Date ~~26~~-5-2024

Status Final R01

Soil Investigations Doordewind Wind Farm Zone

Annex 6 - Section IV

Scope of Work Geotechnical Survey

Investigation Area in Doordewind Wind Farm Zone

Colophon

Project name	Geotechnical survey in the Doordewind Wind Farm Zone
Project number	WOZ2240143/44 - 202312051
Version	Final_R01
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Annex(es)	-
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Approved	P. Lebbink

References

ASTM D6528-17	Standard Test Method for Consolidated Undrained Direct Simple Shear Testing of Fine Grain Soils, ASTM International, 2017.
ASTM D5311-13	Standard Test Method for Load Controlled Cyclic Triaxial Strength of Soil, ASTM International, 2013.
ASTM D5334-22ae1	Standard Test Method for Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe Procedure
ASTM D7400/D7400M-19~~ASTM D7400-19~~	Standard Test Methods for Downhole Seismic Testing, ASTM International, 2019.
~~BS 1377~~	~~Soils for civil engineering purposes Part 1 to 9. British Standard, 1990 to 2022 depending on the section (latest version of each part to be considered).~~
BS EN ISO 17892	Geotechnical investigation and testing
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EN ISO 14688-2:2017	Geotechnical investigation and testing — Identification and classification of soil — Part 2: Principles for a classification. International Organization for Standardization (ISO), 2017.
EN ISO 19901-8:2023	Oil and gas industries including lower carbon energy – Offshore structures – Part 8: Marine soil investigations. International Organization for Standardization (ISO), 2023. EN ISO 22475-1:2021 Geotechnical investigation and testing Sampling methods and groundwater measurements — Part 1: Technical principles for the sampling of soil, rock and groundwater, 2021.
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NEN 8991:2020	Geotechnisch onderzoek en beproeving - Identificatie en classificatie van grond (deel 2)

LIST OF ABBREVIATIONS

BH	Borehole
CPT	Cone Penetration Test
CS-OOO	Certificatie Opsporen Ontplofbare Oorlogsresten (Certification for Detecting Explosive Remnants of War)
DDW WFZ	Doordewind Wind Farm Zone
fs	Sleeve friction
Gmax	Small strain shear modulus
GGM	Geological Ground Model
GIS	Geographic Information System
GM	Ground Model
GP	Geophysical
GT	Geotechnical
GIR	Geotechnical Interpretative Report
IA	Investigation Area
IGM	Integrated Ground Model
LDGM	Legacy Data Ground Model
LTS	Laboratory Testing Schedule
LTAF	Lab Test Assignment Form
LAT	Lowest Astronomical Tide
MIC	Microbially Induced Corrosion
MW	Mega Watt or 106 Watt
MPX	Mega pixels
DDW WFZ	Doordewind Wind Farm Zone
OCR	Offshore Client Representative
PSD	Particle Size Distribution
PCPT	Piezo Cone Penetration Test
PGM	Preliminary Ground Model
PEP	Project Execution Plan
PQP	Project Quality Plan
QA	Quality Assurance
QC	Quality Control
QI	Quantitative Interpretation
qt	Corrected cone resistance
SCPT	Seismic Cone Penetration Test
SCPTu	Seismic Cone Penetration Test with pore pressure measurement
SBP	Sub Bottom Profiler

TC	Total Carbon
TCPT	Temperature Cone Penetration Test
TIC	Total Inorganic Carbon
TOC	Total Organic Carbon
u_2	Pore pressure as measured by the PCPT
VC	Vibrocore
WFZ	Wind Farm Zone
WPM	Work Progress Meeting

Contents

1 Introduction & Background

1.1 Scope document

This document details the scope of the WORK as part of the AGREEMENT that CLIENT has awarded to CONTRACTOR for carrying out geotechnical investigations at the Investigation Area (IA) in the Doordewind Wind Farm Zone (DDW WFZ).

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 organized under the Offshore Wind Energy Act. As part of the tender documentation, the participants will receive an information package in which detailed information on the offshore site is included, including detailed information on the soil conditions at the sites.

1.3 Objective of 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 (GIR) and Ground Model (GM) in order to improve the geological and geotechnical understanding of the Investigation Area in DDW WFZ, 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;
- Where applicable, supplement the findings of the geological desk study and the geophysical survey; and
- Contribute to a Geological Ground Model (GGM), an Integrated Ground Model (IGM) and GIR.

Note that the integration of the collected geotechnical data into the Preliminary Ground model (PGM) with delivery of the associated GIR and IGM will be dealt with under separate contracts.

The GT CONTRACTOR(S) shall cooperate fully with the GM CONTRACTOR in order to allow both GT and GM contractor to achieve their respective goals. Full cooperation shall include, but is not limited to, engaging with the GM CONTRACTOR and give advice as set out in the responsibility matrix in Section 1.9. To achieve this, RVO will facilitate joint workshops and interface meetings with both contractors. Refer to Section 1.9 for further details.

The laboratory test programme for determination of various soil properties, such as 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. The type and quantity of the laboratory tests are provided in Annex [4a] and [4b]. The GT CONTRACTOR shall propose and execute the laboratory testing programme based on a laboratory strategy

framework which will be specified by the CLIENT and GM CONTRACTOR (further details in Sections 1.9 and 2). The Geotechnical Survey WORK is divided into two lots:

- Lot 1 contains seabed in situ testing (PCPT, SCPT, thermal conductivity), sampling (vibrocoring) inclusive of standard laboratory testing (cyclic testing if required) and reporting; and
- Lot 2 contains a borehole campaign comprising borehole sampling, downhole in-situ testing (downhole PCPT & SCPT, Borehole Geophysical Logging) and inclusive of all standard and cyclic laboratory testing and reporting.

1.4 Objective of Lot 1 and Lot 2

Lot 1

The shallow geotechnical investigation must provide relevant information about the soils at the Investigation Area in the DDW WFZ in terms of stratigraphy, lateral variability, and geotechnical properties. The Lot 1 investigations must provide detailed information which will be used as input into morphological studies and an IGM which ultimately seeks to improve the geological and geotechnical understanding of the site in support of the design and installation of wind turbines and their support structures. In addition, the investigation must provide high resolution information of the shallow seabed soils as input for cable design and installation (burial) assessments.

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 and should include, but not be limited to, the following assessments for all relevant stratigraphic layers:

- Soil classification testing and geotechnical description;
- In situ conditions such as strength parameters;
- Thermal capacity and conductivity properties;
- Seismic properties; and
- Archaeological dating analyses.

The laboratory test programme for determination of the properties of the soil shall cover a set of different test types and test quantities to aid foundation and cable design.

Lot 2

The borehole geotechnical investigation must provide relevant information, beyond the depths achieved during the Lot 1 shallow seabed investigation, to a depth defined by CLIENT.

The borehole geotechnical investigation shall consist of a combination of sampling with subsequent laboratory testing and in situ testing. Data acquisition techniques, direct and/or indirect, must provide geotechnical insights and should include, but not be limited to, the following assessments for all relevant stratigraphic layers:

- Soil index tests including classification testing and geotechnical description;
- Soil strength and stiffness (monotonic and cyclic);
- Soil permeability tests;
- Soil consolidation tests;
- Interface shear tests;
- In situ stresses and pre-consolidation stresses due to historical loading (over-consolidation); and
- Geological age dating.

The laboratory test programme for determination of soil strength and deformation properties shall cover a set of different test types and test quantities and will complement the data set acquired in Lot 1.

The complete data set (Lot 1 and Lot 2) must be suitable for the creation of a GIR and allow for integration into the IGM, which together are intended to provide the relevant geotechnical characteristics for wind turbine foundation and cable design and installation.

1.5 Site description

The Doordewind Wind Farm Zone (DDW WFZ) is located approximately 77 kilometres off the north coast of the Netherlands. The location of the DDW WFZ is illustrated in Figure 1~~Figure 1~~~~Figure 1~~.

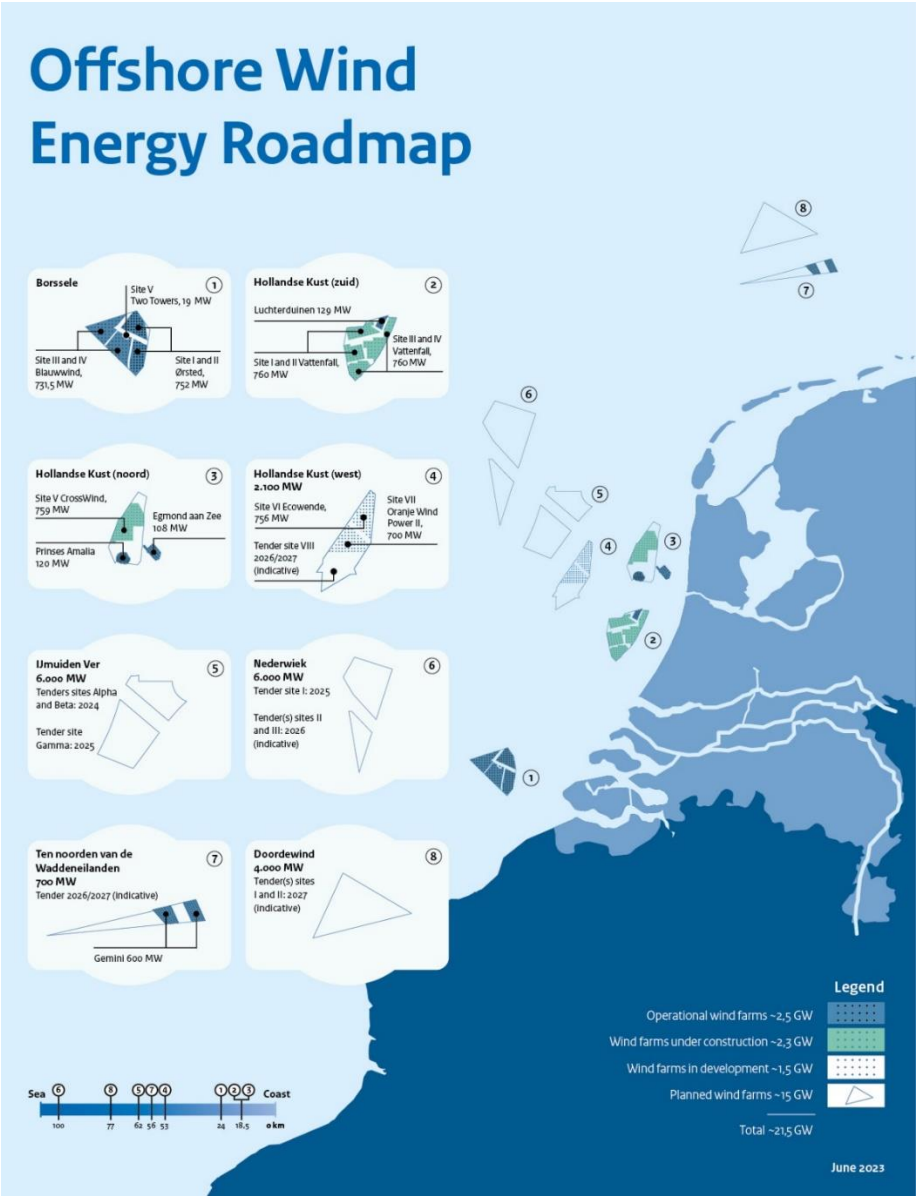

Figure 1: Dutch Offshore Wind Farm Zones overview for road map 2030+. The planned Doordewind WFZ is indicated by #8.

The DDW WFZ is planned to contain a total capacity of 4,000 MW divided over 2 sites of 2,000 MW each. Both Doordewind Wind Farm Site I and Doordewind Wind Farm Site II are planned to be tendered in 2027. More details on the DDW WFZ are provided in Section VII Starting Points and Assumptions.

1.6 Investigation Area (IA)

The geotechnical Investigation Area in the DDW WFZ is illustrated in Figure 2~~Figure 2~~Figure 2 below.

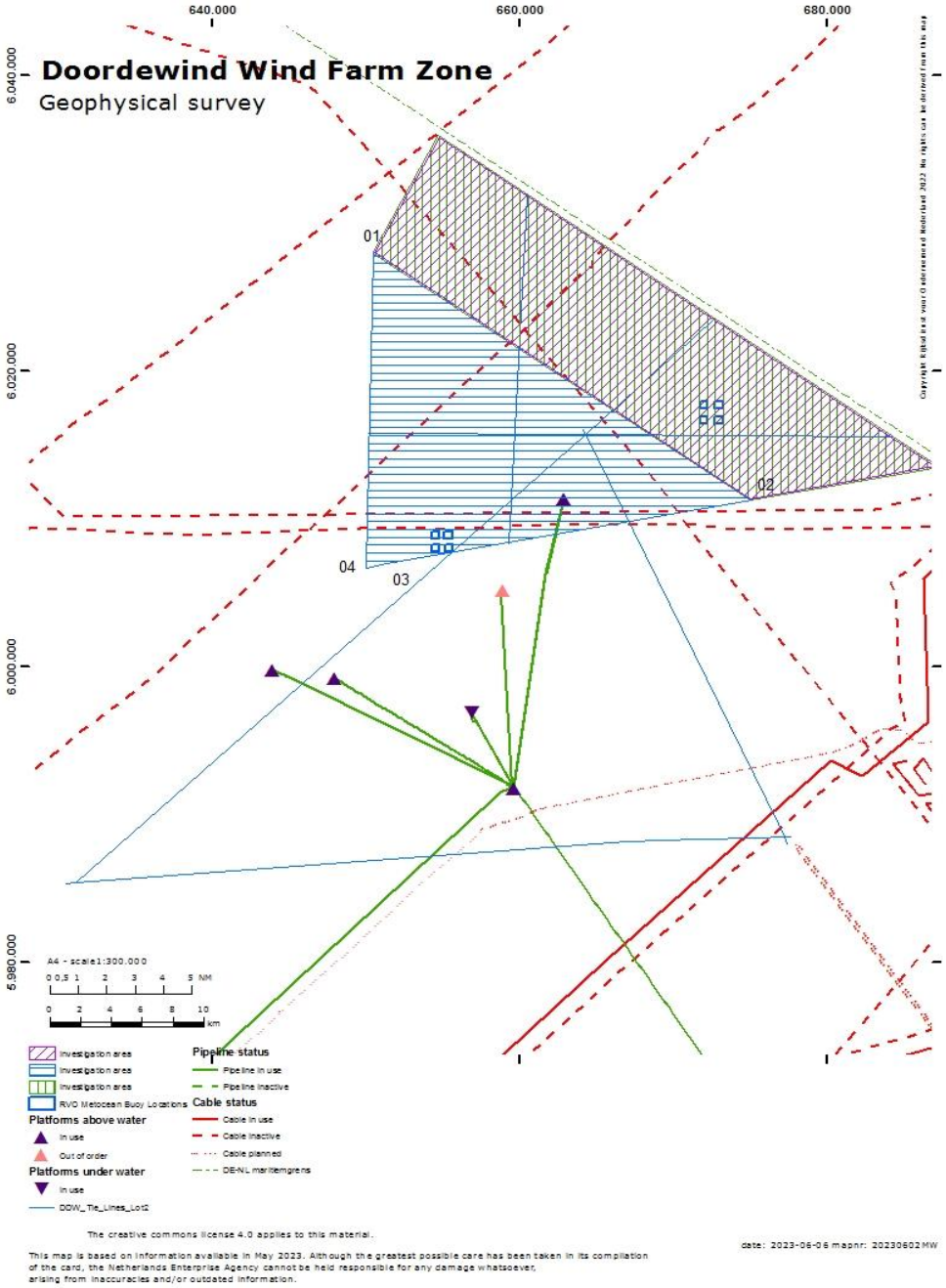

Figure 2: Investigation Area for Doordewind Wind Farm Zone.

The Investigation Area size is approximately 580 km^2 (IA DDW WFZ). The coordinates defining the circumference to the Investigation Area are provided in Table 1~~Table 1~~Table 1 .

Table 1 Coordinates of the Doordewind Investigation Area

Coordinate system : ETRS_1989_UTM_Zone_31N		
EPSG 25831		
~~IA-DDW-3DUHRS /~~ Northern DDW IA (300 km^2)		
Point No.	**Easting**	**Northing**
~~3D_~~IA_01	654758.4	6035783.5
~~3D_~~IA_02	687040.2	6013535.8
~~3D_~~IA_03	674988.3	6011323.1
~~3D_~~IA_04	650565.2	6027994.7
Southern DDW IA (268 km^2)		
Point No.	**Easting**	**Northing**
~~2D_~~IA_01	650459.1	6028068.5
~~2D_~~IA_02	675126.0	6011229.1
~~2D_~~IA_03	651377.0	6006914.0
~~2D_~~IA_04	649971.0	6006646.0

For the Investigation Area the CLIENT has provided indicative quantities for Lot 1 and Lot 2 investigations and laboratory testing. These are specified in Annex [4a] (Lot 1) and [4b] (Lot 2). The quantities should be considered as indicative. The CLIENT reserves the right to adjust these in accordance with the provisions of the Contract.

For Lot 1 this might influence the following deliverables:

- Seabed In Situ Testing Report for IA DDW WFZ;
- Seabed Sampling Report for IA DDW WFZ;
- Archaeological Analysis report for IA DDW WFZ.

