Revolution Wind Export Cable State Waters | Cable Burial Work Plan

Submitted Pursuant to the State of Rhode Island Department of Environmental Management Condition #12 and Rhode Island Coastal Resources Management Council Category B Assent Condition A

May 2024 (v2)

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1.0 Introduction

Revolution Wind, LLC (Revolution Wind) (formerly DWW Rev I, LLC), a 50/50 joint venture between Orsted North America Inc. (Orsted NA)[1] and Eversource Investment, LLC (Eversource), will construct and operate the Revolution Wind Farm Project (hereinafter referred to as the Project). Revolution Wind will provide clean, reliable offshore wind energy that will increase the amount and availability of renewable energy to New England consumers while creating the opportunity to displace electricity generated by fossil fuel-powered plants and offering substantial economic and environmental benefits to the New England region. Rhode Island and Connecticut have adopted substantial renewable portfolio standards and clean energy targets to address issues associated with climate change, highlighting the current and future demand for this Project. In response to this expressed need and demand, Rhode Island and Connecticut have awarded Revolution Wind five Power Purchase Agreements (PPAs) to-date, totaling 704 MW of generation capacity. The Project will fulfill Revolution Wind's obligations to both Connecticut and Rhode Island in accordance with the PPAs.

Power from the Revolution Wind Farm (RWF) will be delivered to the existing mainland electric grid via the submarine export cable referred to as the Revolution Wind Export Cable (RWEC) in federal waters on the outer continental shelf (RWEC-OCS) and in Rhode Island State waters (RWEC-RI), the Onshore Transmission Cable, the Onshore Substation (OnSS), and the underground right-of-way connecting the OnSS to the Interconnection Facility (ICF).

This Cable Burial Work Plan (Plan) has been developed for installation of the nearshore portions of the project in Rhode Island State waters, which includes the RWEC-RI. This Plan is being submitted pursuant Condition #A of the Rhode Island (RI) Coastal Resources Management Council (CRMC) Category B Assent #B2021-07-005, and Condition #12 of the State of Rhode Island Department of Environmental Management (RIDEM) Water Quality Certificate #21-135 and Dredge Permit #DP-21-187 (WQC Permit), which are set forth in Table 1 below along with other relevant conditions.

Table 1 Relevant Permit Conditions

Permit Condition	Detail
CRMC Category B Assent Condition A	Cable Burial Work Plan: The Applicant shall submit a Cable Burial Work Plan for review and approval by the CRMC Council at least 90 days prior to the start of construction of the offshore activities. The Work Plan shall include all elements of the trenching and dredging work in areas within CRMC's regulatory authority. The work plan shall include, at a minimum, a detailed schedule, weather and equipment contingency plans, a detailed list of all equipment and vessels to be utilized, and a detailed anchoring and spud plan.

[1] Note that in October 2018, Deepwater Wind LLC was acquired by Orsted North America Inc

Permit Condition	Detail
CRMC Category B Assent Condition B	Construction Schedule and Time of Year Restrictions: At the request of the RIDEM, the Cable Burial Work Plan shall require a more detailed construction schedule via-a-vis fishery time of year restrictions. In the event that the Project construction schedule changes, the Applicant will be required to provide both CRMC and RIDEM with an updated such schedule, for approval, prior to any changes being made.
CRMC Category B Assent Condition C	Dredge Window: The proposed dredging activities described in the permit application, which includes cable installation using either jet plowing or mechanical plowing approaches, must adhere to the following time of year restrictions and conditions. All in-water construction activities north of the ColRegs Demarcation line shall occur between August 31 and January 31. No further modification to this extended dredge window shall be granted *except, and consistent with RIDEM's July 7, 2023 revisions to Condition 9 of its Water Quality Certificate (21-135) and Dredge Permit (DP-21-187), offshore HDD works would begin July/August 2024 (prior to the approved August 31 start of the approved dredge window) and continue through the approved window.
CRMC Category B Assent Condition F	Cable Burial Plan: Prior to the submittal of the Cable Burial Work Plan, the cable installation contractor shall complete and provide to the CRMC and RIDEM the "Cable Burial Plan." This study shall include a detailed assessment of the anticipated sediment conditions, unforeseen conditions, and the proposed cable installation method. This study shall be included and incorporated into the work plan.
CRMC Category B Assent Condition H	Cable Burial Depth: Target cable burial depth is a minimum cable burial depth of four (4) feet and six (6) feet, or deeper along the entire length of the export cable in state waters. Burial depth shall be determined from the top of the cable below existing seabed. In cases where the minimum burial depth cannot be achieved due to cable and pipeline crossings, machine failures, or unforeseen adverse bottom conditions, Revolution Wind will be required to attain minimum burial depth where Revolution Wind confirms depth can be achieved through reburial using the Capjet plow or similar method. Where Revolution Wind confirms reburial using the Capjet plow or similar method will not achieve minimum burial depth, Revolution Wind will confirm the acceptable burial depth from the cable burial risk assessment approach (which assesses seabed conditions, seabed mobility, and the risk of interaction with external hazards such as commercial fishing gear and vessel anchors engineered zonally along the route). In cases where this Capjet plow or similar method is unsuccessful in achieving burial depth or in the cases of cable or pipeline crossing, secondary cable protection shall be used to minimize risk to the cables and risk to other water users, including hazards such as commercial fishing gear and vessel anchors.
CRMC Category B Assent Condition J	Cable Burial Tools: The applicant is required to use the best tool from their list of available tools (as described in the application and supplemental information provided) to achieve a proper cable burial depth of 4-6 feet or deeper, in accordance with their cable burial work plan. Revolution Wind expects to use jet assisted mechanical plow as the principle proposed method of burial on all segments of the RWEC-RI route except for at and north of the Jamestown Bridge where lower water depths and bridge height restrictions will require burial by jetting or other appropriate and feasible methods. Revolution Wind shall simultaneously lay and bury cables in state waters unless ground conditions are inappropriate or technically unfeasible.
CRMC Category B Assent Condition K	Cable Burial during Construction: Revolution Wind shall mitigate against the risk of not achieving target burial depth by using one or more of the following options, depending on tool choice: a) using the geometry of the plow relative to the seabed and where necessary adjusting the tool settings; b) tuning the plow jetting system to the soil types encountered along the route as necessary c) remotely adjusting the depth of burial on the plow during operations as necessary d) monitoring and managing tow forces, share depth and plow speeds in the event hard clays are encountered;

Permit Condition	Detail
	e) performing continuous, real time trenching performance validation to ensure the tool is operating as per the contractor specification, ensuring the tooling performs optimally for the given burial requirements and the as-encountered ground conditions; and f) performing continuous, real time burial performance validation, understanding cable burial versus the given burial requirements and the as-encountered ground conditions.
RIDEM Water Quality Certificate and Dredge Permit Condition 9	Dredge Window: The proposed dredging activities as described in the permit application must adhere to the following time of year restrictions and conditions. A. Cofferdam installation – The potential cofferdam installation as described in the permit application shall be installed via a vibratory hammer and shall not be limited to a time of year restriction. B. HDD temporary excavation pits – The proposed HDD approach as described in the permit application may occur anytime between August 31 and January 31. Dredge material stored on a support barge must remain wet if reused to fill the exit pits. If the dredge materials begin to dry out, seawater must be pumped onto the spoils to rewet the material. Jet plowing/mechanical plowing – The proposed cable installations north of the ColRegs Demarcation Line as described in the permit that require the use of a jet plow or mechanical plow may occur anytime between August 31 and January 31. This time frame is an extension of the current window of October 15 to January 31.
RIDEM Water Quality Certificate and Dredge Permit Condition 12	Cable Burial Work Plan: The Applicant shall submit a Cable Burial Work Plan for review and approval by DEM at least 90 days prior to the start of construction. The Work Plan shall include all elements of the trenching and dredging work in areas within DEM regulatory authority and at a minimum, a detailed schedule, weather and equipment contingency plans, a detailed list of all equipment and vessels to be utilized, and a detailed anchoring and spud plan.
RIDEM Water Quality Certificate and Dredge Permit Condition 13	Cable Burial Plan: Prior to the submittal of the Cable Burial Work Plan, the cable installation contractor shall complete and provide to the CRMC and DEM the "Cable Burial Plan." This study shall include a detailed assessment of the anticipated sediment conditions, potential unforeseen conditions, and the proposed cable installation method. This study shall be included and incorporated into the work plan.
RIDEM Water Quality Certificate and Dredge Permit Condition 14	Cable Burial Depth: The project shall be required to reach a minimum cable burial depth of four feet, with a target cable burial depth of four (4) feet to six (6) feet, or deeper along the entire length of the export cable in state waters. Burial depth shall be determined from the top of the cable below existing seabed. In cases where the minimum burial depth of four (4) feet cannot be achieved due to cable and pipeline crossings, machine failures, or unforeseen adverse bottom conditions, the Applicant will be required to attain minimum burial depth where they confirm depth can be achieved through reburial using the Capjet plow or similar method. Where the Applicant confirms reburial using the Capjet plow, or similar method, will not achieve minimum burial depth, the Applicant will confirm the acceptable burial depth from the cable burial risk assessment approach (i.e., that assesses seabed conditions, seabed mobility, and the risk of interaction with external hazards such as commercial fishing gear and vessel anchors engineered zonally along the route).
RIDEM Water Quality Certificate and Dredge Permit Condition 15	Cable Burial Tools: The Applicant is required to use the best tool from their list of available tools (described in the application and supplemental information provided) to achieve a proper cable burial depth, in accordance with their cable burial work plan. The Applicant expects to use a jet assisted mechanical plow as the principal proposed method of burial on all segments of the RWEC RI route except for at and north of the Jamestown Bridge where lower water depths and bridge height restrictions will require burial by jetting or other appropriate and feasible methods. The Applicant shall simultaneously lay and bury cables in state waters unless ground conditions are inappropriate or technically unfeasible.

Permit Condition	Detail
RIDEM Water Quality Certificate and Dredge Permit Condition 16	Cable Burial During Construction: The Applicant shall mitigate against the risk of not achieving target burial depth by using one or more of the following options, depending on tool choice: A. using the geometry of the plow relative to the seabed and where necessary adjusting the tool settings; B. tuning the plow jetting system to the soil types encountered along the route as necessary; C. remotely adjusting the depth of burial on the plow during operations as necessary; D. monitoring and managing tow forces, shear depth and plow speeds in the event hard clays are encountered; E. performing continuous, real time trenching performance validation to ensure the tool is operating as per the contractor specification, ensuring the tooling performs optimally for the given burial requirements and the as-encountered ground conditions; and F. performing continuous, real time burial performance validation, understanding cable burial versus the given burial requirements and the as-encountered ground conditions.

This Plan is being submitted to CRMC and RIDEM at least 90 days prior to the start of construction activities in Rhode Island State Waters. Revolution Wind anticipates cable installation, including associated trenching and dredging activities, in Rhode Island State Waters to take place from September 1, 2024 to January 31, 2025 and will adhere to the time of year restriction (TOYR) that restricts in-water construction activities north of the ColRegs Demarcation Line between February 1 and August 31 annually. If work extends beyond January 31, it will resume on or after September 1 after the TOYR. Cable pull-in is anticipated to occur starting in July 2025. In addition, in accordance with Category B Assent Condition F and RIDEM Water Quality Certificate and Dredge Permit Condition 12, the Cable Burial Plan is included as Appendix A.

The cable will be installed by creating a trench using tools provided in Appendix A and the cable installation methodology is further discussed in Appendix B. The only dredging the Project anticipates is at the horizontal directional drilling (HDD) exit pits, which is also described in Appendix B.

2.0 Construction Schedule

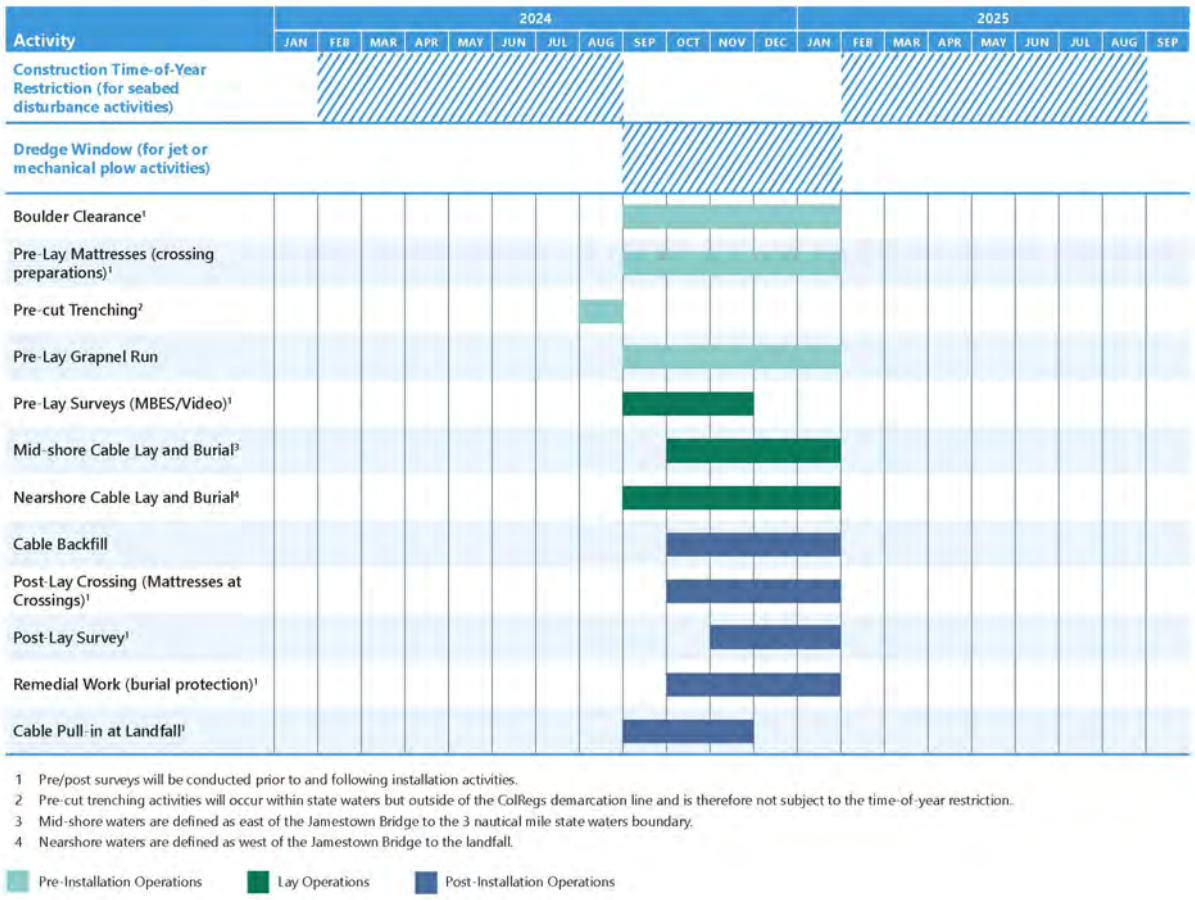
Revolution Wind has included a detailed construction schedule as Figure 2-1 below in accordance with CRMC Category B Assent Condition B. **Figure 2.1-1** below provides an overview of the schedule.

The construction schedule is representative of the time that Revolution Wind and its contractor, expect construction activities to take in Rhode Island state waters, and is subject to TOYR in its various permits.

All in-water construction activities occurring north of the ColRegs Demarcation Line, including dredging activities associated with either a jet plow or mechanical plow, will occur during the dredge window, August 31 through January 31 in accordance with the RIDEM WQC Condition 9 and CRMC Category B Assent Condition C. Landfall cable pull-in activities are scheduled to take place between September 1, 2024 to January 31, 2025. Due to the short installation window, the export cables will be split in different segments to allow for work outside the ColRegs Demarcation Line when restrictions are in place. This will reduce the amount of work to be carried out within the boundary once the restrictions are lifted.

While the schedule builds in allowances for weather-related delays, the marine environment is inherently dynamic and, as such, the schedule is designed to be indicative. In the event the project construction schedule changes, Revolution Wind will provide CRMC with notice under Category B Assent Condition B and will also provide RIDEM with notice prior to any changes being made.

Figure 2-1 Construction Schedule



3.0 Equipment and Vessels

Installation of the RWEC-RI will require the support of construction equipment and various vessels. **Table 2** summarizes the equipment that Revolution Wind plans to use during construction of the RWEC. Appendix A includes specifications for each equipment type.

Table 3 summarizes the vessels Revolution Wind plans to use during construction in state waters, including vessel type, vessel name, and the number of vessels. Certain vessels have not yet been contracted, and thus are reflected in the table as to be confirmed (TBC). Additionally, actual vessel usage, durations of work, and associated specifications are subject to change based on unforeseen changes in vessel availability and/or changes to Project installation schedule. Appendix C includes specifications for each vessel as available.

RWEC installation tools and methods are described in detail in the Revolution Wind Cable Burial Plan, submitted separately pursuant to CRMC Category B Assent Condition F and RIDEM Water Quality Certificate and Dredge Permit Condition 13 and appended to this Plan as Appendix B.

Table 2 Cable Installation Equipment

Equipment Type	Activity
Base Case Equipment[1]	
Jet Sled	Nearshore Cable Burial
Jetting Cable Plow	Midshore Cable Burial
I-plow	Pre-cut trenching
Capjet	Cable Burial (in areas the plow cannot conduct base case burial operations, e.g. joint locations and cable crossing locations)
Diver-operated Dredge	Excavation of HDD Exit Pit
Contingency Equipment[2]	
Capjet	Remedial Burial
Mechanical Trencher	Remedial Burial

1. Base Case Equipment refers to the equipment Revolution Wind plans to use for cable installation in state waters barring unforeseen challenges or circumstances that may require the use of Contingency Equipment.
2. Contingency Equipment refers to equipment Revolution Wind may need to use if unforeseen challenges or circumstances necessitate additional or different tools be used beyond the Base Case Equipment.

Table 3 Cable Installation Vessels for Construction in State Waters

Vessel Type[1]	Vessel Name	# Vessels
Cable Lay Vessel	Aurora	1
Pull-tug[2]	TBC	1
Cable Lay Barge	Marmac 306	1
Cable Lay Barge Tug/Anchor Handlers[2]	TBC	TBC
Pre-lay Survey Vessel (nearshore)	Bella Marie	1
Nearshore Support Barge (Pre-lay Grapnel Run, Mattress, Boulders)	JF Brennan Barge	1
Nearshore Support Barge (Transport)	JF Brennan Barge	1
Support Tug	Bucky	1
Support Tug	Kodiak	1
Crew Transfer Vessel (Nearshore)	Barbara Miller	1
Crew Transfer Vessel (Nearshore)	Katie T	1
Light Construction Vessel (Survey, Pre-lay Grapnel Run, Boulder Clearance, Mattress)	Shelia Bordelon	1
Boulder/Pre-Plowing Vessel	Laney Chouest	1
Trenching Support Vessel (Survey, remedials)	Deep Cygnus	1
Survey Vessel	Marc Robert	1
Remedial Rock Installation Vessel[2]	TBC	TBC
Safety Vessels[2]	TBC	TBC

1 Actual vessel usage, durations of work, and associated specifications are subject to change based on unforeseen changes in vessel availability and/or changes to Project installation schedule.

2 Specific vessel names may be provided to CRMC and RIDEM upon final contracting.

4.0 Equipment and Weather Contingency Plans

This section describes alternative methods and procedures that can be used during a contingency scenario in the case of unforeseen circumstances that require a change in equipment or vessels and/or weather conditions in state waters.

4.1 Equipment Contingencies

If the required burial depth is not achievable with the base case equipment and/or methodology, both Revolution Wind, Marine Warranty Surveyor (MWS) and the Certified Verification Agent (CVA) will be notified through their representatives on the relevant vessel or barge. Nexans will also notify Revolution Wind, who is responsible for the necessary notification towards relevant authorities such as CRMC. Nexans will utilize all available information and resources to propose a new way forward. For example, depending on the issue at hand and the information on the particular issue, this may be an alternative burial method, processing/gathering of survey data or other activity to enable selection of an alternate burial method. The decision to proceed with an alternative burial method and the details around the contingency will be formalized in a Management of Change process or through review of new procedures in the document control system, which will include review of the proposed method versus the Cable Burial Risk Assessment and applicable permits.

4.1.1 Alternative Burial Methodology

The Capjet tool may be used to perform remedial work in the nearshore shallow waters (e.g., burial of joints and/or cable section, grade in-outs etc.). Additionally, should the cable plow fail, a backup solution will be implemented, utilizing the Capjet water jetting system in combination with a mechanical trencher. The Capjet system may be utilized in areas with soft soils, while pre-plowing using a tool like the mechanical trencher may be utilized where burial depths are above 2.0m, where harder soils are anticipated, or in areas of higher boulder density or risk of sub-surface boulders. The Capjet may be used from the Cable Lay Vessel or a support vessel, while the mechanical trencher may be used from a support vessel. For the above contingency scenario, the cable will be temporarily laid on seabed before burial. Appendix A includes specifications for the Capjet and the mechanical trencher.

Burial equipment may from time to time require diver intervention, for example, to load or unload cable.

4.1.2 Cable Repair

Equipment and personnel to perform contingency repairs to the outer sheath will be available on board the cable lay vessel during the installation campaigns. For other repairs an assessment will be made if a

standard Nexans procedure will be used or a projects specific procedure is required, including an assessment of required equipment and personnel to perform the repair.

4.2 Weather Contingencies

Construction will only commence when there is a suitable weather window based on installation analyses performed. Weather forecasts will be monitored and assessed by vessel captains, Revolution Wind representatives, and MWS/CVA as applicable for construction. In case of cable laying activities, the MWS will issue a Certificate of Approval (COA) to enable the works to commence, inclusive of the estimated time to complete the works plus a safety time factor of a specified number of hours or days where appropriate. This will be the operational window where the long-term forecast is within the operational limits of the vessel.

In the case of unforeseen weather while conducting operations, Nexans will consider the options of continuing, holding station, or finding a pre-determined safe haven. For operations other than cable laying, this is a relatively straightforward decision to make with no specific impact to the project other than loss of time. For operations where the vessels are actively cable laying, the need to abandon (i.e. cut) the cable to find a safe haven is a decision for the vessel master to make, having considered the safety of the vessel and crew. Where time allows, a controlled abandonment will be executed in line with the Nexans' abandonment procedure. For example, this essentially requires the cable to be cut and an end seal fitted before the cable is lowered to the seabed and a fix taken. The other more drastic option is to simply cut the cable free of the vessel to enable the vessel to move to a safe location as quickly as possible.

5.0 Anchoring and Spud Plan

Revolution Wind developed the RWEC-RI Anchoring Plan (Plan) for installation of the RWEC-RI and identification of areas restricted for anchoring (see Appendix D). The Plan describes anchoring activities in Rhode Island State waters and describes information that will be provided to contractors regarding areas that are restricted from anchoring (i.e., no anchoring areas). The Plan was submitted to the United States Army Corps of Engineers (USACE) on September 29, 2023 and amended and submitted again on October 4, 2023, in accordance with USACE Conditions 2 and 8, Revolution Wind Condition 12 of the RIDEM Water Quality Certificate #21-135 and Dredge Permit Application #DP-21-187 (WQC Permit), and the CRMC Category B Assent #B2021-07-005. The Plan was submitted to USACE to support the review of the Revolution Wind USACE Individual Permit application. The Plan was approved on October 4, 2023.

Appendix A – Equipment Specifications

Capjet - Cable Burial Tool and Remedial Burial

NEXANS CAPJET

Nexans
BRINGS ENERGY TO LIFE

NEXANS CAPJET trenchers are developed and built by NEXANS Norway and have been used for jetting of cables, umbilicals and pipelines since mid-80s. The CAPJET machines have been frequently optimized since the first design. The water pumps systems can either be based on low pressure pumps or a combined high/low pressure pump system ensuring an optimized setup for the actual soil conditions on site.
Expected burial speed up to 10 m/min and maximum burial depth of 3m

The CAPJET low pressure system is generally optimized for work in soils up to 70 kPa.
For harder soils,up to 175kPa and / or high gravel content,the high-pressure system with an additional 200kW low pressure pump is used.

The CAPJET systems can in addition be equipped to remove rock/debury cables, to improve backfilling or set up for combined soils that include gravels,clay etc.

