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Site Characterization Soil in the Doordewind Wind Farm Zone for Offshore Wind Development

Expert Support Soil Characterisation

Annex 5

Scope of Work

Colophon

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Author	M. Vrolijk, J. Dekker
Reviewed	P-P. Lebbink
Approved	M. Brijder

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Introduction

1.1 Scope document

This document details the Scope of Work (SoW) for soil expert support services within the Doordewind (DDW) Wind Farm Zone that will be investigated for the development of Offshore Wind.

1.2 Background

The Ministry of Economic Affairs and Climate policy is responsible for the legislative framework for the development of offshore wind farms in the Netherlands. Within this framework (a) (concession) tender(s) for construction and operation of (a) wind farm(s) will be organised. As part of the tender documentation, the participants will receive an information package in which detailed information on the offshore site is included. Detailed information about soil and wind & water conditions at the site will be part of this information package. The Contracting Authority for this assignment is the Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland - RVO), sometimes also referred to as Contracting Authority.

1.3 Objective

RVO has been requested to prepare and collect all site data required for commercial developers to prepare a competitive bid. In order to achieve the highest results from the site characterisation, RVO intends to contract high quality experts who can support RVO in managing the site characterisation. The objective of this tender is to conclude an agreement with Contractors who can support RVO on the different site characterisations regarding contracting, quality control and operational support.

RVO is looking for an expert support Contractor who can support RVO with managing the site characterisations and the interfaces between the site characterisations. RVO is specifically looking for expertise in the field of soil characterisation.

1.4 Site Description

Within the Dutch Shelf of the North Sea several areas have been selected for the development of offshore wind. Within the selected areas possibilities for Wind Farm Sites are investigated.

Expert support services shall be performed related to the DDW WFZ. A potential additional scope is included in the event Quality Export Support is required beyond the scope of the base scope or in the event the DDW WFZ boundaries will be extended to allow 6 GW of offshore wind.

The expert services will consider the full characterization of the listed area. The Final content can be adjusted during the course of the execution of the WORK to the needs and priorities as set by the Contracting Authority.

Section below will provide some information about the DDW WFZ.

Doordewind Wind Farm Zone (DDW WFZ)

DDW WFZ is located to the North-East border of the Dutch shelf of the North Sea. The site is located North of the Ten noorden van de Waddeneilanden Wind Farm Zone (Figure 1). It is expected that this site can accommodate a minimum of 4 GW of offshore wind. The WFZ boundaries are subject to change and the borders can extend such that the WFZ can

accommodate up to 6 GW. At the moment the exact location and amount of Wind Farm Sites within DDW Wind Farm Zone is currently unknown. Figure 1 below presents the location DDW WFZ.

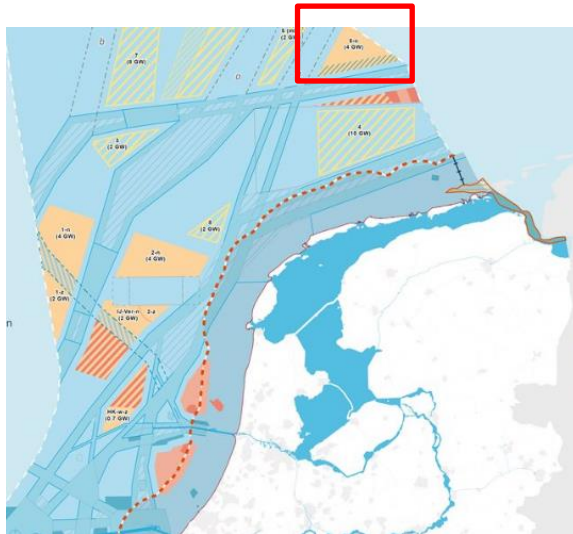


Figure 1: Location Doordewind Wind Farm Zone

The Expert support WORKS are to be conducted, to the site described above. The content of the WORKS and the required expertise is prescribed in more detail in the Scope of Work section.

