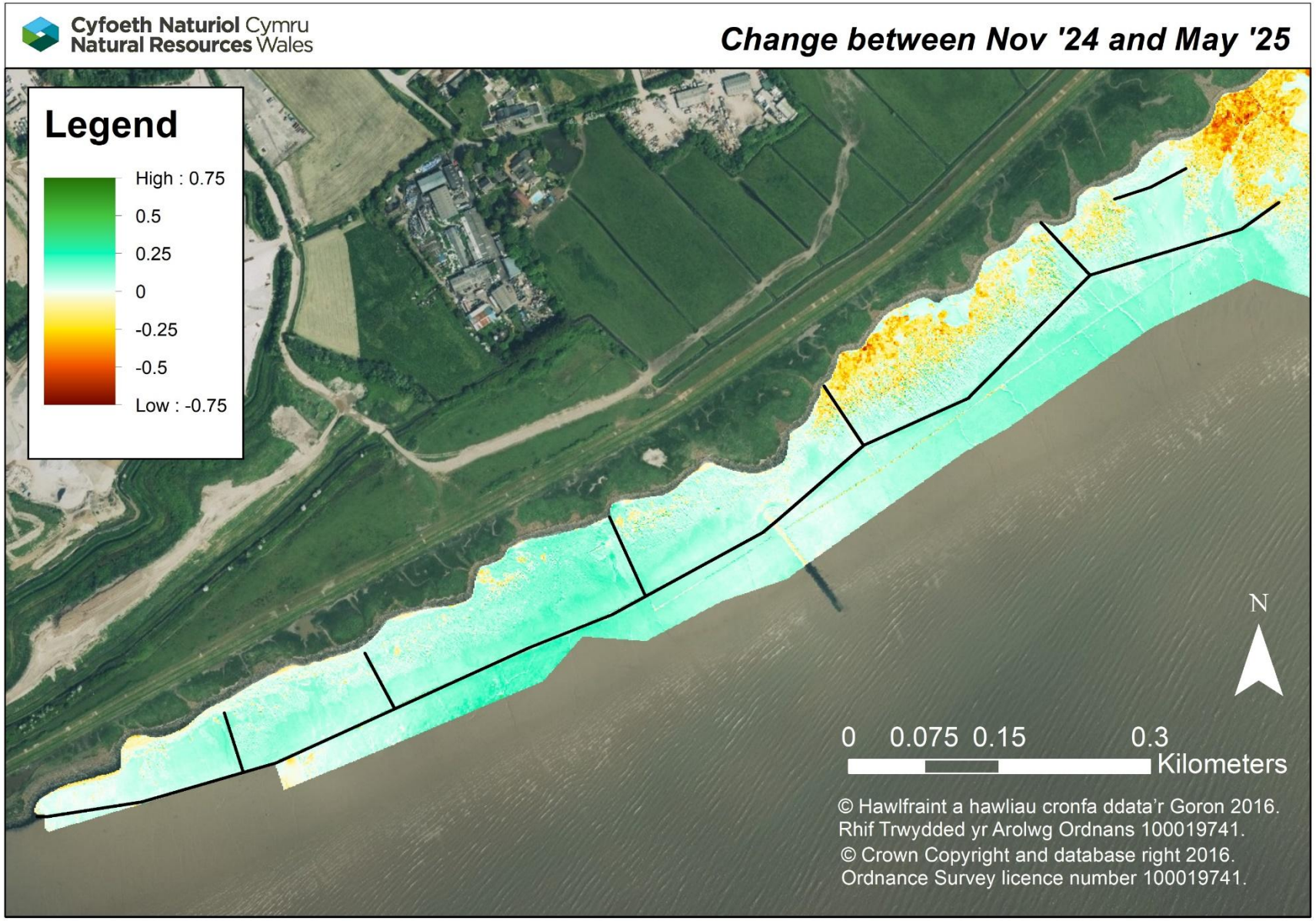
March 2025 ~ 6 months after construction

Marine Licence compliance monitoring

- **Sediment accretion**: Repeated UAV flights which will show sediment increases over time; survey frequency of every two years is proposed as a minimum.
- **Water movement and direction**: sondes and mini-buoys to look at hydrodynamics, sediment availability and depth as part of a baseline understanding of conditions. This will be repeated to understand how hydrodynamics will change as sediment accretion progresses.
- **Changes in extent of saltmarsh and mudflat and sandflat features**: Baseline using recent (2017) NVC saltmarsh survey for extent of saltmarsh communities. Further extent surveys using UAV will likely take place in year 3 as not anticipated that the saltmarsh will develop within a smaller timeframe.
- **Changes in saltmarsh communities:** Monitoring sites using transects were established in 2023 across the polders footprint. Using some or all of these transects (depending on changes in sediment accretion), repeat vegetation monitoring will take place in 2026
- **Changes in mudflat habitats:** Baseline mudflat communities survey in 2024. Further surveys to look changes in mudflat habitat quality planned for 2026



Elevation change – derived from drone measured topography



Conclusions

- **High tidal range and wave conditions complicated design process**
- **Promotion of one habitat over another raised Habitat Regulations Assessment (HRA) questions**
- **Monitoring and maintenance important (and stipulated as Marine Licence conditions)**
- **Feasible to construct polder scheme at comparable cost to other habitat restoration (<£100k per Ha)**
- **Construction largely successful, two main lessons:**
  - Ropes loosened after initial install so needed re-tensioning
  - Brushwood compacted more than expected – design height not always reached
- **No major damage after winter**
- **Evidence of accretion**
- **Ongoing monitoring will establish success of scheme – initial signs promising**

Thank you for listening

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