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Van: [redacted]
Verzonden: vrijdag 22 april 2022 15:23
Aan: [redacted]
CC: [redacted]
Onderwerp: Wijzigingen op de aanvraag Net op zee IJmuiden Ver Alpha
Bijlagen: Bijlage 6 - G-DES.04.001-2GW-MA-Platform_Design_Report_rev 3.0 (002).pdf; Bijlage 13 - TTB-06951_DTS_IJVer Alpha_RPL A04_Rev02.pdf; Bijlage 5 - 2204 _alpha_offshore.pdf

Beste [redacted]

Hierbij sturen wij je een aantal wijzigingen op de aanvraag watervergunning voor het project Net op zee IJmuiden Ver Alpha. Op 27 augustus 2021 is door TenneT TSO B.V. een vergunning aangevraagd als bedoeld in hoofdstuk 6 van de Waterwet voor het verrichten van handelingen in een watersysteem. Op basis van deze aanvraag is een ontwerp vergunning opgesteld en deze heeft van 17 december 2021 tot en met 27 januari 2022 ter inzage gelegen. Op basis van recent verkregen inzichten zouden wij graag een viertal documenten willen wijzigen in de aanvraag. De wijzigingen hebben betrekking op het Platform Design Report, het kabeltracé onshore, het kabeltracé offshore en de Route Position List (RPL).

1. Wijziging Platform Design Report: In het ingediende Platform Design Report (bijlage 6) is aangegeven op welke manier het van het platform afvloeiend (mogelijk verontreinigd) hemelwater wordt gemeten op vervuiling. Er is aangegeven dat het determineren van olie en/of glycol zal plaatsvinden bij 5 parts per million (ppm). Water met meer dan 5 ppm aan olie of glycol zal worden geleid naar een afvoertank (paragraaf 5.2, pagina 11).
Echter, het meten van een vervuiling van regenwater op het platform van 5 ppm blijkt niet haalbaar in de praktijk. Uiteraard zullen de meet- en lozingsvoorzieningen wel voldoen aan de geldende wet- en regelgeving. Het Platform Design Report is hierop aangepast en als bijlage bij deze mail gevoegd. Deze bijlage vervangt de eerder ingediende versie van het rapport (bijlage 6).

2. Daarnaast hebben wij een nieuwe RPL toegevoegd. Versie 4.0, rev. 2 bevat slechts minimale wijzigingen ten opzichte van versie 4.0. De kleine wijzigingen hebben betrekking op enkele punten met betrekking tot de begraafdiepte en een crossing die niet nodig blijkt. Toch lijkt het ons beter om onze laatste versie, en dus update, bij de vergunningaanvraag te voegen en onderdeel van de vergunning te laten zijn. Deze RPL vervangt de RPL van de eerdere aanvraag (bijlage 13).

3. Ook de offshore tekeningen zijn iets aangepast, de lijnen zijn wat vloeiender getekend, uitstulpingen zijn eruit gehaald. Afwijkingen zijn minimaal. Bijgevoegd daarom ook een nieuwe bijlage 5, die de oude bijlage 5 vervangt (tracéoverzicht offshore).

Hierbij verzoeken wij RWS de bijgevoegde documenten te verwerken in het definitieve besluit op onze aanvraag. Indien je vragen hebt vernemen wij dat graag. Alvast dank!

Met vriendelijke groet,

[redacted]

Project Lead Spatial Planning & Licensing IJmuiden Ver Alpha
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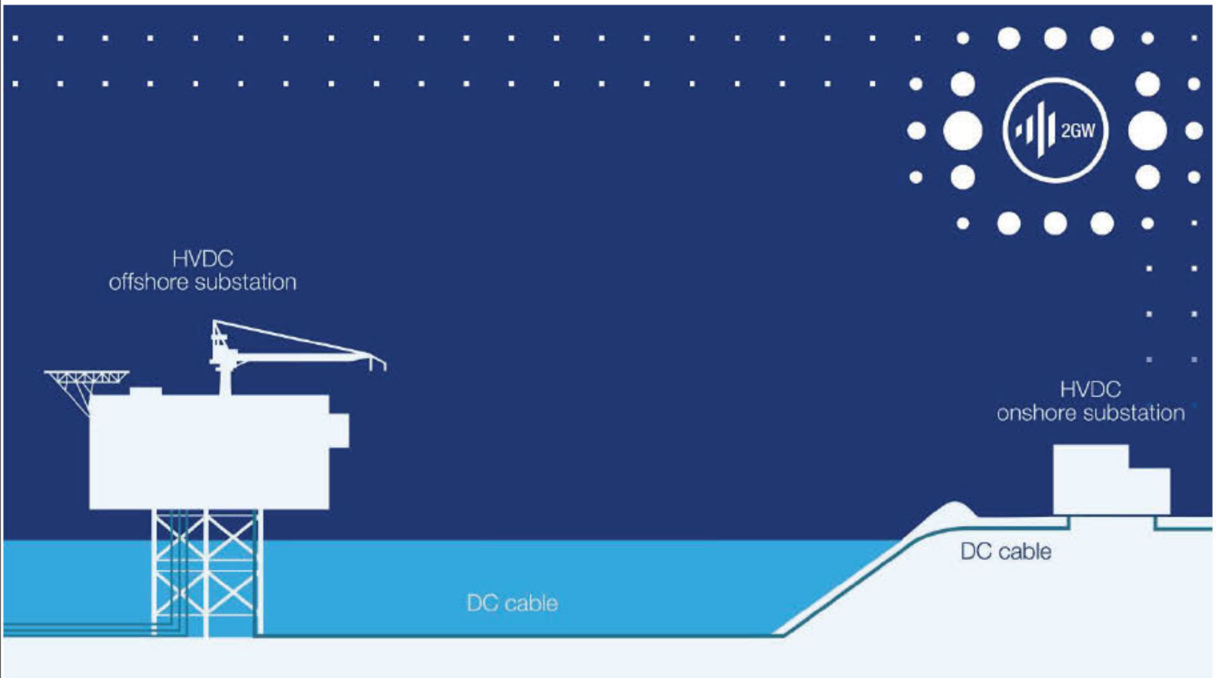
Platform Design Report



Revision history

Revision	Date Released	Change	Author	Released by
1.0	06-07-2021	For Tender	ABO	GSC
2.0	16-09-2021	New Template	ABO	GSC
3.0	13-04-2022	For Tender	ABO	GSC

Table of Content

1 Introduction

1.1 Purpose of this document

The document is part of a set of Employer's Requirements specifying a 2GW Grid Connection System (GCS) and should be read in conjunction with the other Employer's Requirements.

1.2 Scope

The scope of this document is to provide a general description of the standardized 2GW platform considering a short description of all systems based on the equipment on-board, the arrangement of rooms and systems and the operational scenarios.

Where rooms housing specific systems are described, a short conceptual system description is included. For detailed system descriptions, reference is made to the System Design documentation and the System Requirements Specifications.

2 Abbreviations and definitions

HV	High Voltage
SRS	System Requirements Specification
AC	Alternating Current
CCTV	Closed-Circuit TeleVision
DC	Direct Current
ERT	Emergency Response Team
GIS	Gas Insulated Switchgear
GW	Giga Watt
HV	High Voltage
HVAC	High Voltage Alternating Current
HVA/C	Heating, Ventilation and Air Conditioning
HVDC	High Voltage Direct Current
kV	Kilo Volt
LV	Low Voltage
MLQ	Modular Living Quarter
MW	Megawatt
PAGA	Public Address / General Alarm

3 References

DNV-ST-0145	Offshore Substation

4 Project Description

4.1 General

TenneT is developing 2GW 525kV bi-pole HVDC Grid Connection Systems between offshore wind farms and the onshore transmission networks in both The Netherlands and Germany. TenneT has developed a standardized platform, suitable to house the HV system of multiple HV suppliers as the basis for all future 2GW developments until 2030 and possibly beyond.

For this 2GW 525kV Grid Connection System both an offshore and onshore HVDC Substation is required. This project covers the HVDC Offshore Substation, connecting two 1 GW wind farms and converting AC power to DC power, transmitting DC power to another location, either to a DC land station via the normal DC export route or to another platform and/or land station via the so called multi-purpose Interconnector.

The first HVDC Offshore Substations being built under this concept are the IJmuiden Ver Alpha, Beta and Gamma developments of TenneT in The Netherlands, shortly followed by the BalWin 1, 2 and 3 development in Germany.

Throughout the pre-tender design phase attention has been given to the differences between both countries and locations where this standardized platform will be located.

General requirements are incorporated and where required, requirements are made specific for both countries and/or locations.

Furthermore, the goal of the pre-tender design is to realize a standardized platform design for a 2GW 525kV HVDC Offshore Substation with minimal Total Expenditures (TOTEX) and which is able to incorporate the high voltage systems from the different HV system suppliers.

4.2 HVDC Offshore Substation

The HVDC Offshore Substation comprises a jacket foundation and a topside. The topside includes all the electrical equipment for connecting the wind farm to the onshore grid and via the Interconnector to another HVDC Substation:

- Four Converter transformers
- Two 66kV Gas Insulated Switchgear (GIS) modules
- One Air Insulated Switch Yard (AIS)
- Four AC/DC Converter Yards
- Two DC Switch Yards, one connecting the Export DC Cables going to the HVDC Onshore Substation and one connecting the Interconnector DC Cables going to another HVDC Substation
- Two Neutral Switch Yards, one connection to the Export Metallic Return Cable and one connecting to the Interconnector Metallic Return Cable
- Four 66kV/0.4kV Auxiliary Transformers

The topside also houses the required control, protection and auxiliary systems required for a safe and reliable operation. Rooms and accommodation facilities are foreseen to carry out all the required maintenance tasks during the lifetime of the platform.

The jacket will support the topside and has the following key components:

- Two boat landings
- Four J-tubes for 525kV export cables
- Four J-Tubes for 525kV Interconnector cables
- Two spare J-tubes (e.g. to connect future consumers)
- Twenty Eight J-tubes for 66kV array cables arriving from the wind farms

4.3 Standardization

TenneT has the objective of using standardized HVDC Offshore Substations. For TenneT's HVAC substations in The Netherlands, such a series of standardized HVAC substations is already achieved. For the German HVDC Offshore Substations, a standardization program has been carried out as well, resulting in a preferred lay-out of the 900 MW HVDC Offshore Substations.

For the 2GW HVDC Offshore Substations, TenneT wants to take the next steps in standardization.

Major benefits of the standardized lay-out and auxiliary system concepts are that these are independent of the high voltage equipment suppliers. The pre-tender platform design uses generic data, taken as a representative average or maximum from the HVDC suppliers that took part in the Innovation Partnership. As a result, the platform design does present a design that fits with all HV designs, but is to be fine-tuned based on the actual equipment data during the detailed design phase. This fine-tuning should not jeopardize the standard that has been developed for both the layout and the auxiliary concepts.

Apart from obvious operational benefits, standardization brings more benefits to the goal of TenneT, lower Total Expenditure (TOTEX). Benefits are:

- Early stakeholder involvement on platform design
- Shorter project duration by e.g repetitive fabrication
- Lower risk for the Contractors as there is a pre-approved design
- Early involvement of the Certifying Authority
- Lower project execution cost, as many design steps and discussions have taken place prior contract execution
- Operational advantages.

The extent to which the pre-tender design package is fixed and where the remaining degrees of design freedom are, is described in the Systems Requirements Specifications (SRS). The design freedom has been limited to ensure that all future 2GW platforms will have the same system designs and operational principles and will only vary in the detailed execution.

4.4 System Requirements Specifications

For this project, the platform is described using a breakdown in systems.

For each system, the technical requirements are listed in the System Requirements Specifications (SRS) using the Systems Engineering (SE) methodology. This document is describing the resulting Standardized 2GW Platform design that is the outcome of the SRS and based on the high voltage designs as developed by five HVDC suppliers during a yearlong Research & Development phase (Innovation Partnership).

For details on requirements and design of platform systems, reference is made to the SRS and the design documentation.

4.5 Design Concept

The platform houses a 2GW 525kV bi-pole HVDC converter. The electrical flow for AC to DC conversion is followed in the platform design.

The AC current (import) arrives at the North side of the platform and leaves, after conversion to DC (export), at the South side the platform. Cables enter the platform in a straight line from where they arrive per J-tube. No cable crossings from North to South and vice versa are foreseen.

The electrical conversion system being a bi-pole system, is symmetrical over the poles of the HVDC system. This symmetry is in the lay-out over the length of the North-South axis, the main corridor. This symmetrical approach is also maintained for the placement of most Low Voltage (LV) & Auxiliary equipment. Equipment required for operating a specific pole is located at the same side of the corridor as the concerned pole. It also facilitates the requirement that maintenance to one pole does not affect the operation of the other pole.

Poles are named A and B, LV & Auxiliary equipment is named to the pole it is serving, e.g. Converter Cooling Room A and Converter Cooling Room B.

In case redundant LV & Auxiliary equipment is present, these are numbered 1 and 2, e.g. Auxiliary Transformer (Room) A-1 and A-2 and B-1 and B-2.

A few cross links at system level are made in order to increase redundancy and availability, e.g. in HVA/C and LV Power Supply.

The bi-pole includes redundancy, so for each pole, major electrical equipment is 2x 50% (GIS, Transformers, Converters and Reactors). This implies, transmission may continue at lower power output upon failure of one of these components. The electric redundancy is maintained within the platform lay-out by placing the major electrical equipment in separate rooms.

For the LV & Auxiliary power system, a similar redundancy per pole is maintained for switchgear and back-up batteries.

As a consequence of arranging the major electrical components following logic and short electrical connections, a rectangular, compact, empty box appears in the design at the lower deck levels. This rectangular empty box is used to house the LV & Auxiliary equipment and areas used for maintenance activities. Short walking distances between the more frequently visited LV & Auxiliary rooms are therewith achieved.

Operation and maintenance is facilitated by having all major traffic routes being indoor, shielding personnel and materials from the North Sea environment. Traffic routes are kept as much as possible similar over the decks, making them easier to navigate for personnel present on the platform.

No equipment is positioned outdoor, except for the Top Deck. This allows for all maintenance to equipment to be performed from deck level. No overboard maintenance activities are required.

For HVA/C and explosion relief dampers, maintenance is feasible from fixed outer decks or walkways.

Accommodation facilities for multi-day visits or maintenance campaigns are placed on the Top Deck of the platform in a so called Modular Living Quarter.

The platform may be accessed from sea by Crew Transfer Vessels or Offshore Support Vessels with a Walk to Work system or by air via helicopter.

The platform is kept as much a rectangular box as possible, with straight lines and level decks. This allows easy navigation when walking on the platform and for easier fabrication of straight sections and decks, resulting in easier assembly.

A flat & straight stressed skin is selected to allow for automated welding and to lower the risks for corrosion.

4.6 Future Proof

Multi-purpose Interconnector

On the Platform sufficient space has been reserved for a possible future DC connection to another HVDC Onshore or Offshore Substation, an 'Interconnector'. The connecting party at the other side of the connection may differ per Platform location. The high voltage equipment for this Interconnector is expected to be installed at a later moment in time, either still during the onshore construction phase or offshore while the HVDC System is already in operation. The following provisions have been made for the Interconnector:

- Four additional j-tubes have been installed on the jacket (DC+, DC-, neutral, fiber optic).
- The DC and neutral yards have been enlarged to house all the additional Interconnector related equipment.
- A separate pull-in room on deck 1 has been created for the Interconnector cables. This allows pulling and jointing of the cables without having to shut down the HVDC system. This minimizes downtime of the HVDC system during the installation activities for the Interconnector.
- The material handling concept ensures that offshore installation of all the Interconnector components is feasible.

Offshore consumers

The jacket is equipped with 2 spare 66kV j-tubes of which one has been reserved for the possible connection to an offshore consumer at 66kV level. This offshore consumer will connect to a 66kV bay in the 66kV GIS. Sufficient space in the 66kV GIS room has been reserved for these connections. Whether or not a spare j-tube is used for an offshore consumer differs per project.

5 Functional Description

5.1 Topside Lay-Out Concept

The platform comprises 7 deck levels plus a helideck.

Each deck level is characterized by T-shaped corridors, facilitating way-finding. A central placed elevator near the T-crossing facilitates people and parts transfer over the platform. For personnel, a central placed, indoor staircase is positioned near the T-crossing between deck 1 and 5. In the same area, an elevator is located, allowing to transfer goods and personnel between all deck levels and the Top Deck. Using this set-up, all rooms within the platform can be reached via an indoor environment.

Outdoor stair cases are located at 3 sides of the platform. The West and East staircases are mainly meant for emergency escape (but can also be used for regular activities). The South staircase is also used to enter the platform from the MLQ on the Top Deck as alternative to the elevator which is positioned at the North side. This would prevent personnel having to cross the open top deck in case of bad weather.

Floors are kept at one level and raised floors are avoided (top entry cabinets), facilitating handling of materials during the service life of the platform. The need for stairs, other than to reach a next deck level is avoided.

The platform's double bottom is not used for equipment and is normally not accessible with the exception of the drain tank, sewage tank, pump room and for structural inspections required during the operational life-time.

The following decks are defined:

Deck Number	Top of Steel
Deck 1	Elevation + 0.00
Deck 2	Elevation 4.500
Deck 3	Elevation 10.000
Deck 4	Elevation 15.200
Deck 5	Elevation 21.500
Deck 6	Elevation 34.500
Deck 7	Elevation 41.000
Helideck	Elevation 51.000

5.2 Equipment and Room Distribution per Deck

The following sections contain a brief description of systems and rooms present per deck level.

For a detailed description of all rooms, equipment present, their DNV classification, environmental conditions, lighting conditions, fire detection and suppression, etc. reference is made to the Room Book.

Deck 1 - HV rooms

Deck 1 contains for each pole one of the converter rooms and the DC export area. At both sides of the platform, cable pulling and termination areas are available: 525kV export at the South side and 66kV import at the North side. HV areas, including the cable areas, are only accessible for authorized personnel when live. As a consequence the 66kV cable pulling areas are not utilized any further in the lay-out design, except for an area that will be fenced off which will be used as storage area after the 66kV pull-in activities have been completed.

The position of the converter and reactors may differ between HV designs. In this section of the platform, no fixed structural walls are present. The architectural wall present may be positioned or added as required for an optimum HV equipment placement.

With a cable area at both sides of the platform, the need for a cable deck on the jacket is eliminated. All cables may be pulled from within the topsides. Reference is made to the 66kV and 525kV Cable Pulling reports that demonstrate a selection of cable pulling methods from within the topsides.