Water supply Capjet 1700HP
HP and LP front arm nozzles
LP transport water
2 x 400 KW water pumps, Pressure from 13 to 20 or 20 to 30 bar
1 x 200 KW water pump, Pressure from 8 to 12 bar

Water supply Capjet 1450HP
LP front arm nozzles Capjet 1450HP
2 x 400 KW water pumps, Pressure from 13 to 20 bar

Hydraulic system
2 x 135 kW HPU
1 x 15 kW dirty hydraulic
10 x 17 thrusters (each 550 kg)
Bollard pull
Forward approx 2000 kg
Lateral 1000 kg
Vertical 1000 kg
Tension controll front tensioner (free float to 250kg)
all HPUs pressure are software controlled

Main structure and trenching module
Titanium air filled lifting structure, pressure rating 1000 m
Buoyancy (for North Sea operation) 1000 m rating
Adjustable front and aft swords
Vertical adjustable 600 mm
Horizontal adjustment of sword opening 200 mm
SWD Sword (Selective Water Distribution Sword).

Control system
All data are collected on a network which gives local control of all sensors and valve packs.
The latest control system technology as OPC, distributed data collection, touchscreens and WEB based monitoring and support tools.
The system can be fully supported through the internet and low speed connections.
Realtime control system for transformer control, LARS and umbilical winch control and monitoring.
Integration in vessel PMS when power from vessel available
MRU monitoring

Size & weight
Subsea power capacity 1700 HP
Capjet 10 x 4,5 x 2.5 m, max 18 t in air / 100-1000kg in water

Topside systems
Control container 1 x 20`, 7 t
Workshop 1 x 20`, 4 t
Transformer container 1 x 20`, 13 t
Storage container 1 x 20`, 7 t
Generators (optional) 2 x 20`, 18-23 t each

Handling system
Operation up to Hs 3.5 m vessel dependent
AHC Umbilical winch 4.4 x 3 x 2.8 m, 30 t (1000m typ)
LARS 18 t SWL DAF 3.33. 3.5 x 5 x 11m, 42 T

Sensors (typical)
Six color video cameras
Three off electrical P&T units
Obstacle avoidance sonar
Digiuquarts pressure sensor
Digital yoke sensor
Mesotech digital altimeter
Octans fiber optical survey gyro
Position sensors on all hydraulic movements
Doppler

Sensors (Optional)
Cable tracker
Multibeam
INS
3D Imaging sonar

Optional equipment
Backfill plough
Ejector system
Cable trenching to 3,2 m trench depth
Trenching swords with depressor

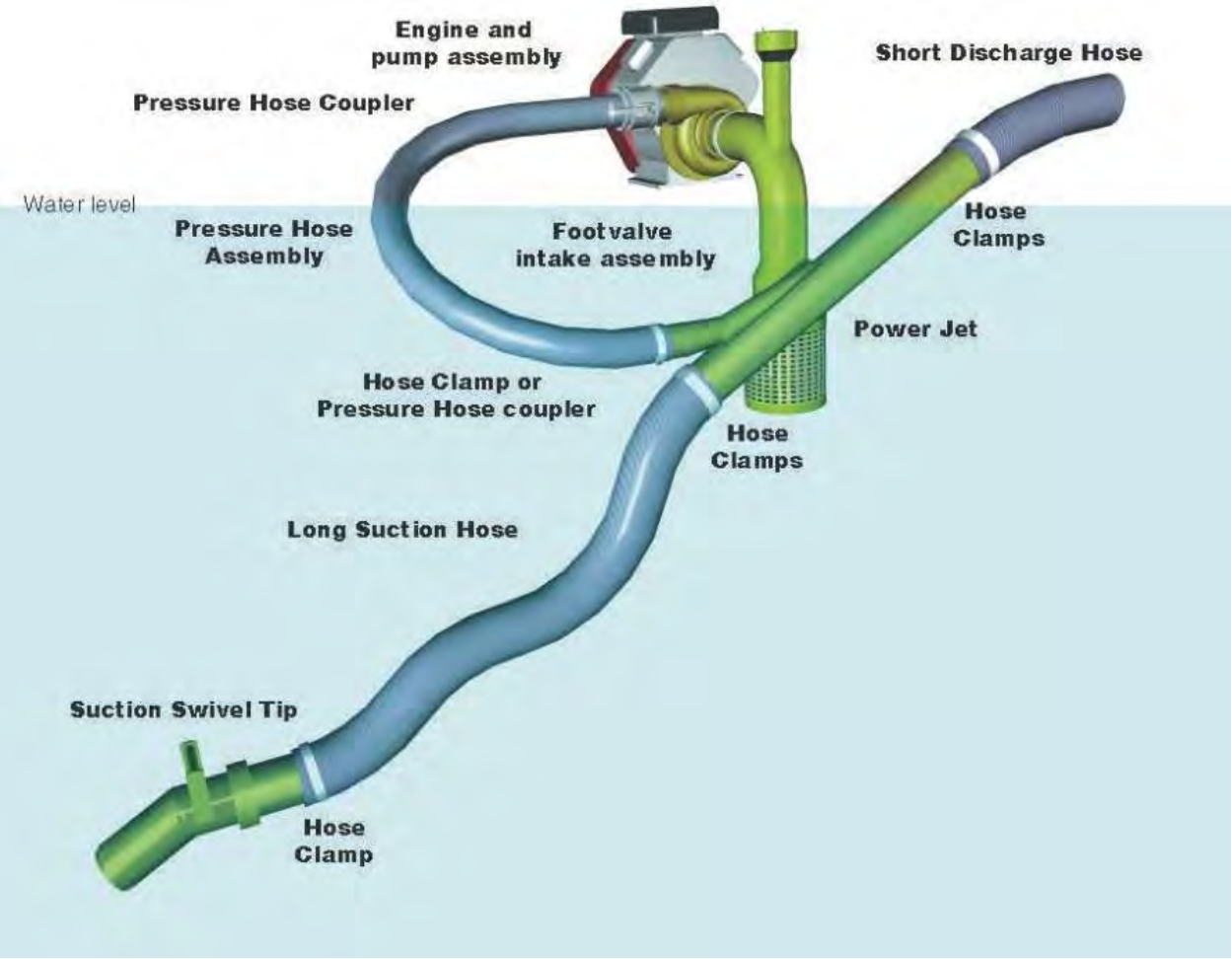



Diver-Operated Dredge – Excavation of HDD Exit Pit

High Lift Portable Venturi Dredge System

The venturi-operated dredge system can transport rock, sand, and gravel slurries up to 150 feet away. Our dredge consists of a 15.24cm (6-inch) power jet with two (2) 7.62mm (3-inch) jet logs, a 15.24m (50 ft) heavy-duty suction hose, and a 15.24cm (6-inch) swivel suction hose tip with a suction-breaking flap. A Godwind HL130 and two 7.63cm(3-inch) fire hoses deliver the water supply to the dredge.

General diagram of the dredge system



Power jet with two 3-inch jet logs

Three-inch fire hose attached to the power

50 feet Heavy Duty Pressure Hose

6” Swivel Suction Hose Tip with suction-breaking Flap

Godwin HL130

Mechanical Trencher – Remedial Burial

SPECIFICATION SHEET

ENS1600 TRENCHER

KEY FEATURES

- Simultaneous cutting and jetting operations.
- Easily and quickly adaptable for a varied range of modes including cutting and jetting.
- Backfill attachment.
- Trench depths up to 3.2m cutting and 5.0m jetting.
- Crane or A-Frame Launch.

ENS1600 trencher is a dual mode tracked vehicle with a proven track record for the burial of pipelines, flowlines, umbilicals and submarine cables. ENS1600 can be configured either in simultaneous cutting and jetting or jetting only mode.

ENS1600 can operate in 3.2m chain cutting mode and upto 5m jetting mode with backwash capability. This offers numerous solutions for product burial to meet specific client requirements.

Whilst typically fitted with a subsea power kit, ENS1600 can be configured to shallow water mode where the vehicle is surface fed from a support vessel.

ENS1600 can work in a number of markets including, but not limited to, Oil and Gas, Power Transmission and Offshore Renewables and power cables on the beach, in the surf and offshore.

ENSHORE
ADVANCED SEABED INNOVATION

ENS1600 TRENCHER

PARTICULARS

Operating Depth	1500m
Max. Product Diameter	300mm (Cutting), 500m (Jetting)
Max. Trench Depth	3.2m (Cutting), 5.0m (Jetting)
Dimensions with cutter and rear jetting (L x W x H)	16m x 7.5m x 4.7m
Dimensions with Backfill Tool (L x W x H)	12m x 7.5m x 4.7m
Weight (In Water)	38te / 20te (with buoyancy)
Weight (In Air)	50te (with jetter, cutter and trough fitted)
Product Loading / Unloading	Diverless Loading/Unloading

SPEED RANGE

No Burial	upto 1500m/hr
Trenching (Cutting Mode)	upto 300 m/hr (Soil Dependent)
Trenching (Jetting Mode)	upto 400m/hr (Soil Dependent)

VEHICLE POWER

Total Power	2 x 600kW HPUs (Subsea power config.)
	1200kW (Surface supplied config.)

SOIL TYPE

Suitable for a range of soil types, including sands and very soft to hard clays.

CUTTING MODE

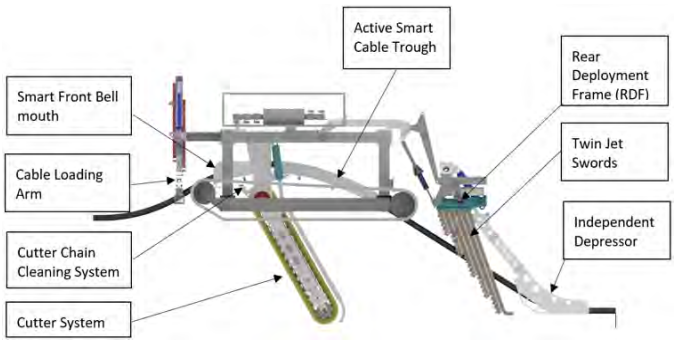
Product Handling	Product passes through trencher over the chain in a protected product highway before rear jet swords simultaneously jet and lower the cable using integrated depressor
Depth Control	0 - 3.2m max. through a combination of differing boom lengths and pup pieces.
Chain Speed	2-4m/sec
Chain Cutter Weight	12.0te

JETTING MODE

Product Handling	Product passes underneath trencher between tracks before passing through jet legs into fluidised trench.
Water Injection	2500m³/hour at 10bar
Trench Depth Control	5.0m max
Jetting Pack Weight	5.0te

TYPICAL SURVEILLANCE EQUIPMENT

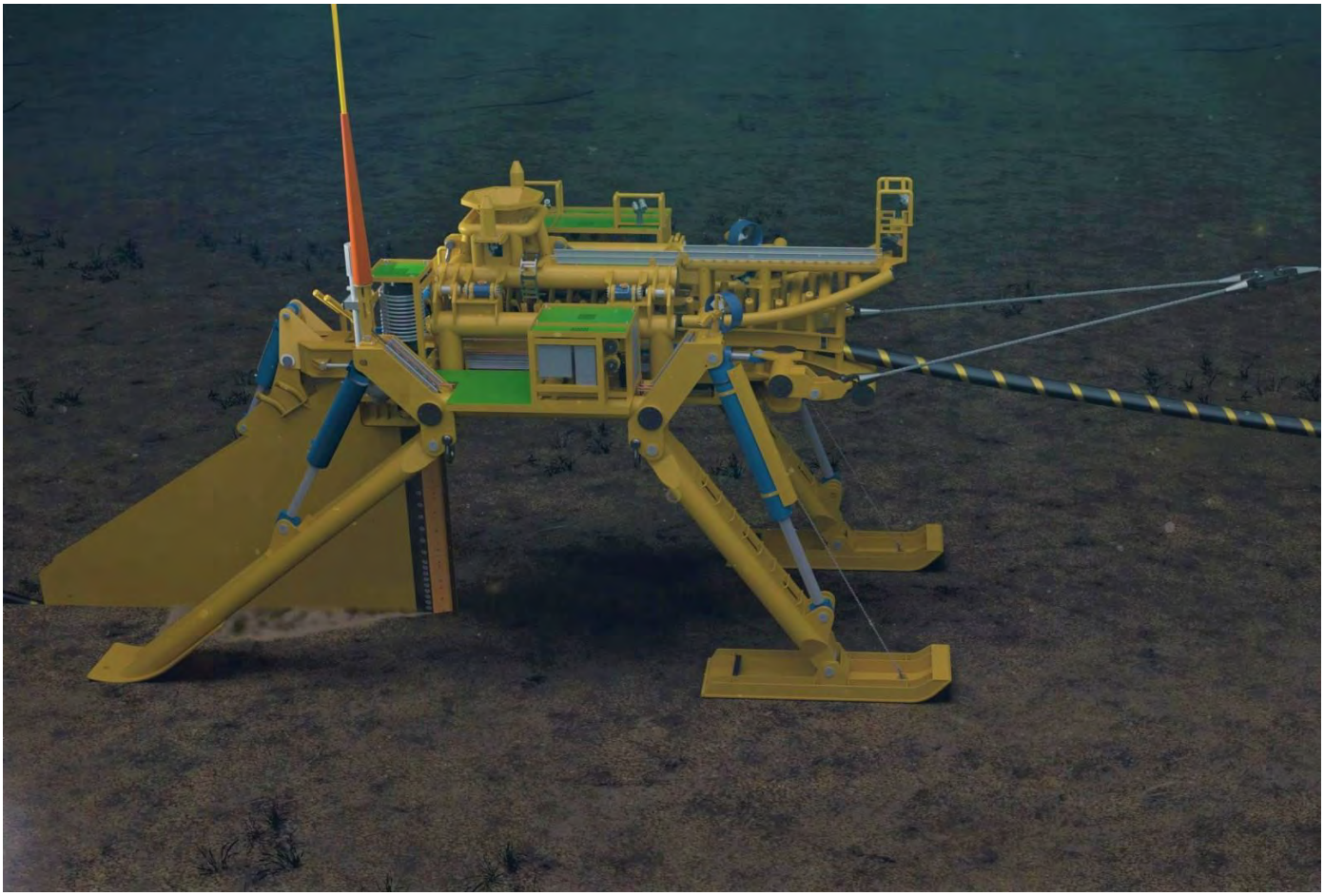
2 x SIT Cameras
2 x Mono CCD Cameras
1 x Colour CCD Camera
4 x Pan & Tilt Units (24v SubAtlantic)
2 x Rotator Units
8 x Subsea Lights
Obstacle Avoidance Sonar (Gemini)
Response/Transponder, TSS350 or 440 can be fitted
Mini F.O.G Gyro
Echosounder/Altimeter + Bathymetric
Hydrophone



ENSHORE
ADVANCED SEABED INNOVATION

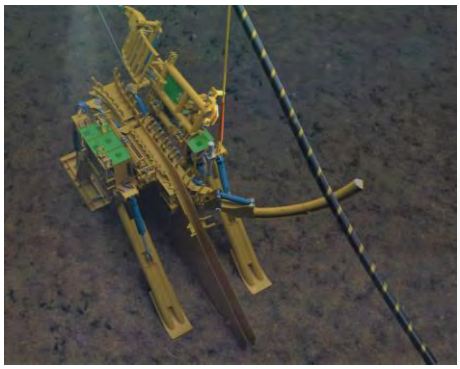
Jetting Cable Plow - Midshore Cable Burial

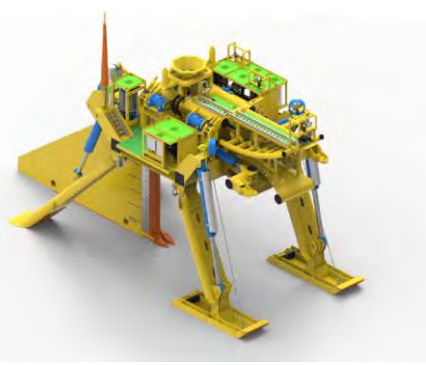
Nexans Jetting Cable Plough



Nexans

ELECTRIFY THE FUTURE





The Nexans Jetting Cable Plough is a jetting plough developed with Cable integrity in focus. The main features distinguishing it from existing ploughs are the top loading feature and utilization of state of the art controls and surveillance.
Developed from Nexans ideas in cooperation with experienced consultants and suppliers it fits perfectly into the Nexans pool of tools

Dimensions

- Dry weight 62t
- Length 12.7m
- Height 7m
- Width 5m

Subsea Hydraulic system

- 2 x 25 HP HPU redundant systems
- 2 x 17-inch thrusters (each 550 kg)
- ROV intervention panel
- Hydraulic valves as pr Nexans Capjet
- Environmentally friendly Panolin fluid

Jetting system

- 250kW water pump
- Modular nozzle cassettes

Performance

- Max trench depth 3.5m
- Max continuous tow force 130t (Peak 150t)
- Minimum product bending radius 5m
- Max product diameter Ø300

Control system

State of the art electronics pod, valve drivers and electronics that has been proven on both Nexans Capjet and Rock cutter
All actuated articulation instrumented and monitored

Surveillance

- Six color video cameras
- Two imaging sonars
- Digiuquarts pressure sensor
- Altimeter
- Octans fiberoptical survey gyro
- Three off electrical P&T units
- Tow bridle angle sensor
- Tow force sensors

Unique features

- Top loading
- Replaceable share can be tailored to project spec
- ROV intervention panel allowing all intact functions to be operated
- Modular jetting cassettes allows optimalization of jetting power

Cable guiding

- 5m MBR
- Product speed sensor
- Depressor load sensor
- Product entry angle sensors

Topside equipment

- Tow winch with 1000m tow wire
- Umbilical winch with 1550m umbilical and CT function
- Power van
- Vessel integrated control room

Nexans
ELECTRIFY THE FUTURE

Jet Sled - Nearshore Cable Burial

Marine Professionals Since 1919
BRENNAN
J.F. Brennan Company, Inc.
818 Bainbridge Street
La Crosse, WI 54603
608.784.7173

Brennan Hydro Jet-sled is a modified ETA Salamander 5. The sled is a heavy-duty surface-powered subsea cable jetting sled designed for both simultaneous lay and burial and post-lay burial operations and capable of burying cable up to Ø280mm (11”) diameter to a depth of 3m (10’) with a minimum bend radius of 4m. The jetting tools are interchangeable depending on the type of cable burial being performed. The seld can be modified to accept 2 m, 3 m, or 6 m burial tools.

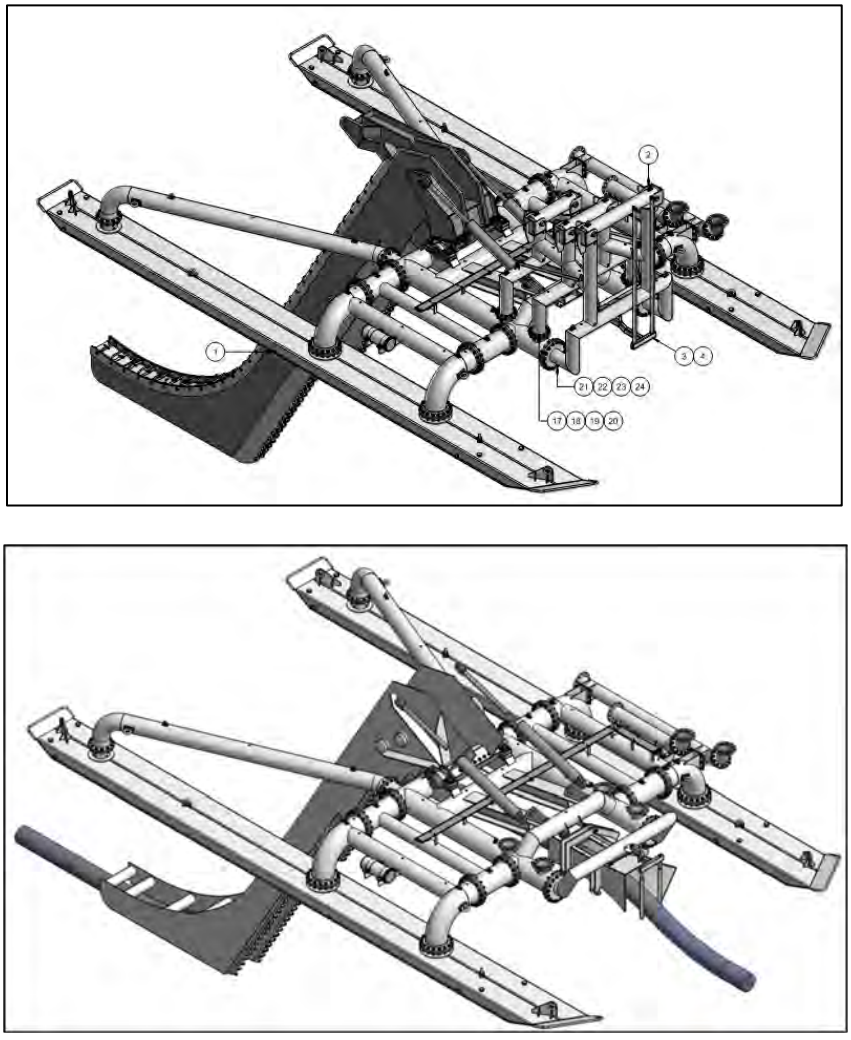


Figure 1 Isometric Projection of Jet Sled in Simultaneous Lay and Bury Configuration

The simultaneous lay and burial tool is a top-loading closed-face aft pipe with two jetting chambers for controlling water pressures to select nozzles with a cable tension load cell sensor on the depressor. In the post-lay burial configuration, an undercarriage bellmouth with horizontal feeler gauges is fitted to the sled. The post-lay tool has an open face with a single jetting chamber on each side of the cable

(Swords). The back side of swords are connected with a depressor and cable tension load cell, providing accurate information during cable burial operations.

General Specifications

Burial Depth	**6.0m**
Trench Depth	**5.4m**
Max Product Diameter	**300.0mm**
Weight in Air	**22.0t**
Water Depth	**90.0m**
Product MBR	**4.0 m**
Max Bollard Pull	**20.0t**

Hydraulic System

- Deployment ram, subsea specification with spherical bearings both ends, fitted with ROTA linear transducer
- Directional control valve with speed control, relief and check valves, fitted onto hydraulic power pack
- 7.5 kW electric-driven hydraulic power pack

Control System

The Control unitcomputer provides for control and monitoring of the main jetting sled functions. Connected to surface junction box, which contains umbilical connection, remote I/O, and power supplies.

Display and data logging

The Control System is capable of displaying and logging data from the following sensors.

- Burial (Tool) Depth
- Pitch
- Roll

- Water Pressure Surface
- Tow Tension
- Share cable tension
- Water Pressure Subsea
- Water Depth

Main Screen

All variables are to be displayed on the main screen graphically and digitally in real

time. It is also possible to Navigate from this screen to the Calibration Screen for

calibrating all the vehicle sensors.

Subsea Pod

The sea pod is a carbon steel pressure vessel with stainless steel faceplate and flange, fitted with local power supply, roll, and pitch sensors, and distributed I/O module. Subsea pod rated to 150 m.

