



Date 15 August 2022

Status Final

Client Representatives Geotechnical survey Investigation Areas IJmuiden Ver Wind Farm Zone, Nederwiek Wind Farm Zone and Hollandse Kust (west) Wind Farm Zone

Annex 8

Scope of Work

Various Sites

Colophon

Project name	Client Representatives Geotechnical survey Investigation Areas IJmuiden Ver, Nederwiek Wind Farm Zone and Hollandse Kust (west) Wind Farm Zone
Project number	WOZ2220048
Version	Final
File name	VS_20220815_RVO_CR GT_Annex 8_Scope of Work-F
Project manager	D. Gerritsma
Author	D. Gerritsma
Reviewed	M. Vrolijk
Approved	P. Lebbink

Table of Contents

1	Introduction	4
1.1	Scope of this document	4
1.2	Contract Parties	4
1.3	Background	4
1.4	Site Description.....	4
1.5	Investigation Area	6
1.6	Aims of the geophysical survey	11
1.7	Timing of the Investigations	12
1.8	Available Information	12
1.8.1	WFZ specific information	12
1.8.2	Other information	13
1.8.3	Geophysical Survey Tender.....	Fout! Bladwijzer niet gedefinieerd.
2	Scope of Work.....	14
2.1	Monitoring of Survey Activities	14
2.2	Health Safety Environmental and Quality monitoring	14
2.3	Number of Client representatives	14
2.4	Requirements to Offshore Client Representatives.....	15
2.5	Schedule of the WORK.....	15
2.6	Mobilization / demobilization	16
2.7	Team set-up	16
2.8	Communication	17
2.9	Reporting	18
3	Survey Requirements.....	19
3.1	Requirements of the Survey Layout and Configuration	19
3.2	Mobilisation and demobilisation	21
3.3	Lost Equipment.....	21
3.4	Testing.....	Fout! Bladwijzer niet gedefinieerd.

1 Introduction

1.1 Scope of this document

This document and its appendices detail the scope of the Work as part of the Contract that Client has awarded to Contractor for provision of Offshore Client Representatives during the geotechnical survey in IJVWFZ, HKWWFZ and NWWFZ.

1.2 Contract Parties

Expert Contractor	Arcadis Nederland B.V. who has been awarded by Client to perform the technical due diligence related to soil
Client	Netherlands Enterprise Agency (RVO)
Offshore Client Representative (OCR)	Person working for Contractor on the project of Client to monitor daily HSE, QC and progress for Client
Contractor	Contracting party which supplies the offshore client representatives as part of the Work
Survey Contractor	Contractor awarded by Client who will provide the survey vessels, equipment and personnel to perform the geotechnical site investigation

1.3 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 permit for construction and operation of (a) wind farm(s) will be organized under the current regulation. 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 on the soil conditions at the site will be part of this information package.

Information on the soil conditions at the site is to be developed through a sequence of commissions for geological, geophysical, geotechnical and morphodynamical studies. Information will be presented as factual data, integrated and interpreted data (a Ground Model) and will be comprehensively reported.

This assignment is containing the request for Offshore Client Representative to monitor the field works of the geotechnical investigation.

1.4 Site Description

The geotechnical Investigation Areas in IJVWFZ, NWWFZ and HKWWFZ are indicated in Figure 1.

After Borssele WFZ, Hollandse Kust (zuid, noord and west) WFZs and Ten noorden van de Waddeneilanden WFZ, investigations shall be executed within the IJVWFZ, NWWFZ and HKWWFZ as part of the Offshore Wind Energy Roadmap 2030+.

The IJmuiden Ver Wind Farm Zone (IJVWFZ) will see offshore wind farm concession tenders, scheduled for 2023 and 2025, with a total capacity of 6 GW. The

Investigation Area IJWWFZ, relevant for this tender will have a capacity of 2 GW and is indicated in Figure 1.

The Nederwiek Wind Farm Zone is planned to contain a total capacity of 6 GW divided over 3 sites of 2 GW each. The wind farm concession tender is divided in two phases and scheduled to be held between 2025 and 2026. Investigation Area in Nederwiek Wind Farm Zone is planned to comprise the first phase within the Wind Farm Zone, its location is indicated on Figure 1.

The Hollandse Kust (west) Wind Farm Zone is planned to contain a total capacity of 2.1 GW divided over 3 sites of 0.7 GW each. The wind farm concession tender is divided in two phases, the first phase being tendered in 2022 and the latter scheduled to be tendered in 2027. Investigation Area Hollandse Kust (west) Wind Farm Zone is planned to be the final phase within the Wind Farm Zone and its location is indicated on Figure 1.