For Lot 2 this might influence:

- Priority Test Report for the GGM
- BH Locations Report for IA DDW WFZ;
- Cyclic Laboratory Testing Report for IA DDW WFZ;
- Geological Age Dating report for IA DDW WFZ.

1.7 Execution of the investigation

CONTRACTOR shall take into account that alignment on the survey planning (timing and location across the zone where the survey is carried out) shall be performed with other contractors working at the site, if required.

1.8 Planning of the investigation

The offshore soil investigation campaign for Lot 1 (investigation in seabed mode) is foreseen to start between 15 January 2025 and 22 February 2025. The key milestones for the execution of the Lot 1 investigation are summarised in Annex [4a].

The offshore soil investigation campaign for Lot 2 (downhole) will follow on from the seabed investigations with a start between the 1st of March 2025 and the 1st of May 2025. The key milestones for the execution of the Lot 2 investigation are summarised in Annex [4b].

Both Lot 1 and Lot 2 scope includes onshore laboratory testing of soil samples. As part of the tender submission, tenderers shall provide a letter from their nominated onshore laboratory confirming that they have sufficient reserved capacity to meet the proposed standard and cyclic laboratory testing schedule(s).

The overall project schedule is highly time-driven in order to comply with RVO's schedule to deliver all data in Q3 2026. Therefore, it is imperative, that the key dates, as mentioned in the Annex [4a] and [4b] will be met. The overall planning, sequence and scopes of events, interfaces with other CONTRACTORS for the Ground Model and Lots 1 and/or Lot 2 and other project parameters might differ from previous projects. CONTRACTOR shall take note of the provided project planning and indicated key dates.

Throughout the duration of the project, Client would like to work with CONTRACTOR in a constructive, pragmatic approach in order to be able to maintain the schedule.

1.9 Interfaces & Responsibilities

The DDW Soil Investigation project is a project in which the GM, GT, and GP scopes are interrelated; the scopes depend on and feed into each other. Given the strict and tight schedule requirements for this project, a close cooperation is foreseen between all parties involved in the project. Especially between the GM and Lot 1/Lot 2 contractors, a lot of interfaces are foreseen. These are summarized in Table 2~~Table 2~~~~Table 2~~.

Table 2 Responsibility matrix for interfaces.

Responsibility GT-Lot1	**Party/Contractor**			
P=Produce E = Evaluate & Execute A=Approve	**CLIENT**	**GT-Lot1 CONTRACTOR**	**GT-Lot2 CONTRACTOR**	**GM CONTRACTOR**
Preliminary Ground Model	A	-	-	P
GT Location Plan: CPTs GT-Lot 1	A	E	-	P
GT Location Plan: Vibrocores GT-Lot 1	A	E	-	P
Lab Test Strategy GT-Lot 1	A	E	-	P
Sample Batching Strategy	A	E	-	P
Clearance of CPT/VC locations GT-Lot 1	-	PE	-	-
Archaeological Analysis GT-Lot1	AP	E	-	-
Standard lab test schedule GT-Lot 1	A	PE	-	A
Standard lab test conditions GT-Lot 1	A	E	-	P
Sample Batching schedule	A	PE	-	A

Responsibility GT-Lot2	**Party/Contractor**			
P=Produce E = Evaluate & Execute A=Approve	**CLIENT**	**GT-Lot1 CONTRACTOR**	**GT-Lot2 CONTRACTOR**	**GM CONTRACTOR**
Preliminary Ground Model	A	-	-	P
GT Location Plan: BH GT-Lot 2	A	-	E	P
Lab Test Strategy GT-Lot 2	A	-	E	P
Sample Batching Strategy	A	-	E	P
Geological Age Dating Strategy GT-Lot2	A	-	E	P
Clearance of BH locations GT-Lot 2	-	-	PE	-
Standard & Cyclic lab test schedule GT-Lot 2	A	-	PE	A
Sample Batching schedule	A	-	PE	A
Geological Age Dating Analysis GT-Lot2	A	-	PE	A
Standard & Cyclic lab test conditions GT-Lot 2	A	-	E	P

Table 2 – additional comments. For Lot 1 and Lot 2, the following shall apply:

1. *For all details of the Ground Model (including PGM), please refer to the Ground Model tender documents.*
2. *The GM contractor shall produce the location plans, lab test strategy, batching strategy and lab test conditions. All these deliverables shall be discussed with the Lot 1/Lot 2 GT contractor and shall be subject to approval by Client. GT Contractor shall execute the scopes as per the approved plans.*
3. *Following the delivery of a lab test strategy and batching strategy, the Lot 1/Lot 2 GT contractor shall produce the subsequent schedules for lab testing and batching. These shall be discussed and approved by Client and GM contractor before the execution of the works.*

For Lot 1 specific, the following applies:

4. *The Client will make use of a dedicated Archaeological Contractor, who shall produce the input for the archaeological analysis. The GT Lot 1 contractor shall execute the works. The sample material shall remain with the Lot 1 contractor at all times.*

Lot 1 and Lot 2 CONTRACTORS shall fully cooperate with other actors involved in the works of the CLIENT. The main requirements for the Lot 1 CONTRACTOR are described in Section 2.5, and the main requirements for Lot 2 CONTRACTOR are described in Section 2.7. CONTRACTOR(S) shall include time for all cooperation efforts. The cooperation efforts shall be performed by senior personnel of CONTRACTOR.

Lot 1 and Lot 2 CONTRACTORS shall cooperate with the GM CONTRACTOR in provision of all information and data necessary to develop a comprehensive GIR and IGM. Vice Versa GM CONTRACTOR shall provide all information relevant for the GT CONTRACTOR to execute the project.

Cooperation shall include but not be limited to:

- Overall planning;
- Geotechnical Location Planning;
- Sample selection;
- Sample batching strategy;
- Laboratory Testing Strategy;
- Geological Age Dating Analysis;
- Development of testing parameters and pressures;
- Advice on any testing deviation from the Bill Of Quantities (BOQ).

GM contractor shall provide the necessary specifications to allow the GT contractor to execute the programme. Both contractors are expected to maintain reasonable response times as to not unnecessary delay the work of the other contractor.

CLIENT encourages co-creation between all parties during all processes to optimise the workflow and promote implementation of novel innovations such as may be forthcoming.

Throughout the duration of the project, Client would like to work with CONTRACTOR in a constructive, pragmatic approach in order to be able to maintain the schedule.

Both Lot 1 and Lot 2 CONTRACTOR shall allow for weekly progress meetings in the Tender proposal for the projected duration of the contract. Additional kick-off meetings shall be allowed for, with one at the start of the contract (both Lot 1 and Lot 2), one at commencement of the standard laboratory testing programme (both Lot 1 and Lot 2) and one at the start of the cyclic laboratory testing programme (Lot 2 only). The kick-off meeting at the start of the contract is to be held at the offices of the relevant GT Contractor, for Lot 1 this meeting should be 1 day long and for Lot 2 this meeting should be 2 days long.

The main interfaces are described below:

- The requirements of the GM CONTRACTOR / CLIENT shall be communicated to all relevant parties in sufficient time for actions to be implemented;
- The Lot 1 CONTRACTOR and Lot 2 CONTRACTOR will provide checks on the geotechnical investigation locations proposed by the CLIENT / GM CONTRACTOR as part of the location clearance process and in order to verify the viability of the location from an operational perspective. In case of any issues arising from the checks, CLIENT shall be notified.;
- Should any outstanding issues still exist, a meeting will then be organised with GM CONTRACTOR, CLIENT experts and Lot 1 and Lot 2 CONTRACTORS as appropriate to discuss and determine the final target locations. These meetings shall be included in the Scope of Work of the ground investigation

CONTRACTOR. CONTRACTOR shall further cooperate fully to ensure that the CLIENT reporting timescales and deliverables are met;

- The Lot 2 CONTRACTOR will assess the Lot 1 CPT locations ("seabed CPTs") at the corresponding borehole locations. Since an overlap between the Lot 1 and Lot 2 campaigns is anticipated, the list of boreholes will be updated periodically by GM CONTRACTOR and CLIENT;
- Lot 1 and Lot 2 CONTRACTORS are required to provide a regular transfer of data to the CLIENT for use by GM CONTRACTOR. This data transfer shall occur during both the offshore survey and onshore reporting phases of the operations at regular time intervals as described in Section 2. During the offshore survey delivery of digital data is required on a regular basis. During the laboratory testing, delivery of digital data of final results are required on a at least bi-weekly (once every two weeks) basis;
- Lot 1 CONTRACTOR will provide Seabed PCPT campaign Reports and Vibrocore Campaign Reports as base geotechnical information for developing the Borehole campaign. It is anticipated that one meeting is required to align with the Lot 2 CONTRACTOR and GM CONTRACTOR. This meeting shall also be allowed for by the Lot 2 CONTRACTOR. Lot 1 and Lot 2 CONTRACTORS shall cooperate fully to ensure that the CLIENT reporting timescales and deliverables are met;
- The Lot 1 CONTRACTOR shall be responsible for proposing a laboratory testing schedule based on a laboratory testing strategy provided by the CLIENT / GM CONTRACTOR. The laboratory testing schedule shall be reviewed by the GM CONTRACTOR and CLIENT prior to execution. The lab test schedule shall be subject to review and approval of CLIENT (maximum 3 review rounds). After approval, CONTRACTOR shall provide an updated schedule at least once a month.
- Lot 2 CONTRACTOR shall be expected to deliver: a GGM Priority Laboratory Testing Report containing all relevant test to start the creation of geological ground model, a Geotechnical Borehole Report containing all standard static laboratory testing and a Cyclic Testing Report providing all cyclic test results and the additional standard testing performed in support of the specification of the cyclic tests, all within CLIENT timeframes.
- Note that the provision of testing parameters and pressures and/or densities for reconstituting samples the CLIENT / GM CONTRACTOR may require the availability of PCPT data at the same location or at locations where the same soil units are present;
- Lot 2 CONTRACTOR shall cooperate fully with the GM CONTRACTOR and all CLIENT experts during the planning and execution of the borehole phase, subsequent standard laboratory testing, and both be receptive to, and provide proposals and technical notes such as are required to inform the project at various stages of the Cycle Times. Lot 2 CONTRACTOR shall also be available to discuss and provide input into the overall testing schedules. These meetings and discussions shall be allowed for by the Lot 2 CONTRACTOR. Lot 2 CONTRACTOR shall further cooperate fully to ensure that the CLIENT reporting timescales and deliverables are adhered to. The Lot 2 CONTRACTOR shall be responsible for proposing the standard laboratory testing schedule based on a laboratory testing strategy (LTS) provided by the CLIENT / GM CONTRACTOR. The laboratory testing schedule shall be reviewed by the GM CONTRACTOR and CLIENT prior to execution. The laboratory testing schedule should include realistic Lab Test Assignment Form (LTAF) review cycles, that are acceptable to CLIENT/GM CONTRACTOR. Note that the provision of testing parameters and pressures of laboratory tests that require reconstitution of the samples by the CLIENT / GM CONTRACTOR may require the availability of

PCPT data at the same location or at locations where the same soil units are present;

- During the execution of the laboratory testing for Lot 1 and Lot 2, and as required, a laboratory representative shall attend the weekly progress meetings with CLIENT to provide technical and schedule updates of the testing programme;
- The GM CONTRACTOR shall be responsible for developing the cyclic testing strategy with the assistance of the Lot 2 CONTRACTOR. Lot 2 CONTRACTOR shall provide an overview of available samples with appropriate location ID, sample type and depth notation.
- Once the type and quantity of tests are assigned to relevant samples, Lot 2 CONTRACTOR will provide a template, if required, where test specifications can be assigned by the GM CONTRACTOR. These specifications may include, but are not limited to consolidation pressures, consolidation times, shear rates, failure criteria, loading conditions and load steps. CLIENT reviews specification before implementation. Lot 2 CONTRACTOR and GM CONTRACTOR shall be expected to cooperate fully on all aspects of the testing programme;
- GM CONTRACTOR shall advise on all laboratory test programmes and planning required for the Lot 1 and Lot 2 CONTRACTORS to progress such laboratory testing as has been scheduled. CONTRACTORS are expected to cooperate fully on all matters relating to the successful progression and completion of the onshore testing programme; and
- Through award of a separate contract, CLIENT will conduct an archaeological assessment using some of the geotechnical results acquired by the Lot 1 CONTRACTOR. Lot 1 CONTRACTOR shall allow to attend two meetings that shall form part of the interface meetings.
- Through award of a separate contract, CLIENT will conduct a Geological Age Dating using some of the geotechnical results acquired by the Lot 2 CONTRACTOR. Lot 2 CONTRACTOR shall allow to attend two meetings that shall form part of the interface meetings.

1.10 Available information

The following studies will be provided by CLIENT separately to the CONTRACTOR before start of the works (uno):

- Geological desk study and UXO desk study for DDW WFZ are available on; https://offshorewind.rvo.nl/cms/view/65dfbc97-a2b9-40f8-9de8-d7eb5c5fa1a6/soil-doordewind
- Archaeological desk study for DDW WFZ is available on; https://offshorewind.rvo.nl/cms/view/65dfbc97-a2b9-40f8-9de8-d7eb5c5fa1a6/soil-doordewind
- UXO desk study for DDW WFZ is available on; https://offshorewind.rvo.nl/cms/view/65dfbc97-a2b9-40f8-9de8-d7eb5c5fa1a6/soil-doordewind
- Persistence tables for DDW WFZ included in Annex [4a] (Lot 1) and [4b] (Lot 2);
- Base map (MPK) containing information on location, attached to Annex [5]: Starting Points and Assumptions;
- Geophysical survey report of DDW and associated digital data, will be made available between Q4 2024 – Q1 2025.

Note that at the time of preparing this tender document, no project specific geophysical or geotechnical data is available for the DDW WFZ.

Further, for information only, the results of the geophysical and geotechnical surveys carried out for Borssele, Hollandse Kust (zuid, west and noord), Ten noorden van de Waddeneilanden and IJmuiden Ver (sites I-IV) WFZs are available at http://offshorewind.rvo.nl/. Since the TNWWFZ is just south of the DDW WFZ, this area might be of geotechnical interest. Note that the scope of work for the surveys carried out by the CLIENT for the previous surveys may deviate from this Scope of Work.

1.11 Certification

It is intended that selected results and deliverables from the offshore geotechnical campaign be certified by an independent certifying body.

Lot 1 and Lot 2 CONTRACTORS shall fully cooperate with the certification body contracted by CLIENT and participate in meetings (technical) discussions in order to achieve the certifications of the deliverables.

The aim of contracted certification body is to issue, for the deliverables, as specified in Sections 2.6 and 2.8, a Certification Report that the report(s) have been drawn up using best practice, according to applicable norms and industry standards (e.g. DNV-SE-0190:2021-09 or equal or better)

Lot 1 and Lot 2 CONTRACTORS shall cooperate in the process towards this Certification Report. The CONTRACTOR shall make available time to adjust its deliverables after review rounds of both CLIENT and certification body.

2 Scope of Work

The scope of work described below is applicable to the Investigation Area in DDW WFZ unless otherwise specified.

2.1 Activities

The activities that need to be carried out to obtain the information detailed in section 1.3 are the following:

Preparation

- All preparatory works required for the geotechnical survey, including preparation of all plans that need to be provided and approved before the works can start.

Seabed sampling and in situ testing in the IA (Lot 1)

- Seabed piezo cone penetration tests (PCPT) and seismic cone penetration tests (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;
- Associated factual reporting (results to be presented in "Seabed Sampling Report" and "Seabed In Situ Testing Report", each of which covers the whole site); and
- Delivery of associated digital data.

Borehole sampling and in situ testing in the IA (Lot 2)

- Boreholes comprising a combination of or exclusively: downhole sampling, downhole PCPT and downhole SCPT;
- P-S suspension logging;
- Density or porosity logging (OPTIONAL);
- Associated reporting (results to be presented in "Geotechnical Borehole Report" which covers the whole site); and
- Delivery of associated digital data.

Standard laboratory testing (Lot 1)

- Standard laboratory test programme (including classification testing, static strength tests and thermal conductivity and electrical resistivity tests);
- Associated reporting (results to be presented in the "Seabed Sampling Report"); and
- Delivery of associated digital data.

Priority Lab Testing (Lot 2)

- In order to facilitate the project schedule and the timely start of the Geological Ground Model creation, a list of priority lab tests have been identified, consisting of a combination of various types of testing.
- Associated reporting (results to be presented in both the GGM Priority Laboratory Testing Report);

Standard laboratory testing (Lot 2)

- Standard laboratory test programme (including classification testing, static strength testing, stiffness testing and compressibility testing);
- Associated reporting (results to be presented in both the GGM Priority Laboratory Testing Report and the "Geotechnical Borehole Report");
- Delivery of monthly digital data during laboratory testing phase; and
- Delivery of all associated digital data with interim and final report(s).

Cyclic Laboratory testing (Lot 2)

- Cyclic laboratory test programme (including static reference strength testing and cyclic tests); and
- Associated reporting (results to be presented in the "Cyclic Laboratory Testing Report" prepared for each site).

Data processing and Interpretation

- Process the data obtained throughout the geotechnical survey;
- Produce derived parameters including interpretation; and
- Delivery of associated digital data.