1.5 Scope of Work

The Contracting Authority intends to conclude the contract with one Contractor, in order to manage the interfaces regarding the studies below adequately.

The scope includes the expert support to the following items*:

- 1) Site characterisation of an area of approximately 4 – 6 GW, expected to be located in DDW WFZ including;
 - 1 Geophysical survey
 - 1 Geotechnical survey
 - 1 Ground model
 - 1 Morphodynamical assessment
- 2) **Optional** (Non-specified) 1000 hours of expert support for works to start site characterization works other than specified in item 1 or in the event the DDW WFZ boundaries will be extended to allow 6 GW of offshore wind. The scope for Expert support can support RVO with:
 - Supporting in Tenders preparations (drafting Scopes of Work) such as GP, GT and/or GM
 - Supporting in Tender assessments such as GP,GT and/or GM
 - Additional hours for extension of the GP,GT or GM scopes due to the Investigation Area increase due to WFZ size increase.
 - Support and/or advice in project transcending subjects

*works can be shifted between sites and scopes within a site, based on developments within the Netherlands, which are determined by the ministry of Economic Affairs and Climate policy.

The SoW is divided in 3 sections;

2. Project set-up
3. Roles and responsibilities
4. Schedule and key dates

2. Project set-up

The DDW Soil package will contain the site characterisation studies as indicated in Figure 2.

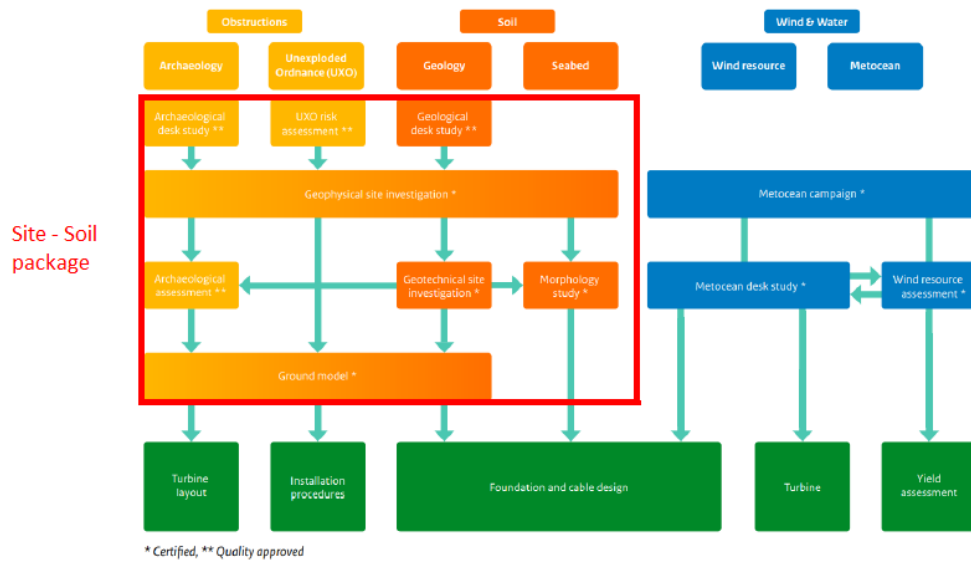


Figure 2: Soil site characterisation package

RVO will manage the soil site characterisations, hereafter called PROJECT. Expert support will be required to assist the RVO team with in-depth knowledge during:

- 1) Drafting of the procurement documents for site study Contractors to execute the studies
- 2) Review process of Contractor bids
- 3) Developments during execution of studies
- 4) Quality and completeness review of Contractor documents
- 5) Operational support during execution of field works

To visualize the PROJECT team set up an organization chart is presented in Figure 3.