In the standardized design, 66kV cables use connection boxes a couple of meters above the J-Tube hang-offs. From these connection boxes, the 66kV cables are routed to their designated GIS bay. This GIS bay is not necessarily the nearest by GIS bay. Crossing of 66kV cables is foreseen to avoid that disconnection of a complete GIS section leads to outage of a complete wind farm. The 66kV cable pulling areas are naturally ventilated.

The use of connection boxes allows the 66kV cables to be installed and connected to the GIS bays already onshore at the construction yard to reduce the length of cable to be pulled in offshore.

For the pull-in of the DC, neutral and fiber optic cables a separate room is created on deck 1 inside the DC rooms A & B (one room for the DC export and one room for the wind-connector). In this DC pull-in room the DC+ and DC- cables will be vertically pulled in and horizontally connected to pre-installed DC cables by using a cable joint inside this room. Each pre-installed cable is connected to the HV termination inside the DC room A & B. The neutral cable will be connected by using a vertical joint with a pre-installed cable connected to the termination in one of the neutral rooms on deck 5. The fiber optic cable is connected to a patch panel inside this DC cable pull-in room. Both cables are pulled in vertically as well.

Deck 1 - LV & Auxiliary Rooms

To facilitate operation & maintenance, Deck 1 contains most rooms required for these operations, for both short and long term visits. These rooms are expected to be visited the most frequent during campaigns.

Near the north-east boat landing, a locker room is positioned in order to allow changing from survival suits to normal work clothing. A control room containing platform control HMI, is presented as well as offices, meeting rooms and a canteen for personnel. Workshops and stores are grouped around the central corridor, facilitating material transport over the platform.

The Diesel storage system and fresh water systems, including their tanks, are located on this deck level, near the bunker station in a room. The tanks are above deck to allow easy inspection and avoidance of entering the confined space between the Deck 1 and the bottom of the platform.

The diesel storage system contains the two diesel storage tanks, filter system to filter and recirculate the diesel over the tanks and the pumps to pump the diesel to the consumers on the Top Deck.

The drain system consists of a large drain tank collecting fluids from the hazardous drain system. The collected fluid will be pumped to a bunkering vessel via the bunker station for further treatment onshore. Collected water complying with the allowed contamination levels according to the applicable laws and regulations is routed overboard via the dump caisson. The drain tank is located in the double bottom to allow gravity based drainage, but the instrumentation is accessible from the top via deck 1, to avoid entering the double bottom.

The sewage produced by the rest rooms and canteen facilities are pumped to the sewage treatment plant on the Top Deck. No sewage will be set overboard, even if this would be allowed under MARPOL regulation. A black water tank is installed to support short duration maintenance campaigns during which the sewage treatment plant is not operational. This tank is installed in the double bottom to allow gravity based drainage, but the instrumentation is accessible from the top via deck 1, to avoid entering the double bottom.

The water system contains two storage tanks, ultraviolet (UV) sterilization and a hydrophore to distribute fresh water over the platform. Fresh water may be used for deck wash and is of potable water quality. A small mobile pump skid is provided, allowing to lower a pump via a caisson into the sea, feeding a water maker. Both the water maker and the bunker station may be used to fill the water tanks. The water supply systems and fresh water tanks are drained during unmanned periods. The hydrant system tank remains filled during unmanned periods.

One of the two ERT rooms is located on this deck level. The ERT rooms contain a change and storage area of the equipment of the Emergency Response Team. This ERT team may rescue injured personnel from dangerous situations. For the purpose of their own protection the ERT may make use of the hydrant system present on the platform. This hydrant system is not intended as a fire-fighting system.

The centralized foam system covers all rooms where more than 100 liters of hydrocarbons are present.These are at least the diesel room, the auxiliary transformer rooms, the main transformer rooms and the DC terminations.

The outer areas of Deck 1 contain two free fall life boats, life rafts and provide space and lay-down for davit cranes positioned above the boat landings.

The elevator has doors at both sides at this deck level to allow easy transports of goods brought by a vessel to the platform.

Deck 2 - LV & Auxiliary Rooms

Deck 2 mainly contains the LV distribution system, including the auxiliary transformers. For each pole, redundant LV supply is foreseen by 2x an auxiliary transformer, 2x a low voltage switchgear room and 2x a battery room per pole.

The rooms are mirrored over the corridor for the other pole. Keeping all LV Auxiliary Power System components close to each other, cable lengths are reduced and control and maintenance activities on the LV Auxiliary Power system centralized as much as possible.

The diesel generator sets, part of the LV Auxiliary power system are located on the top deck and connected using a bus duct.

The Auxiliary transformers are located in naturally ventilated areas, allowing flow of outdoor air through these rooms as cooling medium. The auxiliary transformers may be skidded in or out using the removable panels in the stressed skin wall. The design facilitates both dry-type or oil-filled auxiliary transformers.

The Communication Room 1 contains all the equipment for the Public Data System (Rijkswaterstaat) in The Netherlands and is used for the Weather and Wave Monitoring System in Germany and the equipment as defined under the Communication System (e.g. telephone, PA/GA, CCTV).

There is no North-South corridor between the Converter and DC rooms at this deck level.

Deck 3 -HV rooms

Deck 3 contains for each pole, a 66kV GIS room. These two GIS rooms house the cable bays, and connect via Gas Insulated Lines (GIL) to the above placed HVDC Converter Transformers.

The control & protection cabinets for the 66kV GIS are located inside the GIS rooms.

There is no North-South corridor between the Converter and DC rooms at this deck level.

Deck 3 - LV & Auxiliary Rooms

Deck 3 contains for each pole, the converter cooling rooms. Apart from these rooms, all control & protection, metering and auxiliary control rooms are grouped on this deck.

The auxiliary control rooms house the control cabinets.

The location of the metering rooms at this deck allows for short cabling between GIS and metering rooms. One of the metering rooms is not utilized to its full extent. The space not utilized may be added to another room, allowing location of LV equipment, if required.

Placing the control & protection rooms on this deck level, allows for short connections of the (fiber optical) cables to all converter halls.

The converter cooling rooms are placed at the outer skirts of the platform, allowing for skidding operations during fabrication. Their location also allows for easy pipe routing to the air coolers on the Top Deck.

In case a HV design requires a primary loop though the converters and a secondary cooling loop to the air coolers, the space reserved in the converter cooling rooms allows for this.

A fire-fighting room for the centralized inert gas fire-fighting is also present on this deck level. The inert gas fire-fighting rooms houses the inert gas bottles and the manifold from which piping is routed to each protected area.

Deck 4 - LV & Auxiliary Rooms

Deck 4 contains the HVA/C installations for the platform, allowing short routing towards the adjacent HVDC Converter rooms and auxiliary rooms.

HVA/C is redundant per pole with an additional cross-over, increasing availability during maintenance of the HVA/C equipment.

Deck 4 contains a North-South corridor over the complete length of the platform. This corridor allows easy access to piping, cabling and ducting and is mainly seen as a service corridor.

Deck 5 - HV rooms

Deck 5 contains for each pole, two 500MW HVDC Converter Transformers, four in total. The associated coolers are placed outside on cantilevers. The transformer rooms are naturally ventilated by louvres in the wall and ventilation hoods on the Top Deck. The ventilation buildings can be removed to allow lifting in and out the transformers.

Along the main North-South corridor, on each side and for each pole, a converter room and neutral yard are located. Instead of a corridor along gridline B, a tunnel is created allowing to pass underneath the HV connections (bushings) between GIS and Main Transformers which penetrate the walls under an angle. As the transformer rooms are naturally ventilated, these tunnels are also used as air-locks.

Above walking level, there is a crossing between the two neutral yards through the North-South corridor.

Deck 5 - LV & Auxiliary Rooms

Deck 5 only contains two rooms to store the aerial working equipment required to perform maintenance on the converter towers. The exact location is to be determined during detailed design as the location is HV design dependent.

The corridor present near gridline B, is a tunnel type as overhead HV lines are running.

As the internal stair case cannot penetrate through the AIS switch yard, it ends at this deck level.

The outside deck on top of the Interconnector extension can be used for alternative storage space and to handle materials via the laydown area between a jack-up barge crane and Top Deck crane if the reach is insufficient. This outside deck is also used for the placement of an radar antenna and other antennas as indicated on the antenna area plan.

A second radar is placed at the north side of the platform at the corner of the transformer coolers.

Deck 6 - LV & Auxiliary Rooms

Deck 6 contains two HVA/C rooms, serving the adjacent converter rooms. One HVA/C system per pole with a cross-over between the two poles, increasing availability even further.

The long corridor reaches the elevator at the other side of the platform for maintenance purposes and provides access from the MLQ towards the inside of the platform without having to cross outside areas or walkways. The corridor may also be used to route piping and cabling.

At this deck level the elevator has doors at both sides, to allow access to the top of the transformer coolers and bring equipment to this level.

Deck 6, on top of the transformer cooler areas, is also used to place antennas as indicated on the antenna area plan.

Deck 7 – Top Deck

Rooms

Deck 7 houses several additional rooms. The heli-centre is used as waiting area for the helicopter as well as primary muster station. The first aid room has been positioned close to both the MLQ and the helideck, as well as the second ERT room. A pantry and toilets serve personnel working on the top deck, without having to enter the MLQ in dirty clothes and in case the MLQ may be removed in the future, these facilities remain in place. A second platform control room with the same functionality has been located in this building block as well. The main reason for a second control room and this position, is because during the night an emergency situation may occur during which the Offshore Installation Manager should have direct access towards the CCTV and SCADA systems to evaluate the situation, without having to cross the platform all the way to the other side and deck 1. A second reason is that the operators may prefer to work from this location during evening hours, as it is close to the MLQ. The Control Room 2 is also conveniently located next to the primary muster area. The Communication Room 2 is used for the cabinets related to the various radars and antennas on the south side of the Platform or other cabinets part of the Communication System. The deck store can be used to store all the lifting equipment for the main cranes. The hazardous goods store and paint stores have been positioned away from the MLQ to lower the fire risk for the MLQ.

Modular Living Quarter

In case a Modular living quarter is present, it is located on the Top Deck South. This MLQ may serve as a complete independent living quarter with all associated systems, including a sewage treatment plant and its own HVA/C System. Several interfaces between the MLQ and platform systems are defined, but kept to a minimum (e.g. drain, water, auxiliary power).

Generator sets

Two permanent diesel driven electric generators are located on the top deck. These permanent generators are connected to the LV Auxiliary Power system using External Power Source boxes and bus duct.

Next to the permanent generators, space is reserved for temporary generators which may provide power to the platform during (de-)commissioning and maintenance campaigns when no other power sources may be available in sufficient power capacity. These temporary generators can be handled by the platform crane.

Air Coolers

The top deck houses the air coolers of the converter cooling system and the air coolers of the HVA/C system.

The air coolers are positioned as much as possible away from the helideck and the MLQ. This in order to avoid influence of heated air on the helicopter performance and noise impact on personnel residing within the MLQ.

Filter Hall

Between the air coolers and the laydown area, an area is reserved for a 66kV filter hall. In case such a filter hall is required for the correct functioning of the HVDC converter process, these filters may be positioned in this area inside a protecting shelter.

When planning such a filter hall in detailed design, care shall be taken for walk and escape routes as well as material handling provisions.

In case no filters are needed in the design, the layout of the top deck may be further optimized.

Platform Cranes

The top deck houses two platform cranes. All outside lay-down areas are in reach of one of the cranes, except for the most southern one connecting to the main North-South corridor on deck 1. The cranes are located at the East and West center of the platform. Both cranes can be used to offload goods from visiting platform supply vessels, but only the East crane for bunkering operations. Air coolers have been arranged so that as much as possible risks of falling objects is reduced when lifting platform supplies to the lay down and storage areas. However, the air coolers have still been kept in reach of the cranes to support maintenance activities. The MLQ is also in reach of the main crane, in case future removal or replacement is required. The helideck can be reached by one of the main crane as well.

Helideck

An aluminum helideck is located on the top deck on a space frame. The final height of the helideck shall be determined during detailed design based on the meteorological data and final lay-out of the MLQ. The top deck also houses the DIFFS container and the helideck drain tank.

5.3 Material Handling

All material handling activities during the construction phase, operational phase and for the scheduled and unscheduled maintenance activities have been considered during the basic design, but some aspects need to be detailed during the detailed design phase as the final details on the components were not available.

The basis for the material handling layout are the 3m wide North-South and East-West corridors throughout the platform, all ending in outside laydown areas. For the internal transport between decks the elevator can be used for smaller items and the cranes for the larger components.

Any replacement items on maintainable equipment should consider the minimum walkway widths. The exception to this are items inside the HV rooms that are equipped with removable panels with direct access to laydown areas directly. The locations and dimensions can be optimized during detailed design. These openings may also be used during the fabrication phase of the platform.

The maintenance and material handling concept for the air coolers needs to be further detailed during the detailed design phase, but they have at least been positioned in reach of the cranes to allow maximum flexibility.

In case the main transformers need to be replaced during the lifetime of the platform, the ventilation hoods on the top deck can be removed and the transformer has to be lifted out by a floating crane vessel. During detailed design further provisions will have to be designed to allow this operation to take place.

Lifting to and from Crew Transfer Vessels pushed against the boat landings is done by means of two davit cranes.

The transfer of materials via a Walk-To-Work bridge system has also been considered. Pallets or other smaller objects or lifting bags transferred via these system should be further transported from the landing areas towards other areas of the platform. Therefore the davit cranes positioned above the boat landings can also reach the Walk-to-Work landing areas at the intermediate platforms.

In case a jack-up barge is positioned next to the platform, the transfer of materials can either be done by platform crane or jack-up barge crane. In case the reach is insufficient to directly transfer between the top deck and jack-up barge, Laydown Area Deck 5 South is used as intermediate transfer area between the two cranes.

6 Structural design

6.1 Calculations

For the structural design, dimension-wise a 'one-size-fits-all' principle has been used, but for the weights representative average values have been used to come to a representative design. The final structural design will need to be based on the weight and footprints of the final equipment. Modifications may be required for a specific HVDC design (e.g. footprint interface, penetration locations, etc).

Inplace calculations have been carried out and verified by an external certifying body as proof of concept.

Transport analysis have been performed to demonstrate the limits within which the platform and the incorporated HV, LV and Auxiliary equipment may be transported, both for a long transport using an HTV and a shorter transport on a barge.

The 2GW platform pre-tender design is based on the DNVGL-ST-0145 – 2020 edition.

There is a distinct difference between the Structural Codes & Standards to be used for The Netherlands and for Germany. The pre-tender design is suitable for both The Netherlands and Germany, however for the project specific design the applicable codes in the respective country have to be used.

In the Netherlands the DNV-ST-0145 is the leading design code, while in Germany the BSH7005 standard is the leading code.

All design calculations performed during the pre-tender design are based on the DNVGL-OS-C101 method. As detailed location specific data is not available yet for each installation location, these detailed calculations shall be made during the next design phases. During the pre-tender design typical data from a neighboring platform have been used.

6.2 Topside

The structural configuration of the topside is a stressed skin design with plate stiffeners.

The bottom of the topside is a double bottom, assuring a flat outer surface for ease of maintenance.

This closed box bottom design allows the topsides to be fabricated, loaded out, transported, loaded in and installed on various manners without the need of local strengthening of the topsides.

The double bottom is not used to house any equipment (except for the drain, sewage tank and some pumps and piping). The stiffened side walls and decks overspan the large HV areas without local supporting by columns and/or bracings.

There is one longitudinal structural wall near gridline 2. Two other transverse structural walls are placed near gridlines B and C. On the highest decks, the structural wall near C is not present.

Decks and walls have been strength checked for penetrations for a typical HV set-up. Penetrations may have to be repositioned for a particular HV design.

HV equipment weights and dimensions have been accounted for in the generic structural design. However, this generic structural design does require adaptation to the final HV design during Detailed Design.

Apart from the structural walls named above, all other internal walls inside the platform are non-structural, non-load bearing walls and may be, strength wise, penetrated on any location.

6.3 Jacket

The jacket design is challenging due to the many constraints:

- Large number of j-tubes
- Support both a catamaran and float over installation and decommissioning of the topside
- Standardization of the topside layout
- Water depth restrictions (either deep or shallow)
- Tolerances with the installation vessels

The jacket is a frame structure with eight legs supporting the various installation methods.

A post-piled concept with piles driven though pile sleeves is part of the design, with mud mats supporting the jacket during the temporary un-piled condition. After piling, grout is introduced between the sleeves and the piles.

The jacket has been designed for a typical water depth in the Dutch sector and generic soil conditions. Since the water depths in the Dutch sector are much less than in the German sector, those posed the most challenging conditions for the float-over and catamaran lift options, as the clearances are tight.For the platforms in the German sector, the challenge will be the increased weight due to the deeper waters. During the pre-tender design phase only initial weight assessments have been made for these expected water depths. These aspects are to be further assessed for the project specific locations.

Alternative jacket designs are possible, e.g. a split jacket. Feasibility studies have also been performed for split jacket configurations and concluded this option to be feasible as well for the standardized topside design.

The North tower is supporting all the J-tubes for the wind farms and the South tower is supporting all the J-tubes for the DC connections.

The jackets houses means to access the platform: two boat landings.

The jacket will have to be tailor-made for the site specific soil conditions and water depths.

6.4 Scour Protection

Scour protection is foreseen under the full substructure and around the platform and is intended to protect the windfarm and export cables for scour effects.

6.5 Transport & Installation

Transport topside

For the topside, two transport analysis have been performed as input for the structural design:

- Transport to Europe with Heavy Lift Vessel: topside including auxiliary and HVDC equipment
- Transport to the installation location: Topside including auxiliary equipment and HVDC equipment – barge restricted tow.

Installation topside

The topside is designed to be able to be installed and removed by two installation methods:

Float-over

For the float-over scenario the topside will be installed by a barge or Heavy Transport Vessel where the topside will be placed on a deck support frame to install the topside at the required elevation taking the air gap into account. The barge with the topside will sail to its installation location where the barge will be maneuvered in the float-over slot between the two jacket towers. The barge will be ballasted and the topside weight will be transferred to the jacket. Leg mating units are installed on the jacket to absorb the first impact and for gradual load transfer. After set down of the topside the barge will be ballasted further to obtain sufficient clearance for the exit.

Catamaran lift installation

The catamaran lift installation vessel will pick up the topside at a transfer location with sufficient water depth to allow the vessel to be submerged to the required elevation. The topside will be transferred from the barge to the vessel and picked up by six loading arms. The topside is supported at the underside of the double bottom by yoke plates. With this configuration the catamaran vessel will sail to the installation location. The vessel will sail with its two bows around the jacket and lower the topside on the jacket legs by transferring the weight gradually by its motion compensated lifting beams. After set down the beams will be retracted and the vessel will sail away from the jacket.