Reporting

- Present the results in clear reports and drawings;
- Delivery of associated digital data packages with QA elements; and
- Weekly delivery of available final digital data throughout the laboratory testing phase.

Delivery

- Products of the survey are to be delivered as a coherent and integrated data package with clear documentation.

All data, including the intermediate digital data deliveries and the deliveries part of the factual reports, are to be provided in one consistent format throughout the project. A pilot of data exchange will be setup at the beginning of the project.

This scope of work is designed to provide a minimum specification. The description of the survey targets should inform the Tenderer for preparing their proposal which should clearly describe their suggested specification suitable for achieving the survey objectives.

It should be recognised that the results of the survey are to be integrated with other products and made available to multiple parties as part of the information associated with the wind farm permit tender process described in Section 1.2. The deliverable products of the survey must allow third parties receiving data packages to evaluate, reprocess, reinterpret, or otherwise rework the data to fit the needs of their processes. To this end, it is emphasised that raw data, positioning information, reporting and metadata are important elements of the deliverable package including a clear description of the data provision chain.

As part of the tender submission CONTRACTOR shall be required to clarify the limitations of performing each test type (seismic cone, P-S logging, dissipation testing, thermal conductivity testing) in the respective modes (downhole, seabed) and detail any perceived advantages in changing the anticipated deployment method.

2.2 Requirements of geotechnical survey works

2.2.1 General requirements for both lots in the Investigation Area:

- Obtaining all necessary permissions and / or notifications;
- Familiarising oneself with the anticipated ground conditions before start of site operations;
- Carrying out an independent UXO risk assessment for the proposed borehole and seabed CPT locations and undertake any required additional measures in order to reduce the risk to as low as reasonably practicable (ALARP) according to Dutch legislations including CS-OOO regulations;
- Preparation of the geotechnical survey and pre-mobilisation plans (inc. associated operations plan, HSE plan and quality plan) that need to be provided (and approved by CLIENT) before the offshore works can start;
- Preparing the necessary laboratory testing specifications and schedules for GM CONTRACTOR and CLIENT review and approval;
- Discuss, review, and ultimately perform all batching activities as per GM CONTRACTOR and CLIENT's proposal.
- CONTRACTOR to provide LTAF according to schedule requested by GM CONTRACTOR
- Performing the laboratory testing on obtained soil samples;
- The currently anticipated quantities of investigations and tests are specified in Annex [4a] and [4b]. These quantities should be considered indicative. The CLIENT may adjust these in accordance with the provisions in the Contract;
- Target coordinates of boreholes, seabed CPT and vibrocores will be provided by CLIENT at the date specified in Schedule of Key Dates;
- Inform the CLIENT on the progress of the works; and
- Process the data obtained throughout the geotechnical survey and provide preliminary results (for QC and definition of subsequent tests).
- The CLIENT requires a port call every four weeks (as a minimum) for OCR crew changes (applies to Lots 1 and 2).
- Where possible CONTRACTOR shall make use of any periods of weather standby to undertake port calls (in agreement with CLIENT) to facilitate offload and transport of samples and/or for crew changes.

2.2.2 Specific requirements for Lot 1

The specific requirements for Lot 1 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. 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 SCPT data. Preferably seismic cones also measure pore pressure (i.e., SCPTu). As minimum the SCPT should measure the shear wave velocity, but measuring both compression and shear waves is preferred. 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 (OCR) after consulting the 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 1m, as directed by the OCR;

- 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 approximately 1m depth intervals to target depth of 6m bsf. N.B. The 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 OCR;
- Perform vibrocores at selected locations to obtain a minimum of 3m recovery below the base of the seabed (using 6m core barrel) for:
    - The purpose of subsea electrical cable design;
    - The primary purpose of seabed morphodynamic assessment. The locations will be specified by the CLIENT; and
    - The purpose of archaeological assessment.

Please note that for the purpose of tendering all quantities for the above items are presented in Annex [4a] of the Invitation to Tender.

2.2.3 Specific requirements for Lot 2

The specific activities that need to be carried out to obtain the information detailed in Section 1.3 are the following for Lot 2:

- Drilling boreholes with a combination of sampling, downhole piezocone penetration tests (PCPT) or downhole seismic cone penetration tests (SCPT) to a target depth of 60m (A) or 40m (B). These boreholes can be sub-divided into four types, as follows:
    - Type 1 (A & B) – where the sampling/testing regime consists of quasi-continuous sampling from seabed to a predetermined depth followed by a combination of sampling and PCPT to a target depth of 40 or 60m. 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 (A & B) – where the sampling/testing regime consists of quasi-continuous sampling from seabed to a predetermined depth followed by a combination of SCPTs and sampling to a target depth of 40 or 60m. Preferably seismic cones also measure pore pressure (i.e., SCPTu). As minimum the SCPT should measure the shear wave velocity, but measuring both compression and shear waves is preferred. The seismic tests may be stopped at the depth at which the seismic signal is no longer strong enough to provide reliable results. The main purpose of the Type 2 boreholes is to obtain *in situ* shear (S) wave velocity (and if available P-wave velocity) measurements for deriving the small-strain shear modulus (Young's or bulk modulus). The SCPT system shall 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 shall be performed at depth intervals of approximately 1m, as directed by the OCR. A Type 2 borehole could be located adjacent to a selected Type 1 borehole or adjacent to a Lot 1 SCPT location;
    - Type 3 (A & B) – where the sampling regime consists of continuous sampling from seabed to 40 or 60m depth. The main purpose of the

Type 3 boreholes is to obtain samples for the purposes of laboratory testing. A Type 3 borehole could be located adjacent to a selected Type 1 or Type 2 borehole or adjacent to a Lot 1 CPT Location;
    - Type 4 (A & B) – where the sampling regime consists of continuous destructive drilling from seabed for the purposes of creating an open hole for P-S Logging or for (OPTIONAL) density/porosity logging. A Type 4 borehole could be located adjacent to a selected Type 1 or Type 2 borehole or adjacent to a Lot 1 CPT/SCPT Location;
    - Type 1/2/3/4 **A** = 60m target depth for Borehole
    - Type 1/2/3/4 **B** = 40m target depth for Borehole
- In some of the Type 1 boreholes, selected downhole PCPTs may be replaced with downhole SCPTs. Any such replacements will be notified by the OCR in advance of moving to the relevant borehole location;
- In some of the Type 1 or Type 2 boreholes P-S Logging is to be performed for cross-correlation/verification with nearby Lot 1 SCPT, Lot 2 Type 2 and Geophysical data. The P-S logging tests shall be performed at depth intervals of approximately 1m, as directed by the OCR.
- For any of the borehole types, oversampling of a PCPT or SCPT stroke may be requested by the OCR in order to verify the soil material type being tested;
- Preparation of borehole log and borehole laboratory testing schedule for approval within 24 hours of borehole completion; and
- A unit price is requested to carry out optional (optional) density or porosity logging to be performed in selected boreholes;

For the purpose of tendering, estimated quantities of the different borehole types and the associated samples/tests are presented in Annex [4b].

2.3 Preparation

2.3.1 Scrutinise available information

CONTRACTOR shall scrutinise the information that has been made available by CLIENT. Information that is relevant for carrying out the WORK shall be taken into account while preparing the WORK.

2.3.2 Preparations

Permits

CONTRACTOR shall obtain and arrange all necessary permissions and/or notifications to perform the survey (including all permissions and fees necessary for access and safety arrangements to harbours and offshore positions).

Project Plans

CONTRACTOR shall prepare all project plans as required by the CONTRACT. These documents are included in the list of CONTRACTOR reports and deliverables, and shall include, but not be limited to:

- Project Execution Plan, (PEP) (including applicable method statements, risk assessments, project schedule, and vessel layout diagrams);
- Project Quality Plan/Quality Manual, (PQP, QM);
- Health, Safety and Environment Plan, (HSE); and
- Emergency Response Plans (ERP).

Risks will be discussed with CONTRACTOR on a weekly basis during progress meetings. The Project Quality Plan shall be issued according to EN ISO 9001:2015. CONTRACTOR shall only commence the WORK when all project plans have been

reviewed and approved by CLIENT and CLIENT. Key dates for delivery of all project plans are defined in Annex [4a] and [4b] for Lot 1 and Lot 2, respectively.

2.3.3 UXO Clearance, risk assessment and measures

CONTRACTOR shall carry out an UXO Clearance for the geotechnical locations. Clearance and risk assessment should be done as a minimum according to most recent CS-OOO legislation applicable. CLIENT will provide geophysical data as described below. The CONTRACTOR can use this data for UXO clearance. However, if additional measures or data is needed in the opinion of the CONTRACTOR, to reduce the risk to as low as reasonably practicable (ALARP), costs for additional measures should be priced in Annex [4a] and [4b]. The approach to UXO clearance shall be described in the Project Execution Plan.

The data acquired during the geophysical campaign in the DDW WFZ will be provided to the CONTRACTOR. The ALARP clearance can be conducted by the CONTRACTOR once the data is available. Besides, an UXO desk study for DDW WFZ is available on; https://offshorewind.rvo.nl/cms/view/65dfbc97-a2b9-40f8-9de8-d7eb5c5fa1a6/soil-doordewind.

The results of the geophysical campaign will include the following items on all lines:

- High resolution bathymetric and backscatter survey (MBES);
- Side scan sonar survey (SSS);
- Magnetometer survey in TVG setup (MAG);
- Shallow Penetration Sub-Bottom Profiler (SBP) survey;
- For the southern DDW IA: 2D Ultra High Resolution Seismic (UHRS) data
- For the northern DDW IA: 3D Ultra High Resolution Seismic (UHRS) data
- Extent of interpreted sub-seabed geological units, geohazards, and seabed classification.

CLIENT will provide CONTRACTOR with available data as soon as it becomes available. Priority will be given to data that includes borehole locations. If relevant, CLIENT aims to provide CONTRACTOR with the interpreted data package of the PGM and LDGM, raw datasets and intermediate data. This will be made available to evaluate, reprocess, reinterpret, and rework.

CLIENT will provide all available geophysical data upon request of CONTRACTOR to prepare operations. The geotechnical operations will be planned on the existing data set.

If CONTRACTOR needs more information than presented in the above text, please inform accordingly in the memorandum of information.

If Contractor is of the opinion the acquired information is insufficient and would want to acquire more data, CONTRACTOR should price operation costs accordingly in Annex [4a] and [4b] (e.g., acquiring data, processing, and creating ALARP certificates).

The offshore phase for the entire geophysical survey is *expected* to be completed during Q4 2024.
CONTRACTOR shall first consult the available project documentation/data prior to undertaking any assessments.

2.4 Mobilisation

2.4.1 Mobilisation

Mobilisation considers the mobilisation of the vessel(s) to the IA site, complete with all necessary geotechnical equipment and personnel. CONTRACTOR shall include sufficient consumables and equipment spares in the mobilisation plan to allow for any foreseeable events, costs for the consumables and spares shall be included in the mobilisation rate in Annex [4]. CONTRACTOR shall indicate the proposed port of mobilisation/demobilisation.

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

Mobilisation commences with the installation of equipment, continues through the performance of harbour and offshore trials (e.g., positioning/navigational equipment), and finishes with the completion of equipment calibrations, transit to the site and positioning on the first location.

A detailed mobilisation checklist shall be presented in the Project Execution Plan and shall be approved by OCR prior to departure to the site.

Mobilisation is considered complete:

- After all trials and calibrations have been completed to the approval of the OCR and the CONTRACTOR REPRESENTATIVE. Notice of approval shall be in writing and shall be incorporated in the Mobilisation Report; and
- When the vessel(s) is (are) at the first investigation location, ready to deploy the seabed frame/rig to perform the WORKS;
- Mobilisation report (draft version) is issued to the CLIENT.

WAITING ON WEATHER can only be registered as such when the mobilisation as described above has been completed.

The CONTRACTOR shall provide a Mobilisation Report, which must document as a minimum:

- Equipment mobilised on board and any deviation from the CONTRACTOR procedures;
- Equipment trials and calibrations;
- Equipment calibration certificates;
- Load / Magnetic Particle Inspection (MPI / Non-Destructive Test) tests certificates of installed equipment;
- Vessel Safety Audit not older than 6 months before start of Mobilisation;
- Persons On Board (POB) list;
- Any non-critical defects; and
- Verification report of the testing of the internet speed upload/download carried out to show that the required internet speed onboard each of the site investigating vessels meets the specification given in 2.14~~2.14~~2.1~~4~~.

The CONTRACTOR shall ensure that the final revision of project documentation is provided to the CLIENT for final approval at least 28 working days before the start of the mobilization.

2.4.2 Positioning

The location of survey vessel(s) (a minimum of DP1) and testing devices shall be determined using at least two independent Differential GPS (DGPS) systems.

GPS system accuracy shall be:

- 10cm accuracy in x & y direction; and
- 20cm accuracy in z direction.

Independence between DGPS systems implies that both segments are at least two independent systems. RVO prefers tertiary and quaternary systems for added positioning redundancy. The secondary system shall be available both as a backup for the primary system and for online quality assurance. Additional systems shall be used as independent checks on the primary systems.

The independent secondary system (i.e., independent in all respects except satellites) must be operated in parallel with the primary system, so as to provide full real time redundancy. A continuous comparison between the position solutions derived from the primary and secondary systems must be made throughout the survey. Any differences of more than 1 metre between the primary and the secondary system must be investigated; survey operations must be suspended until the source of discrepancy is found and solved.

The elevation of the CPT / drilling equipment (with reference to the seabed level) shall be accurately measured during the execution of the WORKS. Any settlement of the equipment is to be recorded and reported to the OCR. CONTRACTOR shall provide detailed methodologies on how the settlement of the seabed frame into the seabed shall be measured along with measurement of frame inclination. At least two independent methods to assess sinkage should be applied on site by CONTRACTOR in order that cross-comparison can be made. A settlement gauge must be installed for all Lot 1 and Lot 2 deployments. For Lot 2, (downhole campaign) the drill string or the casing (if any) can be used to control the elevation of the deck or reference datum for sampling. The elevation of strata changes within boreholes is established relative to seabed and to the specified reference level.

The CONTRACTOR shall set up the required equipment (e.g., echosounder) to check the water depth. Water depth data both measured and reduced to the specified datum shall be made available to the OCR and shall be included on the measured and interpreted logs.

Accuracy of water depth measurement: 10 cm.

For each location, a CTD (Conductivity, Temperature and Depth) probe profile or equivalent CLIENT approved methods is established to determine at least the water depth and the water temperature over the water column (sea surface to seafloor, 1-meter intervals).

The exact position of the measurements must be recorded with an acoustic tracking system such as a USBL (Ultra Short Baseline), giving the position of the equipment underwater relative to the vessel surface position.

The acoustic underwater positioning system must be used to provide X, Y and Z offset to all seabed deployed systems. The offset to each sensor is used in real time to provide an absolute position coordinate and logged together with all raw data relative to a common GPS time base.

USBL system accuracy: 0.5% of Slant Range

The CONTRACTOR must provide evidence for CLIENT approval that the USBL system is working and within specified accuracy range.

All measurements should be positioned within a 5m radius of the target coordinates. If re-positioning is required, the seabed frame should be positioned as close to the target coordinates as possible. If an obstruction is encountered on the seabed or the

seabed slope exceeds 5-10 degrees (depending on availability of a levelling system), the seabed frame shall be re-positioned to avoid the obstruction or excess slope whilst keeping the location as close to the target co-ordinates as possible.

Repositioning is to be confirmed and approved by the OCR.

2.4.3 Coordinate reference system and datum

SI units (ISO/IEC8000) are applicable for any activities carried out at the Wind Farm Zone.

All positioning data shall be collected in the European Terrestrial Reference System 1989 (ETRS89) and projected using ETRS89 Transverse Mercator Coordinate Reference System (UTM Zone 31N). The reference for this system is EPSG Projection code 25831 - ETRS89 / UTM zone 31N. The Epoch to consider will be provided by CLIENT.

The vertical datum for the survey is Lowest Astronomical Tide (LAT) using the NL LAT 2018 reference surface as described on the website of the https://www.defensie.nl/downloads/applicaties/2020/06/12/nllat2018.

2.4.4 Seabed Frames for Seabed CPT and Boreholes

Although no sand waves are expected in the Investigation Area, it is normally possible to avoid the more onerous seabed gradients by micrositing the seabed CPTs or boreholes. However, the CLIENT prefers the CONTRACTOR to provide a system that allows for some adjustment in the level of the seabed frame in order to increase flexibility. CONTRACTOR is requested to propose practical methods to attain a level seabed frame for vertical alignment of the cone rods or drill-string, including for drill-string re-entry purposes. CLIENT will prefer practical and proven methods of attaining a level and stable re-entry platform. CONTRACTOR shall provide detailed methodologies on how the tilt and settlement of the seabed frame into the seabed are measured during CPT/drilling operations.

2.4.5 Repositioning on Location (Bump Over)

At some of the geotechnical investigation locations, more than one seabed test (Lot 1) or borehole (Lot 2) may have to be carried out.