Sensors

- Trench depth (fitted in the cylinder)
- Pitch (fitted in the pod)
- Roll (fitted in the pod)
- Subsea water pressure (depth) (External pressure pod)
- Subsea jetting manifold water pressure (External pressure pod)
- Cable tension in tool load cell
- Analog input for surface water pump pressure
- Analog input for surface tow tension

Surveillance

The following surveillance equipment is fitted:

- Sonar
- Responder/transponder
- 2 x cameras
- 3 x lights

Power supply

- 110 V, 60 Hz

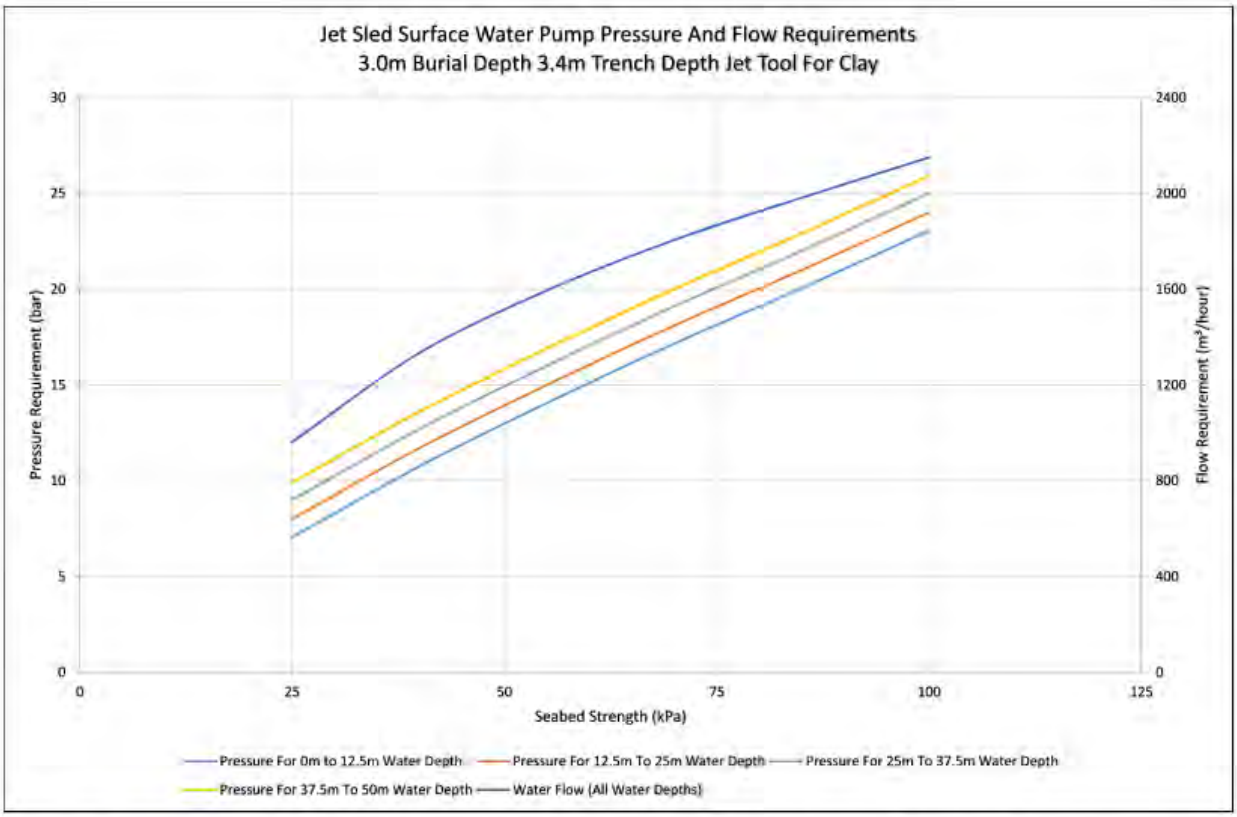
Harness

- Standard molded harnesses fitted with MacArteny subconn connectors.

Umbilical

- Standard Macartney, terminated with Burton connectors at both ends.

Jet sled surface water pump pressures and flow requirements



The above curves are generic. The performance also depends on other factors such as the delivery hose length, delivery hose diameter and nozzle size. Project specific calculations should be performed to guide pump selection.

I-Plow – Pre-cut Trenching

Submersible statistics

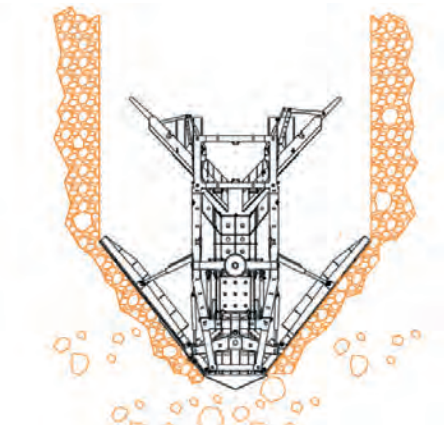
Description	Mode of Operation	Data
Depth rating	All modes	500 m
Burial depth	Pre cut	Variable up to 1.9
Soil type	All modes	Up to 600 kpa
Launch	All modes	A-frame or crane Sea State 6
Length	All modes	15.4 m
Weight	Boulder / pre-cut Backfill	128 t 78 t
Width/Swath	Boulder / pre-cut 2nd pass pre-cut Backfill	15.0 m fixed 10.3 m fixed 14.5 m fixed
Height	All modes	5.2 m
Max tow force	Boulder / pre cut	200 t sustained; 240 t intermittent
Max tow force	Backfill	80 te
Turning radius	All modes	200 m

i-Plough configurations

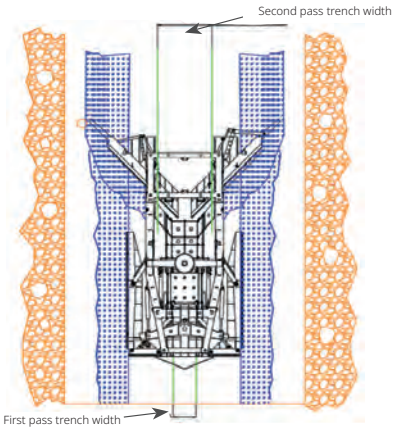
The i-Plough can be used in the following ways:

- Boulder clearance only configuration: If no disturbance to the seabed is required then the share on the i-plough can be disengaed to offer boulder clearance only carrying out a 15m swathe in 1st pass with wider swathes being made possible by a multipass operation.
- Boulder clearance and Pre-cut trenching simultaneously configuration: The plough weight bears on the front dozer blades and the underside of the mouldboards, which are both bearing on the Swathe. The mouldboards deposit the spoil away from the edge of the trench and away from the uncleared boulder area, which has been created. The i-Plough will clear a 15m swath of boulder whilst being able to trench up to 1.9m in first pass depending upon the boulder densities and soil conditions.
- Optional second pass – Should deeper burial depths be required then a secondary pass can be achieved. The boulder swath has now been cleared, so the boulder dozer blades are pivoted backwards to avoid disturbing the existing spoil, and a secondary pass is carried out in the existing trench.
- Backfill configuration: On completion of a simple mode change the i-plough can be reconfigured to backfill mode to carry out the post -lay burial operations once the produt has been laid into the trench. The shape of the backfil blades allows the spoil to be collected and transferred back into the trench covering the product without interacting with any large spoils that has been filtered and moved aside using the dozer blades and tines.
- The i-plough has an extensive surveillence suite that provides accurate route tracking during the operational modes ensuring efficient clearance, cover and protection throughout.

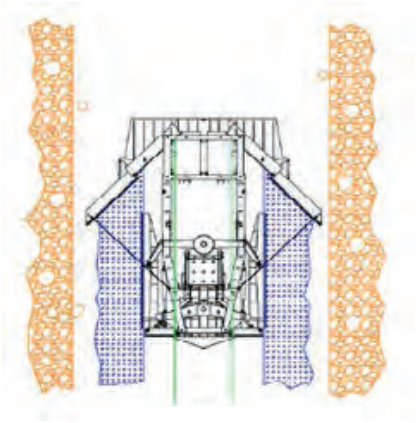
Boulder Clearance Only Profile



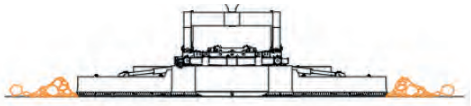
2nd Pass Trenching Profile



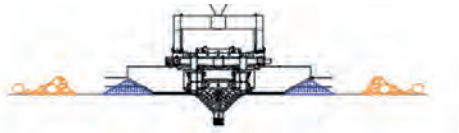
i-Plough Backfill Plough



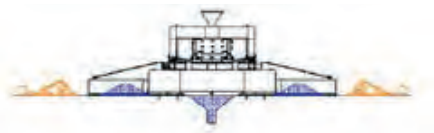
End View Boulder Profile



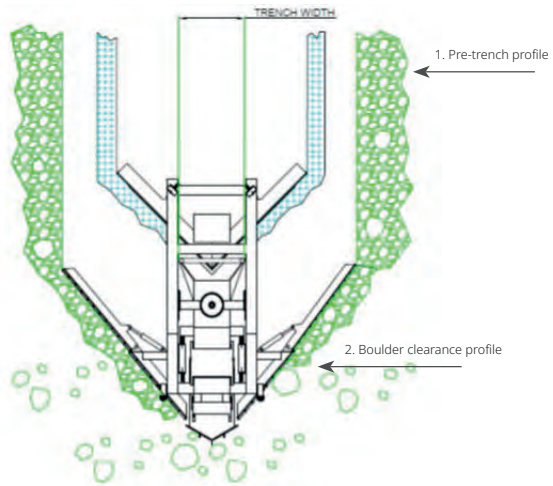
Section View Pre-Cut Spoil Profile



Section View Backfill Spoil

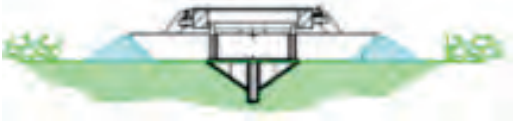


i-Plough Simultaneous Boulder Clearance & Pre-Cut Trench Profile



Pre-Cut Boulder Profile

Pre-Cut Spoil Profile



Appendix B – Cable Burial Plan

Revolution Wind Export Cable State Waters| Cable Burial Plan

Submitted for Agency Review Pursuant to the State of Rhode Island Department of Environmental Management Condition #13 and Rhode Island Coastal Resources Management Council Category B Assent Condition #F

May 2024 (v3)

PUBLIC VERSION -- CONFIDENTIAL COMMERCIAL INFORMATION IN SECTION 3.4 NOT SUBJECT TO DISCLOSURE UNDER APRA (RIGL § 38-2-1) OR FOIA (5 USC § 552)

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1.0 Introduction

Revolution Wind, LLC (Revolution Wind) (formerly DWW Rev I, LLC), a 50/50 joint venture between Orsted North America Inc. (Orsted NA)[1] and Eversource Investment, LLC (Eversource), proposes to construct and operate the Revolution Wind Farm Project (hereinafter referred to as the Project). The purpose of the Project is to provide clean, reliable offshore wind energy that will increase the amount and availability of renewable energy to New England consumers while creating the opportunity to displace electricity generated by fossil fuel-powered plants and offering substantial economic and environmental benefits to the New England region. Rhode Island and Connecticut have adopted substantial renewable portfolio standards and clean energy targets to address issues associated with climate change, highlighting the current and future demand for this Project. In response to this expressed need and demand, Rhode Island and Connecticut have awarded Revolution Wind five Power Purchase Agreements (PPAs) to-date, totaling 704 MW of generation capacity. The Project will fulfill Revolution Wind's obligations to both Connecticut and Rhode Island in accordance with the PPAs.

Power from the Revolution Wind Farm (RWF) will be delivered to the existing mainland electric grid via the submarine export cable referred to as the Revolution Wind Export Cable (RWEC) in federal waters on the outer continental shelf (RWEC-OCS) and in Rhode Island State waters (RWEC-RI), the Onshore Transmission Cable, the Onshore Substation (OnSS), and the underground right-of-way connecting the OnSS to the Interconnection Facility (ICF).

This Cable Burial Plan (Plan) refers use to the Nexans Norway AS (Nexans) Construction Method Statement[2] (CMS) and Nexans Cable Burial Assessment Study[3] for installation of the RWEC-RI in Rhode Island state waters. This Plan is being submitted pursuant Condition #F the Rhode Island (RI) Coastal Resources Management Council (CRMC) Category B Assent #B2021-07-005, and Condition #13 of the State of Rhode Island Department of Environmental Management (RIDEM) Water Quality Certificate #21-135 and Dredge Permit #DP-21-187 (WQC Permit), which are set forth in Table 1 below along with other relevant conditions.

1 Note that in October 2018, Deepwater Wind LLC was acquired by Orsted North America Inc

2 Construction Method Statement (REV01). Nexans Norway AS. November 1, 2023.

3 Cable Burial Assessment Study. Nexans Norway AS. January 16, 2024

Table 1 Relevant Permit Conditions

Permit Condition	Detail
CRMC Category B Assent Condition C	Dredge Window: The proposed dredging activities described in the permit application, which includes cable installation using either jet plowing or mechanical plowing approaches, must adhere to the following time of year restrictions and conditions. All in-water construction activities north of the ColRegs Demarcation Line shall occur between August 31 and January 31. No further modification to this extended dredge window shall be granted *except, and consistent with RIDEM's July 7, 2023 revisions to Condition 9 of its Water Quality Certificate (21-135) and Dredge Permit (DP-21-187), offshore HDD works would begin July/ August 2024 (prior to the approved August 31 start of the approved dredge window) and continue through the approved window.
CRMC Category B Assent Condition F	Cable Burial Plan: Prior to submittal of the Cable Burial Work Plan, the cable installation contractor shall complete and provide to CRMC and RIDEM the "Cable Burial Plan." This study shall include a detailed assessment of the anticipated sediment conditions, unforeseen conditions, and the proposed cable installation method. This study shall be included and incorporated into the work plan.
CRMC Category B Assent Condition H	Cable Burial Depth: Target cable burial depth is a minimum cable burial depth of four (4) feet and six (6) feet, or deeper along the entire length of the export cable in state waters. Burial depth shall be determined from the top of the cable below existing seabed. In cases where the minimum burial depth cannot be achieved due to cable and pipeline crossings, machine failures, or unforeseen adverse bottom conditions, Revolution Wind will be required to attain minimum burial depth where Revolution Wind confirms depth can be achieved through reburial using the Capjet plow or similar method. Where Revolution Wind confirms reburial using the Capjet plow or similar method will not achieve minimum burial depth, Revolution Wind will confirm the acceptable burial depth from the cable burial risk assessment approach (which assesses seabed conditions, seabed mobility, and the risk of interaction with external hazards such as commercial fishing gear and vessel anchors engineered zonally along the route). In cases where this Capjet plow or similar method is unsuccessful in achieving burial depth or in the cases of cable or pipeline crossing, secondary cable protection shall be used to minimize risk to the cables and risk to other water users, including hazards such as commercial fishing gear and vessel anchors.
CRMC Category B Assent Condition J	Cable Burial Tools: The applicant is required to use the best tool from their list of available tools (as described in the application and supplemental information provided) to achieve a proper cable burial depth of 4-6 feet or deeper, in accordance with their cable burial work plan. Revolution Wind expects to use jet assisted mechanical plow as the principle proposed method of burial on all segments of the RWEC-RI route except for at and north of the Jamestown Bridge where lower water depths and bridge height restrictions will require burial by jetting or other appropriate and feasible methods. Revolution Wind shall simultaneously lay and bury cables in state waters unless ground conditions are inappropriate or technically unfeasible
CRMC Category B Assent Condition K	Cable Burial during Construction: Revolution Wind shall mitigate against the risk of not achieving target burial depth by using one or more of the following options, depending on tool choice: a) using the geometry of the plow relative to the seabed and where necessary adjusting the tool settings; b) tuning the plow jetting system to the soil types encountered along the route as necessary c) remotely adjusting the depth of burial on the plow during operations as necessary d) monitoring and managing tow forces, share depth and plow speeds in the event hard clays are encountered;

Permit Condition	Detail
	e) performing continuous, real time trenching performance validation to ensure the tool is operating as per the contractor specification, ensuring the tooling performs optimally for the given burial requirements and the as-encountered ground conditions; and performing continuous, real time burial performance validation, understanding cable burial versus the given burial requirements and the as-encountered ground conditions.
RIDEM Water Quality Certification and Dredge Permit Condition 9	Dredge Window: The proposed dredging activities as described in the permit application must adhere to the following time of year restrictions and conditions. A. Cofferdam installation – the potential cofferdam installation as described in the permit application shall be installed via a vibratory hammer and shall not be limited to a time of year restriction. B. HDD temporary excavation pits - Offshore HDD works would begin July/ August 2024 (prior to the approved August 31 start of the approved dredge window) and continue through the approved window[1]. Dredge material stored on a support barge must remain wet if reused to fill the exit pits. If the dredged materials begin to dry out, seawater must be pumped onto the spoils to rewet the material. C. Jet plowing/mechanical plowing - The proposed cable installations north of the ColRegs Demarcation Line as described in the permit that require the use of jet plow or mechanical plow may occur anytime between August 31 and January 31. This time frame is an extension of the current window of October 15 to January 31. No further modifications to this extended dredge window shall be granted.
RIDEM Water Quality Certificate and Dredge Permit Condition 11	Unexploded Ordnance (UXO) Mitigation: The DEM and Coastal Resources Management Council (CRMC) shall be notified immediately of the discovery of any potential munitions or explosives of concern (MEC) or unexploded ordnance during the cable burial operations. The Applicant shall coordinate the preferred method of mitigation with the DEM, CRMC, and other appropriate agencies in consultation with a MEC/UXO specialist as stated in the UXO Application Supplement noted above in Table 1.
RIDEM Water Quality Certificate and Dredge Permit Condition 13	Cable Burial Plan: Prior to submittal of the Cable Burial Work Plan, the cable installation contractor shall complete and provide to CRMC and DEM the "Cable Burial Plan." This study shall include a detailed assessment of the anticipated sediment conditions, potential unforeseen conditions, and the proposed cable installation method. This study shall be included and incorporated into the work plan.
RIDEM Water Quality Certificate and Dredge Permit Condition 14	Cable Burial Depth: The project shall be required to reach a minimum cable burial depth of four feet, with a target cable burial depth of four (4) feet to six (6) feet, or deeper along the entire length of the export cable in state waters. Burial depth shall be determined from the top of the cable below existing seabed. In cases where the minimum burial depth of four (4) feet cannot be achieved due to cable and pipeline crossings, machine failures, or unforeseen adverse bottom conditions, the Applicant will be required to attain minimum burial depth where they confirm depth can be achieved through reburial using the Capjet plow or similar method. Where the Applicant confirms reburial using the Capjet plow, or similar method, will not achieve minimum burial depth, the Applicant will confirm the acceptable burial depth from the cable burial risk assessment approach (i.e., that assesses seabed conditions, seabed mobility, and the risk of interaction with external hazards such as commercial fishing gear and vessel anchors engineered zonally along the route).
RIDEM Water Quality Certificate and Dredge Permit Condition 15	Cable Burial Tools: The Applicant is required to use the best tool from their list of available tools (described in the application and supplemental information provided) to achieve a proper cable burial depth, in accordance with their cable burial work plan. The Applicant expects to use a jet assisted mechanical plow as the principal proposed method of burial on all segments of the RWEC RI route except for at and north of the Jamestown Bridge where lower water depths and bridge

Permit Condition	Detail
	height restrictions will require burial by jetting or other appropriate and feasible methods. The Applicant shall simultaneously lay and bury cables in state waters unless ground conditions are inappropriate or technically unfeasible.
RIDEM Water Quality Certificate and Dredge Permit Condition 16	Cable Burial During Construction: The Applicant shall mitigate against the risk of not achieving target burial depth by using one or more of the following options, depending on tool choice: D. using the geometry of the plow relative to the seabed and where necessary adjusting the tool settings; E. tuning the plow jetting system to the soil types encountered along the route as necessary; F. remotely adjusting the depth of burial on the plow during operations as necessary; G. monitoring and managing tow forces, shear depth and plow speeds in the event hard clays are encountered; H. performing continuous, real time trenching performance validation to ensure the tool is operating as per the contractor specification, ensuring the tooling performs optimally for the given burial requirements and the as-encountered ground conditions; and performing continuous, real time burial performance validation, understanding cable burial versus the given burial requirements and the as-encountered ground conditions.

1. This language was taken from the modification to the RIDEM Water Quality Certificate (21-35) and Dredge Permit (DP-21-187), dated July 7, 2023.

This Plan is submitted to CRMC and RIDEM prior to submittal of the Cable Burial Work Plan. Revolution Wind anticipates cable installation activities in Rhode Island State waters to take place from September 1, 2024, to January 31, 2025, and will adhere to the time of year restriction (TOYR) that restricts in water construction activities north of the ColRegs Demarcation Line between February 1 and August 31 annually. If work extends beyond January 31, it will resume on September 1 after the TOYR. For the purposes of this Plan and for consistency with the Nexans CMS, the western cable is referred to as Circuit 1 and the eastern cable is referred to as Circuit 2.

2.0 Anticipated Sediment Conditions

Revolution Wind, in collaboration with Fugro USA Marine Inc. (Fugro), MMT (now Ocean Infinity) and Mott MacDonald, developed and executed a series of marine geophysical and geotechnical site investigations for the Revolution Wind Farm Project, which are outlined in Table 2 below. The geophysical surveys performed for the Project acquired a full coverage dataset of multibeam bathymetry, backscatter, side scan sonar, magnetic field, sub-bottom profiler, single channel sparker and multichannel sparker data. Seabed grab samples and sediment plan and profile images were also collected. Geotechnical investigations completed along the RWEC-RI included seabed cone penetration tests, vibracore sampling, and associated index and strength laboratory tests to inform cable design. These data were used by Revolution Wind, and also provided to Nexans, to inform the cable burial design.

Table 2 Geophysical and Geotechnical Surveys Completed

Survey Name	Vessel(s)	Description
2022 Ocean Infinity Revolution Wind Farm (RWF) MEC Inspection Geophysical 2b Export Cable & Lease Area	Sheila Bordelon	Inspection of 265 pMECs. A total of 16 targets were confirmed as UXO within the export cable corridor. It has been possible to engineer the cable route to avoid all the cUXO and hence no EOD is required. All remaining targets identified were classified as non-UXO and of no archaeological significance. Ørsted contracted Ocean Infinity (OI) to perform pUXO Inspections within the Revolution Windfarm and Export Cable Corridor. Ørsted also appointed Search Inc. as the project specific Qualified Marine Archaeologist (QMA). Inspection work was carried out aboard the Shelia Bordelon with its associated Triton XLX 200 HP Work Class Remotely Operated Vehicle (ROV).
2021 Fugro RWF Nearshore Geotech Export Cable Route and Horizontal Directional Drilling	L/B SD-50	3 seabed CPTUs along ECR to 6m bsb 3 boreholes and 3 top push CPTUs along planned HDD section to approximately 25m bsb
2020 Mott MacDonald RWF Nearshore Geotech Export Cable Route	Parker and a 25 foot Carolina Skiff	8 vibrocores along the ECR up to 5.5 m below seabed

Survey Name	Vessel(s)	Description
2020 MMT RWF and RWEC Geophysical UXO / Engineering Survey	Deep Helder	A UXO / Engineering survey within the UXO Hazard zone 2 areas (based on the MEC desktop study and applicable UXO Hazard Zones) along the REV01 Export Cable Route and Site Area. No additional survey was completed in UXO Hazard Zones 1 & 3 as the COP data (ref. 2019 – 2020 Fugro RWF Survey listed below) was sufficient for UXO analysis.
2019 – 2020 Fugro RWF Survey	R/V Fugro Enterprise, M/V Fugro Discovery, R/V Kommandor Iona, R/V Westerly	Survey of the entire RWF and RWEC corridor, except the final approach of the RWEC-RI north of the Jamestown Verrazzano Bridge. M-UHRS data was acquired aboard Fugro vessels and processed and interpreted by a third party. Grab samples and environmental data were similarly collected, processed and interpreted by a third party.
2018 – 2019 Fugro RWEC Route Survey	M/V Megan Miller, R/V Westerly	The area north of JV Bridge was largely completed and incorporated into the G&G Report. All data south of the bridge were reacquired in 2019 - 2020.
2018 Fugro South Fork Wind Farm Extension Survey (SFW01)	M/V Fugro Discovery	The proposed SFW01 development site was surveyed in 2017 (Phase 1) together with a reconnaissance survey of the entire OCS-A 0486 lease. In 2018 coverage of the SFW01 development site was extended eastwards (Phase 2). The SFW01 geophysical data were incorporated into the Integrated G&G Site Characterization Study submitted to BOEM by Deepwater Wind South Fork, LLC, in 2019. In 2020, part of OCS-A 0486 was assigned to SFW01 through the creation of OCS-A 0517, leaving a small section of data from the SFW01 survey within the RWF Project Area; this section of data has been incorporated into the current submittal.
2017 Fugro SFW01 Survey	R/V Fugro Enterprise	
2019 Fugro RWEC Geotechnical Investigation (REV01 GT1A)	M/V Conti	The survey scope included seabed cone penetration tests (CPT), vibracore boring and sampling and laboratory soil testing
2019 Fugro OSS WTG, IAC and RWEC Geotechnical Investigation (REV01 GT1B)	M/V Conti, M/V Regulus	Phase I (July and August 2019): The survey scope included downhole sample borings, downhole cone penetration tests, P-S logging tests, and offshore and onshore laboratory soil testing.
		Phase II (August – October 2019): The survey scope included seabed CPTs, thermal cone penetration tests (TCPT), seismic cone penetration tests (SCPT), conductivity, temperature, and density (CTD) profiling tests, thermal needle probe tests (TNP), vibracore sampling, and onshore laboratory soil testing.