Offshore Wind Energy Roadmap

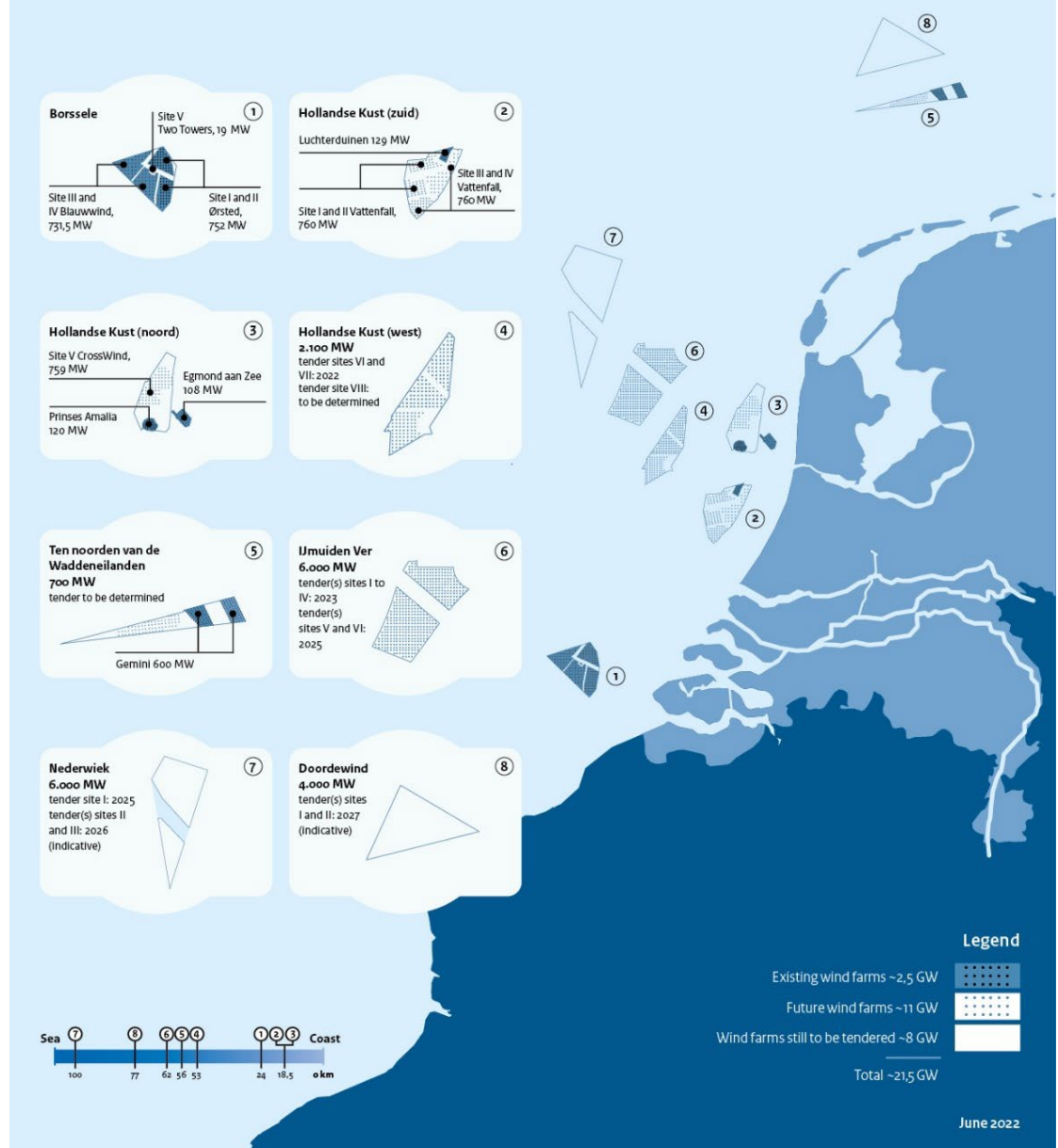


Figure 1. Vicinity map of IA in IJWWFZ, NWWFZ and HKWWFZ.

1.5 Investigation Area

The geotechnical Investigation Areas in IJWWFZ, NWWFZ and HKWWFZ are illustrated in respectively Figure 2, Figure 3 and Figure 4.