For Lot 1, the cost of transiting to location, positioning and setting-up for the first seabed "test" (PCPT, SCPT or TCPT) at each location is covered by Items 2.1, 2.4 and 2.7 in Annex [4a], respectively. ~~If there are any other seabed "tests" carried out afterwards before the vessel transits to another location, the additional cost of "bumping over" (re-positioning) and setting-up for each of these other tests is covered by a separate line item in item 2.10 in Annex [4a].~~ The costs for vibrocores (Lot 1) are covered in Section 2.5.5. The positioning and set-up for the first test applies and is covered by Item 2.11 in Annex [4a]~~(i.e., Items 2.11, 2.12 and 2.13 in Annex [4a])~~ regardless of whether or not any other type of test (e.g., seabed CPT or ~~vibrocore~~TCPT) has just been undertaken at the same location. Bump overs caused by malfunction or breakdown of CONTRACTOR equipment are at cost of CONTRACTOR.

For Lot 2, the cost of transiting to, positioning and setting-up for the first borehole at each location is covered by the vessel operational rate, i.e., the rate for base scope (Item 2.2 in Annex [4b]). If there are any other boreholes (including re-drills) to be carried out before the vessel can transit to another location, i.e., "bumping over", then the transitioning and re-drill to the borehole depth reached prior to the "bump over" is at cost of CONTRACTOR, if the "bump over" is caused by malfunction or

breakdown of CONTRACTOR equipment. The "bump over" is to be charged at operational costs if requested by CLIENT. The CLIENT reserves the right, by decision of the OCR, to terminate a borehole shallower than the target depth of 40 or 60m (depending on the type of borehole) to avoid lengthy redrills, irrespective of the cause of the redrill.

The initial seabed test or borehole at a given investigation location should be positioned within a radius of 5m from the target co-ordinates, preferably along a seismic line that passes through the target co-ordinates. Any other tests or boreholes carried out at the same location should also be positioned within 5m of the target co-ordinates, also preferably along a seismic line that passes through the target co-ordinates and taking into account the ALARP clearance box for the relevant location. In addition, the spacing between each test or borehole should not be less than 3m to avoid any interference. The CLIENT acknowledges that these preferences may not be practical in all cases, especially if the total number of separate tests/boreholes at a given location exceeds four (4).

There may be some locations where the seabed gradient is found to exceed the maximum allowable limit for the equipment or where a boulder is present, despite a prior desk study clearance of the location. In this case, the closest acceptable position is likely to be greater than 5m from the original target co-ordinates. This "micro-siting" process of relocating the vessel and equipment will inevitably involve some additional time to find a suitable alternative location, the associated costs for which are covered by Item 2.10 in Annex [4a] (Lot 1) or Item 2.3 in Annex [4b] (Lot 2).

2.5 Lot 1 Execution of Seabed CPT and Vibrocores

2.5.1 Executing seabed PCPTs

The seabed CPT system shall include a minimum 20 tonne thrust reaction and at least a cone tip capacity of 100kN or 150kN, depending on the cone tip area (see below).

CONTRACTOR should have both 36mm and 44mm rods, and a friction reducer available in order to increase the chances of achieving a greater test depth. CONTRACTOR is permitted to use rods of other configurations with written CLIENT approval but should describe in the offer how and whether they can reach the target depth and why the method is deemed by the CONTRACTOR to be suitable. References, data sheets and other supporting documentation including examples of previous results shall be included to justify deviation from convention.

The tests shall be carried out in full accordance with ISSMFE Reference Test Procedures, EN ISO 22476-1, and Eurocode EN 1997-2 2007. In particular, the cone penetration rate shall be between 15mm/s and 25mm/s with a target of 20mm/s, except if a deviation from this range is accepted by the CLIENT in advance for some specific cases.

Calibration of PCPT should not be older than 6 months before Start of Mobilisation. CONTRACTOR shall provide the calibration certificates for CLIENT review and approval before Start of Mobilisation.

Calibration and maintenance of PCPT cones should meet the requirements of ISO 22476-1:2022, where CONTRACTOR chooses to work to an older version of the standard, details should be provided in the offer on the maintenance and verification program used offshore to ensure the cones remain in good working condition and the results remain valid.

The maintenance and verification program used offshore should include details on how the cone tip, pore pressure stone and sleeve are monitored for signs of wear. It should

also include details on what non-visual (not by eye) methods are used for example by comparing to a standard geometrical pattern similar to an unused cone, or by scanning/photographing or by taking verification measurements.

The seabed elevation at each test location shall be registered by pressure transducers mounted on the seabed frame and corrected for specific gravity of the water column at the location water depths shall be reduced to LAT.

The specifications of the seabed CPT equipment shall include:

- A minimum thrust capacity of 200kN (20 tonnes);
- Cones with projected areas of 10cm^2 and 15cm^2;
- A target penetration depth of 60m; and
- Cone tip capacity of 100kN (10 tons for a 10cm^2 cone) (or 150kN if using 15cm^2 cone).

The typical parameters that define refusal of the seabed CPT are as follows:

1. Total thrust equals nominal reaction provided;
2. Cone tip load is 100% of the cone tip capacity;
3. Sleeve friction is more than 15% of the cone tip capacity or 1.5MPa;
4. Cone deviation is greater than fifteen (15) degrees from absolute vertical over the test depth (i.e., between seabed and the cone tip);
5. Cone deviation increases by more than three (3) degrees over a penetration length of one metre or less; and
6. The CONTRACTOR operator judges that further penetration would damage the equipment, in which case an explanation shall be provided within 24 hours.

The PCPT accuracy class should be a minimum of class 2 or preferably class 1 as detailed in ISO 22476-1.

As part of the tender submission, evidence shall be provided to demonstrate performance of proposed equipment in similar ground conditions, including the physical ability to reach a target depth of ~~6~~50m below seabed. Limitations of the equipment are to be stated clearly by the CONTRACTOR within the proposal.

Reports summarising ground conditions in the general area of investigation is available at http://offshorewind.rvo.nl/ for already investigated WFZ's.

A minimum penetration of 20m is required per location and if requested by OCR, CONTRACTOR shall undertake a maximum of one (1) re-test per location at no cost to CLIENT.

CONTRACTOR is required to produce preliminary CPT plots for measured and derived parameters within 24 hours of the test completion for distribution to CLIENT along with digital data.

2.5.2 Seismic cone penetration tests (SCPT)

CONTRACTOR shall perform seismic cone tests in seabed mode to the target or refusal depth. The same equipment specification and refusal criteria as per Section 2.5.1 are applicable.

Preferably seismic cones also measure pore pressure (i.e., SCPTu). As minimum the SCPT should measure the shear wave velocity, but measuring both compression and shear waves is preferred. The seismic test may be stopped at the depth at which the seismic signal is no longer strong enough for providing reliable shear wave velocity data. The seismic cone shall be deployed in seabed CPT mode using dual array x, y, z

receivers mounted behind a conventional 10cm² or 15cm² cone. The seismic source shall be mounted on a seabed frame.

Acquisition, and processing methods and procedures shall be in accordance with ISO 19901-8:20~~14~~23, ASTM D7400-~~08~~M19 or equivalent CLIENT approved methods. Full details of the proposed methodology, processing and data presentation shall be presented as part of the CONTRACTOR tender submission.

Further specifications on how to obtain standard PCPT data for SCPT locations are given in Section 2.5.1.

CLIENT, GM CONTRACTOR, and Lot 1 CONTRACTOR will agree on the preferred SCPT locations based on the results of the geophysical survey and the initial CPT results if available.

Seismic tests shall be performed at intervals of approximately 1m, as directed by the onboard OCR. Signals shall be stacked in order to achieve an acceptable signal to noise ratio to be agreed with the OCR. The OCR has the right to reject any or all of the stacked signals or components thereof.

Plots shall include measured S-wave velocities (and, if available, P-wave) for presentation as part of the final report. CONTRACTOR shall allow for provision of raw and processed digital SCPT data as a deliverable to CLIENT within the proposal.

CONTRACTOR is required to produce preliminary SCPT plots for measured and derived parameters within 24 hours of the test completion for distribution to CLIENT along with digital (ASCII) data.

2.5.3 Dissipation Testing

CONTRACTOR will be required to perform dissipation tests in specific layers at certain locations across the site. These tests shall be performed with the PCPT in seabed mode. Testing and reporting shall be in accordance with ISO 19901-8:20~~14~~23, ISSMFE Reference Test Procedures or CLIENT approved standards and procedures. CONTRACTOR shall allow for dissipations of 50 percent in all tested soils. Testing shall be in accordance with ISO 19901-8:20~~14~~23, ISSMFE Reference Test Procedures or CLIENT approved equivalent. Full details of the proposed methodology shall be presented as part of the CONTRACTOR submission.

CONTRACTOR is required to produce preliminary dissipation plots for measured and derived parameters within 24 hours of the test completion for distribution to CLIENT.

2.5.4 Thermal Conductivity

For the purposes of cable burial CONTRACTOR shall propose a method to measure the *in situ* thermal conductivity of the shallow soils using a cone or similar method approved by CLIENT. CONTRACTOR should assume testing at 1 metre intervals to a maximum of 6m depth below seabed. Depending on the actual soil conditions a temperature cone (ideal for dense sands or stiff clays where frictional heat is easily generated during penetration), or a thermal probe cone (uses electrically generated heat) shall be used and shall be available on the vessel(s). The results will be used by the wind farm tenderers to inform the design basis for inter array cable installation in conjunction with onshore laboratory tests.

CONTRACTOR shall provide full details of the proposed method including deployment and recovery of the proposed unit, methods of calculation of thermal conductivity and specific heat capacity of the soil, and presentation of the results.

CONTRACTOR should also consider the merits of performing in situ thermal conductivity tests at the same time as the Vibrocore sampling (e.g., FIELAX "Vibroheat"), where required. CONTRACTOR is encouraged to propose alternative novel solutions for measuring the in situ thermal properties of the soils if they are backed-up with supportive field evidence.

CONTRACTOR is required to produce preliminary thermal conductivity plots for measured and derived parameters within 24 hours of the test completion for distribution to CLIENT.

2.5.5 Vibrocoring

In situ sampling for geotechnical and morphological characterisation

To allow for geotechnical characterisation of the shallow soil, vibrocores shall be taken. The vibrocores must be able to achieve a maximum penetration depth of 6m. The inner diameter of the liner should be 100mm however smaller diameters (e.g., 86mm) are permitted if the CONTRACTOR ensures an equivalent quality of the recovered material when compared to the 100mm system. A minimum of 3m recovery is required per location and if requested by OCR, CONTRACTOR shall undertake a maximum of one (1) re-test per location at no cost to CLIENT. Once recovered, the filled core liner is to be cut into one-metre-long segments, described and tested at top of each liner section and in the last (deepest) section tests and descriptions are also to be conducted at the bottom. Following this liner sections are to be capped, sealed, labelled, preserved, and stored for onshore testing.

Offshore field tests at the base of each core liner segment shall contain the following:

- Description and classification of samples
- Natural water (moisture) content;
- Bulk density; and
- Index strength tests in cohesive soils (torvane and pocket penetrometer).

Test quantities provided in Annex [4a], present quantities without the offshore field tests presented above. Offshore field tests presented above should be priced as part of the presented offshore rates per Annex [4a].

In situ sampling for archaeological characterisation

Vibrocore samples are required for the archaeological assessment of shallow subsoil.

The following quantities are foreseen:

- Sixty-four (64) vibrocores at DDW WFZ IA in total of which 6 VC will be used for archaeological purposes.

All vibrocores have a target depth of 6m. The exact locations will be determined by CLIENT and advised by a specialist archaeological consultant. Lot 1 CONTRACTOR shall allow for two interface meetings with the archaeological consultant.

The vibrocores will be inspected by the specialist consultant at the GT CONTRACTOR's storage area. In case this is not possible, for example due to travel restrictions, Client requests the Lot 1 CONTRACTOR to conduct archaeological logging on the vibrocores (6 in total). As such, a line item, based on a metre rate, has been included in Annex [4a] to cover this task.

Archaeological logging shall be in accordance with the '*Standaard Boor Beschrijvingsmethode*' (SBB53), which translates to '*Standard Sample Description Method*'.

The SBB53 contains parameters of NEN 5104, but also provides additional terms to characterize the sediment samples. These terms offer the opportunity to describe phenomena like sedimentary structures, layer boundary characteristics and sedimentary trends observed within a layer in a standardized manner. Also, geological and soil interpretations, and anthropogenic admixtures including archaeological finds are described. The SBB has been incorporated in the archaeological process as the method to be used for the description of sediment samples.

Further specifications on the laboratory analysis are given in Section 2.5.6~~2.5.6~~2.5.~~6~~.

Onshore Laboratory Testing

All onshore laboratory testing on vibrocores shall be carried out at an approved geotechnical laboratory. Any additional subcontracted testing, assigned after contract award, shall require the approval of CLIENT. All core logging and soil testing shall be carried out to EN ISO 14688-1 and EN ISO 14688-2, BS 5930, Eurocode EN 1997-2:2007, ISO 19901-8:20~~14~~23, and ISO 17892 / BS 1377 or CLIENT approved equivalent, as and where applicable.

The CONTRACTOR shall ensure that the CONTRACTOR laboratories and any subcontracted laboratories, are accredited to the most recent issues of standards. If the CONTRACTOR deviates from the latest standards a statement is expected from the CONTRACTOR. The borehole logs shall be compiled under the terms of EN ISO 14688-1 and EN ISO 14688-2. All test data shall be presented in ASCII format for easy manipulation, data transfer, and integration.

CONTRACTOR shall demonstrate a system to prove that every sample is photographed during analysis onshore to a standard to be accepted by CLIENT (cf. "Sample Photography" in Section 2.7.6). All images are to be recorded on hard storage media and backed up. Examples shall be provided to nominated CLIENT expert for approval prior to photography commencing.

As a general guideline, the following types of tests will be required for the different material types expected.

- Natural water (moisture) content (additional to the testing done offshore already);
- Bulk density (additional to the testing done offshore already);
- Particle density;
- Particle size analysis (sieve);
- Particle size analysis (~~using sieve and pipette~~ method to be proposed by Tenderer~~for fines fraction~~);
- Maximum and minimum density;
- Atterberg limits (moisture content, plastic and liquid limits, fall cone test);
- Carbonate tests;
- Organic tests (dichromate and loss on ignition);
- Total Carbon (TC) and Total Organic Carbon (TOC) (dry combustion / elementary analysis) incl. calculation of Total Inorganic Carbon (TIC);
- Determination of permeability and porosity;
- Unconsolidated undrained (UU) triaxial compression tests on undisturbed samples;
- Determination of thermal conductivity and volumetric specific heat capacity (needle probes, hot disc, - see Section 2.7.10) on reconstituted, undisturbed, and remoulded samples;
- Electrical resistivity; and
- Pore water salinity.

The testing schedule shall be proposed by CONTRACTOR based on a laboratory testing strategy provided by the CLIENT / GM CONTRACTOR and approved by CLIENT. See Table 2~~Table 2~~ for the responsibility matrix. Note that the specification of certain laboratory tests may depend on the availability of PCPT data and/or classification test data.

In order to meet the project schedule, a list of priority tests have been compiled. These tests should be prioritized accordingly in order to facilitate the creation of the GGM. The types of tests are referred in Annex 4.

2.5.6 Archaeological Dating Analysis

The exact locations where vibrocores are to be taken for archaeological dating purpose will be determined by CLIENT and advised by a specialist archaeological consultant (see also Section 2.5.5).

CONTRACTOR is responsible for the sampling, storage on board vessel and transport of archaeological dating samples to the port of mobilisation. From the port of mobilisation custody of the samples will be assumed by the specialist archaeological consultant.

CONTRACTOR shall undertake archaeological analysis of shallow subsoil on selected samples recovered from selected vibrocores. The analysis shall include, but not be limited to, the following depending on the interpreted paleo-environment:

- Palynological analysis, (pollen);
- Algae;
- Fungi;
- Spores;
- Dinoflagellate Cysts;
- Foraminifera;
- Diatoms;
- Molluscs;
- Carbon (C14) Dating;
- Optically stimulated luminescence (OSL)

The report shall detail, but not limited to:

- Individual analytical techniques;
- Chronostratigraphic succession;
- Biostratigraphic Events;
- Interpreted paleo-environment;
- Interpreted stratigraphy and stratigraphic stage;
- Extinction markers; and
- Any issue potentially affecting the interpretations and succession for the area.

The archaeological analysis results shall be delivered by CONTRACTOR in a separate archaeological age dating report together with the results of the archaeological logging, if carried out by the CONTRACTOR.

2.5.7 Lost Equipment

CONTRACTOR shall be responsible at their own cost for the marking of the location and recovery of cone rods and other equipment dropped or lost during the execution of the project. 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 lost equipment on, above or at depths less than 0.5m below seabed shall be removed by CONTRACTOR at no cost to CLIENT.

2.5.8 Demobilisation

Upon completion of the survey, all CONTRACTORS personnel shall be demobilised from the vessel(s) in accordance with the CONTRACT. CONTRACTOR is responsible for the removal of all equipment, instrumentation and materials from the project area following CLIENT approval of survey completion.

Demobilisation is deemed to commence when all survey operations have been completed to CLIENT satisfaction and after approval by means of a sign-off by the OCR.

2.6 Lot 1 Data processing and reporting for seabed CPT and vibrocores

After carrying out the seabed CPT and vibrocore investigation of this Lot 1, CONTRACTOR shall process the acquired data during the field work and prepare a detailed report covering the complete scope of work.