Installation jacket

The jacket is designed to allow for two installation methods of the topside. The jacket structure consists of two towers connected via a braced structure. The distance between the legs is sufficient for a float-over installation and the elevation of the slot is sufficient to provide enough exit clearance for the vessel after set down of the topside. The jacket width is small enough to allow sailing around with the two bows of the catamaran lift installation vessel.

The jacket will be installed by a lifting operation which can be performed by a crane vessel or a jacket lift system. After set down on the scour bed the piles will be stabbed into the pile sleeves and driven into the soil. After this the connection between skirt pile and the sleeve will be grouted for a permanent connection.

7 Operation

7.1 Operational Modes

The normal operation mode is characterized as an unmanned mode. This implies that all auxiliary systems shall be capable of autonomous operation: the equipment may be started, stopped and reset remotely but once in operation, the equipment shall maintain its operation, within programmed limits, without interference of any operator.

The following temporary manned modes are possible:

A. One day corrective maintenance trip without overnight stay

B. Multi day corrective maintenance trip with a maximum of two overnight stays

C. Planned preventive and corrective maintenance campaigns with more than two overnight stays. This mode shall be feasible for four uninterrupted weeks)

For the planned maintenance campaigns and (de-) commissioning activities, a Modular Living Quarter is present, providing overnight accommodation, including office space, kitchen, mess room and gym.

The maximum manning is 48 personnel on board (PoB), and the number of cabins provided caters for this.

Since the platform will be manned from time to time, it is to be certified as Type B in accordance with DNV-ST-0145.

7.2 Access and Egress

The following provide means of access or egress to the platform during normal operations:

- Two boat landings
- Three Walk to Work access points on the bottom of deck 1, on three different corners of the platform
- Two Walk to Work access points below deck 1 at the boat landing ladder to allow different vessel sizes to be used
- Helideck

In addition, the following provide additional means of egress in emergency operation:

- Northern free-fall lifeboat
- Southern free-fall lifeboat
- Throw-overboard life rafts at the north and south sides
- Descender devices
- Boat landing ladders

The primary muster area is located in the heli-center on the Top Deck. Secondary and Tertiary muster areas are located near the free-fall life boats on Deck 1.

8 Platform Systems

8.1 General

The HVDC Offshore Substation is broken down into the following systems. This breakdown has also been used for the SRS. Items existing within several systems, co called Typicals are defined (e.g. piping, pumps, electrical cabinets) and requirements formulated in separate SRS.

This chapter only gives a very brief introduction to the installed systems. More detailed descriptions are given in the respective SRS and design documentation.

Auxiliary power	Water supply	Earthing & bonding
Converter cooling	Fire protection	MLQ
HVA/C	Safety	Access & egress
Drain	Communication	Structure
Material handling	Lighting	Layout

8.2 Auxiliary Power System

This system consists of the auxiliary power supply and distribution throughout the platform, including the auxiliary transformers, diesel generators, Uninterruptible Power Supply (UPS) system, batteries and distribution boards.

The single line diagram has been developed as the new standard for the 2GW auxiliary power system which describes the system's redundancies and how this relates to the bi-pole configuration.

8.3 Cooling

A change to former HVDC Offshore Substations is made with respect to the cooling of the HV components. Historically, seawater has been used as cooling medium to cool transformers and converters on the HVDC Offshore Substations.

On the 2GW HVDC Offshore Substations, the Converter Transformers are cooled using natural ventilation in the transformer rooms and large outside radiators, placed on cantilevers and protected by bird cages. The HVDC converters are water cooled at the converter side. This water is not cooled against a secondary seawater loop but directly transported to air coolers positioned on the top deck.

The platform design also allows the installation of a secondary water loop being cooled against aircoolers on the top deck, instead of the single loop solution. However, such a system will result in a larger required capacity of air coolers as there will be intermediate heat exchanges, lowering the efficiency of the air cooling loop and increases losses. Hence, TenneT prefers a single loop cooling system.

The HVA/C system uses its own air coolers. TenneT prefers to have these of the same make and type as the converter air coolers to simplify maintenance activities.

8.4 HVA/C

The HVA/C system is designed to maintain the required indoor air conditions within the platform. The indoor conditions may be defined by the equipment and/or the personnel present. This implies that the indoor conditions for a room may vary between unmanned and manned.

The rooms can be divided into HVDC rooms, Auxiliary rooms and Personnel rooms. Each of these groups of rooms is provided with a dedicated HVA/C system, including a split per pole for the HVDC rooms. This system modularity is meant to maximize the availability, while reducing the risk of potential loss of functionality of critical equipment. It enables maintenance on one pole without interrupting the other pole. A cross-connection between the HVA/C systems for pole A and B is in place to provide extra redundancy.

The HVA/C system is designed to make use of the waste heat emitted by the equipment in the HVDC rooms and Auxiliary rooms by recirculation and heat recovery systems. For the HVDC rooms the use of cooling by fresh air is maximized to reduce chiller operation.

8.5 Drain

The Drain system collects liquids, such as rain fall, oil spillages or exceptional spillages due to equipment failure such as a leaking transformer. Small indoor spillages are mainly handled locally by dedicated drip pans or similar. Larger volumes of liquids will be processed via a drain system. The drain system identifies three typical liquid flows that are each separately processed based on their origin:

- Hazardous; (potentially) contaminated coming from equipment leakages,
- Non-hazardous; rain water or processed fresh water,
- Sewage; sanitary and treated sanitary disposals.

Fluid contamination, resulting in hazardous liquids can come from two potential sources: equipment with glycol content and equipment with oil based content. In case hazardous liquid volumes can be mixed with non-hazardous liquid ingress (such as rain water) these volumes are routed via an oil analyser or glycol analyser (depending the origin of the fluid). In case the contamination is below the set criteria the liquid will be handled as non-contaminated fluid downstream the analyser. In case the contamination is above the set criteria the fluid is routed towards the drain tank. In case there is no risk of liquid volume increase due to non-hazardous liquid ingress these are directly routed towards the drain tank or collected locally in a sump tank.

8.6 Material Handling

The Material Handling system describes all facilities related to material handling on the platform and between visiting vessels and the platform. See section 5.3 for additional information.

8.7 Water Supply

This Water Supply system is supplying water to all fresh water consumers. The water supply system is fed via two large storage tanks. These tanks can be either filled via a bunkering operation with a Platform Supply Vessel or via a fresh water maker that produces fresh water from sea water. The fresh water maker is fed by a sea water lifting pump which is lowered inside a sea water intake caisson. From the two tanks the fresh water is treated by means of filtering, chlorination and Ultraviolet (UV)-sterilizer and distributed by two pumps throughout the platform for potable usage, deck wash purposes and sanitary purposes.

The water supply system also provides fresh water to the hydrant system. The hydrant system consists of independent tanks, pumps and distribution header. The hydrant system is intended for the Emergency Response Teams in case they require water for personnel protection during rescue operations. Hydrants connections are positioned on strategical locations.

8.8 Fire Protection

The Fire Protection System consists of fire detection, active fire protection and passive fire protection.

The Fire Detection System contains automatic detectors, manual call points and beacons. The type and amount of detectors varies per room, based on the processes in these room (e.g. dual detector dependency type B, single detection with integrated false alarm prevention, aspirating smoke detection).

The passive fire protection provides measures to avoid the spreading of fire, ensures safe evacuation routes and prevents the loss of structural integrity of rooms and areas. This is achieved by implementation of fire rated segregation through wall insulation, fire rated doors, fire dampers, fire retardant gratings and fire rated wall penetrations.

The Active Fire Protection system is further subdivided into five separate systems.

The Foam Fire Fighting System protects areas with equipment that contains oil, such as the transformer rooms, uses the compressed air foam technology and is capable of giving two shots.

The Nitrogen Gas Fire Fighting System protects multiple rooms, is a centralized multi-zone system with nitrogen as extinguishing agent and is capable of giving two shots.

The Aerosol Fire Fighting System protects small rooms or single cabinets based on aerosol emitting generators, which extinguishes the fire in a short timeframe.

The Helideck Fire Fighting System protects the helideck by means of a foam based deck integrated firefighting system (DIFFS) and a helideck firefighting hydrant system

Portable extinguishers are provided on strategic points on the platform for the extinguishing of small fires.

8.9 Safety

The Safety System describes all means of rescue, lifesaving appliances and first aid equipment.

The platform is equipped with two free fall life boats, one at the North and one at the South side of the platform. Near the free fall life boats, throw-overboard life rafts and descender devices are available. Survival suits and life jackets are stowed near the free fall life boats for full PoB (persons on board).

At various locations PA/GA call stations are present allowing to alarm personnel in case of emergency.

At each deck level, first aid equipment is positioned near the central elevator and stair case, allowing easy finding of this equipment.

Two ERT rooms are present, equipped with all necessary rescue means.

8.10 Communication

Various communication systems are available on the platform in order to communicate within the platform, to visiting vessels and aircrafts and the landstation. This system also contains meteo and nav-aids systems.

For the Dutch platforms, specific requirements from Rijkswaterstaat (Rijkswaterstaat is part of the Dutch Ministry of Infrastructure and Water Management) are implemented, e.g. radars and various antennas. This system is called Public Data system.

For the German platforms, a Weather and Wave Monitoring System is implemented.

8.11 Lighting

Lighting is present in indoor and outdoor areas of the platform for both normal and emergency situations.

8.12 Earthing & Bonding

Earthing & Bonding is present on the entire platform. It deals with earth fault currents and lightning strikes and divert these towards earth.

8.13 Modular Living Quarter (MLQ)

The MLQ is used to accommodate personnel during maintenance campaigns. The MLQ contains all welfare facilities that are required for a longer manned period, including e.g. a gym, mess, kitchen and sleeping cabins.

8.14 Access and Egress

The Access and Egress system contains all facilities to access and egress the platform. See section 7 for more information.

8.15 Layout

The Layout system describes all requirements for the layout, which has been further detailed in the earlier chapters.

8.16 Structural

The Structural system contains all structural steel elements to support the platform. See section 6 for more information.

Project

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Cable name

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Location

-

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Position Number	KP [km]	Latitude [DDMM.MMMMMM]	Longitude [DDMM.MMMMMM]	Easting [m]	Northing [m]	Depth [m]	Centre_Easting [m]	Centre_Northing [m]	IP_Easting [m]	IP_Northing [m]	Radius [m]	Start Angle [°]	End Angle [°]	Clockwise [Y/N]	Comment	Crossing Angle [°]
1	0,000	51° 31,322537' N	003° 43,207613' E	549961,57	5708126,37											
2	0,020	51° 31,328712' N	003° 43,193241' E	549944,84	5708137,65										DoB borders_R10 - Shore line - VM South	67,9
3	0,069	51° 31,343728' N	003° 43,158292' E	549904,15	5708165,08		549788,43	5707984,64	549897,81	5708169,15	-214,4	32,7	28,7	N		
4	0,084	51° 31,347938' N	003° 43,147158' E	549891,20	5708172,76		549788,43	5707984,64	549885,48	5708175,89	-214,4	28,7	25,2	N	DoB borders_R10 - Navigational Area VM - border A	70,2
5	0,097	51° 31,351180' N	003° 43,137162' E	549879,59	5708178,66		549788,43	5707984,64	549876,97	5708179,88	-214,4	25,2	23,6	N		
6	0,103	51° 31,352495' N	003° 43,132634' E	549874,33	5708181,04											
7	0,112	51° 31,354553' N	003° 43,125286' E	549865,79	5708184,77		549845,76	5708138,96	549860,62	5708187,03	-50,0	23,6	10,8	N		
8	0,124	51° 31,356397' N	003° 43,116054' E	549855,08	5708188,09											
9	0,135	51° 31,357629' N	003° 43,106182' E	549843,65	5708190,26		549827,50	5708092,67	549815,15	5708194,97	-98,9	9,4	336,8	N		
10	0,192	51° 31,354337' N	003° 43,058527' E	549788,60	5708183,62											
11	0,192	51° 31,354207' N	003° 43,058029' E	549788,03	5708183,37											
12	0,203	51° 31,351971' N	003° 43,049567' E	549778,29	5708179,13		549798,23	5708133,29	549775,50	5708177,91	-50,0	336,5	329,5	N		
13	0,209	51° 31,350513' N	003° 43,044866' E	549772,88	5708176,37		549798,10	5708133,50	549771,94	5708175,82	-49,7	329,5	327,0	N		
14	0,211	51° 31,349907' N	003° 43,043261' E	549771,03	5708175,23											
15	0,250	51° 31,338648' N	003° 43,014824' E	549738,35	5708154,04											
16	0,258	51° 31,336349' N	003° 43,009258' E	549731,96	5708149,72											
17	0,258	51° 31,336331' N	003° 43,009216' E	549731,91	5708149,68											
18	0,271	51° 31,331980' N	003° 42,999819' E	549721,13	5708141,51		549846,23	5707985,57	549695,44	5708120,90	-199,9	321,3	302,6	N		
19	0,337	51° 31,306115' N	003° 42,961872' E	549677,72	5708093,14											
20	0,399	51° 31,277510' N	003° 42,934007' E	549646,01	5708039,80		549390,21	5708196,31	549627,80	5708010,03	299,9	121,5	134,7	Y		
21	0,468	51° 31,248296' N	003° 42,896546' E	549603,23	5707985,23											
22	0,494	51° 31,238818' N	003° 42,879743' E	549583,97	5707967,47		549431,45	5708132,88	549572,94	5707957,31	225,0	137,3	145,0	Y		
23	0,524	51° 31,228810' N	003° 42,859434' E	549560,67	5707948,69											
24	0,673	51° 31,183355' N	003° 42,753398' E	549438,87	5707863,25											
25	0,793	51° 31,145000' N	003° 42,669993' E	549343,12	5707791,22		549207,87	5707971,01	549327,02	5707779,11	225,0	143,1	153,3	Y		
26	0,833	51° 31,133760' N	003° 42,640340' E	549309,03	5707770,05											
27	0,841	51° 31,131906' N	003° 42,634291' E	549302,07	5707766,55		549200,90	5707967,51	549293,44	5707762,20	225,0	153,3	158,2	Y		
28	0,860	51° 31,127718' N	003° 42,619002' E	549284,46	5707758,61											
29	0,976	51° 31,105065' N	003° 42,525612' E	549176,87	5707715,58											
30	1,115	51° 31,080108' N	003° 42,411856' E	549045,77	5707668,05		548969,09	5707879,56	549032,76	5707663,33	225,0	160,1	167,1	Y		
31	1,143	51° 31,076034' N	003° 42,388862' E	549019,26	5707660,24											
32	1,179	51° 31,071928' N	003° 42,358754' E	548984,51	5707652,29		548934,34	5707871,62	548971,34	5707649,28	225,0	167,1	174,0	Y		
33	1,206	51° 31,069677' N	003° 42,335705' E	548957,90	5707647,86											
34	1,242	51° 31,067834' N	003° 42,304773' E	548922,16	5707644,10		548898,61	5707867,85	548908,72	5707642,69	225,0	174,0	180,9	Y		
35	1,269	51° 31,067320' N	003° 42,281452' E	548895,20	5707642,89											
36	1,305	51° 31,067804' N	003° 42,250175' E	548859,03	5707643,44		548862,43	5707868,40	548845,79	5707643,64	225,0	180,9	187,6	Y		
37	1,331	51° 31,068993' N	003° 42,227404' E	548832,67	5707645,39											
38	1,450	51° 31,078069' N	003° 42,125823' E	548715,04	5707661,08		548744,80	5707884,10	548705,11	5707662,41	225,0	187,6	192,7	Y		
39	1,470	51° 31,080074' N	003° 42,108814' E	548695,34	5707664,61											
40	1,609	51° 31,097279' N	003° 41,991683' E	548559,58	5707695,20		548609,04	5707914,69	548549,35	5707697,51	225,0	192,7	198,0	Y		
41	1,630	51° 31,100378' N	003° 41,974259' E	548539,38	5707700,76											
42	1,787	51° 31,127326' N	003° 41,845794' E	548390,34	5707749,29		548460,01	5707963,22	548374,95	5707754,30	225,0	198,0	206,3	Y		
43	1,819	51° 31,134049' N	003° 41,820031' E	548360,43	5707761,46											
44	1,823	51° 31,134869' N	003° 41,817432' E	548357,41	5707762,95		548456,99	5707964,71	548350,85	5707766,19	225,0	206,3	210,0	Y		
45	1,837	51° 31,138654' N	003° 41,806340' E	548344,52	5707769,85											
46	1,957	51° 31,171547' N	003° 41,716964' E	548240,59	5707829,83		548353,06	5708024,70	548224,50	5707839,12	225,0	210,0	219,4	Y		
47	1,994	51° 31,183080' N	003° 41,690813' E	548210,15	5707850,92											
48	2,015	51° 31,190265' N	003° 41,677078' E	548194,14	5707864,09											
49	2,252	51° 31,280545' N	003° 41,532257' E	548025,09	5708029,84		548182,61	5708190,49	548007,60	5708046,99	225,0	224,4	236,9	Y		
50	2,301	51° 31,301022' N	003° 41,505858' E	547994,20	5708067,51											
51	2,523	51° 31,402098' N	003° 41,402259' E	547872,65	5708253,72											
52	2,598	51° 31,436314' N	003° 41,367187' E	547831,50	5708316,76											
53	2,891	51° 31,574980' N	003° 41,245122' E	547687,94	5708572,46											
54	2,988	51° 31,620569' N	003° 41,204989' E	547640,75	5708656,52		547836,93	5708766,66	547635,01	5708666,75	225,0	240,7	246,7	Y		
55	3,011	51° 31,631946' N	003° 41,196175' E	547630,36	5708677,51											
56	3,373	51° 31,811873' N	003° 41,074877' E	547487,00	5709009,70											
57	3,725	51° 31,992549' N	003° 40,981389' E	547375,79	5709343,58		547589,26	5709414,68	547374,64	5709347,05	225,0	251,6	253,4	Y		
58	3,732	51° 31,996323' N	003° 40,979545' E	547373,59	5709350,55											
59	4,230	51° 32,254463' N	003° 40,860657' E	547231,70	5709827,75		547447,36	5709891,87	547218,86	5709870,93	225,0	253,4	276,1	Y		
60	4,319	51° 32,301969' N	003° 40,854390' E	547223,64	5709915,73											
61	4,433	51° 32,363107' N	003° 40,865772' E	547235,74	5710029,18											
62	4,686	51° 32,498823' N	003° 40,884814' E	547255,41	5710280,94		547080,93	5710294,57	547256,50	5710294,90	-175,0	94,5	85,3	N		
63	4,714	51° 32,513882' N	003° 40,884993' E	547255,36	5710308,85											
64	4,895	51° 32,611386' N	003° 40,873653' E	547240,57	5710489,46											
65	4,927	51° 32,628765' N	003° 40,871631' E	547237,93	5710521,65											
66	5,046	51° 32,692268' N	003° 40,859522' E	547222,84	5710639,22		547049,25	5710616,94	547221,01	5710653,46	-175,0	82,7	73,3	N		
67	5,074	51° 32,707396' N	003° 40,854599' E	547216,89	5710667,21											
68	5,080	51° 32,710398' N	003° 40,853204' E	547215,23	5710672,76		547047,59	5710622,49	547210,77	5710687,63	-175,0	73,3	63,2	N		
69	5,111	51° 32,725947' N	003° 40,843518' E	547203,76	5710701,48											
70	5,227	51° 32,781907' N	003° 40,799170' E	547151,55	5710804,72		546995,37	5710725,74	547144,69	5710818,27	-175,0	63,2	53,3	N		
71	5,257	51° 32,795860' N	003° 40,785589' E	547135,61	5710830,44											

