Insights from installing a full-scale NID scour pad at an operational offshore wind farm

4th November 2026

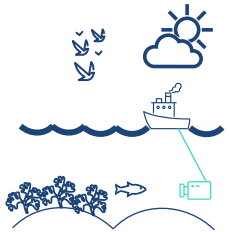
Helen Elphick

Technical Innovation Partner – Biodiversity and Sustainability

Biodiversity positivity offshore requires action across three key focus areas, aligned with our biodiversity policy



Monitoring & data transparency



Improving how we measure nature by using **new technologies** and sharing data in **collaborations**

Negative impact reduction



Applying the mitigation hierarchy **minimises harm** to biodiversity, giving priority to avoidance.

Positive contributions



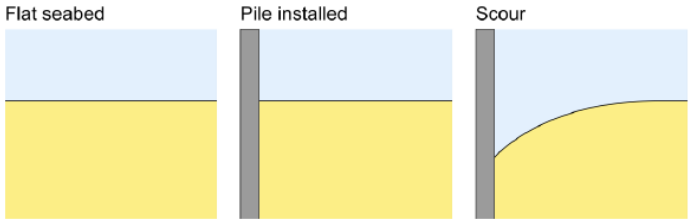
Positive contribution measures for restoration to enable **no net loss** and **biodiversity gains.**

RWE believes that **Nature inclusive scour protection** solutions could be one of the **most cost-effective opportunities** to help achieve our biodiversity goals, because they **replace infrastructure we already need**.
Validating the **engineering and ecological performance** of these new technologies is a strategic priority for us.

The Reef Enhancement for Scour Protection (RESP) pilot directly compares standard and nature-inclusive scour protections.

Strategy A: Free Scour Development

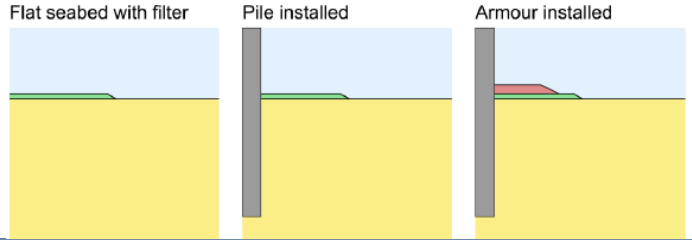
Increase pile length to account for free scour development





Strategy B: Immediate scour protection

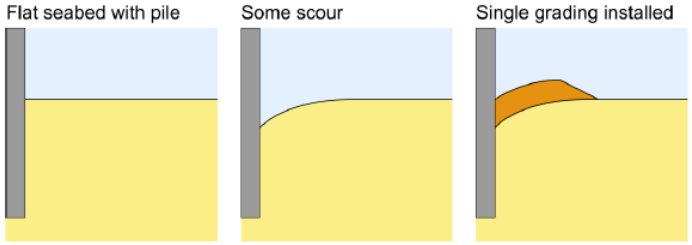
Filter and armour layers of rock or NID materials installed during construction





Strategy C: Monitor and React

Delayed installation of a single layer of rock or NID scour protection, if needed.





Handbook of scour and cable protection methods | Deltares
Cooling Prize Paper: Rock-scour protection of offshore foundations subjected to earthquake-induced liquefaction | Ground Engineering

RESP addresses knowledge gaps across four key themes to move Nature-Inclusive technologies towards commercial readiness



Designing for stability



Optimising Manufacturing



Installation vessel compatibility

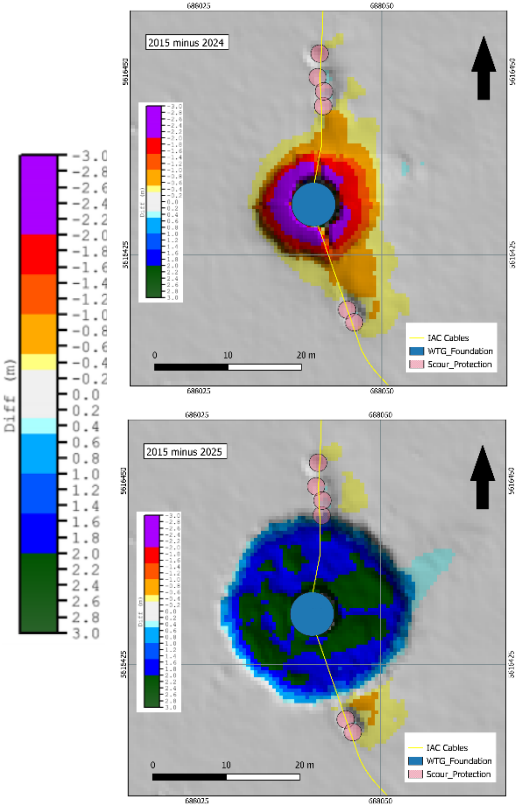


Validating ecological performance

ARC marine® RWE Rampion Offshore Wind UKRI Innovate UK

Technical performance and deliverability: Designing for Stability







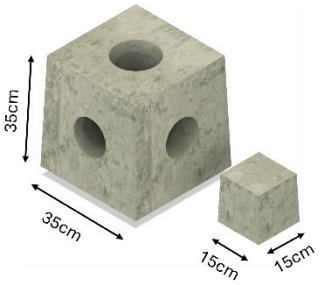
- RESP uses a **combined filter and armour mix** of three small cubes for each large cube.
- During testing, the design performed similarly to a standard rock scour pad in simulated **1-in-50-year storm conditions**.
- **Bathymetric monitoring** found that there was **virtually no change to bathymetry** at the RESP turbine last winter despite **six named storms** happening.