The reporting requirements for the seabed CPT and vibrocore work are detailed below. Quality requirements are described in Annex [6] – Section VI - Quality Requirements & Administrative instructions Geotechnical Survey.

All reports will be written in English and include both an English and Dutch management summary.

Document control requirements, including filename conventions, are included in Starting Points and Assumptions Annex [5].

Reports and deliverables will be delivered by contractors in pdf and original, regular, formats (docx; xlsx; ppt; ASCII; AGS; etc). The data format used for digital deliverables shall remain constant throughout the project.

2.6.1 Provision of digital pilot data

The CONTRACTOR will be requested to provide a pilot database which will include an example output of each of the digital deliverables. This data may include, but not limited to:

- AGS 4 format;
- ASCII;
- Excel or csv and
- LAS files.

The objective of this deliverable is to agree on the file formats to be applied in a consistent manner throughout the entire project. Therefore, CLIENT requests that the CONTRACTOR prepares and provides a pilot data set for review and acceptance by the CLIENT and review by GM CONTRACTOR. Thereafter the digital data format shall not change anymore unless agreed by CLIENT. This also applies to any interim deliveries of laboratory data prior to provision of the final report.

CPT data, as provided by PCPT, SCPT and TCPT shall be provided in AGS format. One additional ASCII format is allowed, provided it is approved by CLIENT as part of the Pilot Data review.

CONTRACTOR shall provide a time schedule for providing the Pilot Data in Annex [4a].

2.6.2 Daily & Weekly reporting

The CONTRACTOR is to submit daily reports throughout the period of the fieldwork, providing full details of previous 24 hours' work and results and projected locations for the forthcoming 24-hour period. Further, CONTRACTOR shall issue a weekly report

providing insight in the progress of the WORK on a weekly basis. The formatting of the daily and weekly report is specified in Section VI of this Contract.

2.6.3 Preliminary CPT results and vibrocore logs

The CONTRACTOR is to provide preliminary (field) results of:

- PCPT plots;
- SCPT plots;
- Dissipation test plots;
- Thermal conductivity test plots;
- Vibrocore logs; and
- ASCII data and PDF plots from PCPT, SCPT, dissipation tests and thermal conductivity tests.

These shall be provided within 24 hours of completion of each test/vibrocore.

2.6.4 Lot 1 Operations Report

The CONTRACTOR shall submit an "Operations Report" for all Lot 1 fieldwork activities, which shall include, but is not limited to:

- Daily logs (DPRs);
- CPT and vibrocore operator's log;
- Location positioning acceptance reports;
- Mobilisation report;
- Incident reports; and
- Full details of all lost and damaged equipment.

This report will be for CLIENT internal use only and will not be published on the RVO website.

The CONTRACTOR shall provide one (1) electronic copy of this report. The delivery schedule is to be provided in Annex [4a].

2.6.5 Field report Lot 1 Seabed CPT

The field results obtained from seabed in situ testing (PCPT, SCPT, thermal conductivity and dissipation testing) shall be presented as the first version of the "Seabed In Situ Testing Report".

The CONTRACTOR shall be required to submit a reporting template for the "Seabed In Situ Testing Report" within one week after the start of the offshore works.

Version 1 (Field Report) of the "Seabed In Situ Testing Report" shall include, but is not limited to:

- A statement of the purpose of the investigation;
- A description of the Work carried out, including reference to specification and standards adopted and any deviations from them;
- Exact locations of all tests. The coordinates should also be provided in electronic format (xlsx);
- Water depth measurements at the actual investigation locations and frame settlement data (if any). The water depths and frame settlement data should also be provided in electronic format (xlsx);
- Drawings (GIS format or similar as well as PDF) showing the locations of all tests undertaken;
- Plots of the following PCPT and SCPT results:
    - Measured cone resistance;

    - Measured sleeve friction;
    - Measured pore water pressure;
    - Friction Ratio;
    - Net cone resistance;
    - Pore pressure ratio;
    - Dissipation test plots of cone resistance and pore pressure versus time;
    - Interpreted relative density (granular materials), including a description of the type of correlation used for the interpretation;
    - Interpreted undrained shear strength (cohesive materials), inclusive a description of the type of correlation used for the interpretation;
    - Seismic test results including interpreted small-strain shear modulus both versus measurements and depth inclusive of a description of the calculation method used;
- Plots of thermal conductivity test results i.e., temperature versus time;
- Calibration report including all on board calibration sheets and calibration certificates of CPT cones used;
- Obstruction list (lost equipment on and below seabed) incl. coordinates and depth;
- ASCII data of PCPT tests inclusive of dissipation, thermal conductivity, and thermal heat capacity test results; and
- ASCII data of SCPT tests, including the derived p- and s-wave velocities as well as the individual seismic traces.

The CONTRACTOR shall provide one (1) electronic copy of this report. The delivery schedule for this report is to be provided by CONTRACTOR in Annex [4a].

2.6.6 Field report Lot 1 Seabed Sampling (Vibrocores)

The field results obtained from seabed sampling (vibrocoring and offshore laboratory testing) shall be presented as the first version of the "Seabed Sampling Report".

The CONTRACTOR shall be required to submit a reporting template for the "Seabed Sampling Report" within one week after the Start of the offshore works.

Version 1 (Field Report) of the "Seabed Sampling Report" shall include, but is not limited to:

- A statement of the purpose of the investigation;
- A description of the Work carried out, including reference to specification and standards adopted and any deviations from them;
- Exact locations of all vibrocores. The coordinates should also be provided in electronic format (xlsx);
- Water depth measurements at the actual investigation locations. The water depths and frame settlement data should also be provided in electronic format (xlsx);
- Drawings (GIS format or similar as well as PDF) showing the locations of all vibrocores undertaken;
- Calibration report including all on board calibration sheets;
- Preliminary (field) vibrocore logs; and
- Obstruction list (lost equipment on and below seabed) incl. coordinates and depth.

The CONTRACTOR shall provide one (1) electronic copy of this report. The delivery schedule for this report is to be provided by CONTRACTOR in Annex [4a].

2.6.7 *Final Report Lot 1 Seabed CPT*

The CONTRACTOR shall submit a complete draft (2nd version) of the "Seabed In Situ Testing Report" as per schedule entered by CONTRACTOR in Annex [4a].

This report should include the following (as appropriate):

- A statement of the purpose of the investigation;
- A description of the work carried out, including reference to specification and standards adopted and any deviations from them;
- Exact locations of all tests, co-ordinates, water depths. The coordinates and water depths shall also be provided in electronic format (xlsx);
- Drawings (GIS or similar as well as PDF) showing the locations of the tests undertaken;
- Plots of the following final (quality assured) PCPT and SCPT results:
    - Measured cone resistance;
    - Measured sleeve friction;
    - Measured pore water pressure;
    - Friction Ratio;
    - Net cone resistance;
    - Pore pressure ratio;
    - Dissipation plots of cone resistance and pore pressure versus time including coefficient of radial consolidation of the soil and definition of method used;
    - Interpreted relative density (granular materials), including a description of the type of correlation used for the interpretation
    - Interpreted undrained shear strength (cohesive materials), including a description of the methods of correlation used for the interpretation and any assumptions made during the interpretation
    - Seismic test results including interpreted shear wave velocity and small-strain shear modulus versus depth inclusive of a description of the calculation method used;
    - Zero offsets before and after the tests with cone ID and corresponding area ratio.
- Plots of final (quality assured) thermal conductivity test results i.e., temperature versus time and specific heat capacity results; and
- ASCII data of PCPT and SCPT tests inclusive of dissipation and thermal conductivity test results and specific heat capacity results.

The CONTRACTOR shall provide one (1) electronic copy of the complete draft report. The draft report shall contain all information to allow a comprehensive review to be performed by CLIENT. The draft report shall be made final after processing of comments and approval by the CLIENT.

CONTRACTOR shall provide one (1) electronic copy of the FINAL REPORT and associated digital data as per key milestone entered by CONTRACTOR in Annex [4a].

2.6.8 *Final Report Lot 1 Seabed Sampling (Vibrocores)*

The CONTRACTOR shall submit a complete draft (2nd version) of the "Seabed Sampling Report" as per schedule entered by CONTRACTOR in Annex [4a].

This report should include the following (as appropriate):

- A statement of the purpose of the investigation;
- A description of the work carried out, including reference to specification and standards adopted and any deviations from them;

- Exact locations of all vibrocores, co-ordinates, water depths as defined in Section 1.6 and 2.4.2. The coordinates and water depths shall also be provided in electronic format (xlsx);
- Drawings (GIS or similar as well as PDF) showing the locations of the vibrocores undertaken;
- Final (approved) vibrocore logs with updated descriptions to be consistent with the presented laboratory test results;
- Final (approved) detailed laboratory test results;
- Summary of Laboratory Test Results;
- Colour photographs of samples/cores both whole and split; and
- Lab test data in AGS format and ASCII format.

The delivery of AGS digital data shall comply with the AGS file format rules and should therefore be validated using the following AGS validator: https://www.ags.org.uk/data-format/ags-validator

The CONTRACTOR shall provide one (1) electronic copy of the complete draft report. The draft report shall contain all information to allow a comprehensive review to be performed by CLIENT. The draft report shall be made final after processing of all comments and approval by the CLIENT.

CONTRACTOR shall provide one (1) electronic copy of the FINAL REPORT and data as per key milestone entered by CONTRACTOR in Annex [4a].

2.7 Lot 2 Execution of Boreholes

2.7.1 Executing boreholes

The borehole log, a detailed description of the soil types, and the *in situ* geotechnical properties determined for the boreholes shall be documented to characterise the strata. These shall be performed in accordance with Eurocode EN 1997-2:2007 and ISO 19901-8:2023. The borehole logs shall, as a minimum; be compiled under the terms of EN ISO 14688-1 and EN ISO 14688-2.

The general requirements for the boreholes are as follows:

1. When the vessel(s) is (are) on station, the position of the vessel(s) and the water depth shall be logged prior to commencing any investigation work at each of the locations. Water depths shall be reduced to LAT; and
2. The target depths for the boreholes will generally be 40 or 60m, depending on the depths of the geological formations of interest at a particular location and the interpreted sub seabed structure. The OCR may request the depth of boring/testing to be terminated prematurely or extended beyond the target depth to a maximum depth of 80 m, should it be determined by the OCR that this is appropriate.

The boreholes shall be progressed by a drilling and sampling technique approved by the CLIENT. It is the CLIENT preferred method to use standard straight flush API drilling and associated sampling and testing methods, however CLIENT is open to suggestions of equivalent approved and verified methods. The drilling and sampling technique used must be fit for sampling with a minimum of disturbance. The drilling and sampling equipment and procedures are to be designed with the aim of obtaining a high sample quality class (according to Eurocode EN 1997-2:2007 and ISO 19901-8:2023) and good core recovery. For cohesive soil samples, quality class 1 or 2 are mandatory. For non-cohesive soil samples, a minimum of quality class 3 or 4 is required.

All drilling parameters during the construction of all boreholes are to be recorded automatically using a CLIENT approved Measurement While Drilling System (such as the Jean Lutz). Continuous recording of all appropriate parameters shall be made whilst advancing the borehole including but not limited to:

- Depth;
- Drilling rate (length per time unts);
- Torque on bit;
- Bit Weight (force units);
- Mud pressure; and
- Rotary speed (revolutions per minute).

Plots of the "as measured" drilling parameters shall be presented in the borehole and laboratory reports and presented digitally as part of the report deliverables.

The sampling and PCPT requirements will depend on the material type encountered. The following regimes should be applied, unless otherwise agreed by the OCR on site.

Between the seabed and the final depth of the seabed CPT at that particular location, quasi-continuous sampling should be undertaken at a nominal interval of 1.0m. The spacing between consecutive samples shall not exceed 0.5m. The appropriate type of sampling tool to use will depend on the soil type however preference shall always be given to sampling tools that are able to disturb the sampled material the least. In stiff cohesive soils, push sampling shall be used. In granular materials, push sampling shall be used, if possible, unless sample recovery is poor, in which case a push sampler with a core catcher or a hammer sampler shall be used instead. Blow counts measured during hammer sampling shall be recorded and presented on the Borehole Logs.

From a depth 0.5m/1.0m above the final depth of the deep seabed CPT (taken during the lot 1 campaign) at that particular location, the following appropriate regime should begin:

Within granular deposits, the boreholes are to be advanced by alternating PCPT (up to 3m stroke) followed by one sample (4m repeat cycle). OCR has the right to change the alternating PCPT/sampling cycle in response to the encountered soil layer without extra charges. Furthermore, CONTRACTOR shall oversample a PCPT stroke where requested, in order to provide enough sample material for the subsequent laboratory programme and to verify soil types where uncertainty regarding material type exists or refinement is required on interpretation of soil types.

Within the cohesive deposits, boreholes are to be advanced by PCPT, (up to 3m stroke) followed by two samples (5m repeat cycle). OCR has the right to change this regime in response to the encountered soil layer without extra charges.

The spacing between the end of samples/PCPT and/or start of samples/PCPT shall not exceed 0.5m. A minimum sample recovery of 80% is mandatory for cohesive soil layers and loose to medium dense non-cohesive soil layers. For dense or very dense non-cohesive soil layers, a minimum sample recovery of 50% is acceptable. If the sample recovery is less than 50% in non-cohesive layers or less than 80% in cohesive soil layers, CONTRACTOR shall be required to perform at no cost to CLIENT an additional push sampling stroke to recover the missing soil samples.

The net weight of the seabed frame shall be reduced to a minimum for the first push to avoid shear failure or other disturbance of the uppermost sediments. The penetration of the seabed frame is to be monitored and recorded as stated previously. The first sample shall be taken at seabed level and be representative of at least the top 0.2m of the seabed.

CLIENT has the right to reject the sampling sequence particularly in the upper section of continuous sampling where quality and/or sample spacing, and gaps compromise the aforementioned objectives. CONTRACTOR is to state in their proposal what remedial action they propose in this event at no cost to CLIENT.

CONTRACTOR is required to produce preliminary Borehole Logs showing offshore laboratory test results and soil layering within within 24 hours of completion of the borehole or as soon as practicable upon completion of moisture content testing, whichever is earliest.

2.7.2 Executing downhole wireline piezocone penetration tests (PCPT)

The down-hole wireline PCPT system shall include a minimum 10 tonne thrust reaction and at least a cone tip capacity of 100kN or 50kN, depending on the cone tip area. The equipment shall be capable of recording tip resistance values of up to 100MPa.

In soils with a normal range in cone tip resistance, 10 cm² piezocones shall be used. In very dense granular soils where the cone tip resistance is very high, 5 cm² cones preferably with piezometer may be used instead with OCR approval.

The tests shall be carried out in full accordance with ISSMFE Reference Test Procedures, EN ISO 22476-1, and Eurocode EN 1997-2 2007.

The CONTRACTOR shall provide the calibration certificates for verification before Start of Mobilisation. Calibration dates of all PCPT cones shall not be older than 6 months before Start of Mobilisation. Contractor shall ensure adequate equipment redundancy and spares for all components, approval of which shall be upon inspection by OCR prior to acceptance of mobilisation and start of the offshore works.

Calibration and maintenance of PCPT cones should meet the requirements of ISO 22476-1:2022, where CONTRACTOR chooses to work to an older version of the standard details should be provided in the offer on the maintenance and verification program used offshore to ensure the cones remain in good working condition and the results remain valid.

The maintenance and verification program used offshore should include details on how the cone tip, pore pressure stone and sleeve are monitored for signs of wear. It should also include details on what non-visual (not by eye) methods are used for example by comparing to a standard geometrical pattern similar to an unused cone, or by scanning/photographing or by taking verification measurements.

CONTRACTOR is required to produce preliminary CPT plots for measured and derived parameters within within 24 hours of completion of the borehole or as soon as practicable upon completion of ~~moisture content~~the dissipation test~~ing~~, whichever is earliest, for distribution to CLIENT along with digital data.

2.7.3 Seismic cone penetration tests (SCPT)

CONTRACTOR shall perform selected seismic cone tests to a depth of up to 60m below seabed with the vessel(s) in borehole mode. The seismic cone shall be deployed in downhole mode using dual array x, y, z receivers mounted behind a conventional cone. Preferably seismic cones also measure pore pressure (i.e., SCPTu). As minimum the SCPT should measure the shear wave velocity but measuring both compression and shear waves are preferred.

CLIENT and GM CONTRACTOR shall select the preferred locations based on the results of the geophysical survey and results of the LOT 1 seabed survey, if available. The seismic source shall be mounted on a seabed frame. Acquisition, and processing methods and procedures shall be in accordance with ISO 19901-8:20~~14~~23, ASTM

D7400-~~08~~M19 or equivalent CLIENT approved methods. Full details of the proposed methodology, processing and data presentation shall be presented as part of the CONTRACTOR tender submission.

Seismic tests shall be performed at least 1m from the start of each CPT stroke and at depth intervals of approximately 1m, as directed by the onboard OCR. The OCR may request additional seismic test, e.g., if major changes in stratigraphy occur. Signals shall be stacked in order to achieve an acceptable signal to noise ratio to be agreed with the OCR. OCR has the right to reject any or all of the stacked signals or components thereof. Drill outs between CPT strokes and hence data gaps shall not exceed 0.5m without the express approval of the OCR.