72	5,262	51° 32,798036' N	003° 40,783034' E	547132,62	5710834,45	546992,38	5710729,75	547123,41	5710846,77	-175,0	53,3	43,2	N		
73	5,293	51° 32,810472' N	003° 40,765550' E	547112,20	5710857,31										
74	5,465	51° 32,874879' N	003° 40,657594' E	546986,33	5710975,53										
75	5,609	51° 32,928526' N	003° 40,567668' E	546881,49	5711074,01	546761,67	5710946,45	546870,70	5711084,15	-175,0	43,2	33,5	N		
76	5,639	51° 32,938525' N	003° 40,547791' E	546858,35	5711092,33										
77	5,644	51° 32,940355' N	003° 40,544105' E	546854,06	5711095,68									CX IS DNWG INFRA BV 20kV power cable, in HDD, no CX structure	84,8
78	5,960	51° 33,046398' N	003° 40,330459' E	546605,36	5711289,96	546494,88	5711123,25	546593,09	5711298,09	-200,0	33,5	25,1	N		
79	5,989	51° 33,054280' N	003° 40,308427' E	546579,76	5711304,34										
80	6,165	51° 33,095189' N	003° 40,171712' E	546421,09	5711378,72										
81	6,494	51° 33,172805' N	003° 39,914758' E	546122,85	5711519,87	546208,41	5711700,65	546102,33	5711529,59	200,0	205,3	218,3	Y		
82	6,540	51° 33,185825' N	003° 39,881755' E	546084,50	5711543,66										
83	6,631	51° 33,216605' N	003° 39,820359' E	546013,04	5711600,07										
84	6,656	51° 33,225058' N	003° 39,803496' E	545993,41	5711615,56	546117,33	5711772,55	545978,64	5711627,22	200,0	218,3	229,0	Y		
85	6,693	51° 33,239145' N	003° 39,780243' E	545966,30	5711641,43										
86	6,903	51° 33,325310' N	003° 39,662414' E	545828,71	5711799,90	545979,73	5711931,02	545820,00	5711809,94	200,0	229,0	236,6	Y		
87	6,930	51° 33,336787' N	003° 39,648718' E	545812,69	5711821,04										
88	6,957	51° 33,349281' N	003° 39,635778' E	545797,53	5711844,06										
89	7,107	51° 33,416947' N	003° 39,565698' E	545715,43	5711968,75	545548,39	5711858,76	545706,17	5711982,81	-200,0	56,6	47,0	N		
90	7,140	51° 33,431272' N	003° 39,547965' E	545694,70	5711995,12										
91	7,364	51° 33,520281' N	003° 39,417268' E	545542,21	5712158,74	545395,90	5712022,39	545538,57	5712162,65	-200,0	47,0	44,0	N		
92	7,374	51° 33,524424' N	003° 39,410852' E	545534,73	5712166,35										
93	7,576	51° 33,600632' N	003° 39,286319' E	545389,58	5712306,32	545250,75	5712162,35	545375,66	5712319,75	-200,0	44,0	32,9	N		
94	7,615	51° 33,613690' N	003° 39,260400' E	545359,42	5712330,26										
95	7,671	51° 33,630534' N	003° 39,219453' E	545311,83	5712361,05										
96	7,791	51° 33,666101' N	003° 39,132988' E	545211,35	5712426,09										
97	8,018	51° 33,723117' N	003° 38,958861' E	545009,24	5712529,98										
98	8,306	51° 33,805260' N	003° 38,747789' E	544764,05	5712680,08	545865,39	5714348,56	544737,06	5712697,89	1999,2	213,4	215,3	Y		
99	8,370	51° 33,825199' N	003° 38,701864' E	544710,66	5712716,56	545865,39	5714348,57	544541,55	5712836,22	1999,2	215,3	227,1	Y		
100	8,783	51° 33,973108' N	003° 38,435513' E	544400,56	5712988,02										
101	9,060	51° 34,079121' N	003° 38,266496' E	544203,60	5713182,81										
102	9,315	51° 34,178701' N	003° 38,114582' E	544026,52	5713365,86										
103	9,461	51° 34,235166' N	003° 38,025921' E	543923,20	5713469,63	544082,64	5713628,38	543898,62	5713494,32	225,0	225,1	242,7	Y		
104	9,531	51° 34,265377' N	003° 37,991241' E	543882,66	5713525,28										
105	9,662	51° 34,328842' N	003° 37,939849' E	543822,28	5713642,41	544022,26	5713745,50	543812,25	5713661,85	225,0	242,7	253,8	Y		
106	9,706	51° 34,350746' N	003° 37,926200' E	543806,16	5713682,87										
107	9,708	51° 34,352001' N	003° 37,925635' E	543805,49	5713685,19	544021,59	5713747,82	543799,83	5713704,71	225,0	253,8	264,2	Y		
108	9,749	51° 34,373475' N	003° 37,919244' E	543797,76	5713724,93										
109	9,754	51° 34,376262' N	003° 37,918826' E	543797,24	5713730,09	544021,06	5713752,98	543796,23	5713739,92	225,0	264,2	269,2	Y		
110	9,774	51° 34,386893' N	003° 37,917982' E	543796,09	5713749,79										
111	9,855	51° 34,430819' N	003° 37,917591' E	543794,94	5713831,20	544019,90	5713834,40	543794,68	5713849,47	225,0	269,2	278,5	Y		
112	9,892	51° 34,450405' N	003° 37,919967' E	543797,37	5713867,53										
113	9,908	51° 34,459311' N	003° 37,922222' E	543799,83	5713884,06										
114	10,111	51° 34,565278' N	003° 37,963619' E	543845,94	5714080,89	544065,00	5714029,57	543849,12	5714094,47	225,0	283,2	290,3	Y		
115	10,138	51° 34,579628' N	003° 37,970761' E	543853,96	5714107,56										
116	10,148	51° 34,584632' N	003° 37,973808' E	543857,40	5714116,87										
117	10,250	51° 34,634776' N	003° 38,009439' E	543897,74	5714210,17										
118	10,347	51° 34,682405' N	003° 38,043284' E	543936,07	5714298,79	544142,58	5714209,49	543943,41	5714315,76	225,0	293,4	302,8	Y		
119	10,383	51° 34,699865' N	003° 38,058550' E	543953,42	5714331,30										
120	10,528	51° 34,765005' N	003° 38,127171' E	544031,62	5714452,73	544220,77	5714330,92	544036,40	5714460,16	225,0	302,8	307,3	Y		
121	10,546	51° 34,772756' N	003° 38,136053' E	544041,75	5714467,19										
122	10,772	51° 34,869286' N	003° 38,256132' E	544178,86	5714647,32										
123	10,903	51° 34,924911' N	003° 38,326777' E	544259,54	5714751,14										
124	10,970	51° 34,953137' N	003° 38,362625' E	544300,48	5714803,82	544162,29	5714911,21	544323,57	5714833,52	-175,0	127,9	103,6	N		
125	11,044	51° 34,988738' N	003° 38,390771' E	544332,41	5714870,09										
126	11,107	51° 35,021688' N	003° 38,404046' E	544347,20	5714931,30	544177,09	5714972,42	544350,18	5714943,61	-175,0	103,6	95,3	N		
127	11,133	51° 35,035116' N	003° 38,407827' E	544351,35	5714956,23										
128	11,140	51° 35,039028' N	003° 38,408466' E	544352,02	5714963,48	544177,76	5714979,67	544352,61	5714969,82	-175,0	95,3	91,2	N		
129	11,153	51° 35,045871' N	003° 38,409181' E	544352,74	5714976,18										
130	11,266	51° 35,107313' N	003° 38,412018' E	544355,02	5715090,09										
131	11,370	51° 35,163024' N	003° 38,413539' E	544355,87	5715193,37	544630,73	5715185,02	544358,50	5715279,95	275,0	271,7	306,7	Y		
132	11,538	51° 35,246936' N	003° 38,461837' E	544410,27	5715349,39										
133	11,544	51° 35,249477' N	003° 38,465028' E	544413,92	5715354,13	544560,47	5715249,75	544514,18	5715494,90	179,9	305,5	33,2	Y		
134	11,819	51° 35,273265' N	003° 38,677510' E	544658,87	5715400,38										
135	11,843	51° 35,265735' N	003° 38,694850' E	544679,02	5715386,60	544763,69	5715510,42	544699,95	5715372,29	-150,0	214,4	195,2	N		
136	11,894	51° 35,254213' N	003° 38,734019' E	544724,43	5715365,65										
137	11,902	51° 35,253112' N	003° 38,741042' E	544732,56	5715363,68	544763,70	5715510,41	544738,11	5715362,50	-150,0	192,0	187,7	N		
138	11,913	51° 35,252016' N	003° 38,750704' E	544743,73	5715361,74	544763,70	5715510,41	544755,52	5715360,16	-150,0	187,7	178,6	N	DoB borders_R10 - Navigational Area VM - border B	76,7
139	11,937	51° 35,251208' N	003° 38,771194' E	544767,40	5715360,46										
140	11,963	51° 35,251431' N	003° 38,793558' E	544793,22	5715361,10										
141	11,964	51° 35,251438' N	003° 38,794269' E	544794,04	5715361,12									DoB borders_R10 - Shore line - VM North	88,9
142	11,979	51° 35,251573' N	003° 38,807798' E	544809,66	5715361,50	544809,28	5715376,50	544825,73	5715361,91	-15,0	178,6	84,6	N		
143	12,004	51° 35,260352' N	003° 38,820528' E	544824,22	5715377,91										

144	12,010	51° 35,263885' N	003° 38,820041' E	544823,60	5715384,45										
145	12,023	51° 35,270837' N	003° 38,819517' E	544822,88	5715397,33										
146	12,075	51° 35,298829' N	003° 38,817404' E	544819,98	5715449,19										
147	12,413	51° 35,480900' N	003° 38,798921' E	544795,65	5715786,48										
148	12,636	51° 35,601146' N	003° 38,795656' E	544789,91	5716009,34									DoB border_R10 - Baseline LAT 0 m	86,8
149	12,732	51° 35,652590' N	003° 38,794259' E	544787,46	5716104,68										
150	13,342	51° 35,981629' N	003° 38,793184' E	544780,82	5716714,56										
151	14,075	51° 36,377034' N	003° 38,791892' E	544772,85	5717447,45										
152	14,075	51° 36,377063' N	003° 38,791892' E	544772,85	5717447,51										
153	14,168	51° 36,427584' N	003° 38,791726' E	544771,83	5717541,15	542671,95	5717518,30	544770,89	5717627,05	-2100,0	89,4	84,7	N		
154	14,340	51° 36,520116' N	003° 38,785344' E	544762,94	5717712,60	542671,95	5717518,30	544730,59	5718060,85	-2100,0	84,7	65,8	N		
155	15,033	51° 36,880889' N	003° 38,638086' E	544587,10	5718379,81	542671,95	5717518,30	544533,68	5718498,56	-2100,0	65,8	58,7	N		
156	15,293	51° 37,005534' N	003° 38,534905' E	544466,01	5718609,80	542671,95	5717518,30	544316,00	5718856,35	-2100,0	58,7	43,0	N		
157	15,867	51° 37,246488' N	003° 38,225469' E	544105,05	5719053,30										
158	16,999	51° 37,667075' N	003° 37,514120' E	543277,63	5719825,80									DoB border - 3 km border and border Nearshore - Offshore	58,3
159	18,063	51° 38,062491' N	003° 36,845031' E	542499,59	5720552,19										
160	18,079	51° 38,068223' N	003° 36,835330' E	542488,31	5720562,72										
161	18,173	51° 38,106071' N	003° 36,780247' E	542424,19	5720632,34										
162	19,112	51° 38,481439' N	003° 36,233829' E	541788,18	5721322,87										
163	19,143	51° 38,493781' N	003° 36,215860' E	541767,26	5721345,57	540222,62	5719922,87	541554,70	5721576,35	-2100,0	47,4	30,4	N		
164	19,766	51° 38,705965' N	003° 35,799579' E	541283,96	5721734,93										
165	20,420	51° 38,886726' N	003° 35,312608' E	540719,70	5722065,43										
166	21,377	51° 39,151182' N	003° 34,599882' E	539893,97	5722549,06	538832,63	5720737,01	539679,51	5722674,68	-2100,0	30,4	16,9	N		
167	21,872	51° 39,259747' N	003° 34,208937' E	539441,64	5722746,76										
168	22,226	51° 39,316626' N	003° 33,915407' E	539102,40	5722849,56	539218,40	5723232,37	538725,64	5722963,73	400,0	196,9	286,0	Y		
169	22,848	51° 39,583536' N	003° 33,685728' E	538833,79	5723342,26										
170	24,459	51° 40,417157' N	003° 34,079982' E	539276,28	5724890,96	538891,67	5725000,85	539299,18	5724971,10	-400,0	106,0	82,4	N		
171	24,623	51° 40,504907' N	003° 34,091389' E	539288,16	5725053,72										
172	25,206	51° 40,817015' N	003° 34,028420' E	539211,10	5725631,67	538814,61	5725578,81	539199,10	5725721,69	-400,0	82,4	56,8	N		
173	25,385	51° 40,906842' N	003° 33,975992' E	539149,40	5725797,71										
174	25,757	51° 41,075703' N	003° 33,801360' E	538945,76	5726109,15										
175	26,498	51° 41,412207' N	003° 33,453277' E	538539,94	5726729,81										
176	26,883	51° 41,586571' N	003° 33,272873' E	538329,66	5727051,43	538831,84	5727379,78	538308,40	5727083,95	600,0	236,8	244,2	Y		
177	26,960	51° 41,623141' N	003° 33,240203' E	538291,51	5727118,93										
178	28,306	51° 42,279259' N	003° 32,740238' E	537706,48	5728330,77	539597,64	5729243,75	537557,66	5728639,04	2100,0	244,2	262,8	Y		
179	28,985	51° 42,629515' N	003° 32,577685' E	537514,44	5728978,61										
180	29,668	51° 42,995550' N	003° 32,507136' E	537428,17	5729656,49	539511,36	5729921,63	537371,26	5730103,64	2100,0	262,8	287,0	Y		
181	30,556	51° 43,469038' N	003° 32,577682' E	537502,86	5730534,76										
182	30,991	51° 43,692959' N	003° 32,690696' E	537629,86	5730950,79	539638,07	5730338,21	537661,62	5731054,89	2099,6	287,0	292,9	Y		
183	31,208	51° 43,802906' N	003° 32,756399' E	537703,97	5731155,15	539638,47	5730338,06	537845,31	5731489,79	2100,0	292,9	312,5	Y		
184	31,928	51° 44,126274' N	003° 33,096449' E	538090,84	5731757,50										
185	32,884	51° 44,503754' N	003° 33,662773' E	538737,24	5732462,17	538074,16	5733070,15	538769,20	5732497,01	-899,6	132,5	126,5	N		
186	32,979	51° 44,542804' N	003° 33,715462' E	538797,32	5732535,02										
187	33,092	51° 44,591836' N	003° 33,774859' E	538864,97	5732626,43										
188	34,618	51° 45,249784' N	003° 34,572169' E	539772,80	5733853,17	538165,14	5735042,89	539938,44	5734077,01	-2000,0	126,5	110,7	N		
189	35,172	51° 45,509972' N	003° 34,804853' E	540036,65	5734337,58										
190	38,018	51° 46,942264' N	003° 35,696199' E	541040,31	5737000,76										
191	38,582	51° 47,226144' N	003° 35,872985' E	541239,25	5737528,63									Doorgaande NAP -20m lijn	25,3
192	42,808	51° 49,352886' N	003° 37,198690' E	542729,73	5741483,54										
193	43,326	51° 49,613172' N	003° 37,361095' E	542912,16	5741967,61										
194	44,982	51° 50,446576' N	003° 37,881323' E	543496,29	5743517,58										
195	45,115	51° 50,513708' N	003° 37,923244' E	543543,34	5743642,43										
196	45,508	51° 50,711095' N	003° 38,046514' E	543681,70	5744009,54										
197	46,853	51° 51,387795' N	003° 38,469271' E	544156,03	5745268,15	548833,47	5743501,36	544164,11	5745289,55	5000,0	290,7	291,2	Y		
198	46,899	51° 51,410762' N	003° 38,483851' E	544172,39	5745310,87	548833,47	5743501,36	544602,58	5746419,00	5000,0	291,2	318,0	Y	CX IS KB0020 BRITNED route BritNed (TenneT and National Grid) van Maasvlakte2 – Isle of Grain, Power cable DC	49,3
199	49,233	51° 52,431562' N	003° 39,642787' E	545485,45	5747214,96										
200	50,602	51° 52,921309' N	003° 40,536835' E	546502,84	5748132,18	544494,03	5750360,34	546977,96	5748560,53	-3000,0	138,0	113,9	N		
201	51,863	51° 53,464179' N	003° 41,185101' E	547237,02	5749145,43										
202	51,958	51° 53,511053' N	003° 41,219513' E	547275,67	5749232,69									DoB border_R10 - constr less crossing 01 - border A1	59,8
203	52,285	51° 53,671550' N	003° 41,337352' E	547408,00	5749531,47	546493,67	5749936,44	547437,14	5749597,26	-1000,0	113,9	105,7	N		
204	52,429	51° 53,744163' N	003° 41,380805' E	547456,56	5749666,54	546493,67	5749936,44	547585,21	5750125,52	-1000,0	105,7	54,7	N	DoB border_R10 - TSS - border A and constr less crossing 01 - border B	51,5
205	53,318	51° 54,202317' N	003° 41,259721' E	547309,68	5750514,48										
206	53,487	51° 54,276904' N	003° 41,176001' E	547212,38	5750651,84	548986,98	5751908,93	546868,36	5751137,48	2174,7	234,7	265,3	Y		
207	54,649	51° 54,860816' N	003° 40,842232' E	546819,56	5751730,62										
208	55,335	51° 55,229469' N	003° 40,786853' E	546749,70	5752413,38										
209	56,499	51° 55,854750' N	003° 40,692890' E	546631,20	5753571,43	544840,55	5753388,20	546597,39	5753901,87	-1800,0	84,2	63,3	N		
210	57,156	51° 56,193912' N	003° 40,537994' E	546447,86	5754198,47										
211	57,325	51° 56,275516' N	003° 40,472968' E	546371,96	5754349,05										
212	62,763	51° 58,906994' N	003° 38,373720' E	543923,88	5759205,23									12 m le line	30,4
213	65,202	52° 00,086993' N	003° 37,430892' E	542825,93	5761383,20									DoB border_R10 - Eurogeul - border A	71,3
214	65,230	52° 00,100763' N	003° 37,419885' E	542813,12	5761408,62										