Data from these surveys were used to characterize the sediment and surficial geology, including obstructions, along the RWEC-RI and to microsite the cable to avoid sensitive benthic habitat and obstructions to the extent practicable. The results of the data are described below.

2.1 Bathymetry

From kilometer post (KP) 0, the route deepens to 27.8 ft (8.5 m) to approximately KP 9.7. Water depth generally deepens along the routes from north to south. In general, the seabed is relatively flat; slopes are rarely above 3 degrees throughout the route.

2.2 Seabed Features and Interpretation

The seabed along the RWEC-RI corridor is relatively flat, with little sign of significant seabed mobility and many areas reported to have little or no change between the data sets compared. Several areas are reported to have no expected seabed change within the project lifetime.

Moraine features and some small-scale bedforms were reported at points along the export routes.

Ripples were recorded in State and Federal waters along the export route survey area, ranging in height from less than 0.16 ft to 0.6 ft (0.05 m to 0.2 m), although the average height was reported to be less than .3 ft (0.1 m). Crest orientation is predominantly 68° trending approximately north to south. Rippled scour depressions were also recorded within the export route corridor. Generally, for trenching operations, features with amplitudes of less than 0.6 ft (0.2 m) are not operationally significant at the wavelengths observed.

Trawl scars were recorded in State and Federal waters along the export route survey area. These features again displayed a low amplitude.

2.3 Geology

Approaching the 3 nautical mile boundary between State and Federal waters, and extending into Federal waters, two glacial drift sheets overlie the area of Block Island, Fishers Island and Long Island. These maximum glacial advances on the East coast of North America from the last (Wisconsinian) glaciation are marked by the terminal moraine system of which Long Island, etc. forms a key part (Schwab et al., 2014). Two series of end moraines, Ronkonkoma Moraine and Harbor Hill Moraine cross the southern New England inner shelf, with the outermost moraines marking the maximum seaward extent of the Pleistocene glaciation. These end-moraine deposits are submerged across Block Island Sound and extend from Martha's Vineyard across the project site. As the glaciers retreated, drift deposits were laid down, to be redistributed in the second and last phase of glaciation.

The morphology of the shelf is therefore dominated by the signature of the glacial meltwater runoff and the Holocene transgression, with geophysical data indicating the sediments at the seabed are composed of reworked sands and coarser sediments such as gravel, cobbles, and boulders together with other glacial deposits.

Previous work suggests that the region is subject to erosion, with the Holocene being intermittently present (reworked sands) and mainly to the south of Long Island. Pleistocene deposits are predominantly glaciofluvial and consist of gravel to fine sands.

The marine deposits found within the West Passage of Narragansett Bay and the Rhode Island Sound comprise of sandy sediments that were deposited in high energy environments, with fine grained (cohesive)

deposits that deposited in deeper, quieter regions. Due to this, the dominant sediment conditions impacting cable burial and design consist of:

1. Recent marine sand deposits, which comprise of sands or silty/clayey sand sediment types interpreted on the seafloor. Where present, these deposits are approximately 1.6 ft to 8.2 ft (0.5 m - 2.5 m) thick.
2. Holocene transgressive deposits, interpreted to be transgressive sand shoal or sand bar deposits but can also comprise of a cohesive (clay) deposit. The cohesive shallow transgressive deposit is found extensively within the Narragansett Bay and is typically a soft cohesive material.
3. Holocene transgressive infill deposits, interpreted as a fluvial-estuarine deposit, comprised of channel infill sequences which were deposited at the beginning of transgression. Deposits comprise of sand or clay. The Cohesive deposit is soft – firm cohesive material.
4. Pleistocene channel infill deposits, interpreted as a glacio-fluvial channel deposit. Deposits comprise of sands, silty sands and sandy silts.
5. Pleistocene moraine deposits, interpreted as the northern-most moraine deposit. Deposits comprise of sands, silty sands and sandy silts. Additionally, this deposit may contain large boulders, which can be seen on the seabed, in regions where this deposit protrudes.
6. Pleistocene outwash deposits, a sandy glacial deposit that is often found at depths greater than 32.8 ft (10 m) below seabed. Within the Narragansett Bay and Rhode Island sound, the deposit is only identified in localized regions that would influence cable burial and design.

North of the Jamestown Verrazano Bridge, The RWEC-RI predominantly interacts with recent marine sands, Holocene sands and clays, with localized regions of Pleistocene marine deposits, typically located at the flanks of the West Passage. Within this region, a north-south trending feature described on nautical charts as "ledge" may represent shallow glacial till or rock. Before reaching the Jamestown-Verrazzano Bridge, a prominent flood shoal or bar feature comprised of 10 ft (3 m) of coarse-grained deposits is passed. As the Jamestown Verrazzano Bridge is approached, Pleistocene moraine deposits are exposed in the eastern portion of the RWEC-RI cable corridor. Next to the Jamestown Verrazano Bridge, debris from the demolition of the former Jamestown Verrazzano Bridge may be present. The main part of the channel is naturally deep under the bridge, which is indicative of strong tidal currents.

South of the bridge, the upper 10 ft (3 m) is comprised of recent marine sands and very soft to firm fine-grained Holocene transgressive deposits. The main part of the channel is naturally deep and, based on hydrodynamic studies, is prone to strong ebb and flood tidal currents. Continuing south toward Dutch Island, the naturally deepened channel achieves depths of 33 ft (10 m) to 66 ft (20 m). A prominent bar deposit crosses the channel at a northwest-southeast orientation. This feature may be the result of high ebb and flood tidal currents. Pleistocene moraine outcrops are present in localized areas along the eastern perimeter of the survey corridor, where localized surface boulders are identified within the corridor, but not on the RWEC-RI.

South of Dutch Island and into the mouth of the West Passage, heading into Rhode Island Sound, sediment conditions are dominated by recent marine sands, transgressive marine clays, and to a smaller extent, transgressive marine sands. Pleistocene moraine deposits are also found in localized regions within the cable burial and design depth. Bedrock may also be present beneath the till surface.

Within the Rhode Island Sound, the RWEC-RI cable corridor passes within the Brenton Reef region. Sediment conditions comprise of recent marine sands, Holocene transgressive sand and clays, with Pleistocene deposits underlying these. The region also indicates that shallow bedrock is exposed or covered by sediment mantles of sand to clay within the survey corridor. Surface boulders are also identified within the survey corridor within the Brenton Reef region.

From Brenton Reef to the extent of RWEC-RI, sediment conditions comprise of recent marine sands, Holocene transgressive sands. Pleistocene moraine deposits and outwash deposits will be encountered in localized regions where Holocene deposits have eroded.

3.0 Cable Installation Methodology

This Plan only describes cable installation methods within Rhode Island State waters and does not include descriptions of cable installation on the Outer Continental Shelf, at the OSSs, or the interlink cable. For the purposes of this Plan, nearshore waters are defined as north of the Jamestown Verrazano Bridge to the landfall and mid-shore waters are defined as south of the Jamestown Verrazano Bridge to the 3 nautical mile State waters boundary.

Nexans' project execution and logistics is restricted by work within the COLREG's boundary (work may take place between September 1 and January 31), as well as Revolution Wind's milestones and completion dates.

3.1 Cable Installation Overview and Sequencing

3.1.1 Near Shore Campaign – Within COLREG boundary

A near shore campaign will be performed installing the first 5.9 miles (mi) (9.47 kilometers [km]) of the export cables from the landfall to a position south of Jamestown Verrazano bridge. The near shore campaign will be performed by a barge due to shallow waters.

1. Collection or transpooling of 2 x 5.9 mi (9.47 km) export cables and spare cable (optionally spare for South Fork).
2. Offloading of spare cable(s) at port.
3. Installation of 5.9 mi (9.47 km) export cable nearshore section Circuit 1 – installation from landfall to a position south of Jamestown Verrazano bridge. 1st end pull in.
4. Installation of 5.9 mi (9.47 km) export cable nearshore section Circuit 2 – installation from landfall to lay down position south of Jamestown Verrazano bridge. 1st end pull in.

3.1.2 Mid-Shore Campaign

1. Collection of 2 x 21.1 mi (34 km) export cable segments
2. Jointing Circuit 1 nearshore with Circuit 1 mid-shore – in line joint.
3. Installation of 21.1 mi (34 km) export cable Circuit 1 – mid-shore (spans State and Federal waters)
4. Return to joint location nearshore
5. Jointing Circuit 2 nearshore with Circuit 2 mid-shore – in line joint.
6. Installation of 21.1 mi (34 km) export cable Circuit 2 – mid-shore (spans State and Federal waters)

7. All cables will be installed in a simultaneous lay and burial configuration, with the exception of the section between KP20-25, which will be pre-cut prior to cable installation and subsequently followed by a post-installation burial pass.

In addition to cable installation, the scope of work comprises of the following activities (including, but not limited to):

- Boulder removal
- Pre-lay grapnel runs
- Pre-lay survey
- Crossing preparations – pre and post-installation works
- Cable protection works nearshore and offshore
- Cable pull-in operations both onshore and offshore platforms
- Backfill operations
- Remedial protection works if required
- Guard vessel operations

Installation sequence and methodology listed above is the base case and contingency methods may be used as detailed, for example, within the Revolution Wind Farm Construction and Operations Plan (COP). Table 3 below further outlines the cable installation overview.

Table 3 Cable Installation Activities Overview (State Waters)

Activity	Approximate Kilometer Post[1,2]	Comment
Survey	0-62.5	Includes pre-boulder survey and clearance, pre-lay and final survey
Pre-lay Grapnel Run	0-62.5	N/A
Boulder Removal	0-62.5	Picking of scattered boulders along all routes
Pre-cut Trench	20-25	Pre-cut trenching run with I-plow
Crossing Preparation	11.4-12	Pre-installation at crossings
Crossing Completion	11.4-12	Post-installation at crossings
Preparations at old Jamestown Bridge	7-7.5	Installation of concrete mattresses
Nearshore Cable Installation	0-9.47	Simultaneous lay and burial
Mid-shore Cable Installation	9.47-62.5	Simultaneous lay and burial Nexans Aurora and jet plow
Burial of Joints, Crossings, Grade Out/Ins	Various	Nexans Capjet water jetting system
Active Backfill	0-62.5	Nexans Capjet water jetting system
Remedial Works (if deemed required)	0-62.25	Contingency work if deemed required

Source: Nexans Revolution Wind Offshore Wind Farm (REV01) Construction Method Statement. Date issued 2023-11-01.

1. Cable installation activities that will only occur in Federal waters were omitted from this table.
2. The 3 nautical mile boundary for State waters is at approximately KP 35.

3.2 Cable Burial Depth

In accordance with the CRMC Category B Assessment Condition No. H and RIDEM Water Quality Certificate and Dredge Permit Condition 14, the target burial depth is a minimum cable burial depth of four feet and six feet, or deeper, along the length of the route in state waters. Where burial cannot occur, sufficient burial depth cannot be achieved, or protection is required due to cables crossing other cables or pipelines, additional cable protection methods may be used (cable protection is discussed further below). The location of the RWEC-RI and associated cable protection will be provided to NOAA Office of Coast Survey after installation is completed so that they may be marked on nautical charts.

Table 4 Burial Requirements for Circuits 1 and 2 within Rhode Island State Waters

Cable	Zone	Kilometer Post Start	Kilometer Post End	Depth of Lowering Requirement[1]
Circuit 1	1	0.0	2.2	4 ft (1.5 m)
	2	2.2	3.0	4 ft (1.5 m)
	3	3.0	3.7	8 ft (2.5 m)

	4	3.7	20	8 ft (2.5 m)
	5	20	21	4 ft (1.5 m)
	6	21	22.2	4 ft (1.5 m)
	7	22.2	26.3	4 ft (1.5 m)
	8	26.3	27.6	4 ft (1.5 m)
	9	27.6	36.1	4 ft (1.5 m)
Circuit 2	1	0.0	2.1	4 ft (1.5 m)
	2	2.1	3.0	4 ft (1.5 m)
	3	3.0	3.8	8 ft (2.5 m)
	4	3.8	20.0	8 ft (2.5 m)
	5	20.0	21.0	4 ft (1.5 m)
	6	21.0	22.1	4 ft (1.5 m)
	7	22.1	26.1	4 ft (1.5 m)
	8	26.1	27.6	4 ft (1.5 m)
	9	27.6	36.7	4 ft (1.5 m)

3.3 Cable Installation Vessels

3.3.1 Cable Lay Barge

The barge to be used nearshore on this project is the Marmac 306 from Crowley, with a 3500 metric ton (Te) turntable setup complete with cable roller firing line, cable tensioners and an over boarding chute arrangement. The nearshore cable lay barge (CLB) scope runs from KP 0.4 to KP 9.5, here the cable ends will be joined together with the mid shore cables. The CLB has a propulsion system with 4 thrusters and a 4-point mooring anchoring system. To assist with the main propulsion systems, the CLB has a 75 Te pull ahead anchor winch. This pulling anchor will mainly be utilized in the shallow water section of the lay routes but can also be introduced in and under the Jamestown Verrazano Bridge area, where the tidal currents are stronger due to the narrow and deeper water passage through this area.

Further, the CLB has a spud leg system, being used for station keeping in water depths up to 49.2 ft (15 m). The spuds will be engaged during the cable pull-ins at the horizontal directional drilling (HDD) exit, as well for station keeping meanwhile relocating the mooring anchors in the shallow water area out until approximately KP 2.2. When the cable ends are deployed at KP 9.5, the CLB will be positioned on spuds.

The thrusters are designed to be operated in a tilted 42° mode, flush with the bottom of the CLB, for when the under-keel clearance is restricted due to low water depth. At KP 2.2 the water depth will allow for the full use of the CLB thrusters, and with approximately 6 meters of water depth, the thrusters will be lowered in full extended vertical mode. In full vertical mode, the thruster capacity is now 8 Te thrust each, and will provide the necessary propulsion for pulling the jet sled during the simultaneously lay and burial of the cables.

The CLB will be Jones Act compliant to transport cables within the US.

3.3.2 Cable Lay Vessel

Nexas has selected its latest installation vessel Nexans Aurora to undertake cable installation of the project, starting at KP 9.5 and working offshore. The vessel covers the complete Nexans submarine product range and has a 10,000 Te capacity turntable. Nexans Aurora is designed to accommodate Nexans own Capjet water jetting system. In addition, the vessel is also designed to perform simultaneous lay and burial utilizing a cable plow. See Figure 1 below.

The vessel also contains a dedicated enclosed cable splicing area offering a controlled environment for performance of all product splicing and termination work to the exact standard as performed in factories. The cable lay vessel (CLV) is holder of dynamic positioning (DP) class III and is equipped with turntable, capstan, tensioning machines, pick-up arms and two laying wheels for cable laying operations.

Figure 1. Nexans Aurora

3.4

REDACTED

CONTAINS CONFIDENTIAL COMMERCIAL INFORMATION IN SECTION 3.4 NOT SUBJECT TO DISCLOSURE UNDER APRA (RIGL § 38-2-1) OR FOIA (5 USC § 552)

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CONTAINS CONFIDENTIAL COMMERCIAL INFORMATION IN SECTION 3.4 NOT SUBJECT TO DISCLOSURE UNDER APRA (RIGL § 38-2-1) OR FOIA (5 USC § 552)

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CONTAINS CONFIDENTIAL COMMERCIAL INFORMATION IN SECTION 3.4 NOT SUBJECT TO DISCLOSURE UNDER APRA (RIGL § 38-2-1) OR FOIA (5 USC § 552)

3.5 Pre-Cable Installation Activities

3.5.1 Pre-lay Grapnel Run

A pre-lay grapnel run (PLGR) will be carried out to remove debris such as ghost gear, wires, and ropes located on the cable routes.

- One run will be carried out along the center line of the chosen cable route in addition to two wing lines.
- If high tensions are encountered then additional runs are made over the same area, with the grapnel being regularly recovered to check polishing and re deployed with an overlap.
- Out of service cables will be cut - the section crossing the chosen cable route and re-routed out of the cable route. Clump weights will be installed on the ends of the cut cable.
- Grapnel runs will be carried out along the entire route.
- The grapnel penetration will be around 1.6 ft (0.5 m), with maximum 4.9 ft (1.5 m).
- One campaign is foreseen before the installation campaigns.

The grapnel run will be carried out by towing a grapnel train from a dedicated vessel.

- The tow wire tensions are monitored at all times with a load cell and logged.
- A steady rise in tension is normally a good indication that the grapnel set has engaged debris.
- The grapnels will then be recovered, and debris removed.
- Recovered debris will be stored onboard and disposed in a suitable manner at the next port of call.
- The grapnel vessel will carry a spare grapnel train and additional cutting graps etc.
- The grapnel vessel may have an ultra-short baseline acoustic positioning system (USBL) system to position the grapnel, and a sufficient online survey system to monitor both vessel grapnel together with tension measurement.
- There will be a dedicated online surveyor on watch during the operation.
- All observations will be logged.
- The grapnel operator is responsible for keeping track of known documented cables during operations, with help of the online surveyor.
- Exclusion zones as per crossing agreements will be adhered to.
- After completed job a filed report listing all observations and potentially relocated obstacles with positions, shall be delivered, to be used for the installation.

Small debris will be removed during preparatory works operations (mattress installation PLGR or pre lay survey operations). Debris will be removed either by recovery or removal out of the cable route. It is also possible to deploy a remotely operated vehicle (ROV) from the CLV for identification and removal should debris be encountered during lay operations.

In addition to removing debris, removal of certain linear features will also occur during PLGR operations. Using the survey data, it is anticipated that Nexans will need to clear linear features crossing the cable route.

Typically, this will be chain, old fishing line or out of service cables. In the case of Revolution Wind, the project has identified an out-of-service cable, which is considered debris.

When a linear feature such as the identified out-of-service cable is positively identified, the contractor will hook it using the PLGR train and recover a cable bight to the vessel's deck. Once the bight has been secured to the deck in two places, the Contractor shall cut the cable typically using a reciprocating saw (see Figure 5). Once cut, the cable ends shall be sealed using suitable heat shrink cap. In line with International Cable Protection Committee recommendations, a clump weight shall be attached to the cable end and the clump weight and cable end shall be lowered back to the seabed a safe distance from the cable route (see Figure 6). Note, it is intended to use heavy chain as the clump weight, which will either self-bury over time or can be actively buried using Capjet or another suitable burying tool.

Figure 6. Representative Out-of-service Cable Cutting Operation on PLGR Vessel

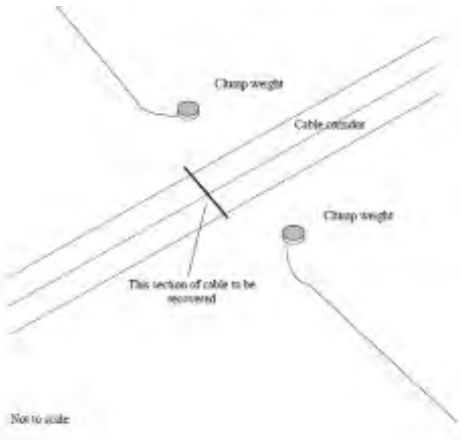

Figure 7. Typical as-left Scenario Using Clump Weights

3.5.2 Crossing Preparations

Seven crossings have been identified in the cable route.

- Prior to cable installation concrete mattresses will be installed at the exact crossing locations to secure separation between the existing asset and the export cables.
- Crane wire or mattress frame will be equipped with transponder(s) to aid in positioning of the mattresses, position is verified by ROV with transponder/sonar.
- Position of the mattresses will be confirmed by multi-beam echo-sounder (MBES) survey.

The cable crossings are located close to each other. The jet plow cannot be deployed in between the crossings. Therefore, as described in Section 3.4.1, the Capjet system will be used. Alternatively, mattresses may be installed in these sections.

During installation, the jet plow will be graded out prior to the asset crossings for safety reasons. The burial tool will be deployed again after the crossing location. The safety distance to the asset is 500 ft (152.4 m) on each side for jet plow operations. Since the safety distance to the asset is 90 ft (27.4 m) for water jetting Nexans proposes to perform post lay trenching with Capjet to reduce the concrete mattress scope. See Figure 7 below.

Note: safety distances to crossings are subject to crossing agreement(s)

- Concrete mattresses will be installed in the grade out section
- Where the cables are surface laid
- At the exact crossing location
- At the grade in section.

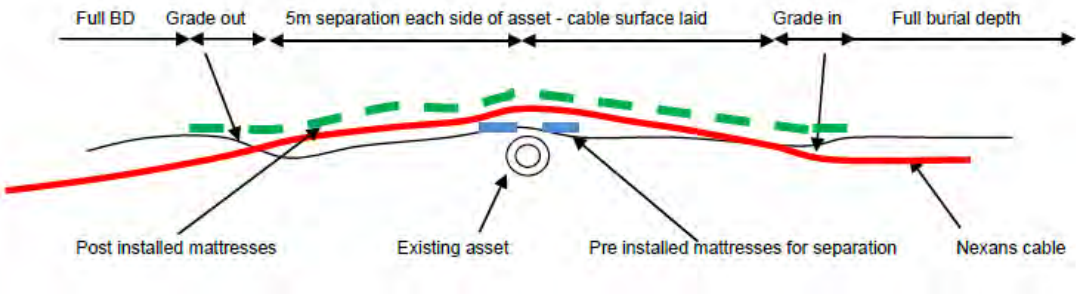

Figure 8. Schematic of typical crossing design

The concrete mattresses will be installed diverless, by a vessel or barge with an appropriate crane for deployment. To ensure a smooth operation an ROV may be used in combination with the mattress deployment frame to position the mattresses accurately along the route. The mattress installation frame could be an intelligent self-propelled unit with self-release mechanism or a simple mechanical frame that is released by a work-class remotely operated vehicle (WROV) once in position (see Figure 8).

However, if and where divers assisted installation are required, a diving plan will be established and deployed for the relevant operations.

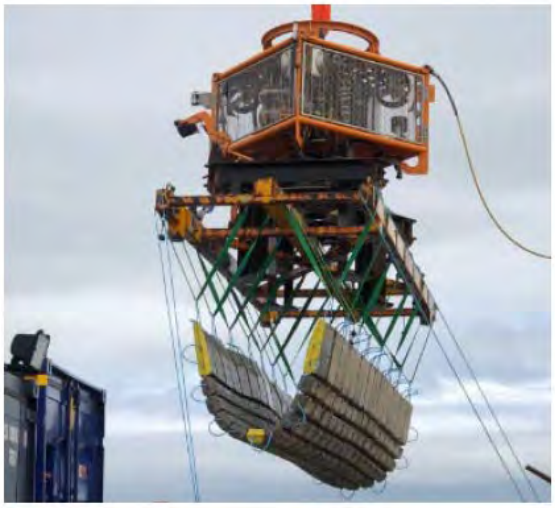

Figure 9. Intelligent Mattress Installation Frame

3.5.3 Pre-lay Cable Surveys

Existing processed survey data are of good quality and has sufficient resolution for route engineering and burial assessment.

Nexans has planned for pre-lay surveys prior to each of the installation operations with the aim of ensuring all debris have been removed during the PLGR and that the route is free of obstructions which could hamper the installation operations. Allowance is also made to check position of cable crossings or OSS cables if required. The survey will be undertaken soon after completion of route preparations on the cables.

The pre-lay surveys will be performed along the center line of the planned route, Nexans will perform the pre lay survey with MBES, camera, still or video, gradiometer, and side scan. An image of the centerline will give a good center line check. A high frequency side scan (~900kHz) will complement the visual inspection, and a gradiometer would give a last center line check for buried magnetic features and potentially crossings. Smaller removal work, based on the pre installation inspection, can be performed by the survey vessel with help of the onboard ROV.

The survey works will be split in two to cover the entire route, a near shore part and an offshore part utilizing two different vessels. An overlap between the two surveys will be ensured.