CONTRACTOR shall allow oversampling in order to verify soil types where uncertainty regarding material exists or refinement is required on interpretation of soil types.

Plots shall include CLIENT approved measured PCPT data and S-wave velocities (and, where available, P-wave) for presentation as part of the final report. CONTRACTOR shall allow for provision of raw and processed digital SCPT data as a deliverable to CLIENT within the proposal.

CONTRACTOR is required to produce preliminary SCPT plots for measured and derived parameters within 24 hours of the test completion for distribution to CLIENT along with digital data.

2.7.4 P-S Logging

CONTRACTOR shall perform selected P-S logging tests up to 60m below seabed with the vessel(s) in borehole mode. The number of locations is indicated in Annex [4b].

CLIENT and GM CONTRACTOR shall select the preferred locations based on the results of the geophysical survey, results of the Lot 1 seabed CPT survey and the results of the Lot 2 SCPT Locations, if available.

Full details of the proposed equipment (including full technical specifications), methodology, processing and data presentation shall be presented as part of the CONTRACTOR tender submission.

After completion of the borehole to the required depth, the borehole may have to be deepened by drilling to allow the first test to be carried out to the target depth.

Depending on the encountered soil conditions and the requirements of the CONTRACTOR engineer and OCR, the drill pipes are to be pulled to a sufficient distance above the P-S logging tool to expose the borehole walls and to enable accurate measurement of the seismic velocities within an open and fluid-filled borehole without any interference from the drill string. Logging with the P-S tool shall start as soon as practicable after pulling of the drill string or other logging tools, beginning from the bottom of the hole and continuing upwards, in order to prevent a collapse of the borehole.

The depth intervals between individual measurements shall be approximately 1m, as directed by the OCR.

Plots shall include p-wave and s-wave velocities for presentation as part of the final report.

2.7.5 Density / Porosity Logging (optional scope)

CONTRACTOR shall provide a price to perform density and/or porosity downhole logging. The objective is to acquire a continuous data set of porosity and/or bulk density of the soils.

CLIENT shall select the preferred locations based on the results of the geophysical survey and results of the Lot 1 seabed CPT survey.

CONTRACTOR shall provide full details of the proposed equipment (including full technical specifications), methodology, processing, and data presentation as part of the CONTRACTOR tender submission.

2.7.6 Recovery of Samples and Laboratory Testing

General

The following tasks shall be carried out offshore on the vessel(s):

- Sample logging (description and classification of samples) immediately after a sample has been retrieved by a qualified CONTRACTOR's (engineering) geologist, and photography of both intact and split samples;
- Moisture content and unit weight measurements;
- Pocket penetrometer tests or torvane test if appropriate on cohesive soil samples;
- Thermal conductivity measurement on undisturbed core samples including heat capacity measurement of the soil using thermal needle probe procedure according to ASTM D5334-22ae1 ~~ASTM D5334-14~~ (preferred offshore). These tests only need to be undertaken on the upper 3m to 5m of a borehole;
- Laboratory Miniature Vane and Unconsolidated Undrained Triaxial Compression Tests (UU tests) where appropriate on cohesive soil samples;
- Selection and proper preservation of suitable "undisturbed" cohesive samples to avoid a change of the soil properties (e.g., waxing of and preservation in cardboard tubes or preservation of whole cores) including labelling of core sub-samples for onshore testing; and
- Selection and proper preservation of suitable samples retained in the Shelby tubes without extrusion (to minimise handling and contamination) for onshore MIC testing.

The above listed offshore testing is to be included within the standard sampling cost rate as provided by CONTRACTOR in Annex [4b]. An indicative regime for offshore testing is provided below in Table 3~~Table 3~~~~Table 3~~, the final executed regime is subject to in-situ soil conditions and the judgement of CONTRACTOR Offshore Engineer.

Table 3 Indicative quantities of Offshore Laboratory Testing per metre

Offshore Laboratory Test	Cohesive Sample	Non-Cohesive Sample
Moisture Content and Unit weight measurements	2	2
Pocket Penetrometer	3 sets of 3 tests (if appropriate for soil)	N/A
Torvane	3	N/A
Thermal Conductivity Measurements	1 per metre in top 3-5m of borehole	1 per metre in top 3-5m of borehole
Laboratory Miniature Vane	1 per metre (if appropriate for soil)	N/A
Unconsolidated Undrained Triaxial	1 per metre (if appropriate for soil)	N/A

As part of the sub-sampling process CLIENT shall instruct CONTRACTOR to remove appropriate sub-samples from nominated boreholes for geological dating analysis. A full list of the required boreholes, samples and depths shall be provided by CLIENT upon completion of Lot 1.

All onshore laboratory testing shall be carried out at an approved geotechnical laboratory. Any subcontracted testing, assigned/initiated after contract award, shall require the approval of CLIENT. For subcontracted testing, assigned/initiated after award, CONTRACTOR shall submit a list of subcontracted laboratory tests to CLIENT in advance for internal use only. All core logging and soil testing shall be carried out, where applicable to Eurocode EN 1997-2:2007, ISO 19901-8:20~~14~~23, BS 5930, ~~and~~ BS 1377 and ISO 14688 or CLIENT approved equivalent.

Cyclic soil testing shall be carried out in accordance with the relevant ASTM standard (e.g., ASTM D5311-13 & ASTM D 6528-17), where applicable. The CONTRACTOR ensures that all laboratories, including subcontracted laboratories, are accredited for the latest issues of respective standards. If the CONTRACTOR deviates from the latest standards a statement justifying deviation is expected from the CONTRACTOR which is subject to approval of CLIENT prior to testing. The borehole logs shall be compiled under the terms of EN ISO 14688-1 and EN ISO 14688-2. All test data shall be presented in AGS or ASCII format as appropriate for easy manipulation, data transfer, and integration.

The CLIENT requires a regular transport of soil samples to laboratory (applies to Lots 1 and 2) to ensure an early start for onshore lab work. If possible, CONTRACTOR shall make use of any periods of weather standby to undertake such port calls to facilitate offload and transport of samples.

Sample Photography

Each recovered sample shall be cleaned of drilling fluid, photographed intact~~, and after removal of a thin veneer of sample to expose any stratigraphy, surface structure or change in properties shall be photographed again~~. After subsampling to preserve undisturbed material and testing the remaining core shall be split and photographed again to record the internal structure so that all details are clearly recognisable in accordance with a CLIENT approved standard. As a minimum 15MPX resolution is required in order that quality, focus, colour, and resolution shall be adequate to resolve millimetre scale features.

The borehole identification, date of sampling, depth data and top/bottom identification MUST be legible along with the project identification, sample identification, a graphic length scale and a standard of tints, (greyscale).

CONTRACTOR shall be required to demonstrate a system to prove that every sample is photographed to a standard to be accepted by CLIENT and recorded on to hard storage media and backup(s). Examples shall be provided to OCR for approval prior to photography commencing.

Onshore Laboratory Testing

Onshore laboratory testing (denoted "Standard") shall be performed on the preserved samples at an approved laboratory selected by the CONTRACTOR. Any subcontracted testing shall require the approval of CLIENT.

As a general guideline, the following types of standard laboratory tests will normally be required for the different material types expected.

- Natural water (moisture) content (additional to any offshore testing already performed);

- Bulk density;
- Particle density;
- Particle size analysis (~~sieve and pipette~~ method ~~for fines fraction~~ to be proposed by Tenderer);
- Maximum and minimum density;
- Atterberg limits (plastic and liquid limits, fall cone test);
- Carbonate tests;
- Organic tests (dichromate and loss on ignition);
- Total Carbon (TC) and Total Organic Carbon (TOC) (dry combustion / elementary analysis) incl. calculation of Total Inorganic Carbon (TIC);
- Direct simple shear (DSS) tests (constant stress or constant volume);
- Shear box (SB) tests;
- Triaxial testing:
    - Unconsolidated undrained (UU) triaxial compression tests on undisturbed and remoulded samples;
    - Isotropically consolidated drained (CID) or Isotropically consolidated undrained (CIU) triaxial compression test;
    - Anisotropically consolidated drained (CADc) or anisotropically consolidated undrained (CAUc) triaxial compression test;
    - Anisotropically consolidated drained (CADe) or anisotropically consolidated undrained (CAUe) triaxial extension test;
- Compressibility testing:
    - Incremental Loading (IL) oedometer;
    - Constant Rate of Strain (CRS);
- Bender element tests (as part of selected triaxial or DSS tests);
- Ring shear tests (soil/soil and soil/steel);
- Resonant column tests (RC);
- Permeability testing with permeameter or triaxial cell;
- ~~Binocular microscopy tests (where batching of samples is considered);~~
- Thermal Conductivity and heat capacity (on reconstituted, undisturbed, and remoulded samples);
- Electrical resistivity (as input for heat capacity calculations);
- Pore water salinity (as input for heat capacity calculations);
- Microbially Influenced Corrosion (MIC) tests; and
- Geological age dating.

Important note for planning and pricing purposes: One CID or SB "test" on granular soil is defined as a set of three sub-tests on three different test specimens (from the same sample) at three different consolidation pressures or a 'multi-stage test' (CID only) in which one specimen is tested at up to three different consolidation pressures.

The testing schedule shall be proposed by CONTRACTOR based on a strategy provided by the GM CONTRACTOR and approved by CLIENT as per the Interface Matrix in ~~(see Table 2).~~ Table 2.

The RC samples are to be consolidated under either isotropic or anisotropic conditions, as specified by CLIENT. The shearing stages will also be carried out under either drained (for non-cohesive soils) or undrained conditions (for cohesive soils), also as specified by the CLIENT.

Sample preparation (e.g., moist-tamped, vibrated, pluviated specimens in sands) is to be stated clearly by the CONTRACTOR within the proposal. Controlled sample preparations, e.g., for ring shear test in non-cohesive soils, which most closely replicates the in-situ soil densities and conditions are preferred.

Any results from the above standard lab test programme that are required for specifying test conditions, pressures and cyclic testing shall be prioritised and issued to the CLIENT and GM CONTRACTOR as soon as they become available, in advance of the draft Geotechnical Borehole Report.

2.7.7 GGM Priority Laboratory Testing

CLIENT has identified a priority lab testing program. This priority lab testing programme consists of standard test and serves as important input for the development of the Geological Ground Model. See Annex [4b] for the priority tests and expected quantities. These tests and subsequent results shall be given priority over other testing. The results of these tests shall be shared with CLIENT and GM contractor as soon as they become available. The GGM priority lab testing report is identified as a Key Milestone.

All reporting costs related to the execution of the laboratory tests shall be covered by the unit rates provided in Annex [4a] and [4b].

2.7.8 Presentation of Borehole Logs

The borehole logs shall, as a minimum; be compiled under the terms of EN ISO 14688-1 and EN ISO 14688-2. All borehole logs shall present the following information as a minimum:

- Coordinates;
- Location names;
- Water depth reduced to LAT and final borehole depth;
- Date of construction and drilling method;
- Stratification or layering presenting the identified
- Geotechnical units (based on available in situ and laboratory test results);
- Inclusions where of engineering significance along with depths;
- Full geotechnical description including strength / consistency / density / structure / inclusions / discontinuities of the units;
- Depth in borehole of samples/no recoveries/CPT tests along with test/sample numbers;
- Cone tip resistance (q_c) and cone sleeve friction (f_s) from both downhole PCPT/SCPT tests and from adjacent seabed PCPT/SCPT tests (as provided by Lot 1 Contractor);
- In-situ Relative Density derived from both the downhole PCPT/SCPT tests and from adjacent seabed PCPT/SCPT tests (as provided by Lot 1 Contractor) (cohesionless soils);
- Undrained Shear Strength determinations for cohesive soils as interpreted from both downhole PCPT/SCPT tests and adjacent seabed PCPT/SCPT tests (as provided by Lot 1 Contractor), and as measured by CIU triaxial, UU triaxial (undisturbed & remoulded), lab vane, torvane, pocket penetrometer, etc.);
- Plasticity Index test results;
- Natural Moisture Content;
- Bulk and Dry Density; and
- Percentage Fines, Carbonate Content and Organic Content.

The RC samples are to be consolidated under either isotropic or anisotropic conditions, as specified by CLIENT. The shearing stages will also be carried out under either drained or undrained conditions, also as specified by the CLIENT.

CONTRACTOR may suggest additional detail to be included in the logs and provide examples as part of their submission.

2.7.9 Cyclic Tests

In addition to the standard laboratory testing programme, a cyclic laboratory testing programme will be required in order to determine the cyclic behaviour of the soils. In addition to the cyclic tests, the cyclic test programme may require additional classification and static reference testing of the selected samples (e.g., if additional batching is performed). Typically for clays, static reference strength testing will already have been executed as part of the Borehole Locations Report. Nevertheless, the execution of the Cyclic Test programme will depend on the completion of the corresponding static reference tests.

The following tests are to be considered as comprising the cyclic component of the cyclic testing programme:

- Cyclic direct simple shear tests (CSS) *with* pre-shearing (400 cycles), performed undrained, with cycling up to 1500 cycles and followed by a static test if cyclic failure did not occur;
- Cyclic direct simple shear tests (CSS) *without* pre-shearing performed undrained on both cohesive and cohesionless soil samples, with cycling up to 1500 cycles and followed by a static test if cyclic failure did not occur;
- Cyclic triaxial compression tests (CTX), drained and undrained, performed on both cohesive and cohesionless soil samples, with and without pre-shearing, with cycling up to 1500 cycles and for the undrained tests followed by a static test if cyclic failure did not occur.

In general, the various loading stages of the CSS and CTX tests will be undertaken under fully undrained conditions for both cohesive and cohesionless samples, whereby the sample drains are closed. The application of the average stress in 1-way cyclic loading may have to be applied drained or undrained. Detailed specification for these tests will be provided by CLIENT and GM CONTRACTOR.

However, for a number of drained CTX tests on cohesionless samples, the sample drains should be kept open during cycling, in order to simulate drained cyclic loading conditions. This may require some limitations on the magnitude and frequency of the applied cyclic loads in order to limit pore pressure build up, depending on the fines content. The Contractor should ensure that the test equipment used can adequately cope with such test conditions, without causing any physical restrictions to the free drainage of the sample, which may be caused, for example, by the diameter of the drainage tubes or the sensitivity and responsiveness of the back-pressure control system.

In the tender submission, the Contractor should preferably provide the specifications of the proposed equipment and documentary evidence showing previous successful performance of drained cyclic triaxial tests with said equipment.

A set of cyclic tests will be undertaken on each soil unit or sub-unit of engineering significance across the WFZ.

2.7.10 Thermal Conductivity Testing

CLIENT wishes to undertake laboratory testing on selected samples to determine the thermal conductivity/resistivity and specific heat capacity properties of the near surface granular and cohesive soils in undisturbed and disturbed state for the purpose of cable design and installation. CONTRACTOR is to detail methods of obtaining,

storing, and testing undisturbed samples of appropriate size bearing in mind the sampling method available and reconstituting for remoulded tests.

Tests shall be carried out using two different methods, as follows.

1. Using the (dual) needle probe method in accordance with ASTM D5334-22ae1~~ASTM D5334-14~~.
2. ISO 22007-2~~.:~~ 20~~08~~22. Plastics-Determination of Thermal Conductivity and Thermal Diffusivity—Part 2: Transient Plane Heat Source (Hot Disc) Method.

Tests should be undertaken on fully saturated samples. Two separate specimens should be tested from each sample in order to duplicate the results. For cohesionless soil specimens, tests should be undertaken at three (3) different densities e.g., starting from the loosest state and using a vibration table to progressively increase the specimen density.

2.7.11 Microbially Influenced Corrosion (MIC)

CLIENT wishes to perform chemical and microbiological laboratory tests testing on selected samples to determine microbial influenced corrosion. The exact locations will be determined by CLIENT / GM CONTRACTOR. The soil samples have to be analysed to determine chemical-physical parameters and also microorganism groups. These are:

- Nitrate-reducing microorganisms;
- Nitrogen compounds oxidizing bacteria (nitrification);
- Neutrophilic ferrous ion oxidizing bacteria;
- Manganous ion oxidizing bacteria;
- Ferric ion-reducing bacteria;
- Manganese IV ion-reducing bacteria;
- Moderately acidophilic and neutrophilic sulphur compounds oxidizing bacteria; and
- (Thio-) Sulphate-reducing bacteria.

Regarding the bacteria, the laboratory test should show in particular the metabolic activity of the microorganisms. The microbiological risk potential should be derived from the laboratory results as well as the assessment of a biologically influenced mass loss rate of the steel-based material.

The cell counts of living bacteria shall be determined by the Most-Probable-Number-technique via dilution series using standardized, selective ocean water media (see ASTM D1141). The microbial activity shall be detected by measuring the heat output of sediment samples by microcalorimetry.

In addition, the TOC shall be determined for each MIC sample. CONTRACTOR shall also include the method they plan to use for the assessment (e.g., publication, external experts, own experiences). Furthermore, geotechnical index tests as water content (WC), unit weight (UW), pocket penetrometer test (PP) and torvane tests (TV) shall be carried out 2x in every soil type within the liner sample on cohesive soils of MIC liner samples. The processing of MIC liner samples includes the shipment to laboratory if needed, splitting of liners, sample photograph, sample description and classification, index test as described above, disturbed (double bags) and undisturbed (wax) sub-sampling for further laboratory testing and integration of results in the various report. The processing of MIC samples shall be included in MIC pricing.