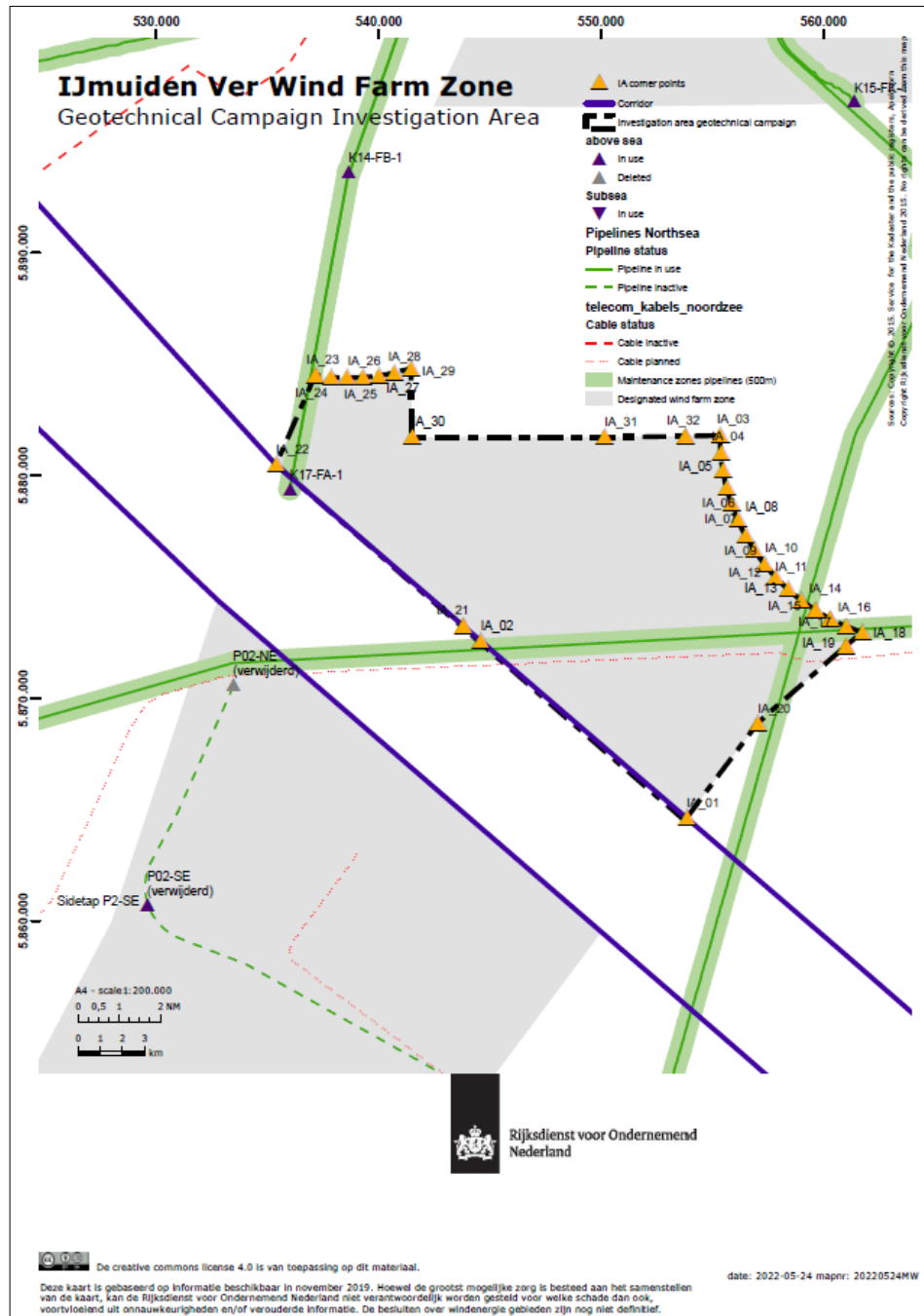


Figure 1. Map of the IJWWFZ, showing the IA in the north of the WFZ.

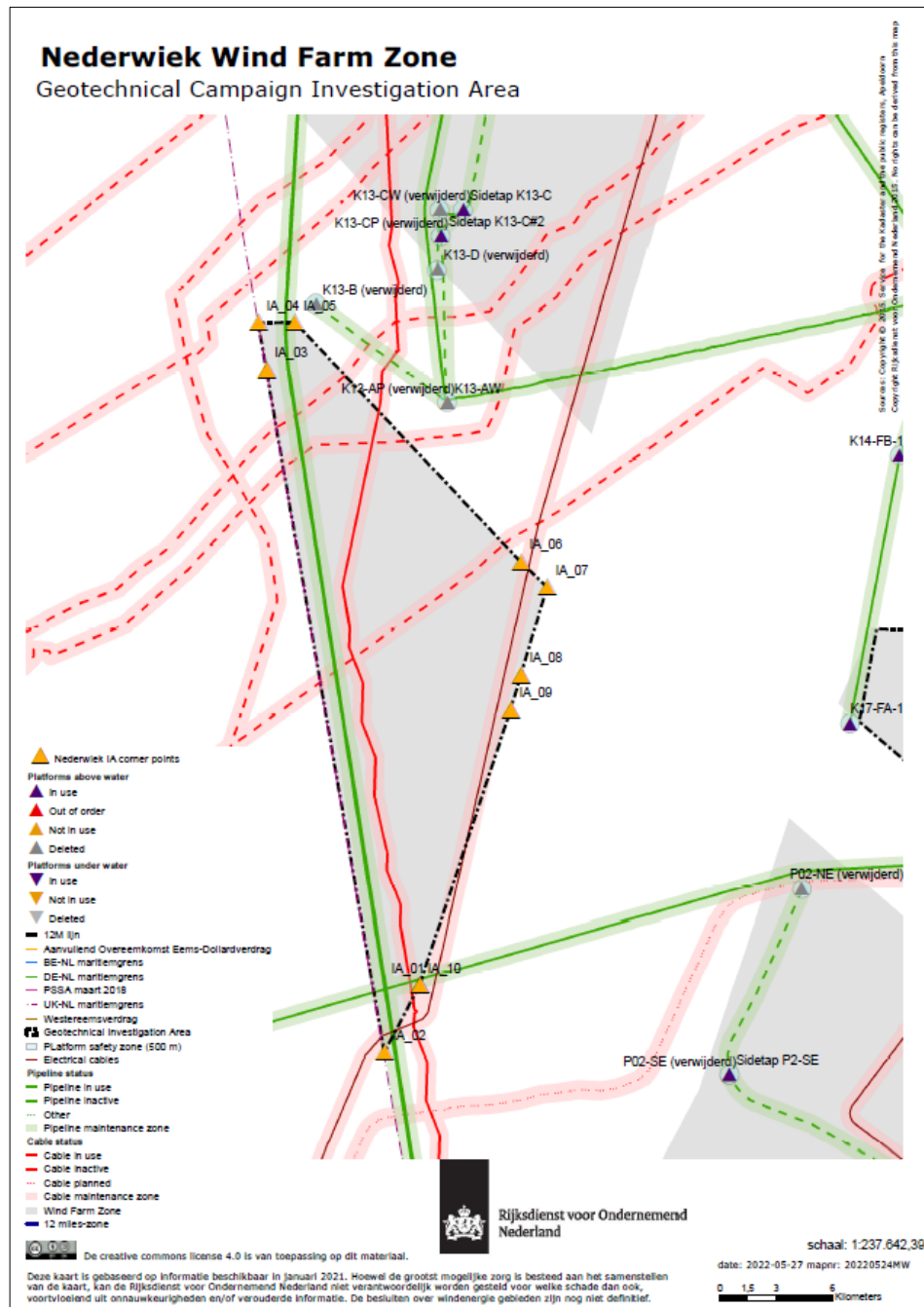


Figure 2. Map of the southern part of the NWWFZ. The IA is indicated with a dashed black line.