3.5.4 Boulder Relocation

Boulder relocation activities will include surface and subsurface boulder relocations to facilitate cable installation. A Boulder Identification and Relocation Plan, which included both State and Federal waters, was submitted to the Bureau of Ocean Energy Management, Bureau of Safety and Environmental Enforcement, and NOAA Fisheries for review and approval. Revolution Wind received federal approval of the plan on

January 12, 2024. The federally approved plan was then submitted to CRMC and RIDEM on January 18, 2024, for their review.

Any boulder relocation will comply with Condition L of the CRMC Category B assent referenced above. In addition, all boulders within State waters will be relocated outside of the 65.6 ft (20 m) cable clearance corridor but within the 131.2 ft (40 m) disturbance corridor using a boulder grab (pick). For the picking of boulders with a grab, Nexans may utilize the UTROV system, or similar, with a combined boulder grab and steerable ROV (see Figure 9). The UTROV boulder grab can remove boulders up to 7.9 ft (2.4 m) in diameter. For larger diameter boulders it is possible to grab a part of the boulder and drag it out of the route. Larger grabs could also potentially be fitted to the UTROV system. The safe working load of the UTROV is 55 tons.

The UTROV has a Gyro, Altimeter, Gemini Acoustic Camera and video cameras fitted as standard and can be fitted with a transponder for position purposes.

Alternatively, a non-intelligent boulder grab with sufficient capacity may be used, powered either by umbilical to surface or from an ROV. A transponder may be fitted on the boulder grab lift rigging for positioning purposes. ROV will provide video feed. The boulder picking system will be mobilized onboard a locally chartered vessel.

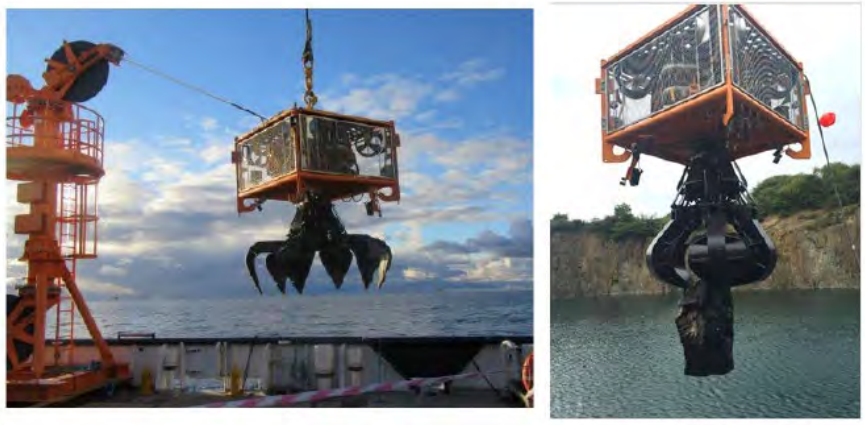

Figure 10. UTROV Boulder Grab system and Principle of Removing Larger Boulders by Grabbing a Section of the Boulder

3.5.5 Pre-cut Trenching

Prior to cable lay a Y-shaped trench will be pre-cut between approx. KP20-25 in order to avoid the risk of sinkage of the cable plow in this area. This will reduce the risk for potential damage to the cable during simultaneous lay & burial and or additional secondary protection. Further details can be found in section 3.4.1.

3.5.6 Pre- and Post-Lay Concrete Mattress Installation

Prior to cable lay under the Jamestown Verrazzano Bridge the base case is to install concrete mattresses to protect the cable from potential debris of the old Jamestown bridge. If necessary, any debris preventing mattress or cable installation will be relocated outside of the 65.6 ft (20 m) cable clearance corridor, but within the 131.2 ft (40 m) disturbance corridor. On completion of cable installation concrete mattresses will be installed on top of the cable for protection purposes. It is expected to cover 200.1 ft (61 m) for Circuit 1

and 265.7 ft (81 m) for Circuit 2 giving total expected footprint of approximately 0.12 acres (ac) (500 m^2) and 0.15 ac (600 m^2). Mattresses to be used are of the same type as for crossings. Concrete mattresses may be installed from a suitable vessel or barge. Based on pre-lay survey data, PLGR operations, and debris removal, it may be feasible to perform simultaneous lay and burial at this location; if this is feasible, it would remove the requirement for mattresses.

3.6 Nearshore Cable Installation

The scope for the nearshore cables is out to approximately KP 9.5, and the seabed water depth ranges between 11.8 ft (3.6 m) and 85.3 ft (26 m). The two nearshore power cables with approximately length of 5.9 mi (9.5 km) each will be installed from an installation barge. The two power cable lengths consist of two different cross sections - the expected cross section split will be installed approximately at KP 2. Both cables are planned as first-end cable pull-in operations. Expected pull-in forces are in the range of 10-15 tons. A pull-in head is planned installed on the end of the power cable, and this has an outer diameter of approximately 1.3 ft (0.4 m).

The installation barge will tow a jet sled behind it to simultaneous lay and bury the cables. For positioning of the barge, a robust solution is to base this on a combination of anchors and spuds from the landfall and out to approximately KP 2.5 at 6 m water depth. From approximately KP 2.5 the positioning of the barge can be based on thrusters. Spuds on the barge can be used to assist station keeping of the barge in waters depths below approximately 32.8 ft (10 m) water depth, if required. One or more tugs can also assist the positioning of the barge in deeper waters. Anchors can be relevant as a contingency solution outside KP 2.5 in case of emergency or extreme weathers. Anchors may be placed outside the 131.2 (40 m) disturbance corridor, but within the areas of potential effects.

After the pull-in operation, the barge will initiate the simultaneous lay and burial of the power cable. At approximately KP 7.2, the installation barge will pass the old remnants of the Jamestown Verrazano Bridge. At this location, it will likely be pre-installed concrete mattresses on both routes due to possible remnants from the controlled demolition in 2006. This will be the only planned location where the jet sled needs to grade out and be lifted off the seabed and past the likely pre-installed concrete mattresses, and grade-in from there. The cables will be laid down on the seabed at approximately KP 9.5, to allow for upcoming inline jointing operation from Nexans Aurora.

3.6.1 Cable Pull-In at HDD Exit Pit

The HDD for cable installation at the landfall occurred from October 6, 2023, through November 1, 2023. The drilling operation was completed successfully by forward reaming from onshore to offshore, enabling the majority of drilling fluid to return to the onshore entry pit for recycling. Any fluid which arrived at the HDD exit location(s) was contained within the excavated pits and recovered to a storage barge using means of mechanical suction, before being disposed of via a licensed waste facility. During the drilling operation, full returns were evident and therefore the fluid captured was a result of the punch out and also from the displacement of fluid in the bore during the pull in of the pipe. No inadvertent returns occurred. Upon completion of the pipe installation, both pits were backfilled using the excavated material.

Cable installation (pull-in) will occur October 2024 and is described below.

Cable Pull-In Preparation

Prior to the commencement of landfall cable pulling, the landfall site will be prepared with the main elements of work:

Land Based Works

- Carry out pre-start site survey to establish baseline.
- Mobilization of site – site office, fencing, security etc. according to Revolution Wind's specification.
- Expose onshore end of two ducts.
- Excavate 2x cable trenches from HDD entry point to transition joint bay (TJB).
- Clean two ducts and install messenger wires prior to pullback (potentially existing messenger wires can be used).
- Open and prepare TJB(s) for cable installation (including drainage of water, removal of soil etc.).
- Maintain 2x cable trenches including TJB's for cable installation works.
- Mobilize pull in equipment including winches, dead man anchors, rollers, quadrants etc.
- Provision of necessary equipment and personnel.

Marine Works

- Mobilize support barge with diver spread, crane, excavation tools, deck winch, etc.
- Expose offshore two duct ends.
- Diver removal of duct cover plate and installation of bellmouths.
- Clean two ducts and install messenger wires prior to pullback (potentially existing messenger wires can be used) NOTE: This task will be conducted in advance of cable pull-in operations and could be a collaborative effort between Land and Marine Teams.

Landfall Pull-in Methodology

- The CLB will set-up on spuds or anchors in alignment with the lay route, close to the position of the HDD exit point.
- The jetting tool will be prepared for cable installation and protection.
- A diver will recover the pull winch wire to the deck of the CLB. The divers will remain on station underwater to observe and will report cable pull-in operations from a safe vantage position.
- The crew of the CLB will connect the sealed cable end to the pull wire.
- When all parties (Shore / Barge) agree, the shore winch will be energized to commence pulling the cable ashore.
- The cable carousel operator aboard the CLB will adjust pay-out speed to suit demand.
- Should the CLB not have floatation to get within close proximity of the end of the HDD, it may be necessary to float the cable. A float removal rig and/or divers will then remove the floats.
- When everything is ready for cable pull-in, the shore crew, in communications with the barge crew, will winch the pull in wire until the cable exits the HDD, through the Transition Joint Bay (TJB), and the

necessary over length specified. During installation the shore winch will continuously monitor the pulling tension of the pull-in wire. When finished with the pull in, the shore winch will hold onto the cable until the CLB begins laying and burying. Once the CLB has made sufficient forward progress, the shore winch would be released from the cable. A temporary hold-back of the cable will be used if necessary.

HDD Grouting and Re-instatement

The grout within each HDD duct is to be installed with the material injected into the duct through a bulkhead fitted to the duct at the landing end. A specialized grout blend which meets the thermal requirements with the necessary flow properties to allow it to be pumped over long distances will be used. The bulkhead will be of a split flange configuration which is to be designed, procured, fabricated, and installed at either ends of HDD ducts. The subsea flanges will be installed by use of divers, which will also operate the valves and monitor during HDD grouting operations.

Post Cable Pull-In Works at HDD Exit Pit

After the barge has laid the power cable a certain distance away from the HDD exit location, the diver(s) at the exit location will get permission to remove the bellmouth and install the split flange. The divers will thereafter assist to ensure the power cable has specified depth of lowering from the HDD exit point and out to where the jet sled transition was completed. Thereafter, the exit pit will be backfilled.

3.6.2 Cable Lay and Burial

After cable pull-in operation is completed, the barge will start the simultaneous lay and burial operation. The jet sled will be towed behind the installation barge. The jet sled will initially transition from its start point outside the HDD exit to obtain the specified power cable depth of lowering. The layback of the sled and the depth of the stinger will be controlled to ensure the power cable is installed according to contractual specifications, to the extent possible.

The depth of the stinger will be monitored onboard the installation barge, but a separate as-trenched survey will be performed to confirm the burial depth and the level of backfill achieved.

The positioning of the jet sled will be by USBL. In very shallow water depths, a separate vessel or work boat will assist by staying close to the jet sled to ensure good positioning.

At approximately KP 7.2 the barge will pass the remnants of the old Jamestown Verrazano Bridge. If simultaneous lay and burial is not feasible due to debris and pre-installed concrete mattresses are deemed necessary, the jet sled will need to transition out before entering these, and the cable free laid on top of the mattresses and transitioning in the jet sled again after having passed the mattresses. Divers operating from a separate platform are required to load and unload cable from the jet-sled. These transition locations are then expected to be covered by first Capjet, and then by post-laid mattresses. The cable lay-down is expected to be at approximately KP 9.5 at 32.8 ft (10 m) water depth, north of the first out-of-service crossing.

After having installed the first nearshore cable, the installation barge will return to the HDD exit location to install the second cable.

3.6.3 Overburial Risk

A requirement to not overbury the cables has been introduced. This is to ensure that the cables are not buried too deep which could result in thermal limitations. Nexans will ensure that the maximum over-burial is not exceeded, including survey tolerances.

An assessment of the risk of overburial has been performed. The risk assessment shows a high risk in the near shore sections if using jet sled and no risk in the remaining part of the routes. To mitigate the risk of overburial, awareness of the issue will be ensured and taken into account during engineering. The use of vertical injector on the nearshore sections is assumed to decrease this risk to a minimum. If using a jet sled, shorter swords and lower water pressure will reduce the risk.

Should overburial be an issue in the sections where the jet plow is utilized the skids can be lowered.

3.7 Mid-Shore Cable Installation

3.7.1 Jet Plow Launch

The jet plow will be constructed with a top loading system. The jet plow will be launched from the lay vessel via the vessel A-frame. The A-frame is equipped with a scissor system to stabilize the jet plow during launch and has a safe working load of 150 Te. The weight of the jet plow is 66 Te with a wet weight of 55 Te (actual weight might vary slightly).

When the jet plow is positioned on the seabed the vessel will move to position the cable into the jet plow. For details of the operation please see Figures 10 through 14 below. This part of the operation will be analyzed/engineered.

For loading of cable into the jet plow in shallow waters (typically 32.8 – 49.2 ft [10 - 15 m]) Nexans will perform a float in of the cable into the jet plow. This methodology will be applicable for the launch of the jet plow at the position south of Jamestown Verrazano Bridge.

Floats are installed onto the cable to make it buoyant. The vessel continues to lay the cable on floats for approximately 328.1 ft (100 m). In this position the vessel stops. A workboat pulls the cable gently sideways to maximize the clearance between the cable and the jet plow during launching of the jet plow.

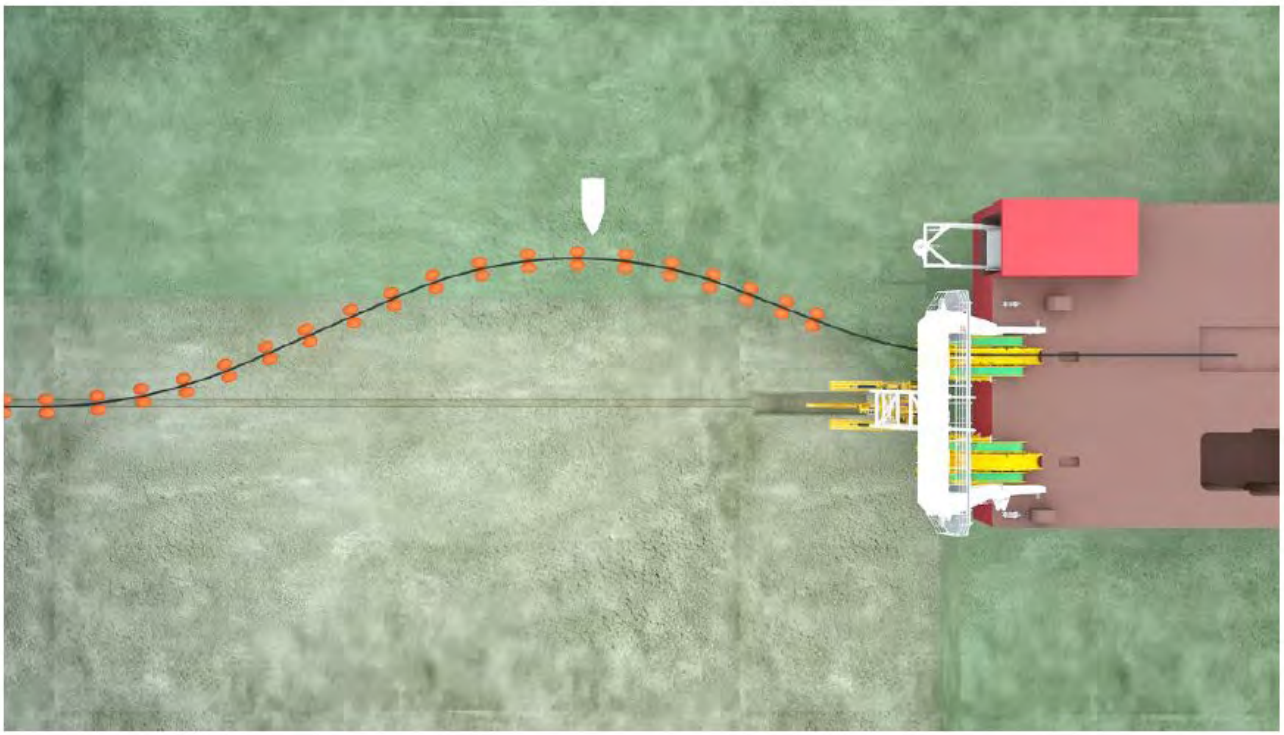

Figure 11. Top View of Vessel and Cable Position During Jet Plow Launch

The clearance between the cable and the jet plow will be approximately 13.1 ft (4 m) during deployment. The jet plow is restricted from rotation and sideways movement in the LARS scissor frame until it is submerged to ensure that it is not hitting the cable.

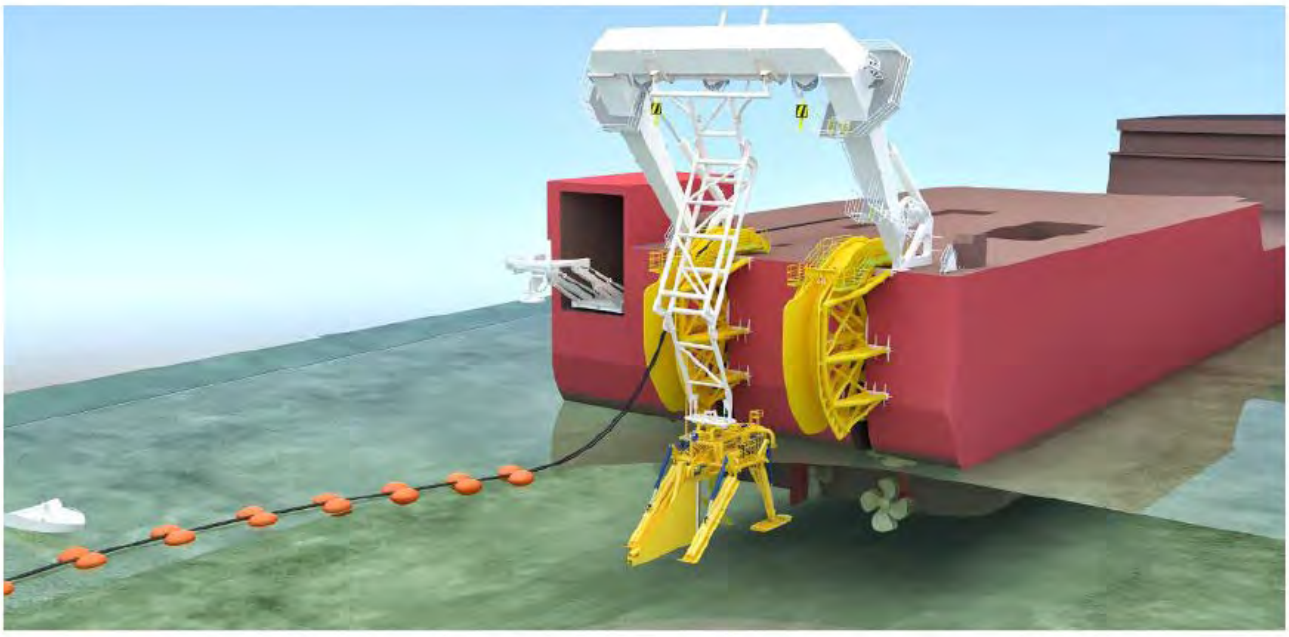

Figure 12. Jet Plow in LARS Scissor Frame During Launching

When the jet plow is landed at the seabed the vessel moves forward and slightly to starboard while paying out tow wire and umbilical.

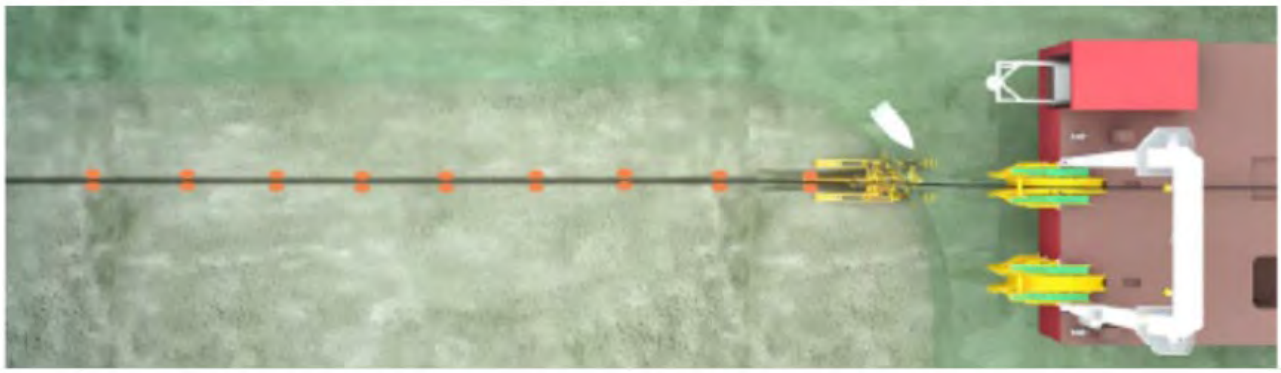

Figure 13. Top View of Vessel Repositioned to Align Cable with Jet Plow

Assisted by the workboat, the cable is now located over the jet plow and the floats will be removed to sink the cable into the open jet plow.

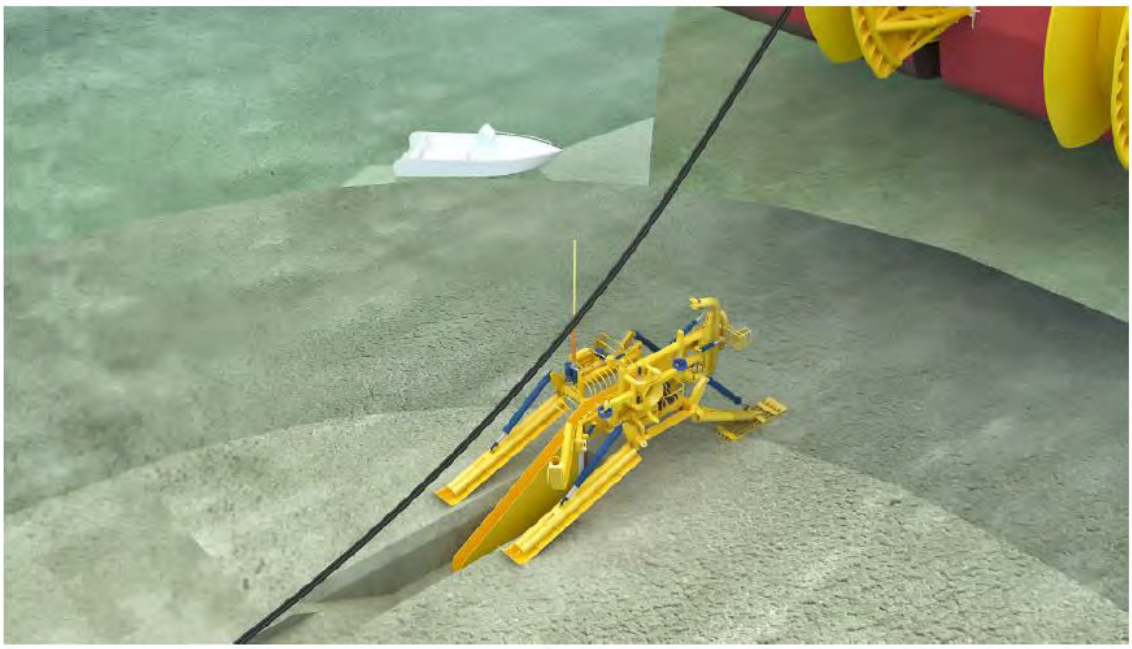

Figure 14. Cable Entering the Jet Plow

When the cable has entered the jet plow, the hinge top is closed, and the depressor is put in position.