The MIC samples shall be stored in a temperature of 5-8°C and preferably remain in sample ("Shelby") tubes to avoid any contamination during sub-sampling. The samples should not be stored for more than two weeks prior to testing. CONTRACTOR

shall optimize the transport of samples with the field work; i.e., ideally, MIC sample taking shall – as far as reasonably practicable - be done prior to a port call such that the maximum storage period will not be exceeded.

CONTRACTOR is to detail methods of designated testing, correlation of risk potential due to metabolic activity of microorganism as well as derivation of a mass loss rate of steel-based material per year for CLIENT's approval. Upon approval CONTRACTOR shall be required to perform said tasks in accordance with CONTRACT.

CONTRACTOR is to provide full details in their proposal as to how they intend to sample sub-seabed soils for the purpose of MIC testing along with methods of storage whilst on board the survey vessel. Sub-samples are to be taken with sterile sampling tools and are to be stored in sterile containers/bags. Storage in sample ("Shelby") tubes is preferred to avoid any contamination from tools or lab personnel during sub-sampling. CONTRACTOR shall detail in their proposal how the material is to be subsampled and what precautions are to be taken to avoid contamination at all stages of the test.

As part of the reporting process CONTRACTOR shall produce a report as part of the Borehole Report, which shall include a risk assessment of the results detailing the level of activity of each of the groups analysed and the resultant interpreted risk potential to emplaced infrastructure. The risk assessment should also indicate which of the groups or individual compounds analysed are likely to constitute the most aggressive in the sampled environment with respect to the prospective material types to be used in offshore wind foundation construction. This analysis should be summarised, tabulated, and presented in order of increased significance.

2.7.12 Geological Age Dating Analysis

CONTRACTOR shall undertake a programme of soil dating (micropaleontological) analysis on selected samples recovered from selected sample boreholes, which will be defined by the CLIENT / GM CONTRACTOR. The analysis shall include but not be limited to the following depending on the interpreted paleo-environment:

- Palynological analysis, (pollen);
- Algae;
- Fungi;
- Spores;
- Dinoflagellate Cysts;
- Foraminifera;
- Diatoms;
- Mollucs; and
- Carbon (C14) Dating.

The report shall detail:

- Individual analytical techniques;
- Chronostratigraphic succession;
- Biostratigraphic Events;
- Interpreted stratigraphy;
- Interpreted stratigraphic stage;
- Extinction markers; and
- Any issue potentially affecting the stratigraphic interpretation and succession for the area.

The results of these tests shall be interpreted and integrated into the geological ground model by the GM CONTRACTOR. CONTRACTOR shall allow for 2 interface meetings with the GM CONCTRACTOR to discuss and align results.

The geological age dating test results shall also be delivered by CONTRACTOR in a separate Geological Age Dating Report.

2.7.13 Storage of Samples

On board the vessel(s), samples shall be stored in a temperature stable environment (5-10°C) with no exposure to direct sunlight and in compliance with the standards as specified above. Samples shall be stored in accordance with CLIENT provided separate (tender) lots within the DDWWFZ. Currently it is anticipated that the total DDWWFZ will be split into 2 lots. Sample storage shall be done in accordance from which area the samples were taken and clearly identified as such for easy later reference.

In the onshore laboratory, samples shall be stored in a temperature (5-10°C) and humidity-controlled enclosure and in compliance with the standards as specified. CLIENT shall approve proposed methods and conditions of storage.

Reference is made to Section 2.7.11 for specific storage requirements related to MIC testing.

The samples used for Archaeological Dating analysis should be stored on the vessel as well as in the onshore laboratory in complete darkness avoiding any exposure to light.

The soil samples shall be stored onshore by the CONTRACTOR for a period of thirty-six (36) months following the soil samples receipt at the onshore laboratory during which time the CLIENT shall be granted free access to the samples. The CONTRACTOR shall store the cores in containers so that they can be retrieved easily. Storage shall be in a temperature (5-20°C) and humidity-controlled environment to ensure the samples do not dry out or suffer any other damage and in compliance with the standards as specified. CONTRACTOR shall confirm and detail the precise method of long-term storage and temperature control for CLIENT approval. CLIENT reserve the right to receive monthly temperature logs from the sample storage facility.

Following the minimum thirty-six (36) months storage period the CLIENT shall instruct the CONTRACTOR of one of the following:

i) a further period of storage,
ii) safe and legal disposal of all samples, or
iii) CLIENT collection of said samples.

The CONTRACT PRICE shall in any case include for the safe and legal disposal of all samples in storage. Option i) shall be at cost to the CLIENT by way of a VARIATION ORDER.

A number of undisturbed samples will be reserved for further standard and cyclic testing. Samples shall be stored at the CONTRACTORS nominated laboratory unless otherwise instructed in writing by CLIENT. Full rights of ownership and access to the samples shall remain with CLIENT for the full storage duration (minimum 36 months).

2.7.14 Batching of samples for coarse-grained material

The laboratory scope for laboratory testing Lot 2 on sand has been optimized with the aim to obtain a more efficient and less time-consuming scope in view of a fit-for-project and time-driven campaign. With this optimization, the need for combining reconstituted sand samples 'batching', is expected to be reduced.

Key assumption for batching is that the sand batches are representative for the in-situ site conditions in a specific layer. Although this assumption can be relatively

crude, e.g., due to loss of the in-situ structure of the sand matrix, the batching strategy outlined here is aimed to maximize representativity for each tested sample

Batching between multiple sampler tubes is only allowed in cases where insufficient sample material from one sampler tube is recovered. In any case it is advised to keep samples from one sampler tube together, in either a single disturbed bag sample or together in a single sample transport box.

The GT contractor shall provide the required amounts of material for all tests (as included in Annex 4(b)). To assist with the batching of samples the following information shall be recorded in addition to standard sample descriptions:

- For cohesive retained samples (both full retained in shelby and shorter waxed samples) the lengths and diameter shall be recorded;
- For non-cohesive material that is placed in bags the mass per bag shall be recorded

A maximum of six batches for cyclic testing is considered.

For the purpose of the tender/ budget allocation it is assumed that the GT contractor will carry out the batching, either offshore or in the laboratory onshore, with the batching operation included within the indicated price.

When samples are combined, the following conditions apply:

- Only samples with similar grain size distribution curves are allowed to be combined, by evidence of PSD curves for each sample (either performed on the vessel or in onshore lab) and from observations by the OCR or qualified engineering geologist.
- The preliminary assigning of samples to batches shall be carried out offshore by the GT contractor, samples should be retained in separate bags/tubes until below bullet point has been completed.
- Final batching shall be carried out onshore in the laboratory after approval by GM contractor on the basis of received PSDs for each sample, borehole log with description of samples by engineering geologist or qualified laboratory technician, LTAF and CPTU data in same or adjacent borehole.
- Only samples from the same geological (sub)unit are allowed to be combined;

Batching samples from multiple borehole's may be required, in specific cases of highly varying soil conditions. This is only allowed after CLIENT's approval

When during the laboratory testing program, re-batching appears to be necessary, this will be in the scope of the Contractor to propose the way forward for re-batching, discuss and agree with the Client and/or GM contractor on the re-batching and execute the re-batching.

2.7.15 Demobilisation

Upon completion of the survey, all CONTRACTORS personnel shall be demobilised from the vessel(s) in accordance with the CONTRACT.

CONTRACTOR is responsible for the removal of all equipment, instrumentation and materials from the project areas following survey completion.

Demobilisation is deemed to commence when all survey operations have been completed, the seabed frame has been recovered, and after approval of the OCR and CLIENT.

2.7.16 Lost Equipment

CONTRACTOR shall be responsible at their own cost for the marking the location and recovery of any and all equipment dropped or lost during the execution of the project. 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 lost equipment on, above or at depths less than 0.5m below seabed shall be removed by CONTRACTOR at no costs for CLIENT.

2.8 Lot 2 Data processing and reporting for boreholes

After carrying out the borehole investigation, CONTRACTOR shall process the acquired data during the field work, carry out the laboratory tests according to the lab programme and lab test strategy that is agreed with CLIENT and prepare a detailed report covering the total scope of work.

The reporting requirements for the geotechnical borehole work are detailed below. Quality requirements are described in Annex [6] – Section VI - Quality requirements & Administrative instructions Geotechnical Survey.

Document control requirements, including filename conventions, are included in Starting Points and Assumptions - Annex [5].

Reports and deliverables will be delivered by contractors in pdf and original, regular, formats (docx; xlsx; ppt; etc).

At least four weeks (twenty-eight calendar days) before the start of vessel mobilisation, CONTRACTOR shall produce a reporting template for the "Geotechnical Borehole Report", to be issued detailing the proposed structure and contents of the report so that CLIENT comments and approval can be communicated as soon as possible.

2.8.1 Provision of digital pilot data

The CONTRACTOR will be requested to provide a pilot database which will include an example output of each of the digital deliverables. This data may include, but not limited to:

- AGS 4 format;
- ASCII;
- Excel or csv; and
- LAS files.

The objective of this deliverable prior to delivery of the factual test results is to agree on the format of the data output as to be applied in a consistent manner throughout the project. This also applies to any interim deliveries of laboratory data prior to provision of the final report.

CPT data, as provided by downhole PCPT and SCPT shall be provided in AGS format. One additional ASCII format is allowed provided it is approved by CLIENT as part of this Pilot Data review.

CONTRACTOR shall provide a time schedule for providing the Pilot Data in Annex [4b].

2.8.2 Daily & Weekly reporting

The CONTRACTOR is to submit daily reports throughout the period of the fieldwork, providing full details of previous 24 hours' work and results and a projection of the work to be completed over the next 48 hours. Further, CONTRACTOR shall issue a

weekly report providing insight in the progress of the WORK. The minimum content of the daily and weekly report is specified in Annex [6] Section VI of this CONTRACT.

2.8.3 Preliminary Field Borehole Logs and PCPT/SCPT results

The CONTRACTOR is to provide preliminary PCPT/SCPT results within 24 hours of completion of the borehole. The CONTRACTOR is to provide the preliminary (field) borehole logs containing the offshore lab test results within 48 hours of completion of the borehole. Prior to submitting the borehole logs and PCPT/SCPT results, CONTRACTOR'S lead engineer shall review and approve the data for release to the CLIENT. The combined results will be used to complete the onshore laboratory test schedule. CONTRACTOR shall also provide a preliminary laboratory testing schedule (LTAF) for each borehole within 72 hours of borehole completion for review by the GM CONTRACTOR and CLIENT.

2.8.4 Lot 2 Operations Report

The CONTRACTOR shall submit an "Operations Report" for all Lot 2 fieldwork activities, which shall include, but not be limited to:

- Daily logs (DPRs);
- Driller's and CPT operator's log and recorded drilling parameters (i.e., torque, mud pressure, bit weight);
- Location positioning acceptance reports;
- Mobilisation report;
- Incident reports; and
- Full details of all lost and damaged equipment.

This report will be for CLIENT internal use only and will not be published on the RVO website.

The CONTRACTOR shall provide one (1) electronic copy of this report. The delivery schedule is to be provided in Annex [4b]

2.8.5 GGM Priority Laboratory Testing Report

The CONTRACTOR shall submit the 1st version of the GGM Priority Laboratory Testing Report, based on the test results of the GGM Priority Laboratory Testing. Since the test results will need to be delivered and reviewed by CLIENT on a weekly basis (see 2.8.7), the report should be a summary of these results. The reporting requirements are the same as per the normal "standard testing" as are mentioned in the Geotechnical Borehole Report reporting requirements (refer to Section 2.8.6 - 2.8.9). The only difference is that this set of tests (results) has priority and hence the results need to be presented in a separate report.

2.8.6 Field report / Geotechnical Borehole Report version 1 (Lot 2)

The field results obtained from the borehole campaign shall be presented as the first version of the "Geotechnical Borehole Report".

The CONTRACTOR shall be required to submit a reporting template for the "Geotechnical Borehole Report" within one week (seven calendar days) after the start of the offshore works.

Version 1 (Field Report) of the "Geotechnical Borehole Report" shall include, but is not limited to:

- A statement of the purpose of the investigation;

- A description of the work carried out, including reference to specification and standards adopted and any deviations from them;
- Exact locations of all boreholes. The coordinates should also be provided in electronic format (xlsx);
- Water depth at each downhole location, reduced to LAT (quality assured) and seabed frame settlement data (if any);
- Drawings (GIS format or similar as well as PDF) showing the locations of the boreholes undertaken;
- Preliminary (field) borehole logs as described in Section 2.7.8 (including offshore laboratory tests results);
- Plots of the following final (quality assured) PCPT/SCPT results:
    - Measured cone resistance;
    - Measured sleeve friction;
    - Measured pore water pressure;
    - Friction Ratio;
    - Net cone resistance;
    - Pore pressure ratio;
    - Interpreted relative density (granular materials), inclusive of a description of the type of correlation used for the interpretation;
    - Interpreted undrained shear strength (cohesive materials), inclusive of a description of the type of correlation used for the interpretation;
    - Seismic Cone (SCPT) test results including interpreted small-strain shear modulus versus depth inclusive of a description of the calculation method used
    - Results of *in situ* thermal conductivity testing including heat capacity and thermal conductivity calculations.
    - Zero offsets before and after the tests with cone ID and corresponding area ratio.
- P-S logging results including interpreted small-strain shear modulus versus depth and a summary of the calculation methods used;
- The results of the downhole density/porosity logging;
- Calibration report including all on board calibration sheets and calibration certificates of CPT cones used;
- Positioning reports for investigated locations;
- Obstruction list including full details of all lost and damaged equipment on the seabed and within the soil including coordinates and depth
- Colour photographs of samples and cores; and,
- Results of Measurement While Drilling (MWD) recording.

The CONTRACTOR shall provide one (1) electronic copy of this report. The delivery schedule for this report is to be provided by CONTRACTOR in Annex [4b].

2.8.7 Weekly data deliveries

In order to provide early input into the ground model, Lot 2 CONTRACTOR is required to provide weekly digital data deliveries of the completed and approved test results. The digital data deliveries must be in the agreed data format (refer to Section 2.8.1). The digital data must be accompanied by a brief technical note outlining the content of the delivery (test types and quantities) and any comments or observations relevant to the test results. Results that are part of the GGM Priority Laboratory Testing should be given priority.

2.8.8 Geotechnical Borehole Report version 2 (Lot 2)

CONTRACTOR shall submit an interim (2nd version) of the "Geotechnical Borehole Report".

The purpose of the version 2 Geotechnical Borehole Report is to provide the GM Contractor with results of required data and laboratory test results in order to allow development of the Geological Ground Model (GGM), a preliminary list of the required laboratory tests for this Report are included in Annex [4b].

In addition to the above requested GGM specific testing, this report version shall include all items of the previous revision and all other available onshore laboratory test results at that time.

2.8.9 Geotechnical Borehole Report version 3 (Lot 2)

CONTRACTOR shall submit a complete (3rd version) the "Geotechnical Borehole Report" upon completion of the standard laboratory testing programme.

In addition to the information included in the previous versions of report (Section 2.8.5 and 2.8.82~~.8.82.8.~~7) updated where appropriate, this report shall include:

- Water depth at each downhole location, reduced to LAT. If water depths (LAT) at the same locations differ from each other during the seabed (Lot 1) and downhole (Lot 2) campaign the CONTRACTOR shall provide an explanation;
- Parameter plots to be presented for each borehole are to include the following measured data:
  - Measured Water Content and Atterberg Limits versus depth;
  - Measured Bulk and Dry Unit Weight versus depth;
  - Particle size by mass percentage less than 2, 60 & 2000 µm versus depth;
  - Measured Undrained Shear Strength versus depth;
  - Thermal conductivity/resistivity and heat capacity versus depth;
  - Summary of dissipation test results for the tested units;
  - Organic Content versus depth.
- Final offshore and onshore laboratory test results (excluding cyclic tests) and summaries shall be reported in accordance with the previous requirements;
- Final borehole logs as set out in Section 2.7.8, with updated descriptions to be consistent with the presented laboratory test results;
- Summary tables of Laboratory Test Results by type of tests and for each laboratory test it shall be specified in which laboratory the test was performed;
- Colour photographs of samples and cores;
- ASCII data of PCPTs and P-S logging (including all raw data and wave forms);
- ASCII data of SCPT tests (including all raw data traces and derived wave velocities);
- ASCII data of density logs~~, gamma ray, DMR and calliper~~ including all raw data;
- Laboratory test data in PDF, AGS and ASCII/Excel format; and,
- An overview of the remaining samples that will be stored.

The delivery of AGS digital data shall comply with the AGS file format rules and should therefore be validated using the following AGS validator: https://www.ags.org.uk/data-format/ags-validator/

The CONTRACTOR shall provide one (1) electronic copy of the interim reports (first and second version) and final (third version) report. The reports shall contain all information to allow a comprehensive review to be performed by CLIENT. The Final

version of the "Geotechnical Borehole Report" shall be made after processing of comments and approval by the CLIENT.