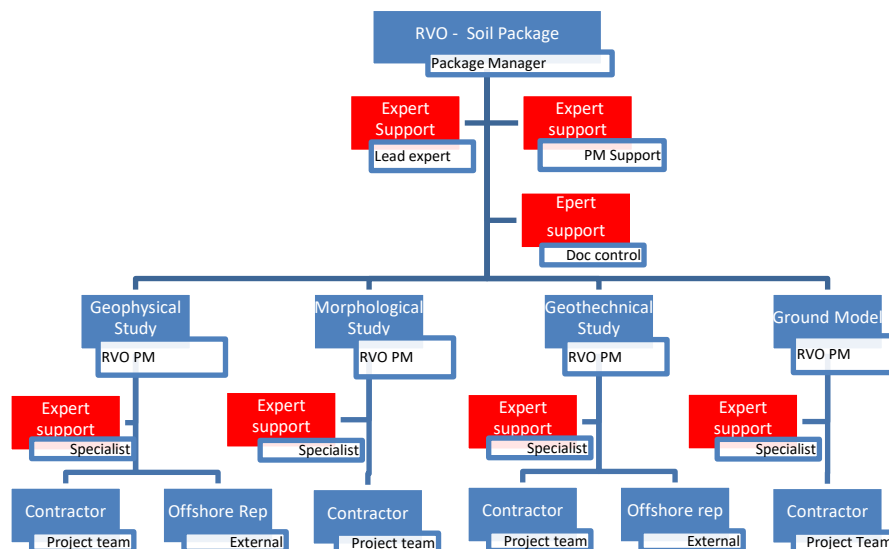


Figure 3: Organization chart soil site characterisation

Items marked in red present the areas where in-depth knowledge support by external experts is requested by means of this SOW.

The PROJECT organization will be built under supervision of a package manager from RVO. The package manager will be responsible for the interfaces between studies, overall planning and overall budget.

In addition to the package manager from RVO there will be multiple RVO project managers assigned to the PROJECT to manage the individual studies. A single RVO project manager can be assigned to multiple studies and can change during the duration of the PROJECT.

The expert support contractor is expected to supply lead expert(s) and specialists. The lead expert will need overall knowledge to participate into the different studies and to advise the RVO package manager where necessary. The main task of the lead expert will consist of interfacing between the studies. For in-depth discussions, reviews and support throughout the PROJECT the lead expert (and the RVO project managers) can call in the specialist experts. For detailed roles and responsibilities of the requested expert support reference is made to section 2 of this SOW.

The aim of the project set up as described is to optimize the interfaces and optimize the use of the specialist knowledge.

During the execution of the PROJECT all communication between the different parties as described above and the site study Contractors will be managed by the RVO project manager. The communication lines are visualized in Figure 4.

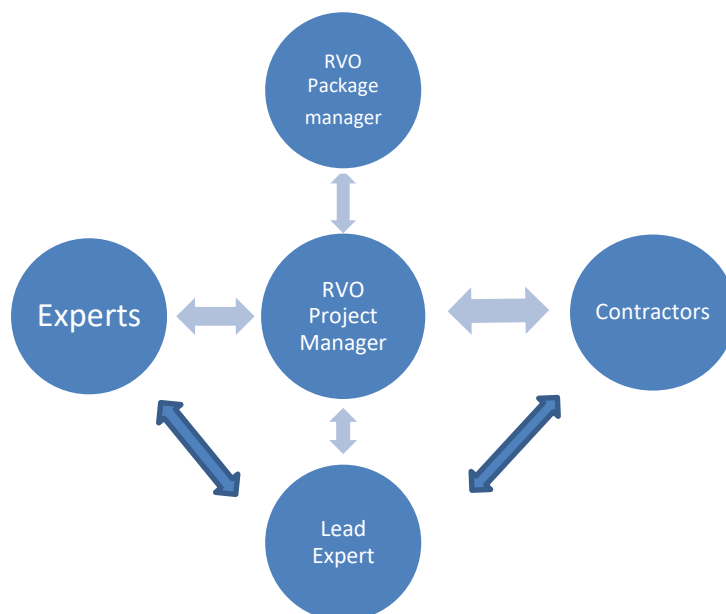


Figure 4: Communication lines

Note: If required during the PROJECT, direct communication lines can be established between the Experts and site study Contractors upon discretion of the RVO project manager(s).