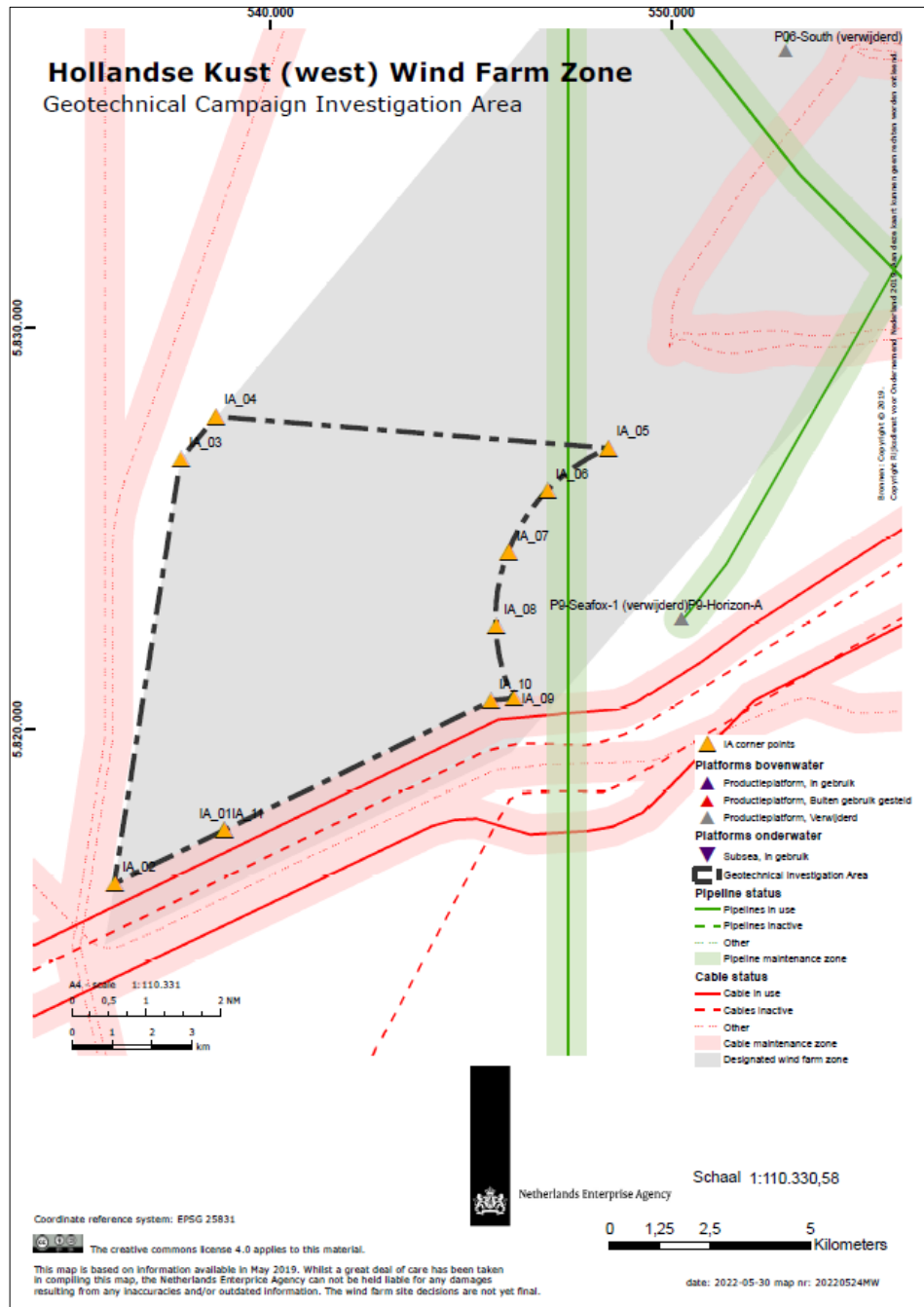


Figure 3. Map of HKWWFZ. Geotechnical IA is indicated with dashed black line in the south of the WFZ.

The Investigation Area sizes are approximately 242 km² (IA IJWWFZ), 273 km² (IA NWWFZ), 80 km² (IA HKWWFZ). The coordinates of the geotechnical investigation areas are provided in Table 1 for IJWWFZ, Table 2 for NWWFZ, and Table 3 for HKWWFZ.

Table 1. Coordinates of the IA IJmuiden Ver Wind Farm Zone

IJmuiden Ver Wind Farm IA coordinates					
Point No.	Easting	Northing	Point No.	Easting	Northing
IA_01	553840	5864629	IA_17	560996	5873238
IA_02	544570	5872588	IA_18	561723	5872967
IA_03	555339	5881786	IA_19	561003	5872341
IA_04	555370	5881011	IA_20	557030	5868886
IA_05	555466	5880241	IA_21	543802	5873248
IA_06	555626	5879482	IA_22	535372	5880486
IA_07	555849	5878739	IA_23	537146	5884508
IA_08	556134	5878018	IA_24	537853	5884419
IA_09	556478	5877323	IA_25	538565	5884384
IA_10	556877	5876658	IA_26	539278	5884405
IA_11	557332	5876030	IA_27	539986	5884481
IA_12	557838	5875441	IA_28	540687	5884611
IA_13	558391	5874898	IA_29	541443	5884816
IA_14	558988	5874402	IA_30	541485	5881716
IA_15	559624	5873959	IA_31	550145	5881716
IA_16	560295	5873571	IA_32	553775	5881765
Coordinate system: ETRS_1989_UTM_Zone_31N					
WKID: 25831 Authority: EPSG					

Table 2. Coordinates of the IA Nederwiek Wind Farm Zone

Nederwiek Wind Farm Zone South					
Point No.	Easting	Northing			
IA_01	513136	5865490	IA_06	518517	5887992
IA_02	511262	5861912	IA_07	519912	5886661
IA_03	504989	5898196	IA_08	518524	5881972
IA_04	504552	5900695	IA_09	517978	5880125
IA_05	506513	5900729	IA_10	513136	5865490
Coordinate system: ETRS_1989_UTM_Zone_31N					
WKID: 25831 Authority: EPSG					

Table 3. Coordinates of the IA Hollandse Kust (west) Wind Farm Zone

Hollandse Kust (west) Wind Farm Site VIII coordinates					
Point No.	Easting	Northing			
IA_01	538831	5817477	IA_06	546895	5826295
IA_02	536107	5816157	IA_07	545921	5824420
IA_03	537761	5826739	IA_08	545615	5822570
IA_04	538642	5827794	IA_09	546054	5820781
IA_05	548418	5827011	IA_10	545487	5820703
			IA_11	538831	5817477
Coordinate system: ETRS_1989_UTM_Zone_31N					
WKID: 25831 Authority: EPSG					

1.6

Aims of the geotechnical survey

The overall objective of the geotechnical soil investigation is to collect factual geotechnical data that enables the creation of a Geotechnical Interpretive Report and Ground Model in order to improve the geological and geotechnical understanding of the Investigation Areas in IJWWFZ, NWWFZ and HKWWFZ, suitable to progress the design and installation requirements for offshore wind farm including, but not limited to foundations and cables.