The complete (3rd version) report shall contain all the information which is to be included in the final report. Both draft and final report shall consist of electronic copies to be provided digitally by web portal transfer. CONTRACTOR shall provide electronic copies of the final geotechnical report and data. Digital data shall be provided for both draft and final reports. Version 3 is the draft version for final reviewed by Client and Certification Authority

Version 4 of the document will then be the final version of the document which will be approved by Client.

The delivery schedule for the various versions of this report is to be provided by CONTRACTOR in Annex [4b].

2.8.10 Cyclic Laboratory Testing Report

CONTRACTOR shall submit an interim (1st version) of the "Cyclic Laboratory Testing Report". This version includes all available laboratory tests results at that time.

The CONTRACTOR shall submit a 2nd version of the "Cyclic Laboratory Testing Report", which shall include a complete set of results.

The "Cyclic Laboratory Testing Report" should include (note that all testing denoted "standard" below refers to the additional static reference strength and classification testing performed):

- A statement of the purpose of the cyclic laboratory tests;
- A description of the cyclic and additional standard laboratory tests carried out, including reference to specification and standards adopted and any deviations from them;
- Results of all cyclic and additional standard laboratory tests results documented in single protocol for each test;
- Summary of cyclic and additional standard laboratory test results by type of tests; for each cyclic laboratory test it shall be specified in which laboratory the test was performed;
- Laboratory test data in PDF, AGS and/or ASCII/Excel format (where appropriate);
- Digital data (ASCII) of cyclic tests, including all cycles at full logging frequency; and
- An overview of the remaining samples that will be stored.

The delivery of AGS digital data shall comply with the AGS file format rules and should therefore be validated using the following AGS validator: https://www.ags.org.uk/data-format/ags-validator/

The CONTRACTOR shall provide a digital copy of each version of the report, which shall be revised or made final (as appropriate) after processing of comments and approval by the CLIENT. Each version of the report shall consist of an electronic copy provided digitally by web portal transfer.

The CONTRACTOR shall also provide the digital data for all tests included in each version of the report. For the 3rd and final version of the report, the digital data for each test shall be presented in Excel format (well-annotated and user-friendly). For other versions of the report, the digital data can be provided in simple ASCII/CSV format (with explanatory notes).

The delivery schedule for the various versions of this report is to be provided by CONTRACTOR in Annex [4b].

2.9 BRO Requirements

The Basisregistratie Ondergrond (BRO) or the Key Register for Registry of the Subsurface is a Dutch national database developed and managed by TNO on behalf of the Ministry of Internal affairs.

The objective of the BRO is to consolidate all geotechnical data publicly acquired in a national database available to the public through an online webservice: www.BROloket.nl (Dutch) or https://basisregistratieondergrond.nl/english/ (English). Typically, parties contracted to provide services to the Dutch government are required to provide the geotechnical information into a specified format to the BRO.

CLIENT therefore wishes to move towards providing the acquired geotechnical data for Lot 1 and Lot 2 in BRO compatible format in addition to the required deliverables stated in the previous Sections. This implies:

- Executing the (onshore and offshore) laboratory testing to the standards specified by the BRO (compliant with conventional international standards except for carbonate content, organic content testing, pocket penetrometer and torvane testing) with sample descriptions according NEN8990:2020 and NEN8991:2020;
- Performing PCPT testing according to ISO22476-1;
- Borehole descriptions according to NEN8990:2020 which is the national annex of the ISO14688-1; and
- Provision of all acquired digital data in BRO accepted XML data format.

SCPT testing, P-S logging, TCPT and cyclic testing is currently not covered by the BRO.

CLIENT prefers that the CONTRACTOR could provide the digital data listed in this section in the BRO XML format in addition to the standard deliverables mentioned above, and develops, in open-source format, the required tools to convert the data to XML.

The BRO is the primary source and custodian of the required data format. The XML file format is specified on the following BRO website (Dutch only):

- https://www.bro-productomgeving.nl/bpo/latest/bodem-en-grondonderzoek

An open-source example that can be used as an example implementation for conversion from the GEF file format to BRO is publicly available on GitHUB, here:

- https://github.com/BROprogramma/CPT_GEF_CONVERTER

Note however, that these files are no longer developed by the BRO. Any files downloaded from non RVO websites are done so at CONTRACTOR's own risk.

As guidance on the BRO requirements for geotechnical works reference is made to the MEMO included in appendix C of the document; Annex [5] - Starting points and assumptions.

In Annex 4 [a] and/or [b], CONTRACTOR will need to indicate the rate for the support in order to deal with the BRO requirements. CLIENT has provided an estimated duration for this work.

2.10 Certification

CONTRACTOR shall participate in meetings, workshops and support the certification process for all deliverables as required, also if Certification is expected to take place after the Final Delivery of the Documentation or even the IGM. The CONTRACTOR shall assist the CLIENT during the certification process including final review cycle(s) and the answering of queries from the Certifying Authority.

Certification will follow the process outlined in the appropriate section of the latest version of document DNV-SE-0190 Project Certification of wind power plants and documentation referenced therein.

CLIENT will submit approved deliverables for review to a certification provider which may return requests for clarification and/or amendment. The CONTRACTOR (including potential subcontractors) shall assist to answer these requests. The certification provider may require support to develop sufficient understanding of the methods applied and CLIENT may be proactive in introducing personnel from the certification provider into selected meetings and workshops (by mutual agreement with CONTRACTOR).

In Annex 4 [a] and/or [b], CONTRACTOR will need to indicate the rate for the support in order to deal with the Certification requirements. CLIENT has provided an estimated duration for this work.

2.11 Documents, meetings and Reporting

2.11.1 Pre-Mobilisation Documents and Reports

CONTRACTOR shall deliver all pre-mobilisation documentation, reports and assessments in accordance with CLIENT'S requirements, (Section 2.3.2 and 2.4.1) a minimum of twenty-eight (28) calendar days prior to mobilisation. These shall include but not be limited to:

- Lot 1 and Lot 2 Contractor:
  - Common Marine Inspection Document (CMID) Vessel audit
  - Dynamic Positioning (DP) trials and position holding report
  - Positioning acceptance report comprising position check against the proposed target test co-ordinate (see Section 2.4.3);
  - USBL calibration certificate(s), not older than 1 year and performed in water depth of 100m or greater;
  - Project Execution Plan (PEP) (including applicable Method Statements and Risk Assessments);
  - Project Quality Plan/Quality Manual, (PQP, QM);
  - Health and Safety Plan, (HSE);
  - Emergency Response Plans, (ERP);
  - Mobilisation report (per vessel, to be submitted within 2 days after mobilisation is completed); and
  - Verification report of the testing of the internet speed upload/download carried out to show that the required internet speed onboard each of the site investigating vessels meets the specification given in 2.142~~.142.1~~4. This shall form part of the mobilisation report.

- Lot 1 Contractor
  - Location clearance report for seabed CPT and vibrocore locations.

- Lot 2 Contractor

- Location clearance report for assigned borehole locations.

2.11.2 Progress and Regular Interface Meeting

The CONTRACTOR shall be available to provide regular updates during Work Progress Meetings (WPM) with the CLIENT. It is estimated that meetings will be scheduled at least on a ~~bi-~~weekly basis for 1.5 hrs. The CONTRACTOR shall attend these meetings with the designated project manager and relevant technical specialists. Occasionally multiple technical specialists may be required to attend to discuss specific topics of the WORK. The CLIENT will prepare a meeting agenda, track actions in an action list and document meeting notes. CONTRACTOR will be required to provide a weekly report at least 24 hrs prior to the WPM. The weekly report shall contain up to date information on the progress of the WORK, risks, and opportunities, forecasted delivery dates and potential changes to scope as required.

During the execution of the WORK multiple interfaces are recognised. The main interfaces are with the GP contractor and the GM contractor. The CONTRACTING AUTHORITY requests the CONTRACTOR to participate in Joint Progress Meetings to discuss relevant interfaces and interdependencies of the WORK and to promote collaboration between parties. The CONTRACTOR shall attend these meetings with the designated project manager and relevant technical specialists. Joint Progress Meetings will be scheduled on 2-weekly basis for the duration of the contract (1.5 hrs per meeting). Given the challenging schedule and the many interfaces with the GM Contractor, the frequency of these meetings has been increased from 4 to 2-weekly compared to similar previous projects.

2.11.3 Workshops/Meetings to discuss outside of WPM and interface meetings

The CONTRACTOR is required to attend various meetings and workshops. The workshops and meetings will be required at various stage throughout the contract period and will be utilised to, for example, discuss the results and output of various deliverables, alignment with interfaces or to discuss issues that may arise during the execution of the work. In some instances, preparation in the form of a presentation may be requested by the CLIENT. For this Tender, workshops and regular meetings will be required and the CONTRACTOR is expected to cost these appropriately.

The CONTRACTOR shall be available for regular meetings with CLIENT with regard to the coordination and progress of the project. As a minimum the following meetings will be established, separately or combined as appropriate:

- Project Kick-off Meeting and close-out meeting – onshore (1-day);
- HIRA/HAZID meeting – onshore prior to mobilisation;
- Live technical Kick-Off meeting – onshore (2-day);
- Vessel Kick-Off Meeting(s) – on vessels executing work;
- Daily meetings on site between Client Offshore Representative(s) and CONTRACTOR key personnel;
- Meetings for QA of onshore data processing and interpretation
- Any other meetings as specified in the CONTRACT, especially Annex [6] Section IV – Scope of Work.
- Meetings with Certification Authority

The CLIENT reserves the right to plan any other meetings that are deemed necessary during the execution of the works. CONTRACTOR shall make relevant representatives available for these meetings.

Progress reporting requirements are described in Annex [6], Quality requirements & Administrative Instructions Section VI.

2.11.4 Roles and Responsibilities

The DDW Soil Investigation project is a project in which the GM, GT, and GP scopes are interrelated; the scopes highly depend on and feed into each other. Table 2 in Section 1.9 above gives an overview of the roles & responsibilities for the different work items; which party/contractor will supply/execute the work item and which party/contractor will approve the work item.

2.11.5 Project and Site Description

The Contractor shall provide a 2 to maximum 5-page summary including the aims, objectives and approach and the main results to be published in the Project and Site Description (PSD). An example is provided here: https://offshorewind.rvo.nl/files/view/3b960c83-6a0c-4d19-9164-f10cdb77873f/1625051036hkw_20210630_project%20and%20site%20description-f.pdf. The summary for the Project and Site Description (PSD) shall be provided as Word file.

2.12 Answering additional questions

It is anticipated that additional questions (from market or CLIENT) regarding this geotechnical survey will be received after delivery of the study results. The CONTRACTOR is requested to support the Contracting Authority in answering these questions.

Time and financial expenditure will be arranged and compensated for by means of a Variation Order.

2.13 Webinar

Following completion of all laboratory testing and reporting, the results of the investigation will be presented in a public webinar to be hosted by CLIENT. See examples at http://offshorewind.rvo.nl. Contractor is requested to include in their offer following activities:

- Preparation of required presentations, including illustrations;
- Attend the webinars at a studio location in the Netherlands (location to be confirmed) with two experts;
    - One expert (each lot) to present the presentation;
    - One expert (each lot) to participate in the expert panel to support in the answering of questions of the webinar participants during the presentation; and
- Support in the answering of questions after the webinars.

The date of the webinar will be determined in cooperation with end users of the study. The following assumptions serve as a guideline for the planning of the webinar:

- The complete set of certified end products has been published at offshorewind.rvo.nl;

- End users are in a phase when they are potentially using the end product for the preparation for the upcoming permit tender; and
- End users should have sufficient time for a detailed reading between disclosure of certified end product and webinar.

The webinar for the present Scope of Work is anticipated to be held in Q3 2026 for DDW WFZ. Costs associated with the webinars are to be carried by CONTRACTOR. The cost associated with the use of the studio facility for the webinars will be at cost of CLIENT.

2.14 Offshore Representation

The CLIENT may require up to three (3) CLIENT OFFSHORE REPRESENTATIVES (OCR) per vessel to witness the offshore phase of the surveys works.

The CONTRACTOR is responsible for providing safety induction training for the OCR who are to work on or visit any vessel in connection with the execution of the work.

The CONTRACTOR shall provide adequate facilities for the OCR on any vessel to include a private cabin, office space including colour printer, communication systems and messing facilities. The CLIENT cabin shall have an uninterrupted internet connection with a minimum speed of 1024 kbits/sec upload / download.

CONTRACTOR shall make use of any periods of weather standby to undertake port calls to facilitate offload and transport of samples.

CONTRACTOR shall make a port call at least every four weeks to allow for rotations of OCR and CONTRACTORS crew.

2.15 Risk mitigation for COVID 19 and other diseases

CONTRACTOR shall propose suitable measures against transmittable diseases (e.g., COVID-19) that may negatively impact the execution of the investigations, subsequent office work and laboratory testing as part of the required HSE management documentation.

3 Schedule of Key Dates

The DDW Soil Investigation project is a time driven project in which the GM, GT, and GP scopes are interrelated; the scopes depend on and feed into each other. To avoid delays and consequential knock-on effects between the scopes, it is crucial that the CONTRACTOR meets the defined timelines.

The dates specified for the Lot 1 and Lot 2 by CONTRACTOR in Annex [4a] and [4b] – "Cycle Times" and prices/rates will be inserted in a table at contract award. KEY DATES can only be modified in accordance with the principles specified in Annex [6] - Section VI – Quality Requirements & Administrative Instructions.

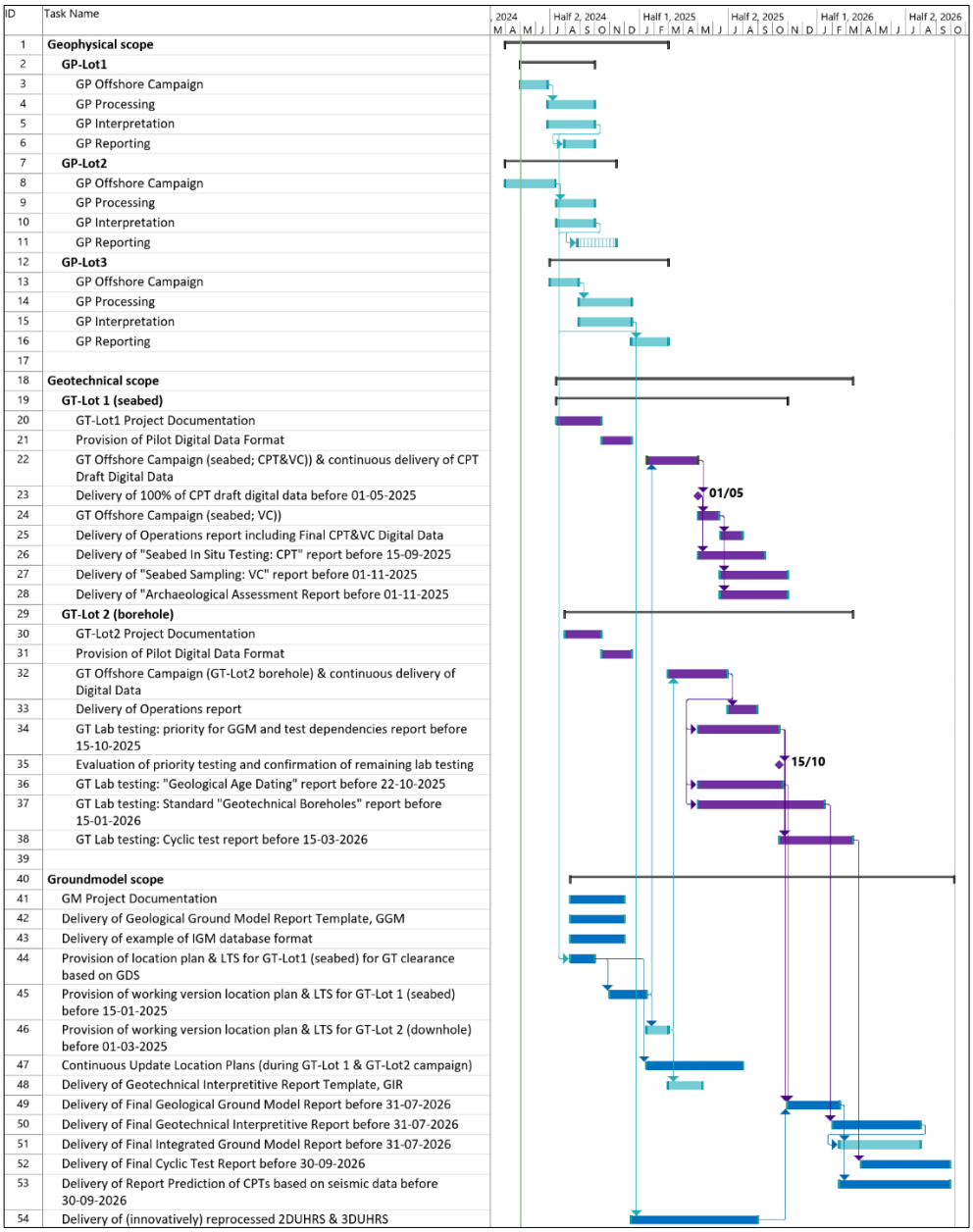

Figure 3: Schematic timeline of Geophysical/Geotechnical/Ground model scope, including interfaces.