215	66,522	52° 00,725494' N	003° 36,920340' E	542231,78	5762561,81									DoB border_R10 - Eurogeul - border B	71,3
216	67,833	52° 01,359549' N	003° 36,413075' E	541641,73	5763732,27										
217	68,859	52° 01,855817' N	003° 36,015856' E	541179,88	5764648,43										
218	69,116	52° 01,980358' N	003° 35,916146' E	541063,97	5764878,36										
219	72,859	52° 03,790496' N	003° 34,465750' E	539379,18	5768220,44	535620,54	5766346,24	538803,93	5769374,08	-4200,0	63,5	29,4	N		
220	75,360	52° 04,760957' N	003° 32,990945' E	537680,52	5770006,36										
221	77,632	52° 05,370224' N	003° 31,265070' E	535701,23	5771121,24										
222	78,462	52° 05,596426' N	003° 30,637373' E	534981,52	5771535,46										
223	79,133	52° 05,778003' N	003° 30,129789' E	534399,64	5771868,01	535292,79	5773430,79	533423,58	5772425,85	1800,0	209,8	273,7	Y		
224	81,143	52° 06,687399' N	003° 29,348772' E	533496,59	5773547,70										
225	82,315	52° 07,318303' N	003° 29,422421' E	533572,75	5774717,80										
226	82,631	52° 07,488505' N	003° 29,442296' E	533593,30	5775033,46										
227	83,594	52° 08,006243' N	003° 29,502769' E	533655,79	5775993,68										
228	86,291	52° 09,457283' N	003° 29,672384' E	533830,95	5778684,85									CX OOS KB0002 Concerto1 segment 1 East FluteLtd from Zandvoort (NL) to Zeebrugge (B), f beroptic, telecom	85,8
229	87,872	52° 10,308335' N	003° 29,771954' E	533933,68	5780263,26									CX OOS KB0051 NL-UK 4 Unknown, from Scheveningen (NL) to Lowesoft (UK) telecom coaxial	79,1
230	89,317	52° 11,085698' N	003° 29,862959' E	534027,52	5781705,01	537215,29	5781425,51	534054,26	5782009,93	3200,0	275,0	285,9	Y		
231	89,927	52° 11,408527' N	003° 29,963804' E	534138,31	5782304,25										
232	91,790	52° 12,379187' N	003° 30,386058' E	534606,82	5784106,95	524681,96	5786460,08	534672,45	5784383,75	-10200,0	103,3	100,1	N		
233	92,359	52° 12,679113' N	003° 30,491092' E	534722,54	5784663,78	524681,96	5786460,08	534737,54	5784747,61	-10200,0	100,1	99,2	N	CX OOS KB0001 UK-NL 5 Unknownfrom Scheveningen (NL) to Lowesoft (UK) telecom coaxial	85,5
234	92,529	52° 12,769577' N	003° 30,517236' E	534751,14	5784831,69										
235	93,245	52° 13,152873' N	003° 30,594050' E	534833,61	5785542,84										
236	93,407	52° 13,239366' N	003° 30,611387' E	534852,22	5785703,32										
237	94,320	52° 13,728170' N	003° 30,709386' E	534957,40	5786610,23										
238	94,718	52° 13,941593' N	003° 30,752186' E	535003,32	5787006,22									DoB border_R10 - constr less crossing 02 - border A1	60,0
239	94,818	52° 13,995132' N	003° 30,762923' E	535014,84	5787105,55										
240	95,068	52° 14,128607' N	003° 30,789695' E	535043,56	5787353,20										
241	95,842	52° 14,543234' N	003° 30,872877' E	535132,78	5788122,49									DoB border_R10 - constr less crossing 02 - border B	60,0
242	96,158	52° 14,712598' N	003° 30,906862' E	535169,22	5788436,73										
243	96,581	52° 14,939107' N	003° 30,952321' E	535217,96	5788857,00										
244	96,879	52° 15,098452' N	003° 30,984298' E	535252,24	5789152,64	533064,66	5789386,08	535267,50	5789295,66	-2200,0	96,1	88,6	N		
245	97,166	52° 15,253114' N	003° 30,996442' E	535264,01	5789439,45										
246	97,496	52° 15,430971' N	003° 30,989830' E	535254,14	5789769,10									Zone Bruine Bank +5km border	76,2
247	100,563	52° 17,084820' N	003° 30,928311' E	535162,34	5792834,48	536461,76	5792873,39	535155,32	5793068,88	1300,0	268,3	288,7	Y		
248	101,027	52° 17,330790' N	003° 30,991254' E	535230,65	5793290,97										
249	101,838	52° 17,744238' N	003° 31,225351' E	535491,26	5794059,31	533881,34	5794605,37	535571,88	5794297,03	-1700,0	108,7	91,9	N		
250	102,337	52° 18,007436' N	003° 31,306848' E	535580,37	5794547,89										
251	103,142	52° 18,441469' N	003° 31,335911' E	535607,60	5795352,74									CX OOS KB0019 UK-NL 6 KPN, from Katwijk (NL) to Covehite (UK) Telecom coaxial	87,6
252	104,255	52° 19,041307' N	003° 31,376093' E	535645,22	5796465,05									CX OOS KB0033 Hermes1 GTS, from Zandvoort (NL) to Aldeburgh (UK) Telecom f beroptic	85,4
253	104,654	52° 19,256165' N	003° 31,390490' E	535658,70	5796863,47										
254	106,014	52° 19,989638' N	003° 31,439658' E	535704,71	5798223,58										
255	106,908	52° 20,471207' N	003° 31,471956' E	535734,92	5799116,58									CX OOS KB0066 Rioja3 KPN Veume (B) to Egmond (NL) telecom, fiberglass	26,0
256	108,594	52° 21,379946' N	003° 31,532936' E	535791,93	5800801,71									CX OOS KB0018 TAT14 segment I, British telecom from Katwijk (NL) to Saint Valery en Caux (F) iberoptic, telecom (is OOS but the corridor is l kely to be reused)	63,8
257	111,198	52° 22,783498' N	003° 31,627207' E	535879,97	5803404,40									CX IS KB0030 Ulysses2 MCI World Com form IJmuiden (NL) to Lowesoft (UK) fiberoptic, telecom	77,1
258	111,235	52° 22,803197' N	003° 31,628531' E	535881,21	5803440,93										
259	111,335	52° 22,857425' N	003° 31,629177' E	535881,21	5803541,47									PX IS PL0173_PR Dana Petroleum Netherlands B.V.from P11B DeRuyter to Aftakking naar P15-D gaspipe, 8 inch	58,7
260	114,200	52° 24,402588' N	003° 31,647593' E	535881,21	5806406,07									CX IS KB0045 Circe 1 North, Viatel UK Ltd from Zandvoort (NL) to Lowesoft (UK) fiberoptic, telecom	82,4
261	115,167	52° 24,924004' N	003° 31,653814' E	535881,21	5807372,74										
262	115,940	52° 25,341166' N	003° 31,658793' E	535881,21	5808146,12									CX IS KB0003 Concerto1 Segment 1 North Flute Ltd from Zandvoort (NL) to Sizewell (UK) telecom	84,5
263	116,652	52° 25,725038' N	003° 31,663377' E	535881,21	5808857,79									CX As planned KB0115 Circe north 2 replacement Zayo, from Zandvoor (NL) to UK, telecom fiberoptic	85,8
264	116,865	52° 25,840237' N	003° 31,664752' E	535881,21	5809071,37										
265	117,952	52° 26,426469' N	003° 31,671757' E	535881,21	5810158,20										
266	118,868	52° 26,920457' N	003° 31,677662' E	535881,21	5811074,02	535081,21	5811074,02	535881,21	5811168,00	-800,0	90,0	76,6	N		
267	119,055	52° 27,020547' N	003° 31,659629' E	535859,43	5811259,42										
268	120,131	52° 27,585970' N	003° 31,446234' E	535610,12	5812305,86										
269	120,914	52° 27,997672' N	003° 31,290797' E	535428,60	5813067,82	530953,83	5812001,76	535384,34	5813253,58	-4600,0	76,6	71,9	N		
270	121,296	52° 28,196142' N	003° 31,201501' E	535324,85	5813435,02										
271	121,310	52° 28,203383' N	003° 31,197708' E	535320,45	5813448,42									CX IS KB0074 Atlantic Crossing 1 Segment B1 Global Crossing, from castricum (NL) to Whitesand (UK) fiberglas telecom	82,7
272	122,123	52° 28,621432' N	003° 30,978652' E	535066,91	5814221,64										
273	122,361	52° 28,743531' N	003° 30,914659' E	534992,86	5814447,47									CX OOS KB0015 Rembrandt 1 KPNQwest from Beverwijk (NL) to Lowesoft (UK) fiberoptic, telecom	82,3
274	122,484	52° 28,806857' N	003° 30,881468' E	534954,45	5814564,60	535809,65	5814845,02	534887,03	5814770,22	900,0	251,9	278,9	Y		

275	122,909	52° 29,033214' N	003° 30,854064' E	534920,45	5814984,01										
276	122,955	52° 29,057787' N	003° 30,860649' E	534927,58	5815029,62									CX IS KB0029 Pangea Segment 2 Alcatel Submarine Networks, from Lowesoft (UK) to Egmond (NL) fiberoptic, telecom (is OOS but may be placed in service in the future)	55,3
277	123,191	52° 29,183460' N	003° 30,894331' E	534964,04	5815262,87									CX As Planned KB0113 Scy la HDD EU Networks, from IJmuiden (NL) to Lowesoft (UK), telecom, fiberoptic	54,5
278	123,534	52° 29,365819' N	003° 30,943210' E	535016,94	5815601,33	535510,94	5815524,11	535032,29	5815699,54	500,0	278,9	301,4	Y		
279	123,730	52° 29,464309' N	003° 31,003655' E	535084,04	5815784,40	534486,37	5816148,81	535156,48	5815903,22	-700,0	121,4	98,9	N		
280	124,005	52° 29,602195' N	003° 31,088286' E	535177,97	5816040,71										
281	126,351	52° 30,850846' N	003° 31,423260' E	535540,22	5818358,26										
282	128,212	52° 31,841726' N	003° 31,689315' E	535827,69	5820197,40										
283	128,388	52° 31,935211' N	003° 31,714427' E	535854,82	5820370,92	533681,21	5820710,67	535881,21	5820539,77	-2200,0	98,9	90,0	N		
284	128,729	52° 32,118364' N	003° 31,739973' E	535881,21	5820710,67										
285	129,073	52° 32,303904' N	003° 31,742203' E	535881,21	5821054,65										
286	130,559	52° 33,105467' N	003° 31,751842' E	535881,21	5822540,72										
287	133,873	52° 34,892873' N	003° 31,773363' E	535881,21	5825854,53										
288	135,057	52° 35,531518' N	003° 31,781062' E	535881,21	5827038,56										
289	137,822	52° 37,023222' N	003° 31,799063' E	535881,21	5829804,16										
290	138,902	52° 37,605481' N	003° 31,806096' E	535881,21	5830883,66										
291	142,187	52° 39,377613' N	003° 31,827528' E	535881,21	5834169,18										
292	145,693	52° 41,268511' N	003° 31,850438' E	535881,21	5837674,92										
293	147,761	52° 42,383634' N	003° 31,863969' E	535881,21	5839742,37									CX OOS KB0065 UK-NL10 Unknown, from Egmond (NL) to Lowesoft (UK) telecom coaxial	83,8
294	148,871	52° 42,982768' N	003° 31,871244' E	535881,21	5840853,18										
295	150,316	52° 43,761954' N	003° 31,880713' E	535881,21	5842297,81										
296	152,051	52° 44,697517' N	003° 31,892092' E	535881,21	5844032,36										
297	152,210	52° 44,783082' N	003° 31,881890' E	535868,56	5844190,91	534881,21	5844032,37	535774,09	5844779,21	-1000,0	80,9	19,3	N		
298	153,284	52° 45,209207' N	003° 31,303169' E	535211,75	5844976,16										
299	156,941	52° 45,874031' N	003° 28,241972' E	531760,29	5846184,96										
300	158,274	52° 46,072141' N	003° 27,102386' E	530476,44	5846544,03	530611,11	5847025,55	530474,83	5846544,48	500,0	195,6	196,0	Y		
301	158,278	52° 46,072642' N	003° 27,099539' E	530473,23	5846544,94	530611,11	5847025,55	529987,77	5846684,21	500,0	196,0	286,6	Y	CX OOS KB0067 UK-NL 14 Cable and Wireless from Egmond (NL) to Winterton (GB) fiberoptic, telecom	0,4
302	159,068	52° 46,409982' N	003° 26,799451' E	530131,90	5847168,24	530611,11	5847025,55	530148,65	5847224,50	500,0	286,6	300,0	Y	DoB border_R10 - TSS - border B	89,6
303	159,185	52° 46,467596' N	003° 26,841021' E	530177,98	5847275,34										
304	162,154	52° 47,849657' N	003° 28,175101' E	531661,18	5849847,17									Zone Bruine Bank +5km border	75,6
305	163,292	52° 48,379381' N	003° 28,686876' E	532229,75	5850833,04	532056,49	5850932,95	532251,20	5850870,23	-200,0	120,0	95,7	N		
306	163,377	52° 48,422393' N	003° 28,710263' E	532255,49	5850912,95										
307	163,543	52° 48,511638' N	003° 28,726056' E	532272,13	5851078,53	532471,13	5851058,53	532274,13	5851098,36	200,0	275,7	287,1	Y		
308	163,583	52° 48,532583' N	003° 28,733285' E	532280,00	5851117,41									DoB border_R10 - 200m from J-tube	77,2
309	163,788	52° 48,638068' N	003° 28,788190' E	532340,37	5851313,39										

Revision	Date	Issued by	History
RPL_A01	2020-12-16	101528	created new route DTS_IJVer-Alpha-RPL-A01
RPL_A02	2021-02-10	101528	Adjustments crossing the shipping route Maas Noord West VSS
RPL_A02	2021-02-11	101528	Adjustments passing the Lichtplatform Goeree on the east side
RPL_A02	2021-02-11	101528	Route optimising for he parallel routes with other cable projects
RPL_A02	2021-02-11	101528	Route optimising in the nearshore area through the Roompot
RPL_A02_rev06	2021-03-09	101528	Rearangement of the windkavels led to the changes in he route within
RPL_A02_rev06	2021-04-23	101528	Route through Veerse Meer added, adjustments HDD VeerseGatdam, Atron
RPL_A03	2021-07-16	101528	TSS and nature areas borders added
RPL_A04	2021-10-27	101528	Route through Roompot and Veerse Meer adjusted,
RPL_A04	2021-10-27	101528	Roompot 200m and VM 100m to the west. Place for the 4th cable
RPL_A04	2021-10-27	101528	Additional burial borders added
RPL_A04	2021-11-04	101528	Burial borders conform Burial_borders_R7
RPL_A04_rev01	2022-02-08	101528	Burial borders R10 applied
RPLA04_rev02	2022-03-14	101528	KB0078 COAM withdrawn by the RWS, will not be installed

Geodetics

Horizontal Coordinate System	
Projection:	ETRS 1989 UTM Zone 31N
Projection EPSG:	25831
Central Meridian:	3° E
Lattitude of Origin:	00° N
False Easting:	500000
False Northing:	0
Central Scale Factor:	0,9996
Datum:	ETRS 1989
Spheroid:	GRS 1980
Semi-major axis:	6378137
Inverse Flattening:	298,257222101

Lat/Lon Coordinates	WGS 1984 based

Vertical Coordinate System	
Reference system:	
Model:	

Geodetic Transformation: ETRS_1989_To_WGS_1984	
Source Datum:	ETRS 1989
Source Datum EPSG:	6258
Target Datum:	WGS 1984
Target Datum EPSG:	6326
Source projection:	ETRS 1989 UTM Zone 31N
Source projection EPSG:	25831
Target projection:	WGS 1984
Target projection EPSG:	4326
Datum Transformation Parameters:	
Shift dX [m]:	0
Shift dY [m]:	0
Shift dZ [m]:	0
Rotation rX [arc secs]:	0
Rotation rY [arc secs]:	0
Rotation rZ [arc secs]:	0
Scale Factor [ppm]:	0
Rotation Centre X (m):	
Rotation Centre Y (m):	
Rotation Centre Z (m):	
Reference Epoch:	
Epoch - unix time stamp (time 0 is):	YYYY-MM-DD

(*) - source:	ArcGIS

Geodetic Transformation: ETRS to RD_New EPSG 25831 to 28992		
Source Datum:	ETRS1989	
Target Datum:	D_Amersfoort	
Source projection:	UTM Zone 31 North (Central meridian 3° East)	
Target projection:	Double_Stereographic GCS_Amersfoort	
Datum Transformation Parameters:		
Shift dX:	593,032	
Shift dY:	26	
Shift dZ:	478,741	
Rotation rX:	0,409394 arcsec	
Rotation rY:	-0,359705 arcsec	
Rotation rZ:	1,868491 arcsec	