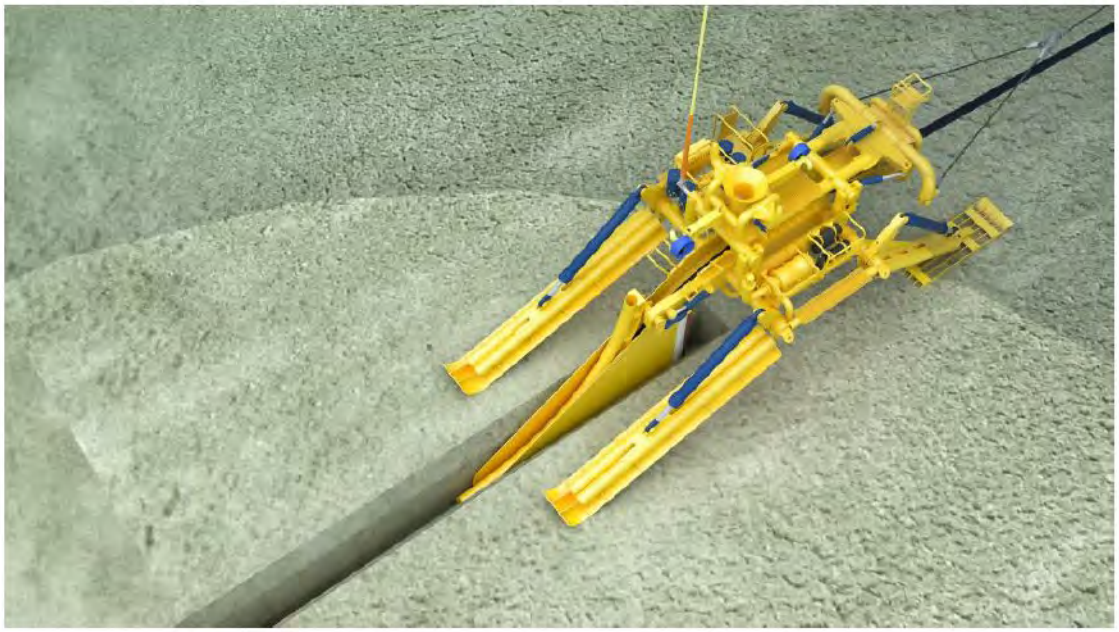

Figure 15. Cable Secured into the Jet Plow

Finally, the vessel moves forward while paying out on tow wire and umbilical until it is in correct position to start simultaneous lay and burial operation.

3.7.2 Simultaneous Lay and Burial – Monitoring

When the jet plow has been launched and the cable loaded into the jet plow, the simultaneous lay and burial operations will commence. The routing of the cables and the soil data will have been closely reviewed and a copy of this data be available to the plow pilots for each section as they progress along the route, ensuring the operation is carried out within the operational limitations and contract burial depths are maintained. The jet plow is kept onto the cable line by both changing the vessels relative line position and using the steering bridle monitoring closely environmental parameters such as slope angles, pitch and roll and maintaining the correct entry angle as the cable entering into the jet plow bell mouth and passes through the vehicle.

The installation vessel slowly starts to move forwards while pulling the jet plow. The shear of the jet plow will be lowered ensuring grade into the contract depth of lowering. Any rises in tow force are carefully monitored. A tug may be utilized to increase the vessel bollard pull if required. The jet plow operator is in constant contact with the DP operators maintaining a steady and constant overground speed.

Typically, the following parameters will be monitored during operations:

- Cable tension
- Shear position
- Tow forces – port and starboard load cells and tow winch
- Tension in the plow cable handling system
- Visual observation via cameras
- Obstacle avoidance sonar
- Profiling sonar
- Plow positioning system
- Water injection system status
- The jet plow is designed for subsea loading. ROV intervention to release the cable in case of breakdown.
- ROV touchdown monitoring will be performed during cable lay activities to ensure integrity of the cable, avoid snagging, identify potential debris in the pathway etc.

3.7.3 Tow Vessel and Tow Management

The installation vessel may be assisted by a tug vessel during the jet plow operations to ensure sufficient bollard pull for the jet plow. The pull tug vessel will handle peak loads and be present in case of bad weather. In bad weather the bollard pull from Aurora will be reduced.

The simultaneous lay and burial operation will be performed on DP only. No anchors will be utilized.

3.7.4 Monitoring of Burial Depth

The achieved depth of burial is defined by the relative jet plow shear position; this is adjusted by making small adjustments to the stabilizers and skids positions. Should the tow force rise to unexpected levels during the operations, the burial depth will be reduced in order to maintain forward movement and any

significant deviations from contract and/or COP / CRMC assent burial depth will be discussed with the on-board stake holders. Real time monitoring of the burial depth is performed by an altimeter.

A separate as-buried survey will be carried out after the operations to confirm the burial depth and the level of backfill achieved. See Section 3.9.1 for additional information.

3.7.5 Installation Tolerances

Controlling the accuracy of the burial depth with the jet plow will be done with the depressor position. Sinkage of the jet plow skids into the seabed could potentially give a wrong misreading of the actual burial depth. To overcome this the Nexans jet plow design will incorporate an altimeter measuring the burial depth relative to the undisturbed seabed. This way the measured depth will be more accurate.

3.8 Cable Installation Contingencies

The cable installation methodologies described in Sections 3.6 and 3.7 above are the base case. In addition, to the base case, Nexans has identified contingencies in the event that the base case method needs to be altered. The contingencies are described below.

3.8.1 Contingency Cable Burial and Protection Methodology

Should the cable plow fail, a backup solution will be implemented. Nexans will utilize the Capjet water jetting system in combination with a mechanical trencher. The Capjet system will be utilized in areas with soft soils. The mechanical trencher will be utilized where burial depths are above 2.0m and where harder soils are anticipated. Capjet may be used from the CLV or a support vessel while the mechanical trencher will be used from a support vessel.

For the above contingency scenario, the cable will be temporarily laid on seabed before burial.

3.8.2 Contingency Rock Installation

While mattresses will be used as the primary means of secondary protection, rock may be used as a contingency secondary protection solution. Depending on the quantity of rock required it will either be installed in rock bags or filter units from a support vessel or from a dedicated rock installation vessel using fall-pipe, side discharge or crane. A barge may also be used for this in the nearshore area.

The fall-pipe vessel carries large quantities of rock in the vessel cargo holds and deposits rock on the seabed through a fall-pipe. By adjusting the position of the end of the fall-pipe rock can be placed with high accuracy. A side discharging vessel carries rock in its cargo holds and discharges it directly over the side, which is beneficial for working in shallower water. A dedicated rock installation vessel is used when large amounts of rock is needed.

Rock bags and filter units may be installed directly with a crane or using a dedicated lifting frame connected to the crane. Rock bags typically contain 1 to 2 Te of rock, filter units typically 2 to 8 Te. Positioning and survey will be done by a WROV with transponder and sonar, a transponder will also be fitted on the crane wire.

3.8.3 Contingency to Concrete Mattress

As an alternative to concrete mattresses, rock gabions of suitable dimensions may be used. Installation method is similar to concrete mattresses. In addition, rock bags may be used if deemed required. Figures of a rock gabion and a rock bag are below.

Figure 16. Rock Gabion in Concrete Mattress Handling Frame

Figure 17. Typical Rock Bags

3.9 Post-Installation Work

3.9.1 As-Buried Survey

An as-buried survey will be carried out after each of the installation campaigns to confirm burial depth and level of backfill that has been achieved. The surveys will be performed by survey systems deployed from the installation vessels and collated to give a final result. The as-buried survey will also cover the nearshore section.

The survey will be performed using cable tracker and MBES, mounted on a WROV where water depth allows for WROV operations. For areas with insufficient water depth survey equipment will be deployed from a dedicated shallow water survey vessel.

To perform a cable tracker survey, a tone will be applied to the cable. The cable ends need to be accessible / or previously prepared for grounding, for both tone injection and grounding, this needs to be part of the overall plan so that Nexans can have access to the cable end after pull-in at the landfall. Nexans can start and control the tone from the survey vessel, but there must be onshore support if a physical restart is needed. Nexans is following the development of a contact free toning system and will use this if available.

For the project, the TSS-350 system is planned to be utilized due to Revolution Wind requirements.

All survey operations are monitored and logged by the Nexans survey team, and data will be processed and delivered continuously. Processing of the data takes approximately 12 hours depending on the data quality. The result will be made available as soon as possible, both offshore but also if required on an online solution or at an ftp.

After the surveys are completed, as-built listings will be provided in an agreed template/format together with an as-built database. Nexans will collect as built information from the Nearshore operations and all

other relevant operations and update the as-built listing/database with the newest data, Preliminary data will be available during each operation.

3.9.2 Cable Backfill

In case active backfill is required for remedial burial, the Capjet system can be utilized equipped with a plow system. The system has been used with good results in other projects where a certain level of backfill is required. The Capjet can be run in an open trench in an underreaming operation. A sword with nozzles pointing into the trench walls will be utilized to collapse the trench walls. This is typically favorable in areas where spoil heaps and loose materials are not present to scoop into the trench. See Figure 17 below.

Figure 18. Capjet Backfill Plow

If the above-mentioned method is not feasible due to environmental conditions or unsuccessful, subsea rock installation, concrete mattresses or rock bags could also be used to increase the protection level (described further in Section 3.9.4 below).

3.9.3 Post-Installation of Mattresses at Crossings

After the cables have been installed mattresses will be installed on top of the cables to ensure adequate protection from the grade out all the way to the grade in section. The installation work will follow the same methodology as outlined in Section 3.3.2 and be compliant with asset owners' crossing agreements.

3.9.4 Remedial Work

Should the attempt to bury the cables with Capjet not be successful, remedial protection will be by external means such as mattressing or rock installation. Mattressing will mainly be performed in smaller sections where burial depth is not achieved.

4.0 Potential Unforeseen Conditions

The primary potential unforeseen conditions that could influence cable installation are encountering previously unidentified munitions and explosions of concern (MECs) and archaeological resources. If encountered, MECs will be addressed in accordance with Appendix G – Munitions and Explosives of Concern (MEC) and Unexploded Ordinance (UXO) with Risk Assessment and Risk Mitigation Strategy (Ordtek 2021) of the COP and the Unanticipated Discoveries Plan for Submerged Archaeological Sites, Historic Properties, and Cultural Resources Including Human Remains, Revolution Farm for Lease Area OCS A-0486 Construction and Operations Plan (SEARCH 2023).

In addition, as described throughout this Plan and as outlined in Table 2, Revolution Wind undertook several surveys to identify potential hazards, environmentally sensitive resources, or cable installation constraints. By evaluating these data, Revolution Wind microsited the RWEC-RI to avoid or minimize impacts and the potential to encounter unforeseen conditions. Revolution Wind also identified appropriate base case tools and installation methods for cable installation.

5.0 References

BOEM 2023. Memorandum of Agreement Among the Bureau of Ocean Energy Management, Wampanoag Tribe of Gay Head (Aquinnah), Mashantucket (Western) Pequot Tribal Nation, Mashpee Wampanoag Tribe, The State Historic Preservation Officers of Connecticut, Massachusetts, New York, and Rhode Island, Revolution Wind, LLC, and the Advisory Council on Historic Preservation Regarding the Revolution Wind Farm and Revolution Wind Export Cable Project.

Nexans Norway AS 2023. Construction Method Statement.

Nexans Norway AS 2024. Cable Burial Assessment Study.

SEARCH 2023. Unanticipated Discoveries Plan for Submerged Archaeological Sites, Historic Properties, and Cultural Resources Including Human Remains, Revolution Wind Farm for Lease Area OCS A-0486 Construction and Operations Plan.

Appendix C – Vessel Specifications

Boulder/Pre-Cut Trenching-Plow Vessel

M/V LANEY CHOUEST | Multi-Purpose Light Construction Vessel

M/V Laney Chouest

SPECIFICATIONS

REGISTRATION	
Hull	216
Vessel Type	Multi-Purpose Light Construction Vessel
Year Built	2003
ACCOMODATIONS	
Accommodations	58
DIMENSIONS	
Dimensions	348 ft. X 72 ft. X 31 ft. (106 m X 22 m X 9.4 m)
Design Draft	21 ft. (6.4 m)
Clear Deck	183.5 ft. x 56 ft. - 10,276 sq. ft. (56 m x 17 m - 952 sq m)

SPECIAL FEATURES	
Positioning	DP 2
Shark Jaws	Two (2) 700 MT
Tow Pins	Two (2) 300 MT
Tuggers	Two (2) x 15 Tons, Five (5) x 12 Tons
Ship Motion	Two (2) Passive Type Anti-Roll Tanks
Stern Rollers	Two (2) 14 ft. dia. x 20 ft.
Cranes	Two (2) x 20 Ton at 45 ft. Radius-Fixed Boom
Cranes	One (1) x 2.5 Ton at 68 ft. Radius-Knuckle Boom
Cranes	One (1) x 2 MT at 35 ft. Radius-Knuckle Boom
A-Frame	350 MT Hydra Marine fitted with two 10 ft. dia. Sheaves
Moon Pool	42 in. dia. for Keel Hauling Objects
ROV	One (1) Schilling Robotics UHD 200HP 4000M System

Cable Lay Barge Vessel

McDONOUGH
Marine Service

The Barge People
www.mcdonoughmarine.com

Marmac 306 – ABS Class Load Line Deck Barge

OFFICIAL NUMBER: TBN

HULL BUILD NUMBER: 182

FLEET LOCATION(S) Amelia Louisiana

REGISTERED IN: United States

BUILD DETAILS
Built in December 2023(estimated delivery)

BARGE MEASUREMENTS
300' Length
100' Width
19' 9" Height

LOAD INFORMATION
Design Deck Load–4500 lbs. PSF
Cargo Capacity at load line–11,318 short tons Gross Registered Tonnage–4262
Net Registered Tonnage–1278
Load Line Draft–15' 7-7/16"

Picture courtesy of Technip.

O: 504-780-8100 F: 504-780-8200 A: 3500 N. Causeway Blvd., Suite 900, Metairie, LA 70002

Cable Lay Barge Tug Vessel

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SEACOR MARINE

Main Particulars

LENGTH OVERALL	265.1 ft	80.8 m
BEAM OVERALL	51.8 ft	15.8 m
DEPTH	19.0 ft	5.8 m
LOADED DRAFT	15.4 ft	4.7 m
DEADWEIGHT	2,446 Lt	2,485 Mt
TONNAGE (ITC) GRT	2,540	
TONNAGE (ITC) NRT	790	

Cargo Deck

TONNAGE	1,600.3 Lt	1,626.0 Mt
STRENGTH	1,024.1 Lb/ft²	5.0 Mt/m²
LENGTH	141.7 ft	43.2 m
WIDTH	41.0 ft	12.5 m
CLEAR AREA	5,882.5 ft²	546.5 m²

Capacities

FUEL OIL	137,634 USG	521 m³	
POTABLE WATER	100,121 USG	379 m³	
DRILL WATER	211,258 USG	800 m³	
WATER BALLAST	211,258 USG	800 m³	
LIQUID MUD	277,117 USG	1,049 m³	6,598 BBLs
DRY BULK	7,487 ft³	212 m³	
BRINE	98,536 USG	373 m³	2,346 BBLs
LFL/METHANOL	98,536 USG	373 m³	
DISPERSANT	4,597 USG	17 m³	

Discharge Rates

FUEL OIL	26,417 USG/hr.	100 m³/hr.
POTABLE WATER	26,417 USG/hr.	100 m³/hr.
DRILL WATER	26,417 USG/hr.	100 m³/hr.
WATER BALLAST	26,417 USG/hr.	100 m³/hr.
LIQUID MUD	59,967 USG/hr.	227 m³/hr.
LFL/METHANOL	19,813 USG/hr.	75 m³/hr.
DRY BULK (Free Air)	1,497 ft³/Min.	42 m³/Min.

Machinery

MAIN ENGINES	Caterpillar 4 x 3516C
MAIN GENERATORS	4 x 2,250 kW, 690 V, 60 Hz, 3 Ø
AUX. GENERATOR	1 x 425 kW, 480 V, 60 Hz, 3 Ø
TOTAL INSTALLED POWER	12,639 HP / 9425 kW
EMERGENCY GENERATOR	1 x 175 kW, 480 V, 60 Hz, 3 Ø
BOW THRUSTER #1	Brunvoll CPP, 800 BHP, 9 MT thrust
BOW THRUSTER #2	Brunvoll CPP, 800 BHP, 9 MT thrust
STERN THRUSTER #1	Brunvoll CPP, 800 BHP, 9 MT thrust
STERN THRUSTER #2	Brunvoll CPP, 800 BHP, 9 MT thrust
PROPELLERS	Fixed Pitch Propeller (Conventional) in nozzles
RUDDERS	Twin independent Fish Tail Rudders

Deck and Anchor Handling

ANCHORS	2 x 1,846 Kg
CHAIN	439 m x 38 mm Ø chain
CHAIN CAPACITY	10,594 ft3-300 m3
WINCH MODEL	Rolls Royce Brattvaag, Electro-Hydraulic
LINE PULL	Two Drum Reverse Waterfall / 295 Lt, 300 Mt
WINCH CAPACITY DRUM #1	76 mm x 2,000 m, (3" x 6,600')
WINCH CAPACITY DRUM #2	76 mm x 2,000 m, (3" x 6,600')
BRAKE CAPACITY	393 Lt, 400 Mt
STORAGE REEL #1	76 mm x 2,000 m, (3" x 6,600') each drum
STORAGE REEL #2	76 mm x 2,000 m, (3" x 6,600') each drum
TUGGER WINCH #1	11 Mt
TUGGER WINCH #2	11 Mt
STERN ROLLER	SWL 350 Mt (16' x 8')
SHARK JAWS	2 x Karmfork, 295 Lt, 300 Mt
TOWING PINS	2 Pair x Karmøy hyd w/ locking flaps

Performance

MAXIMUM SPEED	14.0 Knots
CRUISING SPEED	12.0 Knots
ECONOMICAL SPEED	10.0 Knots
BOLLARD PULL	120 MT

Fuel Consumption

FUEL MONITORING SYSTEM	Yes	
MAXIMUM	380.7 USG/hr	34.6 m³/Day
CRUISING	122.4 USG/hr	11.1 m³/Day
ECONOMICAL	97.1 USG/hr	8.8 m³/Day

Accomodation

CABINS	18
BERTHS	43
SPECIAL PERSONNEL	22
SINGLE CABINS	8
DOUBLE CABINS	6
4 PERSON CABINS	6
CREW MESS	1
OFFICES	1
CHANGE ROOM	1
LOUNGES	1
HOSPITAL	1

Rescue Capabilities

FRC #1	MP660 Springer, Full SOLAS 6.6 m, 6 person, 32-34 kt max speed, diesel waterjet, self righting

Electronics & Controls

DYNAMIC POSITIONING	Class 2
DP SYSTEM	GE/Converteam
DP REFERENCE #1	3 x C-NAV 3050
DP REFERENCE #2	Multi Target Laser Based Positioning System
DP REFERENCE #3	Sonardyne Ranger (Fusion)
GYROS	3 x TSS Meridian
ECDIS	Coastal Navigator
RADAR #1	Furuno S Band
RADAR #2	Furuno X Band
GMDSS	Area A3
AIS	Yes
VDR	No
DEPTH SOUNDER	Yes
NAVTEX	Yes
IRIDIUM IOP	Yes
VSAT BROADBAND	Yes

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Special Equipment

FIRE MONITORS	Yes
DELUGE SYSTEM	Yes
FOAM FIRE FIGHTING	2 x 1,810 m3/hr
SURVIVAL CRAFT	6 x 25 person inflatable liferafts
STABILITY COMPUTER	Yes
MUD TANK CIRCULATION	Flygt Agitators (2) per tank
NITROGEN INERTING	For Methanol Tank Inerting
OIL DISPERSANT	Yes, 8m Arms P&S, For application of concentrated or dilute dispersant from 8m spray arms PT or STBD
WATER MAKER	10MT/day
CRANE #1	TC-10-24-40 9,750 lbs @10' , 3,013 lbs @ 40'
ROV CAPABILITIES	OCEANEERING - MILLENIUM PLUS ROV (220 HP) SPREAD
ROV POWER SUPPLY	800A & 600A from Main SWBD
CONTAINER SUPPLY	4 x 480 V, 63A, 3Ø & 4 x 220 V

Documentation

CLASS	ABS ✠A1, Towing Vessel, Fire Fighting Vessel Class 1, Offshore Support Vessel, Ⓔ, ✠AMS, ✠ACCU, ✠DPS-2, UWILD
CLASS ID	12230766
FLAG	USA
USCG	OSV, SubCh L & I Vessel
OFFICIAL NUMBER	1205366
IMO	9707809
CALL SIGN	WDG3786
MMSI NUMBER	366766000
BUILD YEAR	2012
BUILDER	EASTERN SHIPBUILDING GROUP INC
HULL NUMBER	167

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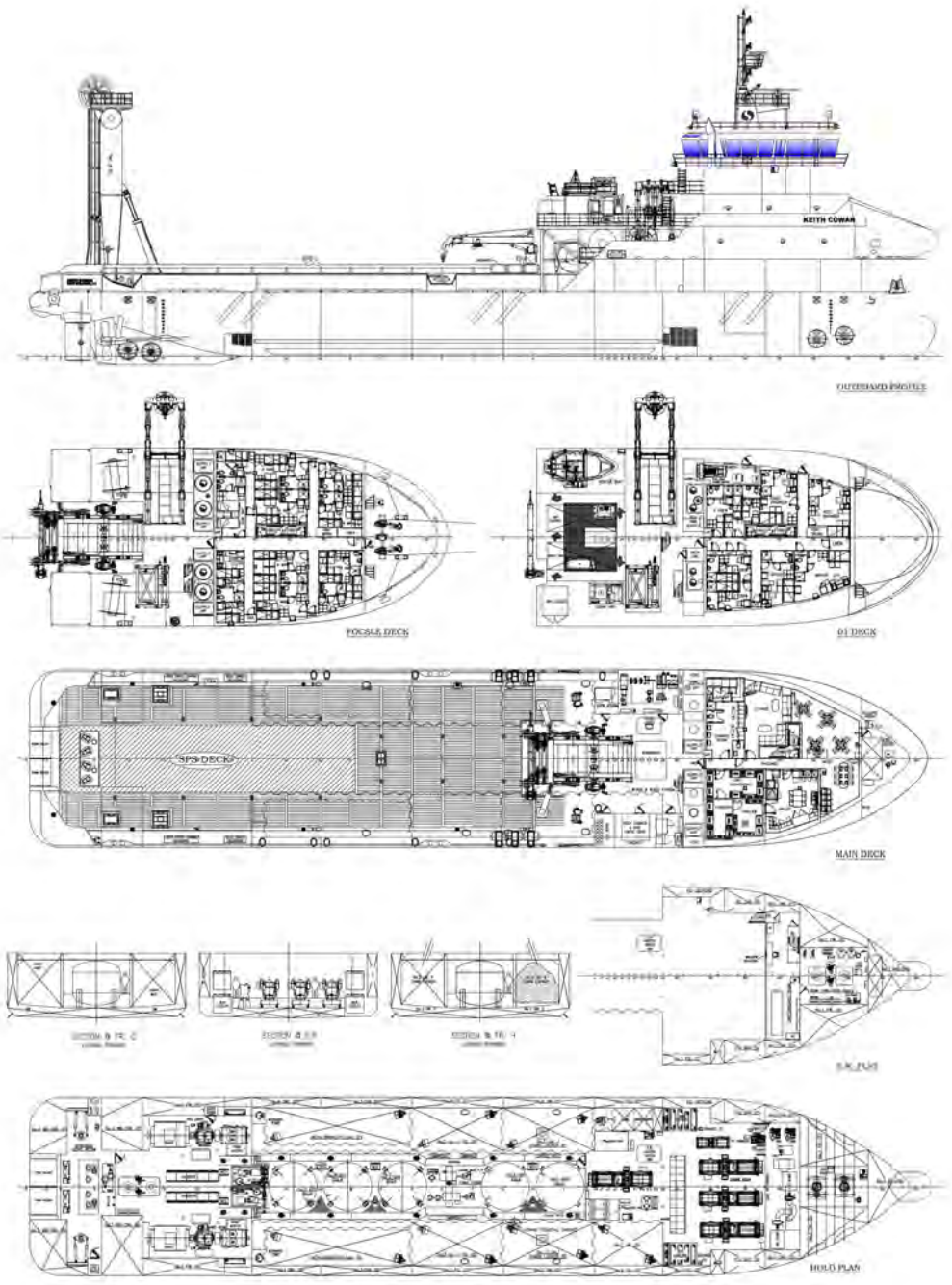


Cable Lay Vessel

CLV NEXANS AURORA

NEXT GENERATION OF CABLE INSTALLATION VESSELS

Nexans
BRINGS ENERGY TO LIFE

COMPLETE CABLE SOLUTIONS FOR SUBSEA APPLICATIONS

Nexans offer a world leading range of subsea High Voltage and umbilical products and systems. The majority of our systems are delivered as complete turn key solutions on a worldwide basis. We serve our customers innovative solutions anchored in world leading know how. Our products are designed and produced by a global team of highly skilled experts. We have large capacity manufacturing plants in Europe, in Asia and in North America. Wherever required, we have a fleet of specialized and dedicated vessels as well tools for installation to accommodate your needs.