The objective of the investigation and laboratory testing programme is to:

- Determine the vertical and lateral variability in soil conditions;
- Provide relevant factual geotechnical data for the design including, but not limited to foundations and cables;
- Provide information on the ecological conditions at Investigation Areas NWWFZ and HKWWFZ;
- Where applicable, supplement the findings of the geological desk study and the geophysical survey;
- Contribute to an Integrated Ground Model and Geotechnical Interpretive Report

Note that the development of the Integrated Ground Model may be executed by a different contractor than the Survey Contractor. Furthermore, the geotechnical works have been divided into two parts; the shallow geotechnical investigation (including PCPT's, SCPT's, thermal conductivity testing, vibrocores and ecological sampling), and the borehole geotechnical investigation (including boreholes in combination with downhole sampling, downhole CPT's and SCPT's, P-S suspension logging, density logging, and downhole magnetic resonance logging). These parts are also tendered in two lots, therefore these works may be executed by two different Survey Contractors. Further information on the geotechnical tender can be found at [Geotechnical Survey for Investigation Areas in IJmuiden Ver, Nederwiek and Hollandse Kust \(west\) Wind Farm Zones - Details - TenderNed](#)

The laboratory test programme for determination of soil strength and deformation properties are to include different types and quantities of tests, but should permit preliminary foundation design to be performed and to establish a design basis for the detailed foundation design.

1.7 Timing of the Investigations

The offshore shallow soil investigation campaign (investigation in seabed mode) is foreseen to be carried out in Q1 and Q2 of 2023. For IA NWWFZ and IA HKWWFZ an ecological survey will be supplementary to the geotechnical seabed investigation. The shallow geotechnical investigations are required to commence at IA IJWWFZ to enable timely input into the integrated ground model for this area. It is anticipated that following completion of IJWWFZ, the survey will then continue with the execution of the seabed investigations at IA NWWFZ followed by IA HKWWFZ. However, the Survey Contractor is free to optimise the investigation at the three areas. Note that the shallow geotechnical investigations Survey Contractor cannot commence the geotechnical acquisition at IA NWWFZ before May 2023 in order to enable geophysical data acquisition to take place prior. This will be arranged under a, yet to be appointed, separate contract.

The offshore soil investigation campaign for borehole geotechnical investigation will follow on from the seabed investigations. Therefore, it is anticipated that the borehole investigations can commence at IJWWFZ in Q2 2023. The borehole geotechnical investigation Survey Contractor can only commence at a borehole location once the shallow geotechnical investigations by Survey Contractor is finished. Following the completion of the borehole scope at IA IJWWFZ, it is anticipated that the borehole scope at IA NWWFZ will be required to be completed next in order to meet the required completion date of the overall site investigations. It is anticipated that the field execution will be in Q3 2023. The boreholes scope at IA HKWWFZ is potentially to be completed last. It is anticipated that the execution will be in Q4 2023 to Q2 2024.

Table 4. Indicative Geotechnical survey schedule

Geotechnical Survey schedule		
Survey	Location	Indicative starting period
Shallow Seabed survey	IJWWFZ	Q1 – Q2 2023
Shallow Seabed survey	NWWFZ	Q1 – Q2 2023
Shallow Seabed survey	HKWWFZ	Q1 – Q2 2023
Borehole survey	IJWWFZ	Q2 2023
Borehole survey	NWWFZ	Q3 2023
Borehole survey	HKWWFZ	Q4 2023 – Q2 2024

1.8 Available Information

1.8.1 WFZ specific information

Client has carried out desk studies on the entire IJWWFZ including IJ56, and on the entire HKWWFZ. The following desk studies are available on <https://offshorewind.rvo.nl>;

- Geological desk study;
- Archaeological desk study;
- UXO desk study.

In HKWWFZ, geophysical field works have already taken place, covering IA HKWWFZ as well. The results are also available on <https://offshorewind.rvo.nl>.

For NWWFZ, the above desk studies will be provided prior to the start of the field works.

1.8.2 *Other information*

Further, for information, the results of the geophysical and geotechnical surveys carried out for Borssele, HKZ, HKN, HKW, TNWWFZ are available at <https://offshorewind.rvo.nl/>. It should be noted that this scope of work deviates from those of previous investigations *and may introduce additional requirements*.

2 Scope of Work

This section describes the Scope of Work for the OCR. Details of the Survey works are presented in section 3.

2.1 Monitoring of Survey Activities

The OCR will monitor the field works performed by the Survey Contractor during the execution of the works. The OCR will have the task to monitor safety, Quality and progress of the data acquisition.

The shallow geotechnical investigations shall consist of a combination of sampling with subsequent laboratory testing and in situ testing. Both data acquisition techniques must provide geotechnical insights. The works comprise the following tasks;

- Seabed cone penetration tests (CPT) using standard piezocones (PCPT) and seismic cones (SCPT);
- Dissipation tests during seabed PCPT;
- Thermal conductivity testing using a thermal cone penetrometer, FIELAX Vibroheat or similar as proposed by the Contractor;
- Vibrocore sampling;
- Ecological soil and water sampling at IA NWWFZ and at IA HKWWFZ
- Associated operational and factual reporting (results to be presented in "Seabed Sampling Report" and "Seabed In Situ Testing Report", each of which covers the whole site. One report is required per wind farm site i.e. one report for IA IJWWFZ, one for IA NWWFZ and one for IA HKWWFZ);
- Delivery of associated digital data

The borehole geotechnical investigation of Investigation Areas in IJWWFZ, NWWFZ and HKWWFZ shall consist of a combination of sampling and in situ testing followed by laboratory testing. Both data acquisition techniques must provide geotechnical insights. The works comprise the following tasks;

- Boreholes with a combination of downhole sampling, downhole PCPT and downhole SCPT;
- P-S suspension logging, density logging, spectral gamma ray logging, and downhole magnetic resonance logging tests in completed boreholes;
- Associated reporting (One report is required per wind farm site: i.e. one report for IA IJWWFZ, one for IA NWWFZ and one for IA HKWWFZ);
- Delivery of associated digital data.