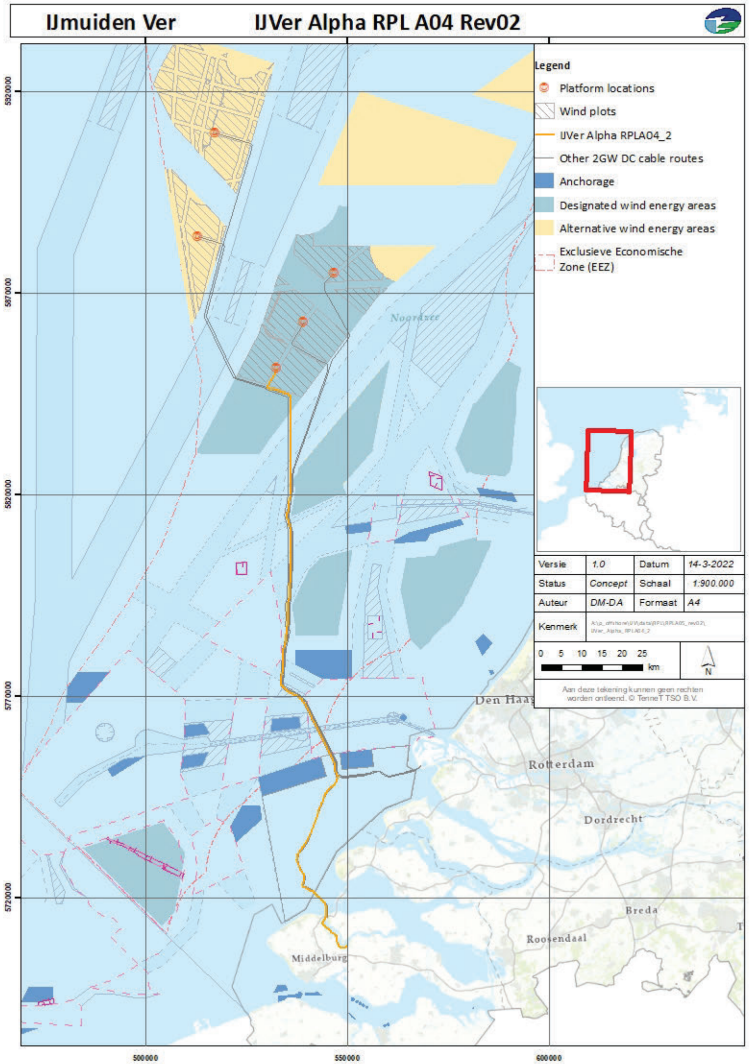
Scale Factor:	4,0772
xcr	3903453,148
ycr	368135,313
zcr	5012970,306

ROUTE POSITION LIST (RPL) ABBREVIATIONS

RPL NAMING CONVENTION	RPL Issue
DESK TOP STUDY RPLs	DTS(1,2...)
SURVEY ROUTE RPLs - (Agreed survey route with subsequent changes, during survey ops)	SR(1,2...)
POST SURVEY ROUTE RPLs - (incl. Slack, PLUP/DN, Bus, transitions and Repeaters etc)	PSR(1,2...)
AS-BUILT RPL - (Manufactured lengths)	AB(1,2...)
POST-LOAD RPLs - (Loaded cable lengths)	PL(1,2...)
AS-LAID RPLs - (subsequent issue numbers reflect repairs/changes)	AL(1,2...)

Abbreviation	Meaning	Erklärung	Typical Use	MakaiPlan Type
AB-xxx	As-Built	Bestandslage		
AC	Alter Course	Kurswechsel		
AF	As Found (Cable) by MAG / SSS	Detektierte Kreuzung	CX NorNed AF MAG	Ref
AL-xxx	As-Laid			
BAS	Burial Assessment Survey	Untersuchung zur Kabelverlegbarkeit		
BJ	Beach Joint	Strand-Muffe		Body
BMH	Beach ManHole	Muffengrube	BMH Hilgenriedersiel	
CC	Cable Corridor	Kabelkorridor	Enter CC	Ref
CL	Centre Line	Zentrallinie		
CX	Cable Crossing	Kabelkreuzung	CX Old Cable OOS DB	Ref
DB	Database position of cable	Kabelkreuzung laut Datenbank	CX Old Cable OOS DB	
DE	Duct End	Rohrende	DE	Ref
DS	Duct Start	Rohranfang	DS	Ref
DTS	Desk Top Study	Studie zur Voruntersuchung		
EEZ	Exclusive Economic Zone	Ausschließliche Wirtschaftszone (AWZ)	EEZ Country MB	Ref
EOB	End of burial	Endpunkt der Kabeleinspülung	PLUP EOB	Ref
EOGI	End of Grade-In			
EOGO	End of Grade-Out			
EP	End Pipe	Lehrrohrende		
FS	Final Splice	End-Muffe	FS Segment Name	Body
FSPL	Fibre Splice	Glasfaser-Muffe		Body
IS	In-Service	in Betrieb	IS Segment Name	Body
JB-xxx	Joint Box	Muffe	JB-001 Any other comment	Body
JT	J-Tube	Kabeleinzugsröhre		
KP	Kilometre Point	Sta ionierung		
LC	Land Cable (instead of Land)	Landkabel		Cable
LP	Landing Point	Anlandepunkt	LP Norderney North Beach	Ref
MAG	Magnetometer Identified Cable	Magnetometer-Fund (Kabelkreuzung)	CX Unidentified MAG	
MB	Maritime Boundary	Seegrenze	TW Country MB	Ref
OOS	Out of Service	außer Betrieb	CX Old Cable OOS DB	
OWF/OWP	Offshore Wind Farm / Park	Offshore Windfarm / -park		
PF	Platform (converter)	(Konverter-) Plattform	PF BorWin x	
PLB	Post Lay Burial	nachträgliches Einspülen	PLB Start	Ref
PLDN	Plough Down	Pflug/ Schwert runter	PLDN	Ref
PLGR	Pre Lay Grapnel Run	Räumungs-Fahrt vor dem Verlegen		
PLI	Post Lay Inspection	Nachkontrolle (Verlegung)		
PLIB	Post Lay Inspection and Burial	Nachkontrolle und Einspülen		
PLUP	Plough Up	Pflug/ Schwert hoch	PLUP	Ref
PN	Planned cable	Kreuzung mit geplantem Kabel	CX Planned cable name PN	Ref
PSR-xxx	Post Survey Route	RPL nach Survey		
PX	Pipeline Crossing	Pipeline-Kreuzung	PX Pipeline name	Ref
RD	Rock Dump	Steinschüttung		Cable
RPL	Route Position List	Trassierungs-Liste		

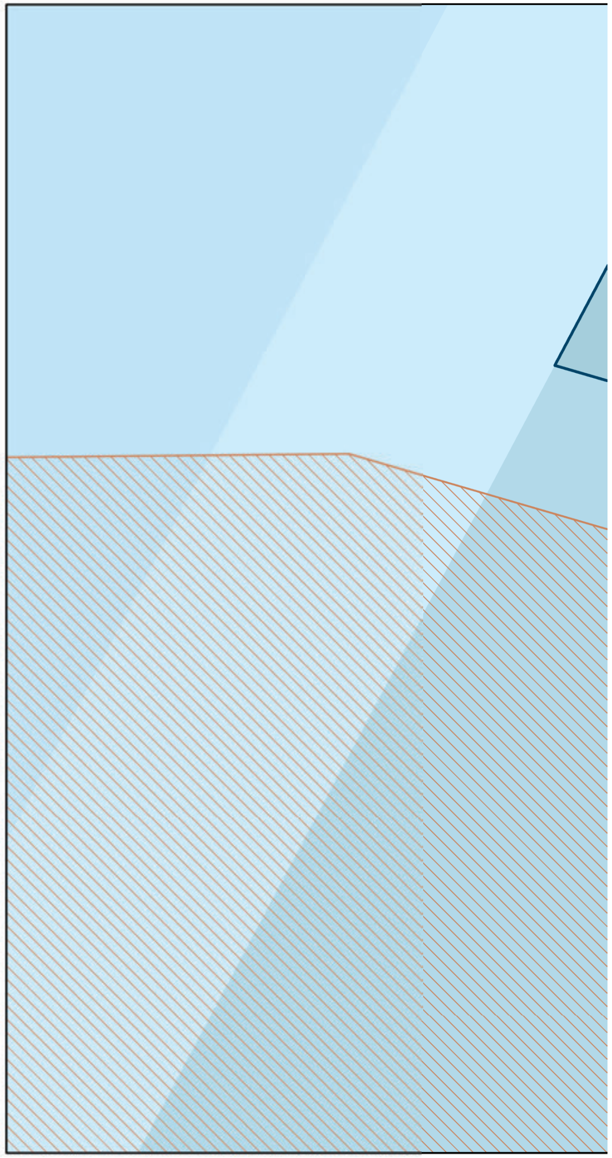
RPTR-xxx	Repeater	Verstärker	RPTR-001	Body
SC	Slack Change	Veränderung des Durchhangs	SC 3%	Ref
SE	Shore End	Flachwasser-Ende		Ref
SLD	Straight Line Diagram	Liniendiagramm		
SOB	Start of burial	Einspülbeginn	PLDN SOB	Ref
SOGI	Start of Grade-In			
SOGO	Start of Grade-Out			
SP	Start pipe	Lehrrohranfang	SP	Ref
SR-xxx	Survey Route	Vermessungs-Trasse		
SSS	Side Scan Sonar Identified Cable	Seitensichtsonar Kabelfund	CX Cable name AF SSS	Ref
TPA	Traffic Precautionary Area	Verkehrsvorrang-Gebiet	Enter TPA	
TR	Transition	Übergang (Einspülung)	TR LWP-40/LW--40	Body
TSS	Traffic Separa ion Scheme	Verkehrstrennungs-System	Enter TSS	
TSZ	Traffic Separation Zone	Verkehrstrennungsgebiet (VTG)	Enter TSZ	
WD	Water Dep h	Wassertiefe	WD 20 m	Ref
WK	Wreck	Wrack	WK Wreck name	Ref

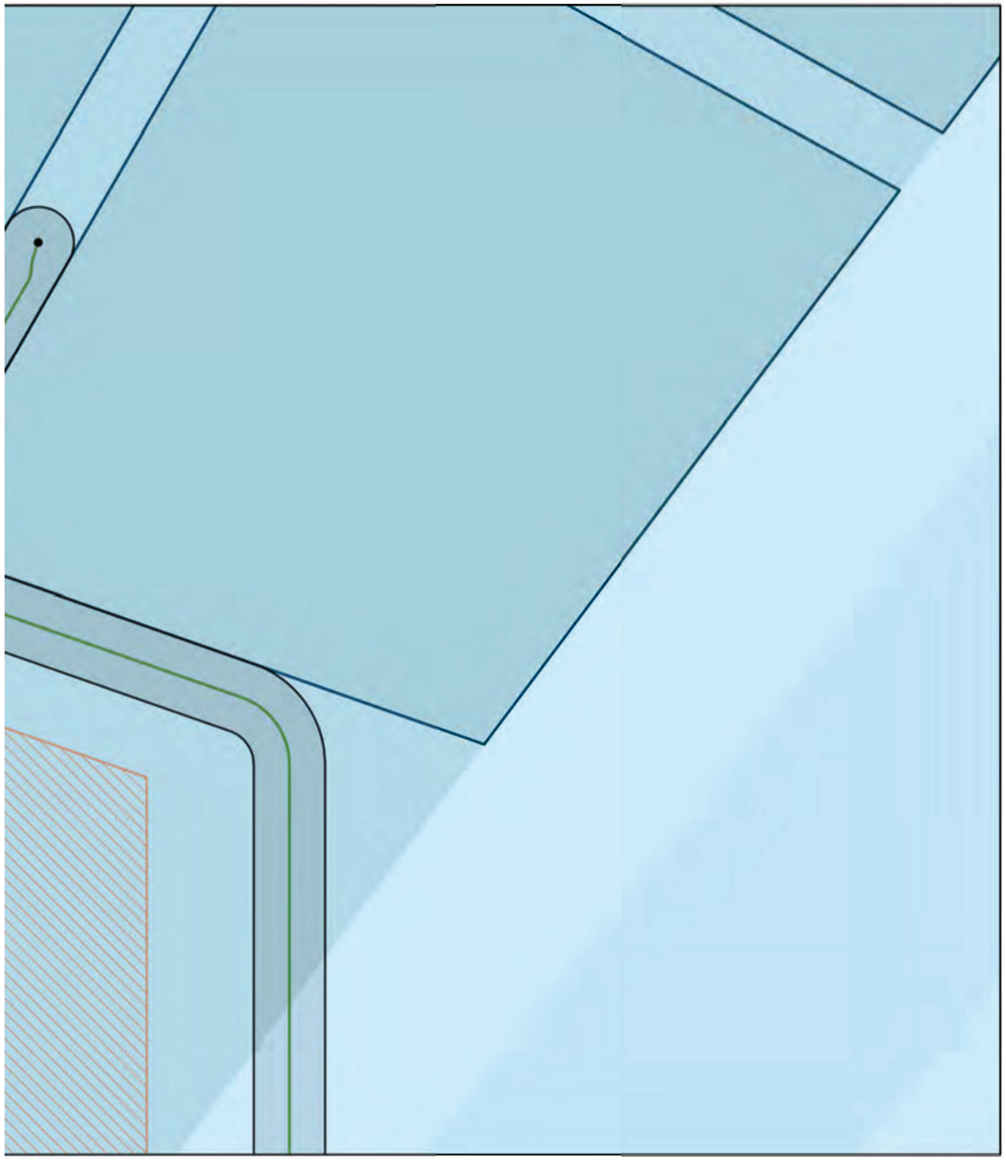

IJmuiden Ver
IJVer Alpha RPL A04 Rev02
Legend
Platform locations
Wind plots
IJVer Alpha RPLA04_2
Other 2GW DC cable routes
Anchorage
Designated wind energy areas
Alternative wind energy areas
Exclusieve Economische Zone (EEZ)
Noordzee
Den Haag
Rotterdam
Dordrecht
Breda
Roosendaal
Middelburg
Versie 1.0
Datum 14-3-2022
Status Concept
Schaal 1:900.000
Auteur DM-DA
Formaat A4
Kenmerk
0 5 10 15 20 25 km
N
Aan deze tekening kunnen geen rechten worden ontleend. © TenneT TSO B.V.
500000
550000
600000

Version	Date	Creator	Comment
Draft	2021-07-01	Anna Wolowicz-Trouwborst	Template creation containing arcs
1,0	2021-10-11	Anna Wolowicz-Trouwborst	Cover page update

Net op zee IJmuiden Ver Al

Zee tracé





Versie	1.0	Datum	22-4-2022
Schaal	1:75.000	Formaat	A3
Kenmerk	2204_alpha_offshore kaartbeeld 1 van 11		

0 1 2 3 4 Km

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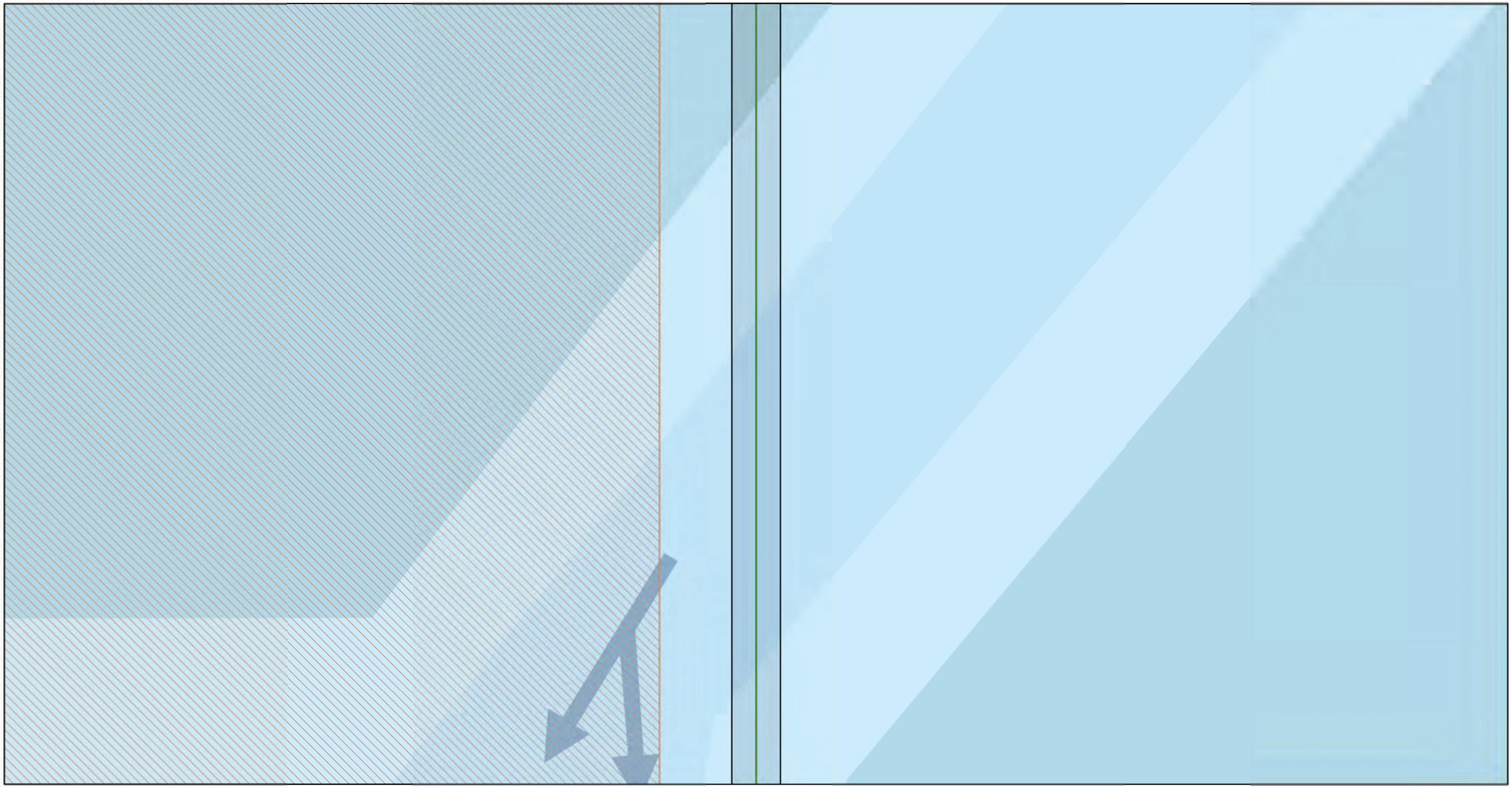
Net op zee IJmuiden Ver Alpha

Zee tracé



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Schaal	1:75.000	Formaat	A3
Kenmerk	2204_alpha_offshore kaartbeeld 2 van 11		