3. Roles and Responsibilities

This section describes the roles and responsibilities for the expert support during the PROJECT.

The following hour estimation is made (Table 1)

- Base scope 8.500 hours for SoW items 1
- **Optional scope** 1000 hours SoW item 2.

Table 1: Scope of Work, hours for main and optional scope per expert(s).

Role	Hours base scope (8.500 hours)	Hours optional scope (1.000 hours)
Lead specialist	1.000	1000
Geophysical / Geological Expertise	1.500	
Geotechnical Specialist Expertise	2.500	
Ground model Specialist Expertise	2.500	
Morphological Specialist Expertise	500	
PM support	500	-
Total amount	9.500	

An hour estimation per expertise/work package under item 1 and 2 is presented below (total of 9.500 hours), the optimal scope of 1000 hours under item 2 can be assigned to a single or multiple experts roles.

Lead Specialist (1000 hours in main scope)

This expert must have geophysical, geotechnical and morphological understanding. The lead expert will be the interface during progress meetings with RVO and the site study Contractors. The lead expert shall be capable to participate during the calls as representative of all specialist experts. The lead expert should be able to answer questions related to the studies or be able to capture the essence and transfer them to the experts to arrange follow up.

To improve interfaces and consistency it is important that the lead expert will supervise and participate in all studies together with the RVO project managers.

If required a deputy (temporary) lead expert can be assigned to support the lead expert during absence or when workload requires.

Required know-how: the lead expert will need to have a proven track-record in project management and interface skills next to general knowledge regarding geotechnics, geophysics, morphology and ground models of the North Sea. For detailed in-depth knowledge the lead expert can consult the specialist experts in the team, but the lead expert will need the following required know-how:

- a. Project management and interface skills;
- b. The general site conditions, especially the shallow geology till 100 metres BSF, in the North Sea;
- c. Understanding of the interpretation of geophysical results for post processing into the ground model, morphological study and geotechnical site characterisation;
- d. Understanding if the interpretation of geotechnical results for wind turbine foundation and infield cable design purposes;
- e. Understanding of the state-of-the-art methods and equipment for the geophysical surveys (e.g. hydrographical and geophysical methods);

- f. State-of-the-art lab tests (standard and cyclic; MIC).

Activities and responsibilities (but not limited to)

- Participate in meetings related to the geophysical study, geotechnical study, morphological study, ground model and vessel calls during project execution;
- During the meetings it is expected that the lead expert can represent the expert group and participate in discussions;
- Manage interfaces between studies, experts and RVO;
- The lead expert will have to share information between the teams so that all experts have all the required information. When questions arise the lead expert will arrange follow up with the correct party;
- Quality assurance and quality control;
- Participate in webinars;
- Drafting the SoW for contractors to execute the studies;
- Assessing the contractor's bids.

Expert support contractors are requested to offer at least **one** senior expert for the lead expert position. The lead expert(s) will be assessed as part of the team.

Geophysical and Geological Specialist Expertise (1500 hours in main scope)

Within the project team expertise is required supporting RVO during the works during the geophysical campaign. These expert(s) must be geophysicist(s) with experience in geophysical soil characterisation and operations for wind farm / foundation / infield cable design for projects in the North Sea. Experience in other geographical areas with similar conditions to the North Sea is also considered relevant.

Required know-how (the experts together must cover the required know-how)

- a. The general soil and surface conditions (up to 100 m BSF) in the southern North Sea or similar geological settings in relation with geophysical site surveys;
- b. Relevant state of the art research, data acquisition and analysis methodologies of geophysical data and campaigns for wind farm / foundation / infield cable design projects;
- c. State of the art processing and interpretation methodologies relevant for shallow (100 m BSF) subsurface as well as surface geophysical data
- d. Software and data-management relevant for geophysical data acquisition and interpretation (e.g. IHS Kingdom, ArcGIS, SonarWIZ) (software must be available, will not be supplied by CLIENT)
- e. State of the art equipment (vessels, hydrographical and geophysical (in particular seismic survey equipment)).