Technical performance and deliverability: Manufacturing

- RESP uses 75,000 low carbon RESP reef cubes of **two sizes to improve seabed stability**.
- The cubes were manufactured by ARC marine in Cornwall, UK. **Full QA/QC procedures** implemented including drop testing and inspections.
- New designs and tools have been identified that can **accelerate future manufacturing processes**, and **cost efficiencies from co-locating** ports and scour protection material manufacturing could be significant.

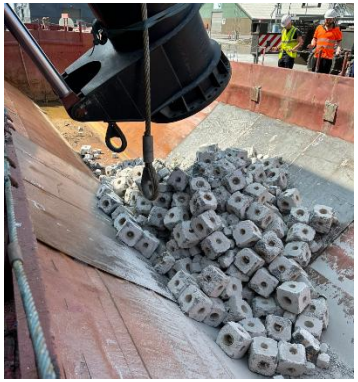








Technical performance and deliverability: Installation







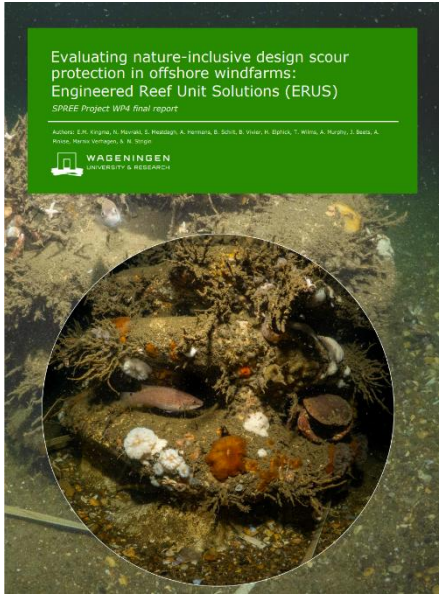


- A key objective for RESP was to confirm that **Reef cubes can be installed via a standard fall pipe vessel.**
- A batch of cubes was run through the vessel's mechanism in June 2025 to identify risks and make **adjustments to prevent fall-pipe blockages**.
- This preparatory work enabled the scour pad to be installed on time, budget and with no incidents in October 2025.
- Future optimisations have been identified to support future scaling-up.

Ecological performance: Design and planning

- **NID scour protection is designed to enhance ecological functions** for different taxonomic groups in different ways. Key benefits come from higher surface area, armour layer porosity, surface roughness and complexity.
- **Long-term, adaptive ecological monitoring** is required to evaluate impacts and validate ecological performance of all NID technologies.
- **Establishing clear and testable ecological objectives at the start** is critical – PAS 1401 was developed to help with this, but finalising the monitoring design for RESP has still been very challenging.





Nature-inclusive-marine-structures-Code-of-practice_PAS_1401.pdf
Evaluating nature-inclusive design scour protection in offshore windfarms

Ecological performance: Monitoring Plan

We are monitoring how species and habitats at the RESP turbine change over time and how they compare to the ecological communities at other turbines with rock scour pads and unprotected turbines.

Years	Locations	Scope / Methods
2024 (baseline)	RESP + six reference turbines	**Full ecological survey:** Photo quadrats, baited video monitoring of fish, water and sediment samples for eDNA and physical parameters, plus macrofaunal grabs. Samples taken on scour pad (where possible) and at increasing distances away. **Data analysis:** Species richness, abundance and species / habitats of commercial and conservation importance at RESP turbine and controls.
2026 (Y1) 2028 (Y3) 2030 (Y5)	RESP + six reference turbines	



Image credit: ARC marine

We will publish our results after each post-installation survey to show how the ecological communities associated with the RESP scour pad are developing, and how they compare to traditional rock-protected and unprotected foundations. **First ecological report expected Summer 2027.**

Ecological performance: Early Insights

- Full results will from Year 1 monitoring be published mid-2027 but initial analysis of the video data looks very promising!

Videos collected in Summer 2026 show Reef cubes® providing a habitat for crabs, lobsters and several fish species, as well as Reef cubes® encrusted with juvenile blue mussels and bryozoans.

Full analysis and comparison to neighbouring rock-protected and unprotected turbine foundations is underway and updates will be published on the project website in due course.

https://www.rwe.com/en/research-and-development/wind-power/reef-enhancement-for-scour-protection/.





As Nature-Inclusive Scour Protection solutions mature, we start to understand their implications for project costs and risks

1. We now have direct experience of how to **adapt standard scour protection design and installation methods** to work with NID technologies.
2. Industry experience with a range of suppliers is growing, but **inconsistent appetite and regulatory conditions within and across markets** are holding back deployment at scale.
3. There are **significant opportunities to further reduce risks and improve commercial viability,** e.g. manufacturing at scale, reduced volumes due to better interlocking and co-location with installation services.
4. **Long-term monitoring is essential** to validate technical and ecological performance. Initial signs from RESP and other pilots are positive, but it is too early to draw firm conclusions.

Thank You

Any Questions?

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