0 1 2 3 4 Km

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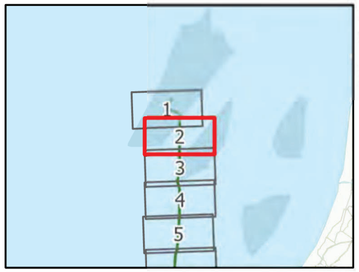
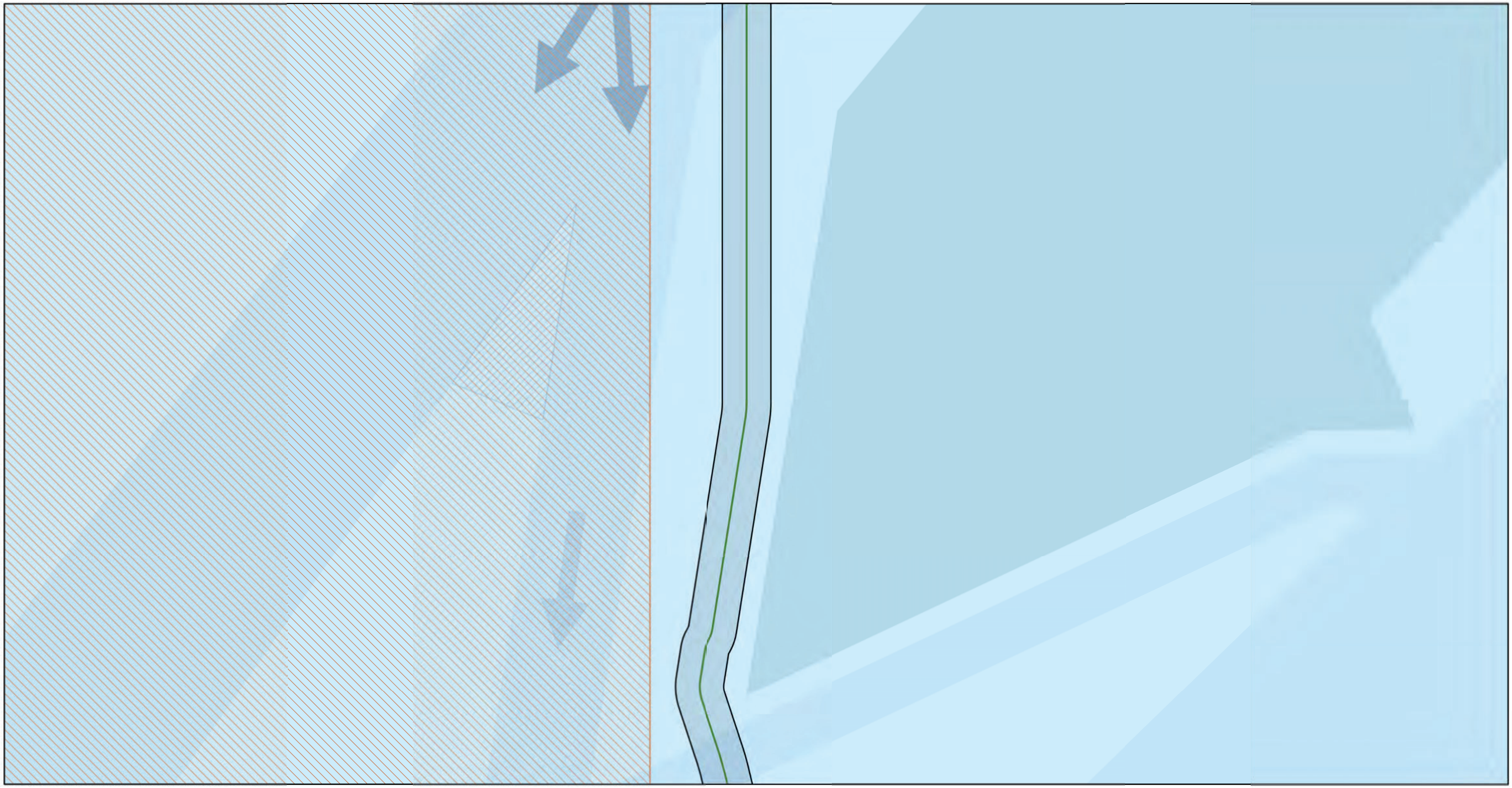


- IJVer Alpha zeetracé
- Vergunningszone
- Indicatieve ligging Bruine Bank
- Andere aangewezen windenergiegebieden
- Clearways scheepvaart

Net op zee IJmuiden Ver Alpha

Zee tracé



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Kenmerk	2204_alpha_offshore kaartbeeld 3 van 11		

0 1 2 3 4 Km

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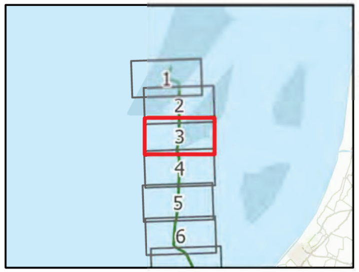
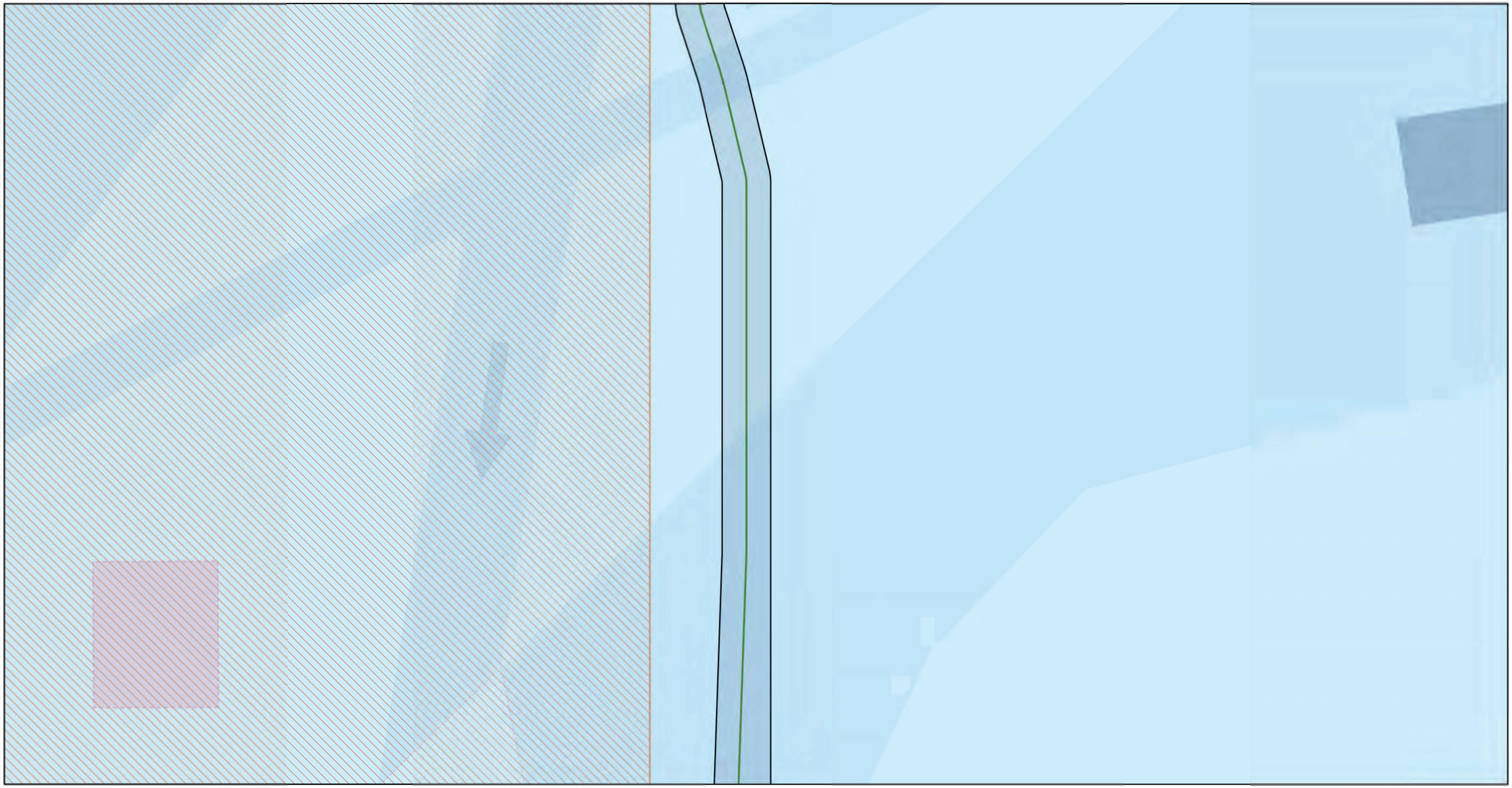


- IJVer Alpha zeetracé
- Vergunningszone
- Indicatieve ligging Bruine Bank
- Seperatiezone
- Andere aangewezen windenergiegebieden
- Clearways scheepvaart

Net op zee IJmuiden Ver Alpha

Zee tracé



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Kenmerk	2204_alpha_offshore kaartbeeld 4 van 11		

0 1 2 3 4 Km

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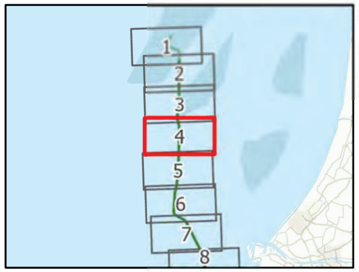
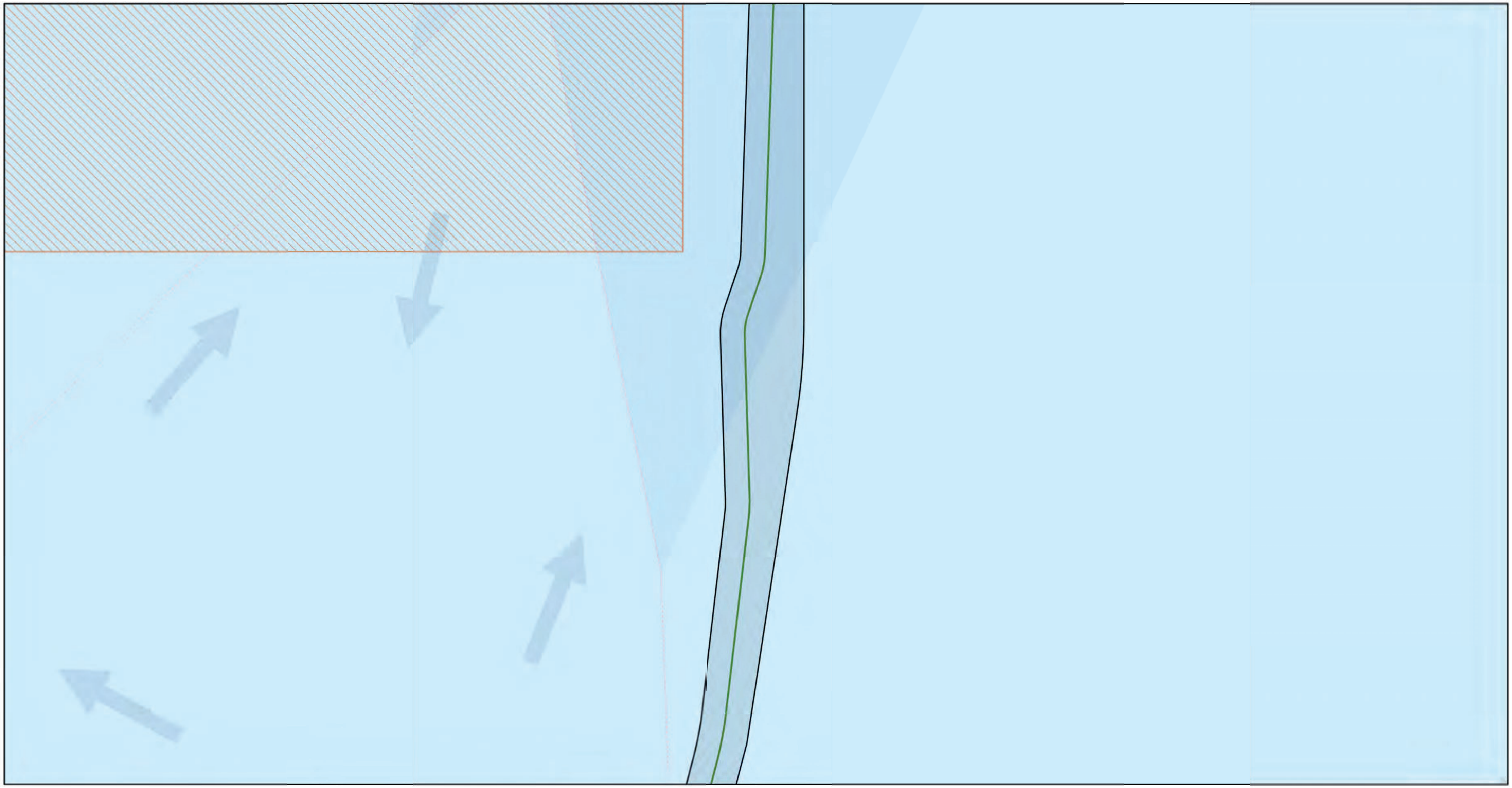
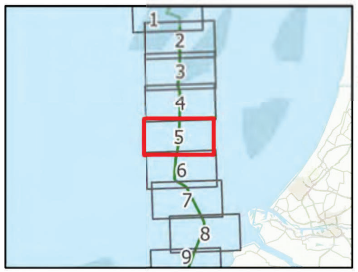


- IJVer Alpha zeetracé
- Vergunningszone
- Indicatieve ligging Bruine Bank
- Special area
- Te vermijden gebied
- Ankergebieden
- Andere aangewezen windenergiegebieden
- Clearways scheepvaart

Net op zee IJmuiden Ver Alpha

Zee tracé





- IJVer Alpha zeetracé
- Vergunningszone
- Indicatieve ligging Bruine Bank
- Special area
- Clearways scheepvaart

Versie	1.0	Datum	22-4-2022
Schaal	1:75.000	Formaat	A3
Kenmerk	2204_alpha_offshore kaartbeeld 5 van 11		

0 1 2 3 4 Km

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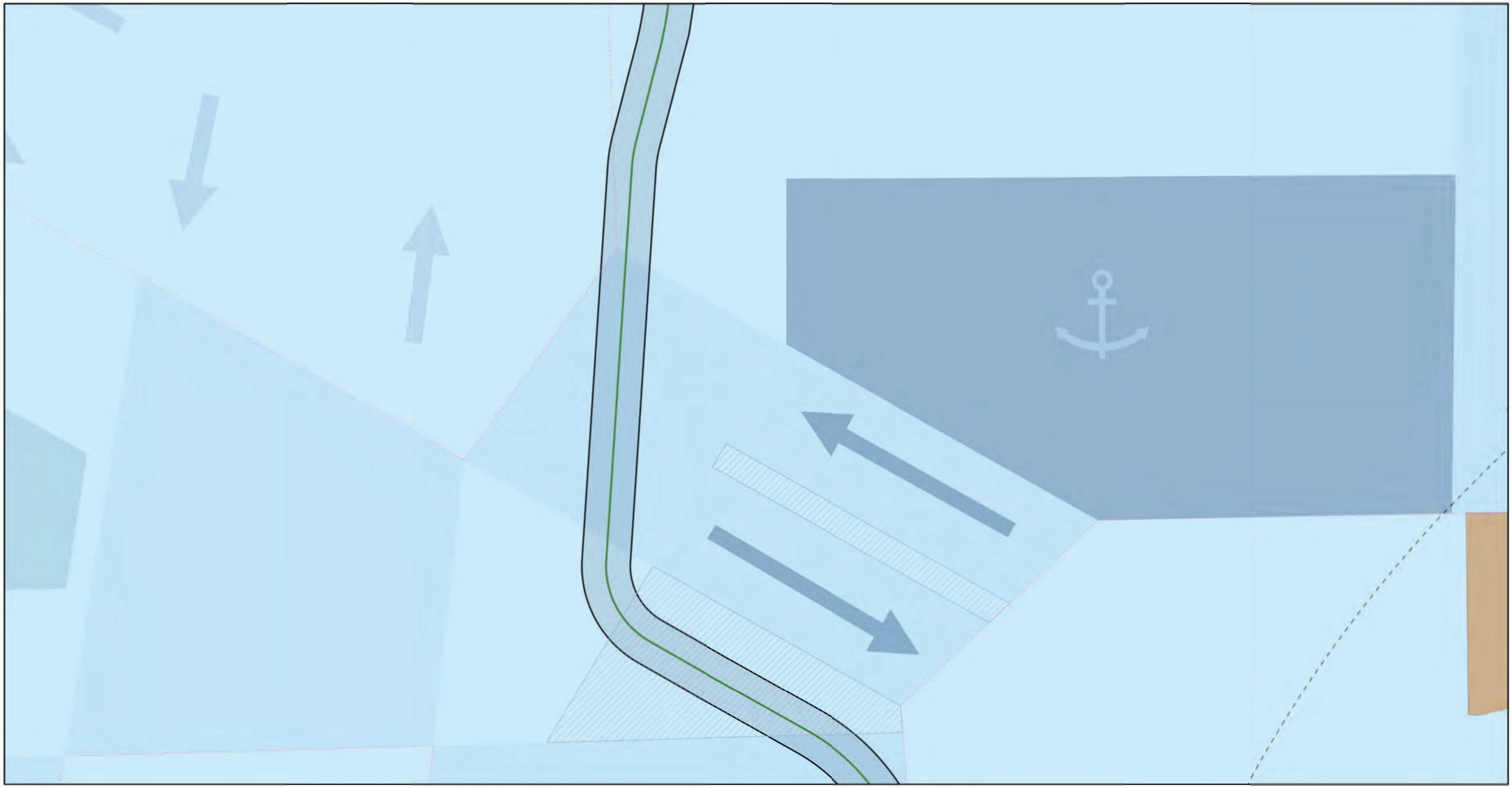
Net op zee IJmuiden Ver Alpha

Zee tracé



Versie	1.0	Datum	22-4-2022
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0 1 2 3 4 Km