Nexans Aurora – a custom made cable installation vessel

Nexans Aurora encompasses more than a century of our experience in submarine cable installation and brings it to the next level with regards to capacity and capability.

LARGE CAPACITY

Nexans Aurora is equipped with a large capacity cable handling spread including a 10 000 tonnes split turntable with dual product lay lines with capacities and features to handle safely and efficiently the full Nexans submarine systems product line.

HIGH CAPABILITY

The vessel also contains a dedicated enclosed cable splicing area offering a controlled environment for performance of all product splicing and termination work to the exact standard as performed in our factories.

WORLD LEADING DESIGN

The design is based on the combined experience of Nexans, Skipsteknisk, Ulstein Verft and MAATS Tech, each world leading in their own fields to produce a subsea cable and umbilical systems installation vessel for worldwide operations, covering the full range of shallow and deep subsea activities.

PREPARED FOR THE FUTURE

Nexans Aurora is prepared for vertical lay operations and complex subsea construction tasks in deep waters in addition to the principle built in structural and system capacities and flexible design features to allow easy adaptation to customers future needs.

HIGHEST LEVEL OF SAFETY

Nexans Aurora offers the highest level of safety and redundancy in design and equipment level to ensure an unsurpassed operational standard and ensured uptime regardless of area of operation.

SELF CONTAINED

Nexans Aurora is designed and equipped to make the vessel as self contained as possible. This includes capacity for long range and long duration operations without resupply as well as onboard facilities to ensure a high level of independence and reduced need for local support during operations in areas of minimal infrastructure.

ENVIRONMENTALLY FRIENDLY

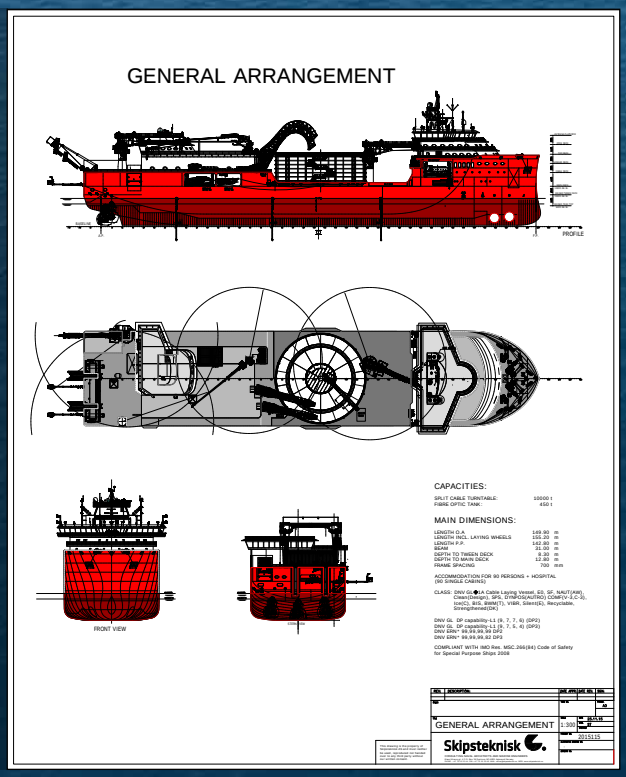
Nexans Aurora offers environmentally friendly solutions with a high efficiency diesel generator plant using low Sulphur fuel, regeneration of cable lay braking power and use of power from shore during cable loading operations.

The vessel design offers inherent separation of work and living areas with the application of the highest work environment standards including exclusive use of single cabins.

BRIEF TECHNICAL DATA

Class: DNV GL
Loa: 149,90 m
B: 31,00 m
DWT: 17 000 t
Speed: 14 kts
Accommodation: 90 persons in single cabins
DP Class: 3
Power: 6 x 3 450 kW
Propulsion:
3 x 3 200 kW Azimuth (stern)
2 x 3 000 kW Tunnel (bow)
1 x 3 000 kW Retractable Azimuth (bow)
Main cable turntable: 10 000 t
Under deck cable tank: 450 t

All data subject to change.



For inquiries contact:
Vessel Operations Manager Knut Flage +47 906 66 831
Chartering Manager Lars Tronvold +47 926 84 446
E-mail: vesseloperations.no@nexans.com

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0605 Oslo, Norway
Telephone: +47 22 88 61 00
www.nexans.no

Allkopi Netprint AS/ 350 ex/August 2018

Nexans
BRINGS ENERGY TO LIFE

Crew Transfer Vessels

Barbara Miller

Home Port	Staten Island, NY
Official #	D1024685
Passenger Count	24
Type of Vessel	Crew/Dive Boat
Hull Construction	Aluminum
Length	57'
Beam	15' 6"
Draft	6' 8"
Range	40 Hours
Cruising Speed	20 KTS
Top Speed	23 KTS
Fuel Capacity	1,800 Gallons
Total Horsepower	1,080
Call Sign	WDA 4712
Navigation Equipment	SSB, (2) VHFs, Radar, GPS plotter
Special Equipment	Swim Platform, 8KW Generator, Enclosed heated and cooled cabin

Vessel Identifier	**JFB 70036**
Vessel Type	**CTV/Work Boat**
Manufacturer	**Scully Manufacturing**
Length	**26 FT**
Beam	**8.5 FT**
Draft	**2.5 FT +/-**
Rated Horsepower	**400 HP**
Drive Type	**Twin 200 HP Honda Outboards**
Notes	**Radar Navigation Package, AIS, Full Marine Radio setup with loudhailer system, EPIRB, SART plus safety package including immersion suits, trauma kit, signal flares, etc.**
	

Light Construction Vessel

Shelia Bordelon Data Sheet

General Information

IMO No.	9670638
Owner/Manager	Bordelon Marine, LLC
Vessel Type	Ultra Light Intervention vessel
Year Built	2015
Place Built / Builder	Bordelon Marine Shipbuilders
Flag State Authority	USA (Jones Act Compliant)
DP Classific tion	DP2
Classi cation	ABS / A1, AMS, +DPS-2, ACCU, USCG L&I, CRC
Official Numbe	1259393

Dimensions

Length	257 ft.	(78.33m)
Breadth	52 ft.	(15.8m)
Depth Molded	18 ft.	(5.5m)
Light Draft	12.5 ft.	(4.6m)
Loaded Draft	15 ft.	(4.6m)
Deadweight	3,285 LT	

Main Work Deck

Main Deck Area	6,280 ft².	(583.43m²))
Main Deck Dimensions	123'x44'	(37.49m x 13.41m)
Strength	1080 lbs per sq ft. = 5273 KG/M2	
Lars Deck Area	2912 sq. ft.	
Lars Deck Dimensions	56' x 52	
Strength	1080 lbs per sq ft. = 5273 KG/M2	
Electrical Power to Deck	480v (3)Phase, three locations	
Air Power to Deck	95 psi	

Capacities

Drill Water	178 kts	(674m³)
Potable Water	96k gal	(363m³)
Diesel Fuel	122k gal	(462m³)
Lube Oil	6190 gals | [2] tanks 3095 gals each	
Hydraulic Oil	3394 gals | [2] tanks 1697 gals each	
Watermaker	8,000 USG/day (30 m3/day)	

Accomodations

Total Berths	60
Stateroom	19
Heads/ Showers	22
Laundry [2] Facility	8 untis in each facility
Hospital	(1) 3 person capacity
Offic	Offshore Manager | Conference Room| ROV Online Room | Project Office | Clien | Survey Area | Shift Supervisor Desk | Dedicated PDU and Instrument Room |
Other	Lounges | Office

Crane

Crane Description	NOV (50) ton AHC 20 tons @ 3000m single fall
Static Payload Capacity	50 Ton
Wire Length	3070m
Wire Diameter	48mm
Maximum Boom Height	22M
Ship/ Rov Crane	10 ton Fixed Boom Support Crane
Certific tions	ABS/DNV lifting notation 2015. Manride/ handling certific tion 2015

**Power source to crane is fully redundant

Machinery

Main Propulsion	(2) Cummins QSK 60 Tier 3	(1641kW)
Main Generator	(4) Cummins QSK 38 Tier 2	(1044kW)
	(2) Cummins QSK 19 Tier 2	(563kW)
Emergency Generators	(1) Cummins 6TA8	(201kW)
Azimuthing Thrusters Bow	(2) Schottel 1215, 4400HP Total	
Thrusters	(2) STT2 FP 975 HP (708 kW each) Continuous Rating	
Dive Support Capability	YES	

Performance

Maximum Speed	12 kts	(200 USG/Hr.)
Service Speed	10 kts	(145 USG/Hr.)
Eco Speed	8.5 kts	(130 USG/Hr.)
Fuel Consumption on DP		(12-30 USG/Hr.)

Navigation snd Communication

Radars	(2) Furuno Ultra-High Def 6KW- 12KW w/MT Bridge-mate display
ECDIS	(2) Nav-Suite 8700 Series, Bridge-mate integrated.
Gyros	(3) MT 6400 series, independent signal
Echo Sounder	(1) Skipper GDS102
Speed Log	(1) Skipper DL850
Auto Pilot	(3) MT Bridge-mate MTOS
GMDSS	(1) Sailor A3 150 W-SAT, C/SAT
Inmarsat C	(2) Sailor 6066, Dual Min-C

ROV Information

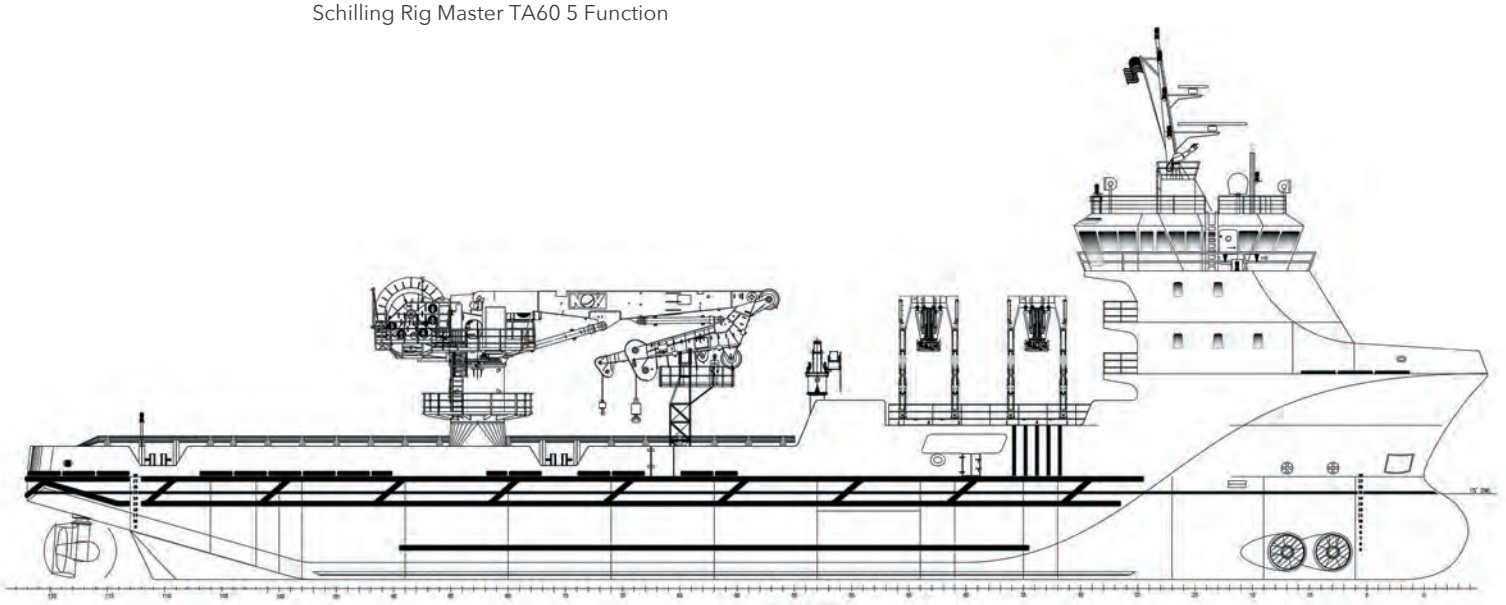
Type	Triton XLX 200 HP Work Class ROV
Number of systems	1
Depth Rating	3000 msw
Umbilical Length	3300m
Tether Length	1000m
Manipulator	Schilling T4 7 Function Manipulator Schilling Rig Master TA60 5 Function

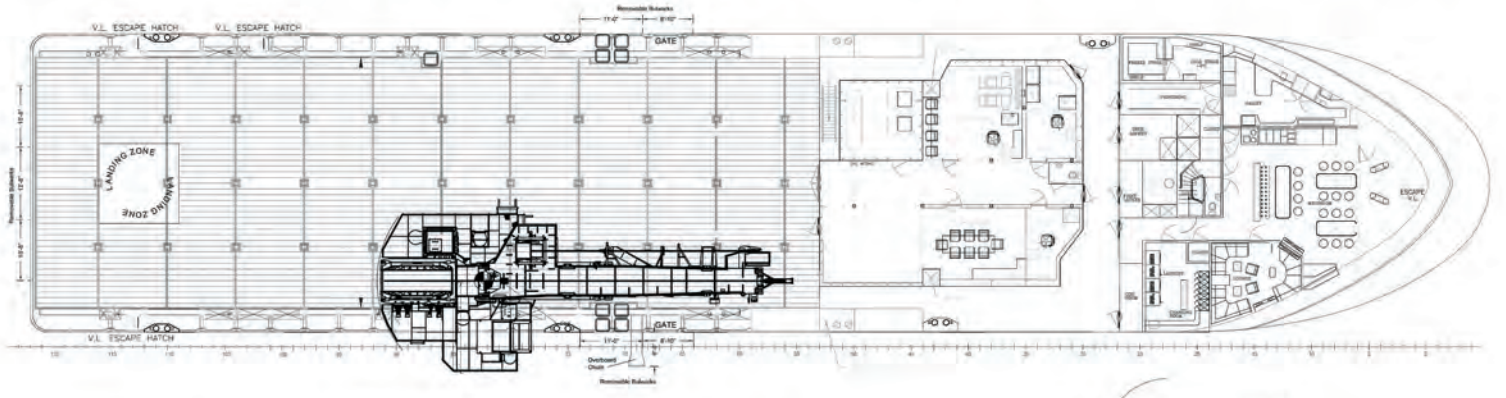
Safety

Life Rafts	6 x 25-man USCG and ABS approved
Fast Rescue Craft	1 Schatt Harding with 40 hp motor
Fire Fighting	Water and Foam capacity

DP & Referencing Systems

Marine Technology	DP2 w/Full Bridge-mate integration, Independent consoles
DGPS	(3) CNAV 3050 Systems, with independent tracking
Cyscan	(1) MT Bridge-mate CyScan
RadaScan	(1) MT Bridge-mate RadaScan
USBL	(2) Ranger2 PRO Systems (2) Independent thru-hull deployment systems





Pre-lay Survey Vessel

Vessel *MV Bella Marie*

MV Bella Marie Specifications

Dimensions

Length	40’
Beam	14’
Draft	2.5’
Displacement	12 t
GRT	8 t
Aft Deck	122 sq ft

Propulsion and Power

Main Engines	2x Volvo Penta D6 2x 340 HP
Propulsion	2x Volvo Drives
Generator	15 kW Phasor
Transit Speed	23 knots
Maximum Speed	28 knots

Capacities

Fuel	300 gal
Fresh Water	60 gal

Safety Equipment

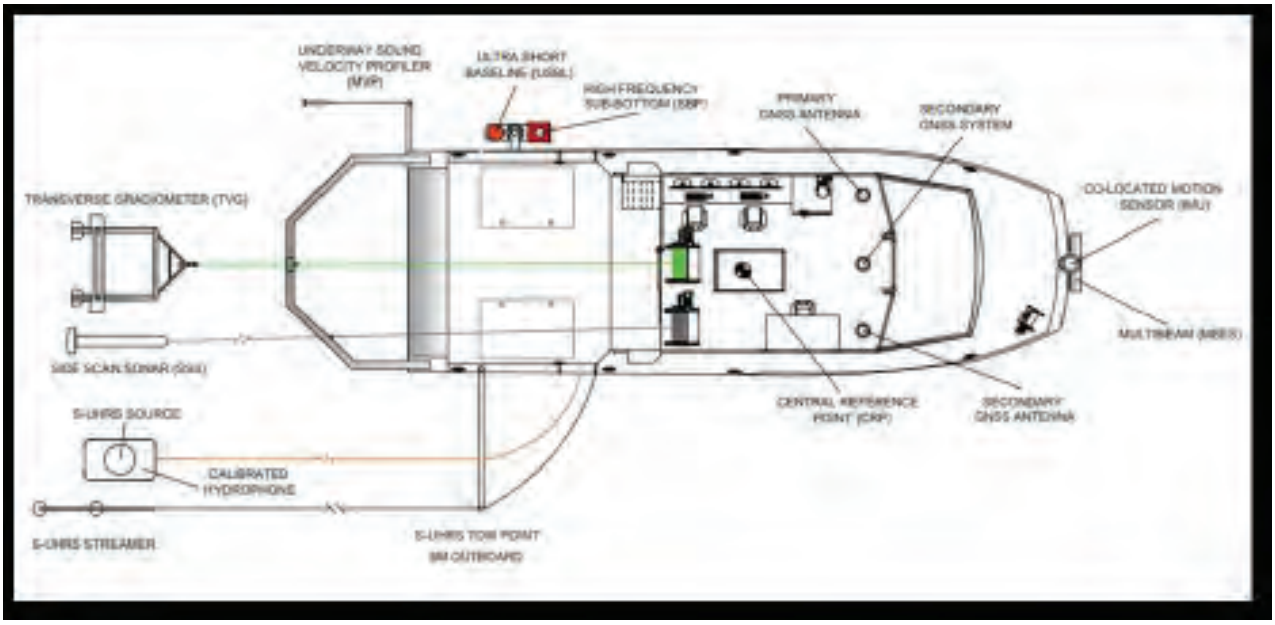
Life Raft	12 person Viking
EPIRB	Hydrostatic release
Winch	Hydraulic bow

Navigation

Radar	Garmin
Autopilot	Garmin-Volvo DPS
Chart System	Garmin
Echosounder	Garmin
Communications	2x VHF
AIS	Garmin

Deck / Equipment

Moon Pool	Centerline in lab 3’ x 2’
A-Frame	Hydraulic 2T SWL (aft deck)
Davits	1x Foredeck port side 2x Aft deck, port & starboard
Bow Pole	Centerline bow retractable survey pole mount
Top Deck	6x GNSS mounts 2x LiDAR / Camera / FLIR
Winch	Permanently installed high speed winch
Rackmount	Shock mounted rack system



MV Bella Marie Deck Layout

Trenching Support Vessel

CYG 11.11 Vessel General Information

Table of Contents

1.0 SCOPE

The purpose of this document is to detail the specifications of the vessel and the services available onboard and on the back deck on Deep Cygnus for oncoming projects. Particulars, working air, fresh water, seawater, high pressure washer, fuel oil supplies and cranes are all detailed.

1.1 Vessel General Information

Deep Cygnus is a purpose-built Offshore Construction Vessel designed by Skipsteknisk AS, ST-256 L.
The vessel is specially designed for operation under severe weather conditions and with high maneuverability and station keeping capabilities.
The vessel can be outfitted and prepared for the following duties:

- Cable laying from carousel
- Trenching operations over the side
- ROV operations from hangar
- General DP operations
- General Offshore construction services
- A-frame operations over stern
- Diving operations
- CTV Portable Boat Landing
- W2W Gangway operations

1	Name of Vessel	Deep Cygnus
2	Type of Vessel	Offshore Construction Vessel
3	Nationality	NIS
4	Shipyard/Build	Bergen Yards Fosen, Norway
5	Building Year	2009
6	DNV No.	28614
7	DNV Class Notations	✠DnV +1A1 SF, E0, DYNPOS AUTR, CLEAN, COMF C3 COMF V3, HELDK-SH SPS Safety Certificate issued 2019-07-15 Document of Compliance for The Carriage Of Dangerous Goods issued 2019-01-15.
8	DP System	K-Pos 31 DP2
9	Port of Registration	Aalesund
10	Call Sign	LACV8
11	IMO	9479541
12	MMSI No	257205000

Vessel Dimensions/Propulsjon/Engines

1	Length o.a.	122.4m
2	Beam	22m
3	Accommodation	92 persons
4	Suez Gross	9608.03T
5	Suez Net	9022.72T
6	SCID (Suez Canal Id)	28614
7	ITC-69 Gross	9423T
8	ITC-69 Net	2827T
9	ITC-69 Length	109.843m
10	ITC-69 Beam	22.0m
11	ITC-69 Depth	10.0m
12	Breadth Extreme	24.0m
13	Height Extreme from BL.	44.60m
14	Lpp	109.843m
15	Dept, moulded (2nd deck)	22.0m
16	Hull Type	Mono
17	Summer Loaded Draft	7.30 m
18	Summer Loaded Deadweight	7877.33T
19	Summer Loaded Displacement	13942.99T
20	Light Ship Weight	6065.66T
21	Dead Rise	3.2m

22	Bilge Keel Radius	
23	No. of and type of rudders	NA
24	No. of propellers	2
25	Propeller type	Azimuth
26	No of tunnel thrusters	2 (1-bow,1-stern)
27	No of Engines	6
28	Engine type	Diesel Electric
29	Engine`s total power	16000HP / 12000KW
30	Switch Board/Power Plant	690V/60Hz
31	TPCI	23.157T/cm
32	MGO Storage Capacity	2063.4m3
33	POT water Storage Capacity	774.8m3
34	Technical Fr. Water Storage Cap.	2x35m3/day
35	Water Ballast Capacity	3779m3
36	Radius of Gyration	
37	Design draught (moulded)	7.3m
38	Design trim (rake of keel) over Lpp	0.0m

Vessel Navigation Equipment

1	Radars	SAM Electronics 1 S-band, 2 X-band
2	ECDIS	SAM Electronics Wartsila Valmarine
3	DGPS Navigation	SAAB R4 Navigation System
4	Gyro Compass	3-Anschutz
5	Auto Pilot	Anschutz Pilotstar D
6	Eco Sounder	SAM Electronics DEBEG 4630
7	Speed Log	SAM Electronics
8	VDR	SAM Electronics DEBEG 4300
9	AIS	SAAB R5
10	Bridge Navigation Watch Alarm	SAM Electronics WAS40P
11	Helicopter Monitoring System	ShoreConnection HMS 900

Vessel Communication Equipment

1	GMDSS Operational Area	A1, A2, A3
2	Accounting Authority and Address	Vard Electro AS NO-6002 Aalesund Norway
2	MF/HF/Radio Tlx	Sailor
3	Navtex	SAM Electronics 2918
4	VHF GMDSS	4-Sailor
5	GMDSS VHF Emergency	Sailor
6	SART	2-Tron20
7	EPIRB Free Float	Jotron Tron 40S Mk II
8	EPIRB Manual	Jotron Tron 60 S GPS
9	Inmarsat C	2-Sailor ,425720511 / 425720513
10	Sound Reception System	TOA Remote Microphone
11	Helicopter VHF, Fixed	2-iCOM
12	Helicopter VHF, Portable	2-iCOM IC-A6E / 1 iCOM IC-A16E
13	NDB Beacon 410 kHz	Yes

Vessel Dynamic Positioning Equipment

1	DP System	Kongsberg DP Class 2, K-Pos DPC 31
2	Joysticks	Kongsberg cJoy
3	Reference Systems	4-DGPS, 1-HiPAP, 1-Fanbeam Laser, 1-Taut Wire, 1-RADius Dual
4	Sensors	3- Anschutz22 Gyrocompass, 3-Gill Wind Sensors, 2-MRU5, 1-MRU2
5	Differential Positioning	2-Seapath 200, DPS232, DPS i2

Vessel Cranes/Deck Loading Capacity

1	Offshore Crane 150t (Main Deck)	McGregor Hydramarine Offshore Knuckle Jib Crane AHC. **Details in 5.1**
2	Offshore Crane 15t (Main Deck)	Dreggen 12T Electro-Hydraulic Knuckle boom Crane. **Details in 5.2**
3	Helideck Crane	2 Sormec provision cranes, SWL 2T
4	Deck Strength/Deck Covering	10T/m2 (5T/m2 on deck hatches)

ROV Survey Arrangement

1	WROV	STB ROV hangar
2	OBS ROV	PS ROV Hangar
3	Carousel	Foundations in deck with guiding- and launching equipment
4	On-line survey	On-line offices, prepared for clear com, phone, etc.
5	Off-line survey	Off-line office with conference room, phone, etc.
6	ROV workshop	Workshop and maintenance area.