2.2 Health Safety Environmental and Quality monitoring

The OCR will monitor daily the Health, Safety, Environmental and Quality (HSEQ) of the works performed by the Survey Contractor. The OCR will assess if the Survey Contractor is working according their own HSEQ procedures and as per the requirements as set by Client. Reference is made to the HSE and Quality requirements as set in the tender for the Survey Contractor (Ref. 1.8.3).

2.3 Number of Client representatives

Client expects the Survey Contractors will work with one (1) vessel, but the Survey Contractor has the possibility to utilize 1 or up to 2 vessels simultaneously. However, there is a possibility that the two lots overlap for a short period of time, so this

possibility has to be accounted for. For each vessel two (2) OCRs shall be available on the vessel and will work in a 12 hour shift.

The duration of rotations between crew changes is to be determined by the Survey Contractor. The OCR rotation schedule shall be based on the Survey Contractor's rotation plan. Client expects a possibility to change OCR each 2-4 weeks.

Client requests to submit eight (8) OCRs to account for all possible scenarios, including the utilization of 2 vessels at once.

2.4 Requirements to Offshore Client Representatives

Requirements relating to Personnel for Offshore Client Representative for the geotechnical survey. The personnel involved in the executing of the Work, must:

- Have experience with the execution of geotechnical soil investigations carried out for offshore wind projects, including:
 - (Deep) CPTs
 - Boreholes till at least 60m
 - Vibrocoring
 - other projects for which similar investigations are carried out, and have proven in depth knowledge on technical and contractual issues relevant for these works;
- have been trained for working in the offshore environment as demonstrated by their CV's
- have at least knowledge, skills and competences to perform at EQF level 5 (in the Netherlands MBO) (<https://europa.eu/europass/en/compare-qualifications>)
- have at least level B2 (http://www.coe.int/t/dg4/linguistic/Cadre1_en.asp) in English language (writing and speaking)
- have training and medical certificates valid to perform offshore work in the Dutch North Sea, including as a minimum BOSIET (Basic Offshore Safety Induction and Emergency Training'), or equivalent
- The personnel, available for the role of Offshore Client Representative, (including their responsible superiors) may not have any financial or other direct personal or business interests with specific results of investigations to be carried out or with specific recommendations or answers to the investigation questions. In the event of an apparent personal or business conflict of interest, the employee(s) must be immediately replaced at the request of the Contracting Authority.
- The Contractor guarantees availability of the required amount of personnel according to the planning and schedule of the Client and geotechnical Contractor.
- The Contractor guarantees prompt replacement of Offshore Client Representative(s) in case of dropping out of representatives during the execution of the work and can provide additional candidates if this would be required. These candidates must have at least equal or more qualifications than the Offshore Client Representatives initially offered.

2.5 Schedule of the Work

Duration of the Work will be depending on the workability, the amount and efficiency of the vessels as provided by the Survey Contractor.

The Survey will start in Q1 2023 and will, in stages, continue until Q1-Q2 2024. Client expects starting date of the mobilization in January 2023 at the earliest.

For the purpose of this SOW a number of 250 vessel days is expected, the 250 days can be divided over 1 or 2 vessels per lot.

The narrowing window, specifying the starting date of the offshore works for which the OCR need to be made available, will be defined as follows:

- *Client will as soon as possible provide information on the indicative period in which the survey will take place.*
- *One month before the intended start of the offshore works, Client will provide a best estimation of the mobilisation date and location.*
- *One week before the intended start of the offshore works, Client will provide an update with best estimation of the mobilisation date and location.*
- *After award of the contract with both Survey Contractors in November, a more detailed overall planning can be made.*

After the start of the Work notifications on the exact crew change date will be provided by Client as follows:

- *One week before crew change, the crew change date can be specified with a precision of 2 days;*
- *48 hours before crew change, the exact crew change date shall be specified.*

One or two months prior to the start of the campaign, a kick-off meeting is held between Client and Survey Contractor. At least one of the OCRs who will join the first rotation on the vessel is requested to attend this meeting in person in order to learn and give input on the campaign strategy. In case other OCRs cannot attend the meeting, the attending OCR should brief the other OCRs on the content. If the attending OCR is not available at the start of the campaign, the substitute OCR should be briefed on the content of this meeting as well.

2.6 Mobilization / demobilization

Contractor shall arrange all travel arrangements from and towards the mobilization port set by the Survey Contractor.

Travel arrangements include:

- Flight / train or other travel costs
- Hotel and foods
- Mandatory vaccinations if applicable / test to be able to travel

Client expects the mobilization port of the Survey Contractor to be within the Netherlands.

2.7 Team set-up

The Client has organized the project set-up within the IJ56, NW and HKW investigation by splitting the works of Wind & Water investigations and Soil investigations. The Geotechnical survey is part of the Soil site investigation.

The Soil site investigation is managed by RVO project managers together with a team of contracted experts. The package is set up under supervision of a package manager from RVO overseeing all the studies related to soil. The RVO package manager is supported by a lead expert who is involved as well in all studies. Both the Package manager as the lead expert will manage all interfaces between the studies.

The Geotechnical survey will be managed by an RVO project manager who is supported by a team of contracted experts with in-depth knowledge related to the study.

Organogram of the project set-up is presented in Figure 5. The position of the geotechnical OCR in the organogram is highlighted red.