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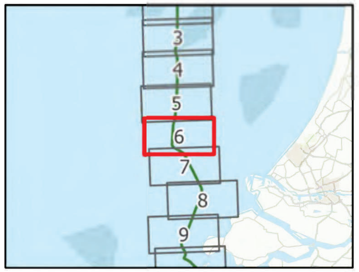
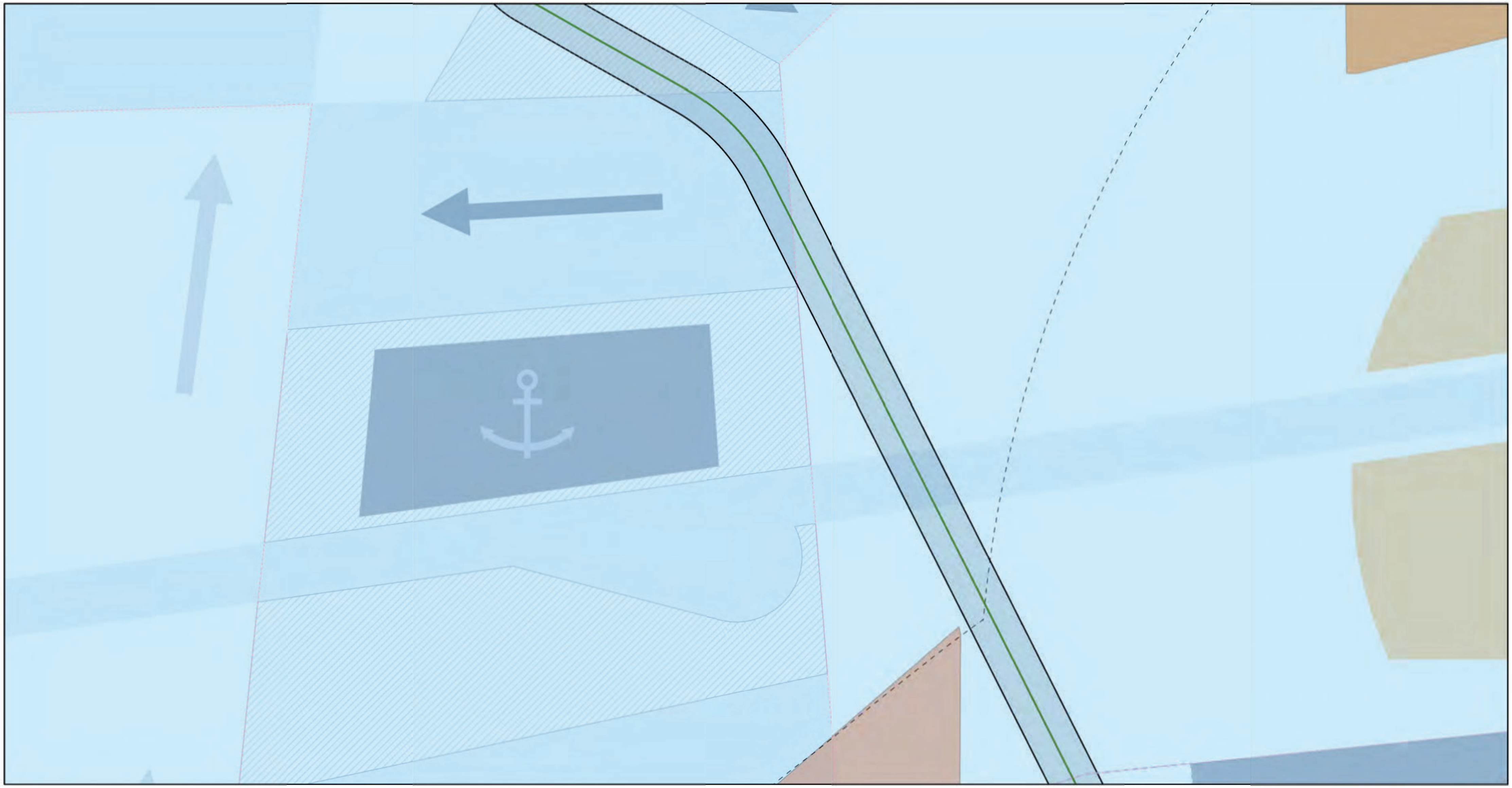


- IJVer Alpha zeetracé
- Vergunningszone
- 12-mijlszone
- Seperatiezone
- Special area
- Vergunde zandwingebieden
- Toekomstige zandwingebieden
- Ankergebieden
- Andere aangewezen windenergiegebieden
- Clearways scheepvaart

Net op zee IJmuiden Ver Alpha

Zee tracé



Versie	1.0	Datum	22-4-2022
Schaal	1:75.000	Formaat	A3
Kenmerk	2204_alpha_offshore kaartbeeld 7 van 11		

0 1 2 3 4 Km

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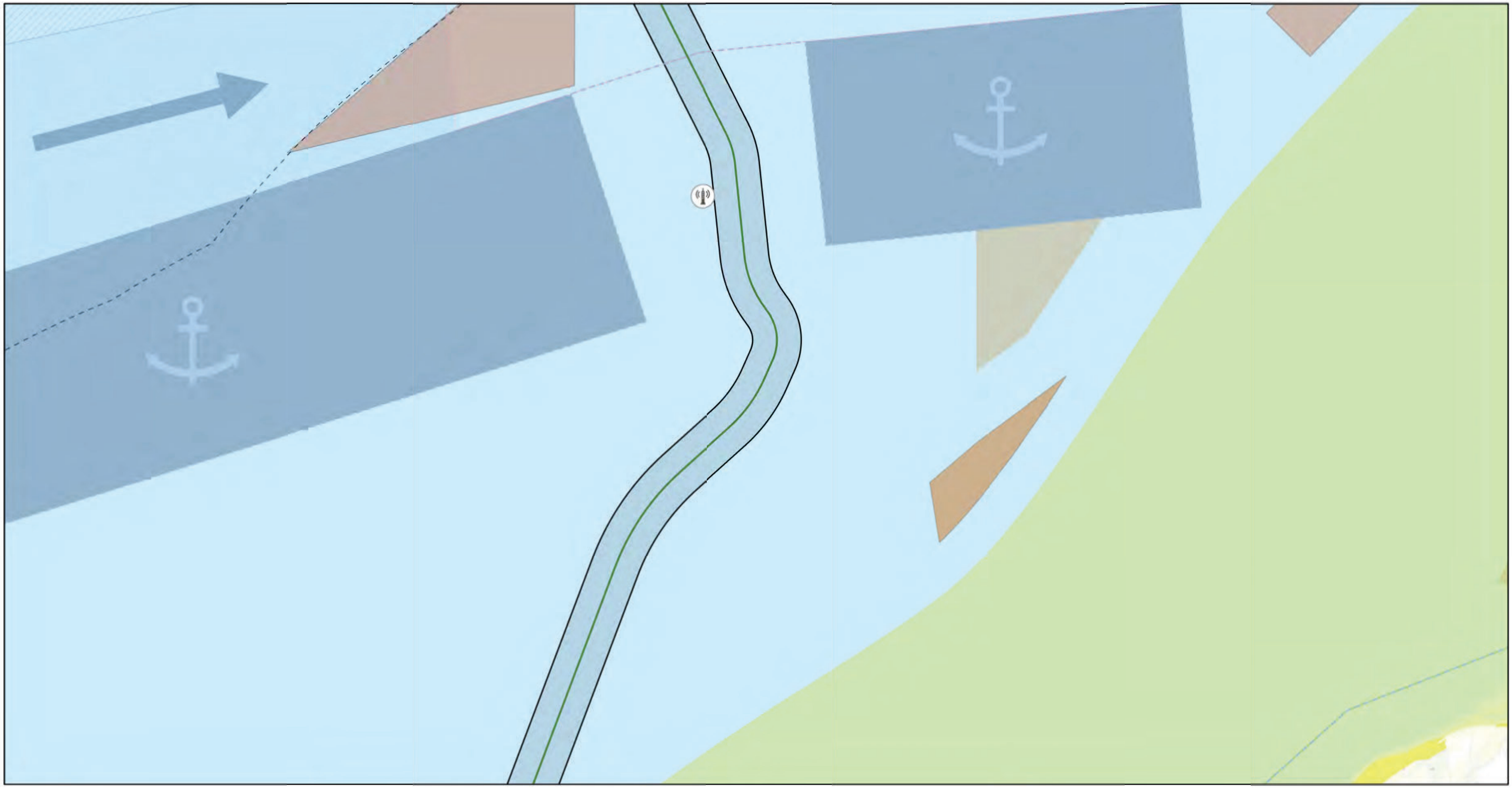
IJVer Alpha zeetracé
Vergunningszone
12-mijlszone
Inshore Traffic Zone
Seperatiezone
Special area
Vergunde zandwingebieden
Toekomstige zandwingebieden
Ankergebieden
Clearways scheepvaart

Net op zee IJmuiden Ver Alpha

Zee tracé



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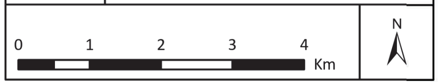
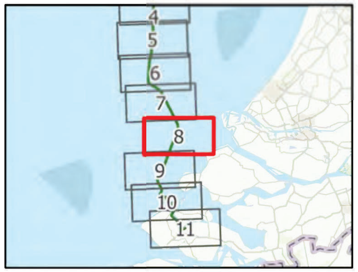
Schaal	1:75.000	Formaat	A3
Kenmerk	2204_alpha_offshore kaartbeeld 8 van 11		





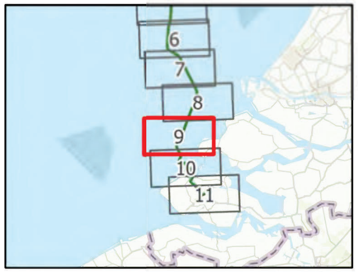
Lichteiland Goeree
IJVer Alpha zeetracé
Vergunningszone
12-mijlszone
Inshore Traffic Zone
Seperatiezone
Special area
Vergunde zandwingebieden
Toekomstige zandwingebieden
Ankergebieden
Clearways scheepvaart

Natura2000

Habitatrichtlijn
Vogel- en Habitatrichtlijn

Net op zee IJmuiden Ver Alpha

Zee tracé



Versie	1.0	Datum	22-4-2022
Schaal	1:75.000	Formaat	A3
Kenmerk	2204_alpha_offshore kaartbeeld 9 van 11		

0 1 2 3 4 Km

N

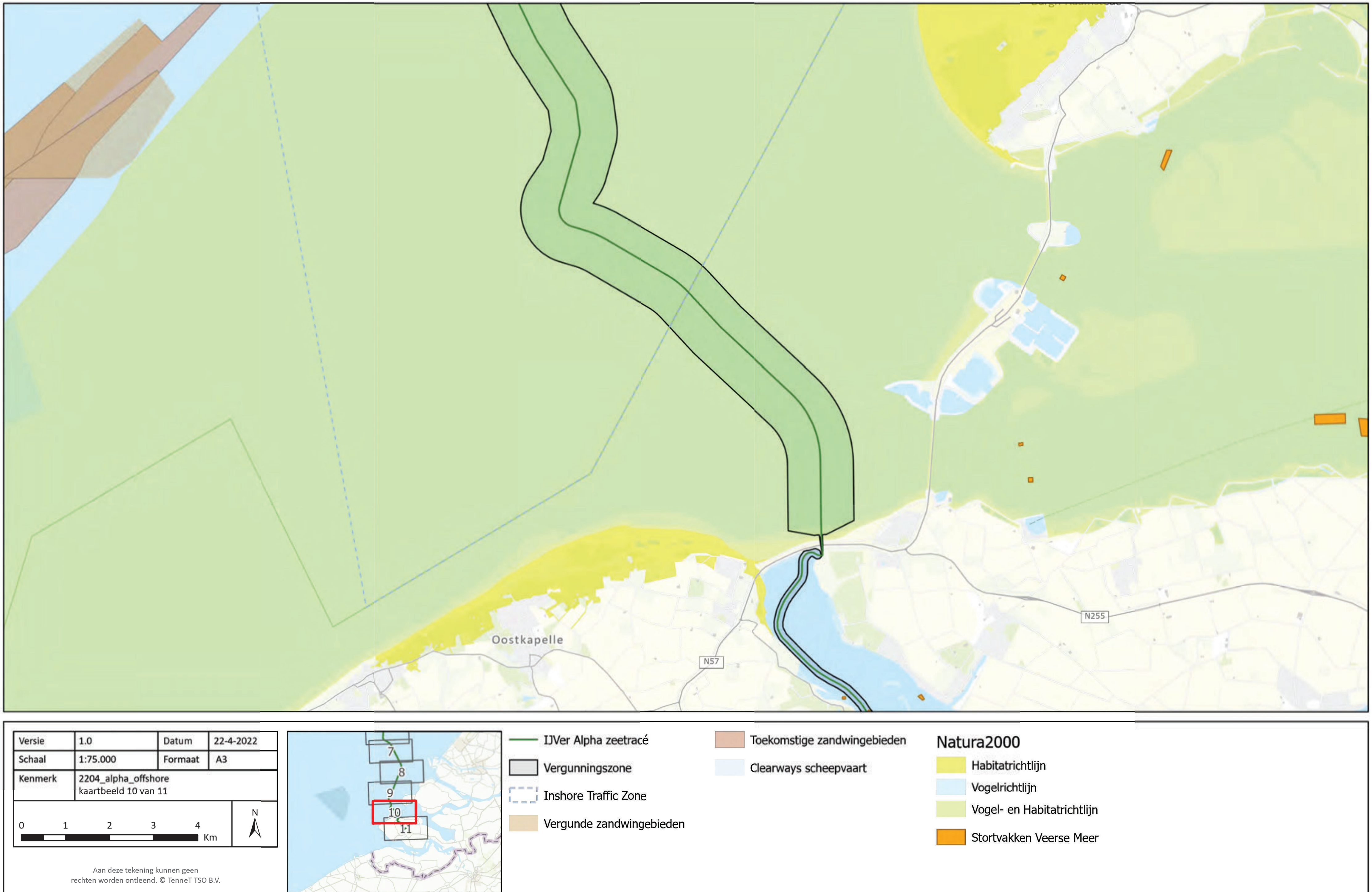
- IJVer Alpha zeetracé
- Vergunningszone
- Inshore Traffic Zone
- Special area
- Vergunde zandwingebieden
- Toekomstige zandwingebieden
- Ankergebieden
- Clearways scheepvaart

Natura2000

- Habitatrichtlijn
- Vogel- en Habitatrichtlijn

Net op zee IJmuiden Ver Alpha

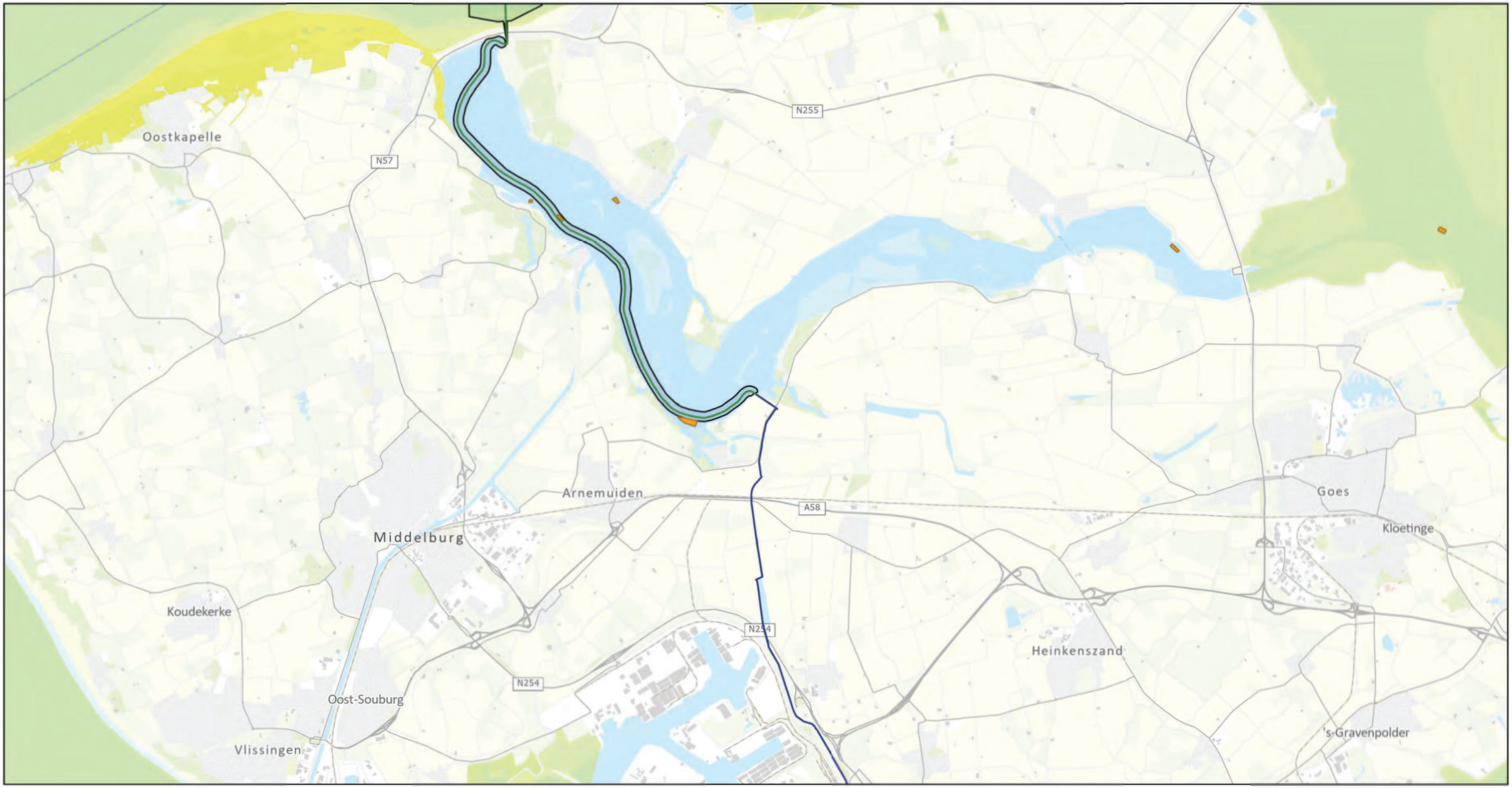
Zee tracé



Versie	1.0	Datum	22-4-2022
Schaal	1:75.000	Formaat	A3
Kenmerk	2204_alpha_offshore kaartbeeld 10 van 11		

Net op zee IJmuiden Ver Alpha

Zee tracé



Versie	1.0	Datum	22-4-2022
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0 1 2 3 4 Km

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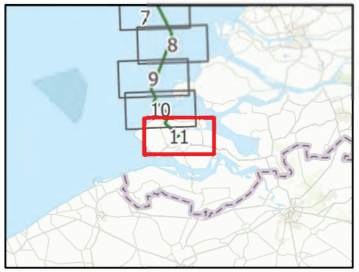

- IJVer Alpha zeetracé
- IJVer Alpha landtracé
- Vergunningszone
- Inshore Traffic Zone

Natura2000

- Habitatrichtlijn
- Vogelrichtlijn
- Vogel- en Habitatrichtlijn

- Stortvakken Veerse Meer