Activities (but not limited to):

- Preparation of the procurement documents for the geophysical survey tender;
- Review and evaluate proposals of the geophysical survey tender;
- Support in managing the geophysical survey: check the planning, assist in document control (including check on required actions from progress meetings);
- Onshore QC of data samples during project execution in co-operation with the on-board Client Representative;
- Review of deliverables such as geophysical reports, hydrographical data and geophysical data;
- Involvement in geological desktop studies in case geophysical processing is part of the scope;

- Support in transferring deliverables of the geophysical survey to the contractors of other site studies (e.g. geotechnical survey, ground model, morphological assessment)
- Support in disclosing deliverables to the public (check of content offshorewind.rvo.nl and HDD (Hard Disk Drive), webinars, PSD (Project Site Descriptions), etc.).

Expert contractors are requested to offer at least **two** available experts, one of them should be a senior expert.

Geotechnical Specialist Expert(s) (2500 hours in main scope)

These experts must have geotechnical engineering skills with experience in operations for wind farm / foundation / infield cable design for projects in the North Sea. Experience in other geographical areas with similar conditions to the North Sea is also considered relevant.

Required know-how (the experts together must cover the required know-how)

- a. The general site conditions, especially the shallow geology till 100 metres BSF, in the southern North Sea or similar geological settings, in relation with geotechnical site surveys;
- b. State-of-the-art methods and equipment for in situ tests (e.g. PCPTs, SCPTs) and sampling methods (rotary drilling techniques, , vibro-cores, wireline logging,);
- c. State-of-the-art lab tests (standard and advanced cyclic testing, MIC);
- d. Interpretation of results for wind turbine foundation and infield cable design purposes;
- e. State-of-the-art design methods for wind turbine foundations;

Activities (but not limited to):

- Drafting Scope of Work for the geotechnical campaign tender;
- Review and evaluate proposals (e.g. project documentation, suitability vessels and equipment, equipment set up, project execution plan, line plan), in some cases providing a second opinion;
- Contribute to defining a CPT and borehole plan;
- Contribute in defining a lab testing programme (standard and cyclic);
- Onshore QC of results during project execution in co-operation with the on-board Client REP;
- Review of deliverables (for example reports and geotechnical data);
- Support in disclosing deliverables (check of content offshorewind.rvo.nl and HDD, webinars, Project and Site Description, etc.).

Expert contractors are requested to offer at least **two** available experts, one of them should be a senior expert.

Ground model Expertise (2500 hours in main scope)

These experts must have ground model engineering skills with experience for wind farm / foundation / infield cable design for projects in the North Sea. Experience in other geographical areas with similar conditions to the North Sea is also considered relevant.

Required knowhow

- a. The general site conditions, especially the shallow geology till 100 metres BSF, in the North Sea;
- b. Interpretation of geotechnical and geophysical results for wind turbine foundation and infield cable design purposes;
- c. State-of-the-art design methods for wind turbine foundations;

- d. Compiling or reviewing ground models;
- e. Working with Kingdom© software or other ground model software (software must be available, will not be supplied by CLIENT).
- f. Reviewing ground model

Activities (but not limited to):

- Drafting procurement documents for the ground model tender;
- Review and evaluate proposals (e.g. project documentation, suitability vessels and equipment, equipment set up, project execution plan, line plan), in some cases providing a second opinion;
- Contribute to defining a CPT and borehole plan;
- Contribute in defining a lab testing programme (standard and cyclic);
- Review of deliverables (for example reports and geoscience data);
- Support in disclosing deliverables (check of content offshorewind.rvo.nl and HDD, webinars, Project and Site Description, etc.);

Expert contractors are requested to offer at least **two** available experts, one of them should be a senior expert.