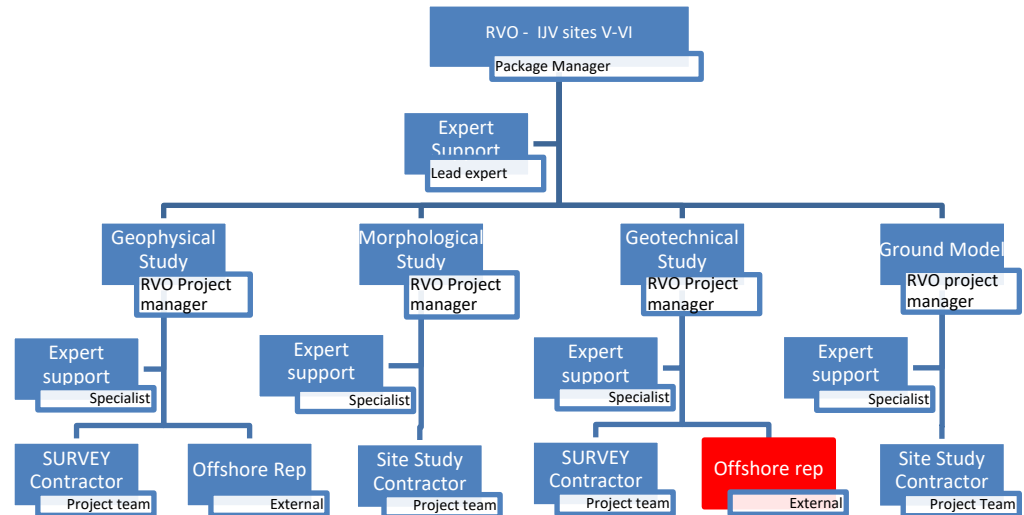


Figure 5. Organogram soil package

2.8

Communication

The communication lines are based on the team organization as presented in section 2.7. The communication from the OCR shall always include the RVO project manager and related expert(s). The expert team will advise together with the RVO project manager on any queries from the OCR regarding to contract, HSEQ and or progress.

The OCR shall discuss queries during the Work with Client's on-shore team, consisting of the RVO project manager and the Expert Contractor. For the OCR first point of communications is presented as below:

- 1) Contractor; Travel arrangements
- 2) RVO project manager; for planning, contractual items and approval of travel arrangements
- 3) Lead Expert; for technical questions and data acquisition

Figure 6 is presenting the communication lines within the Geotechnical investigation with the position of the OCR indicated in red.

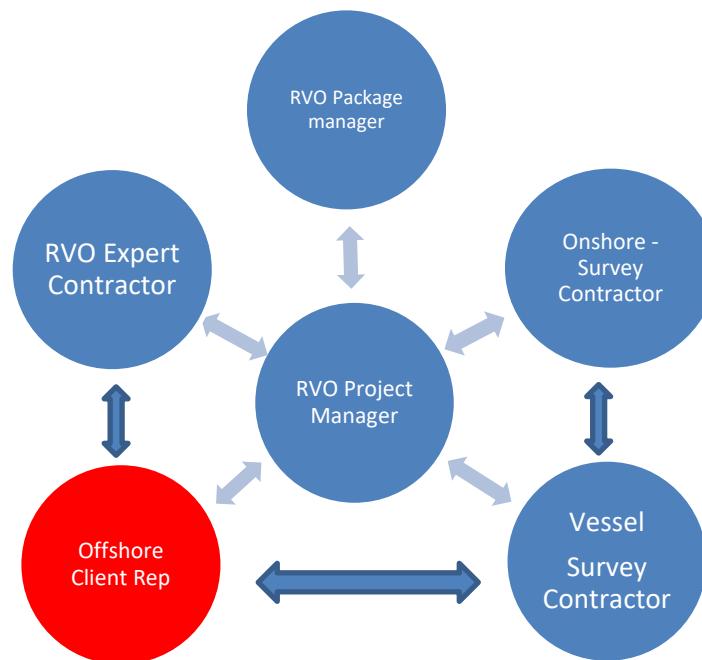


Figure 6. Communication lines

2.9 Reporting

The reporting requirements for the geotechnical survey work are as follows:

Daily & Weekly reporting

The Survey Contractor is to submit daily reports throughout the period of the fieldwork, providing full details of previous 24 hours' work and results.

The Survey Contractor may be requested by the Client to provide Data Quality Reports ("DQR") when appropriate. The DQR will not have to be provided on a daily basis but the Survey Contractor must be prepared to compile and provide these reports under the supervision of the OCR. Content of standardised elements of DQRs is to be established at the TKOM (Technical Kick off-Meeting).

The OCR will issue a daily update to the Client including:

- Summary of works completed last 24 hours
- Planning upcoming 24 hours
- HSE items of last 24 hours
- Quality items of last 24 hours
- Any observations and/or notes

Furthermore, the OCR will participate in short progress meetings with Client and Survey Contractor, three (3) times a week (vessel progress calls).

3 Survey Requirements

The OCR shall monitor the field works as performed by the Survey Contractor. This section describes the main requirements of the survey components of Client and Survey Contractor. Detailed information can be found in the Scope of Work for the Survey Contractor: [Geotechnical Survey for Investigation Areas in IJmuiden Ver, Nederwiek and Hollandse Kust \(west\) Wind Farm Zones - Details - TenderNed](#)

3.1 Requirements for Geotechnical survey works

The specific requirements for the shallow geotechnical investigation and all three wind farm sites are as follows:

- Carry out seabed CPT with a target depth of 60m, using either a standard piezocone penetrometer (PCPT) or a seismic cone (SCPT), as specified in the CPT Plan. Survey Contractor shall have sufficient length of CPT rods mounted within the seabed unit to physically achieve at least 25m corrected vertical penetration including allowance for rod deviation from vertical;
- Seismic seabed CPTs (SCPT) shall be carried out to a target depth of 60m in order to obtain standard cone data, however the seismic tests may be stopped at the depth at which the seismic signal is no longer strong enough for providing reliable shear wave velocity data. This decision will be made by the Offshore Client Representative after consulting the Survey Contractor. The seismic cone should include dual geophones (set approximately 0.5-1.0m apart) to enable an accurate measurement of the shear wave velocity over the associated soil interval. The seismic tests should be performed at depth intervals of approximately 1-2m, as directed by the Offshore Client Representative;
- Perform *in situ* thermal conductivity tests using a cone (or similar method approved by Client) at selected locations across the zone, for the purpose of subsea electrical cable design. At each location tests should be carried out at approx. 1m depth intervals to target depth of 6 m bsf. N.B. The Survey Contractor should have both a temperature cone and thermal probe available onboard vessel (or similar equipment approved by Client);
- Perform dissipation tests during seabed PCPT tests at locations and depths to be agreed with Offshore Client Representative;
- Perform vibrocores at selected locations to obtain a minimum of 3m recovery below the base of the seabed (using 6 m core barrel) for the purpose of subsea electrical cable design;
- Perform additional vibrocores at selected locations to a target depth of 6m with a minimum recovery of 3m for the primary purpose of seabed morphodynamic assessment. These vibrocores may be located in groups of 5 along transects perpendicular to selected sandwaves. The locations will be specified by the Client. These are only required for the IA HKWWFZ and the IA NWWFZ;
- Perform additional vibrocores at selected locations to a target depth of 6m with a minimum recovery of 3m for the purpose of archaeological assessment; and
- Ecological soil and water samples are required to be collected to provide base line information at IA HKWWFZ and the IA NWWFZ.

The specific requirements for the borehole geotechnical investigation and all three wind farm sites are as follows:

- Drilling boreholes with a combination of sampling, downhole piezocone penetration tests (PCPT) and downhole seismic cone penetration tests

(SCPT) to a target depth of between 60m and 80m. These boreholes can be sub-divided into three types, as follows:

- Type 1 - where the sampling/testing regime consists of quasi-continuous sampling from seabed to a predetermined depth following by a combination of sampling and PCPT to a target depth of 60-80m. This may include oversampling of a PCPT stroke in order to verify the material type, as directed by the Offshore Client Representative. The main purpose of the Type 1 borehole is to obtain general soil data (i.e. samples and PCPT) for developing geological and engineering soil models. Type 1 boreholes will be located adjacent to one of the deep seabed CPTs from Lot 1;
- Type 2 - where the sampling/testing regime consists of quasi-continuous SCPTs carried out to a target depth of 60m or the depth at which the seismic signal is no longer strong enough to provide reliable results. The main purpose of the Type 2 borehole is to obtain *in situ* shear wave velocity measurements for deriving the small-strain shear modulus. The SCPT system shall include dual geophones (set approx. 0.5-1.0m apart) to enable an accurate measurement of the shear wave velocity over the associated soil interval. The seismic tests shall be performed at depth intervals of approximately 1-2m, as directed by the Offshore Client Representative. Oversampling of selected SCPT strokes may be required, as directed by the Offshore Client Representative. A Type 2 borehole will be located adjacent to a selected Type 1 borehole for correlation with the relevant laboratory test results;
- Type 3 - these boreholes will be drilled purely for the purpose of extending a seabed CPT from the shallow geotechnical investigation to a depth of 60m because of the shallow refusal depth of the seabed CPT. Between seabed and a fixed distance (approx. 2m) above the seabed CPT termination depth, occasional samples will be required in units of engineering significance. Below this depth, quasi-continuous downhole PCPT shall commence with occasional sampling/oversampling as directed by the Offshore Client Representative. A Type 3 borehole will be located adjacent to a selected seabed CPT from the shallow geotechnical investigation;
- P-S logging is to be performed in selected Type 1 boreholes for cross-correlation/verification with either adjacent seabed SCPT or adjacent downhole SCPT results. This should involve drilling-out the Type 1 borehole to a sufficient depth beyond 60m so that the first P-S logging test can be performed at 60m below seabed. P-S logging tests should be undertaken at depth intervals of approximately 1m, or as directed by the Offshore Client Representative;
- Density logging, spectral gamma ray logging and downhole magnetic resonance logging is to be performed in selected Type 1 boreholes;
- In some of the Type 1 or Type 3 boreholes, selected downhole PCPTs may be replaced with downhole SCPTs. Any such replacements will be notified by the Offshore Client Representative in advance of moving to the relevant borehole location;
- For any of the borehole types, oversampling of a PCPT or SCPT stroke may be requested by the Offshore Client Representative in order to verify the soil material type being tested; and
- Preparation of borehole log and borehole laboratory testing schedule for approval within 48 hours of borehole completion.

3.2 Mobilization and demobilization

Mobilisation of the vessel(s) to the site, complete with all necessary geotechnical equipment and personnel. Survey Contractor shall include sufficient consumables and equipment spares in the mobilisation plan to allow for any foreseeable events. Survey Contractor shall indicate the proposed port of mobilisation/demobilisation as well as the number of port calls foreseen during the survey.

The Client requires a port call approximately every four weeks (as a minimum) for Offshore Client Representative crew changes (applies to Lots 1 and 2 of the Survey Works).

The Client requires a regular transport of soil samples to laboratory, typically biweekly, (applies to Lots 1 and 2). In addition, Survey Contractor shall make use of any periods of weather standby to undertake such port calls to facilitate offload and transport of samples.

The harbour to be used for mobilisation of survey vessel(s), equipment and personnel shall be approved by the Client.

Demobilization of the vessel will be authorised when all the data required have been acquired and have passed field QAQC criteria to the satisfaction of the OCR.

3.3 Lost Equipment

Survey Contractor shall be responsible at his own cost for the marking the location and recovery of equipment dropped or lost during the execution of the project. Survey Contractor shall mark the positions of equipment on or below the seabed with marker buoys if necessary and recover the equipment at the earliest possible opportunity. All equipment shall be removed to a reference level which is the trough of mobile sand waves in the area.