Morphological Expertise (500 hours in main scope)

These experts must be morphodynamic experts, preferably with experience with seabed conditions and morphodynamics for wind farm / foundation / infield cable design for projects in the (Dutch sector of the) North Sea.

Required know-how:

- a. Experience with assessment of morphodynamical desk studies ((morpho)dynamics, physics) for offshore wind farms or cable lay-out;
- b. The general seabed conditions in the (Dutch sector of the) North Sea;
- c. Experienced in seabed morphodynamics, sand waves and bedform migration, morphodynamical analysis.

Activities (but not limited to):

- Drafting procurement documents for the morphodynamical assessment tender;
- Review and evaluate proposals of the morphodynamical assessment tender;
- Review of the (draft) reports of the morphodynamical assessment;
- Review of the data;
- Reporting and document control, e.g. during review of deliverables;
- Participate in expert meetings;
- Disclosure of information to the market (publication at offshorewind.rvo.nl, contribution to the Project and Site Description, market questions, webinars, etc.)

Expert contractors are requested to offer **at least one** senior expert..

PM support (500 hours in main scope)

The PM expert support will work alongside the RVO project managers of the different site studies for site characterisation. The PM expert will support in managing interfaces.

Required know-how:

- a. Procurement and (contract) management of geophysical and / or geotechnical surveys;
- b. General understanding of geophysical and geotechnical surveys;

Activities (but not limited to):

- Interface management;

- Prepare Minutes of Meeting;
- Manage document review procedures;
- Support contract management.

Expert support contractors are requested to offer available expert(s) for each requested expertise. The core team should contain all the required know-how as described in this Section of the Scope of Work. The Geophysical/geological, Geotechnical and ground model expertise needs to be covered by at least 2 experts. For the lead expert the Morphological expertise and the PM support a single person can be selected. One expert can work on multiple expertise's (e.g. one expert can work both as Geophysical expert and ground model expert to fulfill part of the requested know how of each package). Additional experts offered will be assessed as backup experts. It should be clear in the project plan who the above-mentioned main persons per position are and which persons are offered as backup per position.

Table 2: Required experts per position for soil Scope of Work.

Role	Amount of experts	Required amount of senior experts
Lead expert	1 or 2	1
Geophysical and geological expertise	2 or more	1
Geotechnical expertise	2 or more	1
Ground Model expertise	2 or more	1
Morphological expertise	1 or more	1
PM support*	1	1

*This person will not be assessed

It is envisaged that no more than 3 persons from the expert group will participate in the weekly meetings with the site study Contractors in order to make sure the meetings stay effective. Other experts can be consulted outside of these meetings when necessary. The participation of the specialist experts in meetings is to be agreed at the start of the project. In this way the interfaces can be kept to a minimum and no information is lost throughout studies and within the core team.

Outside of the experts as requested in table 2 the Tenderer is expected to have sufficient backup available in the event one of the experts become unavailable. Additionally it might occur that multiple packages will run simultaneously (e.g. Site characterisation of DDW). In the event that multiple campaigns run simultaneously a flexible pool of backup experts is required to be able to assist if workload requires.

4. Schedule of Key Dates

At this moment the Contracting Authority anticipates that the geophysical and geotechnical surveys will be executed covering a Wind Farm Site(s) suitable for 4GW – 6GW. Best estimation for the planning of the scope is presented below.

Planning Site characterisation 4-6 GW scope (Within DDW):

Geophysical campaign	
Tender	Q2 2023
Offshore Campaign	Q1-Q2 2024
Reporting	Q2-Q4 2024

Geotechnical campaign	
Tender	Q4 2023– Q1 2024
Offshore Campaign - CPT & VC campaign - BH campaign	Q4 2024 - Q2 2025 Q2-Q3 2025
Lab program & Reporting	Q3 2025 - Q2 2026

Ground model	
Tender	Q1 2024
Ground Modelling	Q1 2025 -Q2 - 2026

Morphological assessment	
Tender	Q3 2024
Reporting	Q2-Q3 2025