Fire and Safety

1	DNV Fire Control and Safety Plan	Multipurpose/ROV Trencher,Yard No.81,Drawing No.81-505-001-1
2	Lifeboats	Jiangyin Wolong TPC-20-III, 1-Portside 1-Stbside, each 103 PAX
3	FRC/Man overboard boat	MP-741 Springer, 10 persons
4	Liferafts	Survitec ESR TO, 6 rafts à 16 persons
5	Lifejackets	Seamaster-1983, 111pcs
6	Immersion Suits	TK007SE, 85 pcs, Sea Eco+ 11 pcs.
7	Fire couplings and hoses	40 pcs.
8	EEBD	Ocenco M.20.2 T, 14 pcs.

MGO/Fresh Water Consumption

1	MGO Consumption/Max Speed	38m3/day 14,5 kts
2	MGO Consumption 12 kts	29m3-34m3/day
3	MGO Consumption 11.5 kts	27m3-32m3/day
4	MGO consumption 9,5 kts	20m3-25m3/day
5	Endurance, nominal (60% MCR)	Approx. 51 days
6	MGO Consumption DP	11-15m3/day
7	MGO Consumption in Port/Mob	4-6m3/day
8	Fresh Water Consumption	22m3/day

Helideck Capability

1	Maximum “D” Value	20.88
2	Maximum take-off weight	12.8t
3	Rules CAA CAP437/ DNV	

Accommodation (total 92 bunks)

1	Maritime Crew Cabins	14 x 1-man and 5 x 2-man cabins
2	Client/Charterer Cabins	16 x 1-man and 26 x 2-man cabins
3	Charterer/Client Offices	5
4	Meeting rooms, offices	Various decks
5	Helideck reception area	Deck 4
6	Laundry	3 x laundries
7	Hospital	Deck 4
8	Messroom	1st deck, Self-serving area, capacity 66 men

TV Lounge

TV Lounge

Vessel Communication

1	Ships Email (Master)	master@deepcygnus.no
2	V-Sat (Main Communication)	+47 21 03 45 35
3	Inmarsat Fleet Broadband	+870 773 945 452
4	Inmarsat C (Tlx)	425720511/ 425720513

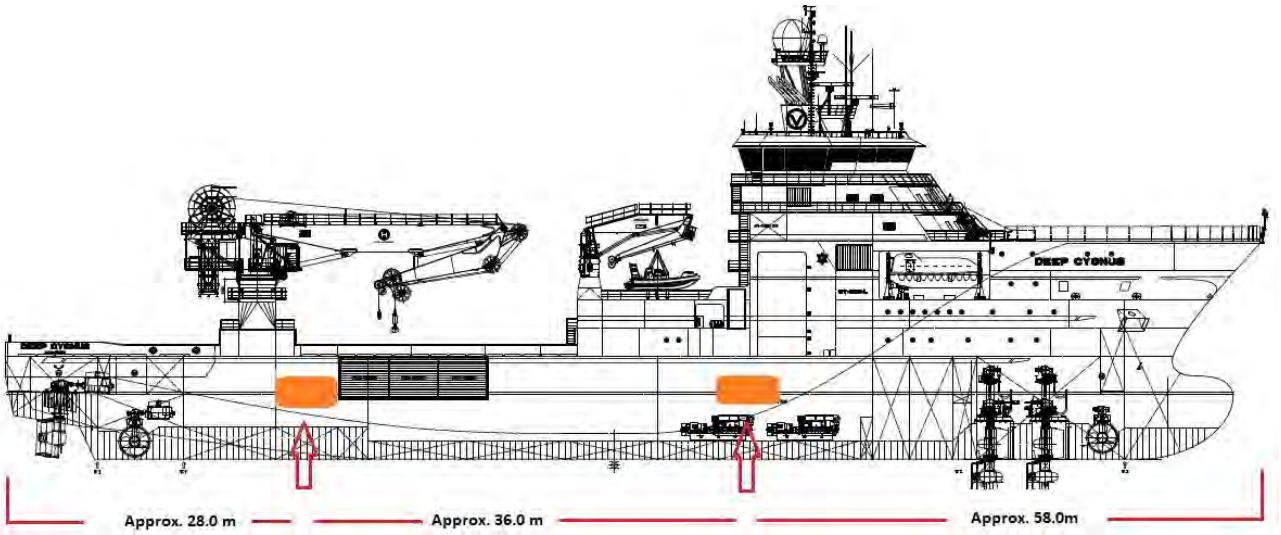
Vessel ISPS Info

1	Company in Charge of Security	Volstad Management AS
2	Company Security Officer Name	Frode Hoddevik
3	Company Security Officer phone	Norway, +47 90987722 mob
4	Company Security Officer Email	frode@volstad.com

Owner/Management

1	Owner	Deep Cygnus KS
2	Owners Address	P.O. Box 1137 Sentrum, 6001 Aalesund, Norway
3	Management	Volstad Management AS
4	Management Address	P.O. Box 1137 Sentrum, 6001 Aalesund, Norway

Fender Requirement Mooring

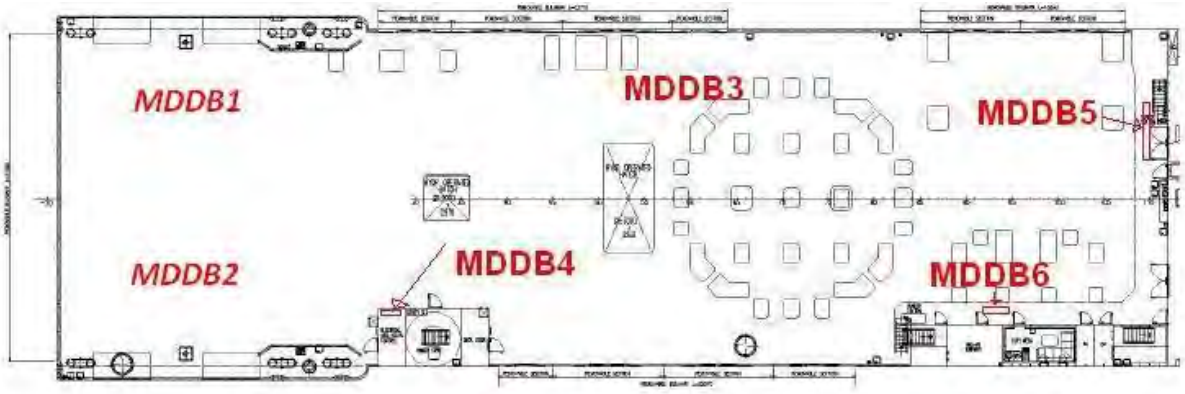


2.0 POWER SUPPLY DECK

There are three main areas with power outlets to the back deck (MDDB4, MDDB5 and MDDB6). The first (MDDB4) is on the stbd side of the ship, aft of the main crane pedestal. There is a small hatch with a Roxtec penetration on the bulkhead which allows cables and plugs to be routed from deck equipment to the power supply.
The second (MDDB6) is on the stbd side of the ship outside the duty mess.
The third (MDDB5) is on port side, just aft of the accommodation.

On tween deck there are three areas with power distribution that is possible to get on main deck. MDDB1 is located on port side of main propulsion room, MDDB2 is located on the starboard side of the main propulsion room on Tween deck and MDDB3 is located on port side in upper cargo room. MDDB3 have sometimes been used on main deck with cables going through lifted Roxtec penetration to deck.

For larger rated supplies, this has to be supplied from ROV SWB located on tween deck.



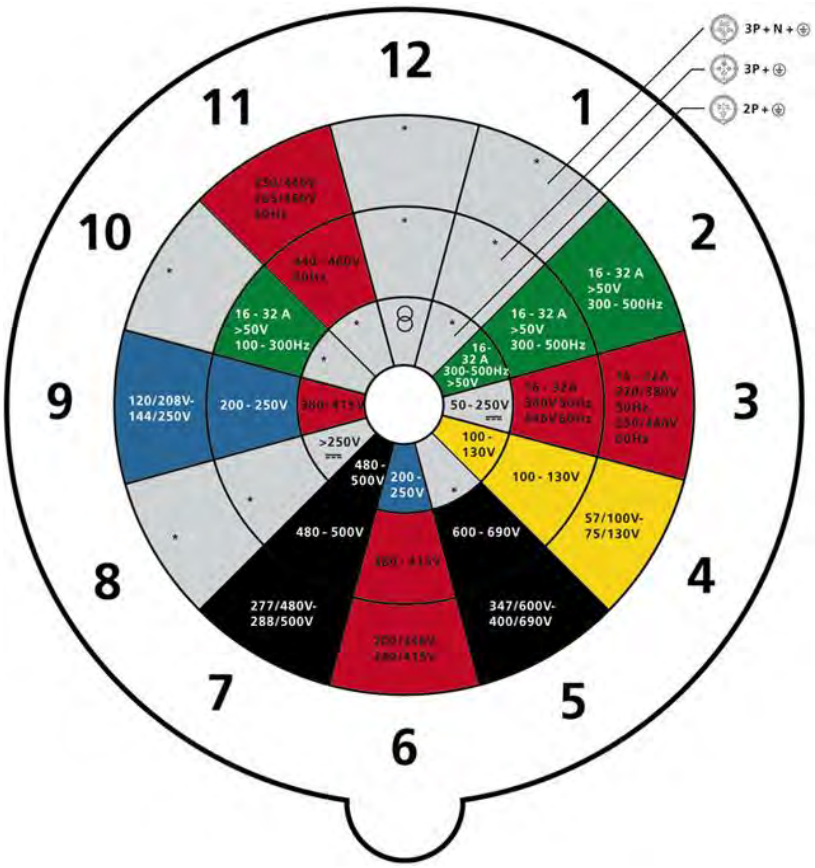
Power Distributions Main deck & Tween deck

Plugs to connect Equipment to the vessel should be according to the following specifications.

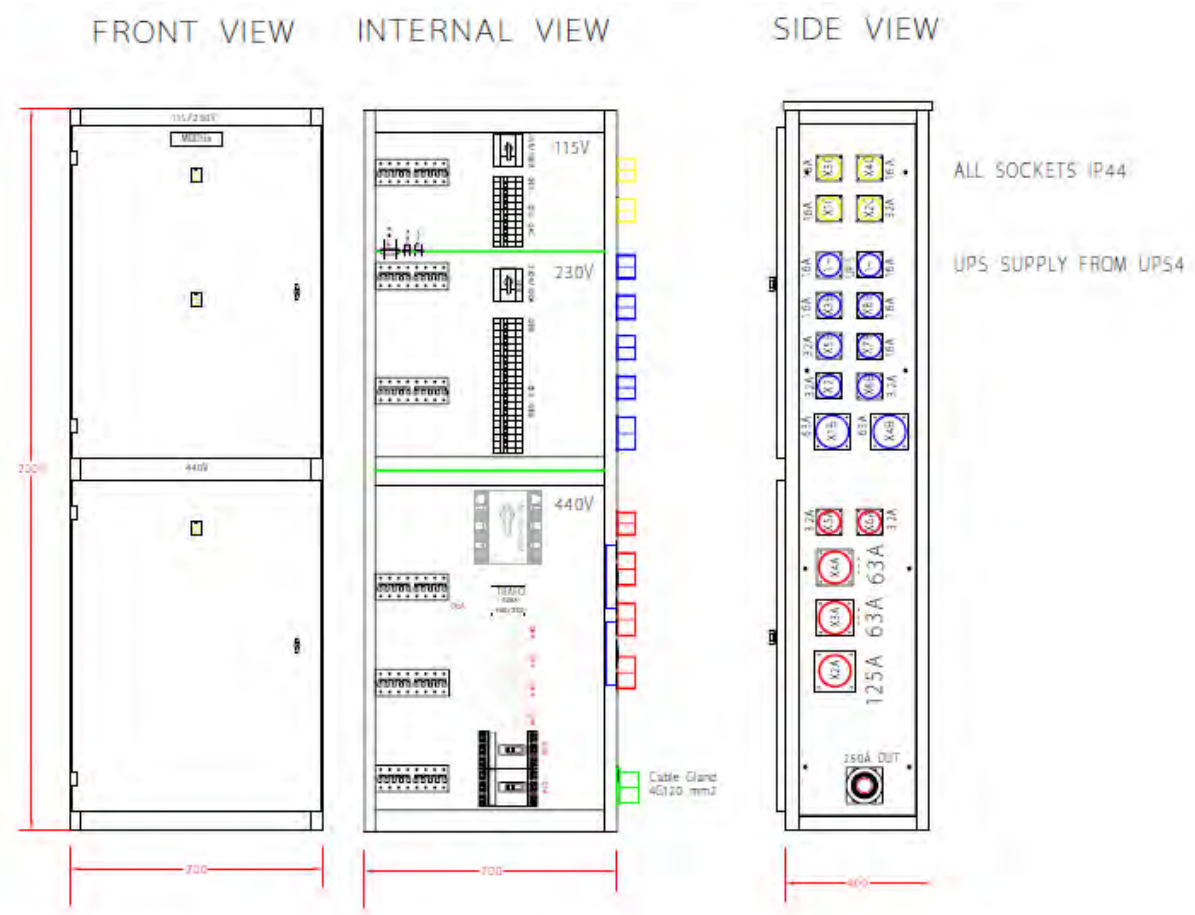
110V:
216-4 (1 phase 110V (2pins) with earth @4)
232-4 (1 phase 110V (2pins) with earth @4)
316-4 (3 phase 110V (2pins) with earth @4)

230V:
216-6 (1 phase 230V (3pins) with earth @6)
232-6 (1 phase 230V (3pins) with earth @6)
263-6 (1 phase 230V (3pins) with earth @6)
316-9 (3 phase 230V (4pins) with earth @9)
332-9 (3 phase 230V (4pins) with earth @9)
363-9 (3 phase 230V (4pins) with earth @9)

440V:
332-11 (3 phase 440V (4pins) with earth @11)
363-11 (3 phase 440V (4pins) with earth @11)
3125-11 (3 phase 440V (4pins) with earth @11)



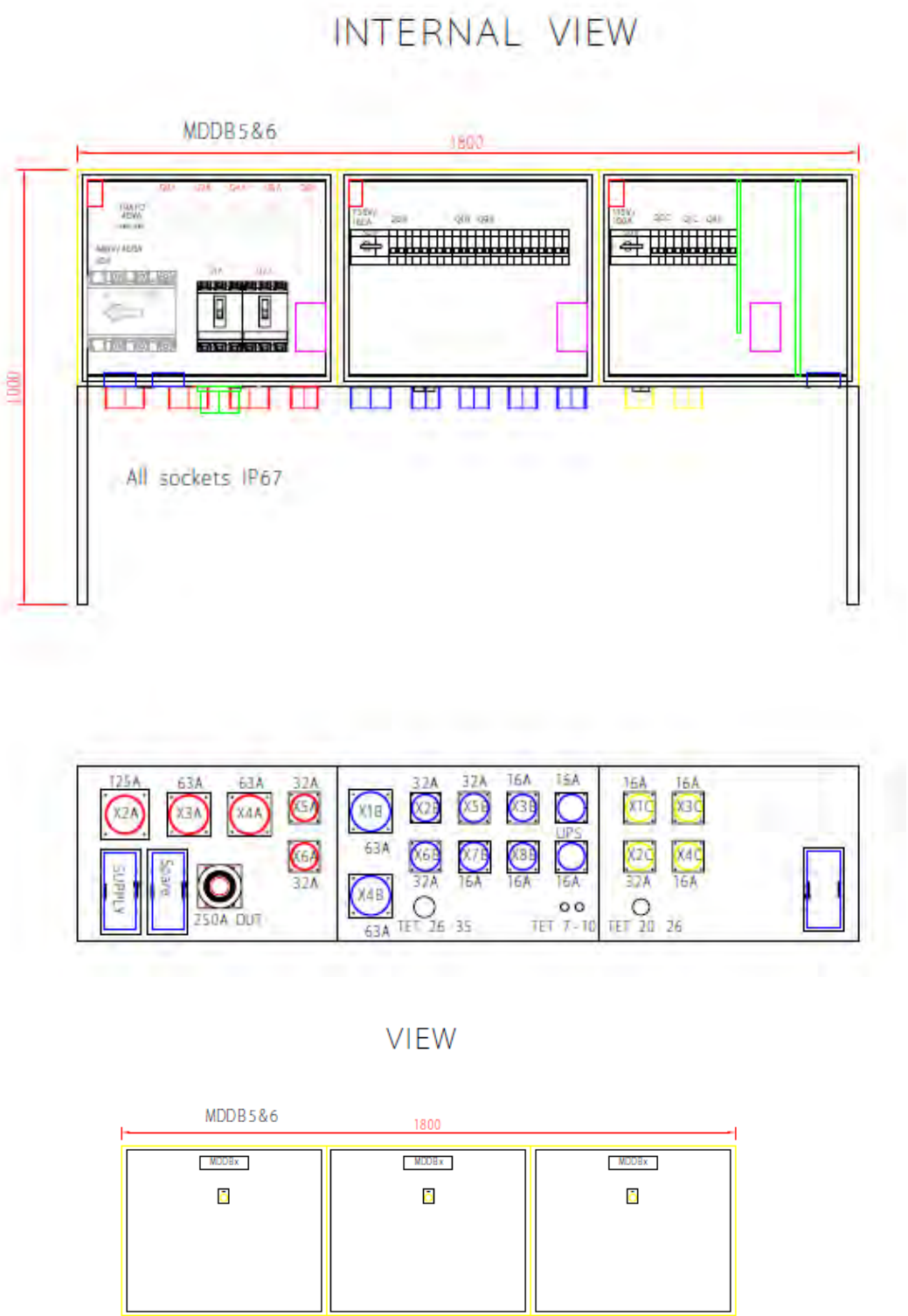
MDDB1, MDDB2, MDDB3 and MDDB4 details;



ARMAMENT:

440V	230V	110V	230V UPS
1 Mainwitch: 320-630A	1 Mainwitch: 100A	1 Mainwitch: 100A	2 Socket 16A 1ph
1 Fusebreaker 250A	2 Fusebreaker 63A	3 Fusebreaker 16A	
1 Fusebreaker 125A	3 Fusebreaker 32A	1 Fusebreaker 6A	
2 Fusebreaker 63A	3 Fusebreaker 16A		
2 Fusebreaker 32A	1 Fusebreaker 6A		
1 Fusebreaker 6A			
1 Transformer 40VA 440/230V			

MDDB5 and MDDB6 details:



DISTRIBUTION MDDB1-A – 440V AFT OF CAROUSEL PS TWEEN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891- 63001
Supply from: ROV SB 440V No. 1 – Q108	**Cable type: TI 3x1x185**		**Cable no.: 871-2611\13**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS320-630, 3P									
Q0A	Control Voltage (Power on lamp)		3			6				
Q1A	Spare		3			250				
Q2A	Socket	11h	3			125				
Q3A	Socket	11h	3			63				
Q4A	Socket	11h	3			63				
Q5A	Socket	11h	3			32				
Q6A	Socket	11h	3			32				

DISTRIBUTION MDDB1-B – 230V AFT OF CAROUSEL PS TWEENDK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63002
Supply from: ROV SB 230V – Q101	**Cable type: TI 3x35**		**Cable no.: 871-2615**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0B	Contol Voltage (Power on lamp)		1			6C				
Q1B	Socket	9h	3			63C				
Q2B	Socket	9h	3			32C				
Q3B	Socket	9h	3			16C				
Q4B	Socket	6h	1			63C				
Q5B	Socket	6h	1			32C				
Q6B	Socket	6h	1			32C				
Q7B	Socket	6h	1			16C				
Q8B	Socket	6h	1			16C				

DISTRIBUTION MDDB1-C – 110V AFT OF CAROUSEL PS TWEEN DK.		
Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63003
Supply from: ROV SB 110V – Q101	**Cable type: TI 3x16**	**Cable no.: 871-2616**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0C	Control Voltage (Power on lamp)		1			6C				
Q1C	Socket	4h	1			32C				
Q2C	Socket	4h	3			16C				
Q3C	Socket	4h	1			16C				
Q4C	Socket	4h	1			16C				

DISTRIBUTION MDDB2-A – 440V AFT OF CAROUSEL SB TWEEN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63004
Supply from: ROV SB 440V No. 7 – Q708	**Cable type: TI 3x1x185**		**Cable no.: 871-2621\23**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS320-630, 3P									
Q0A	Control Voltage (Power on lamp)		3			6				
Q1A	Spare		3			250				
Q2A	Socket	11h	3			125				
Q3A	Socket	11h	3			63				
Q4A	Socket	11h	3			63				
Q5A	Socket	11h	3			32				
Q6A	Socket	11h	3			32				

DISTRIBUTION MDDB2-B – 230V AFT OF CAROUSEL SB TWEEN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63005
Supply from: ROV SB 230V – Q201	**Cable type: TI 3x35**		**Cable no.: 871-2625**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0B	Contol Voltage (Power on lamp)		1			6C				
Q1B	Socket	9h	3			63C				
Q2B	Socket	9h	3			32C				
Q3B	Socket	9h	3			16C				
Q4B	Socket	6h	1			63C				
Q5B	Socket	6h	1			32C				
Q6B	Socket	6h	1			32C				
Q7B	Socket	6h	1			16C				
Q8B	Socket	6h	1			16C				

DISTRIBUTION MDDB2-C – 110V AFT OF CAROUSEL SB TWEEN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63006
Supply from: ROV SB 110V – Q201	**Cable type: TI 3x16**		**Cable no.: 871-2626**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0C	Control Voltage (Power on lamp)		1			6C				
Q1C	Socket	4h	1			32C				
Q2C	Socket	4h	3			16C				
Q3C	Socket	4h	1			16C				
Q4C	Socket	4h	1			16C				

DISTRIBUTION MDDB3-A – 440V AFT OF CAROUSEL PS TWEEN DK.			
Date: 24.10.08 Rev. no.: 0 Rev. date:	Fuse: Merlin Gerin Type: *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63007
Supply from: ROV SB 440V No. 1 – Q109	**Cable type: TI 3x1x185**		**Cable no.: 871-2631\33**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS320-630, 3P									
Q0A	Control Voltage (Power on lamp)		3			6				
Q1A	Spare		3			250				
Q2A	Socket	11h	3			125				
Q3A	Socket	11h	3			63				
Q4A	Socket	11h	3			63				
Q5A	Socket	11h	3			32				
Q6A	Socket	11h	3			32				

DISTRIBUTION MDDB3-B – 230V AFT OF CAROUSEL PS TWEEN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63008
Supply from: ROV SB 230V – Q103	**Cable type: TI 3x35**		**Cable no.: 871-2635**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0B	Contol Voltage (Power on lamp)		1			6C				
Q1B	Socket	9h	3			63C				
Q2B	Socket	9h	3			32C				
Q3B	Socket	9h	3			16C				
Q4B	Socket	6h	1			63C				
Q5B	Socket	6h	1			32C				
Q6B	Socket	6h	1			32C				
Q7B	Socket	6h	1			16C				
Q8B	Socket	6h	1			16C				

DISTRIBUTION MDDB3-C – 110V AFT OF CAROUSEL TWEEN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63009
Supply from: ROV SB 110V – Q103	**Cable type: TI 3x16**		**Cable no.: 871-2636**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	switch-isolator INS100, 3P									
Q0C	Control Voltage (Power on lamp)		1			6C				
Q1C	Socket	4h	1			32C				
Q2C	Socket	4h	3			16C				
Q3C	Socket	4h	1			16C				
Q4C	Socket	4h	1			16C				

DISTRIBUTION MDDB4-A – 440V AFT OF CAROUSEL PS U.CRANE FOOT			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63010
Supply from: ROV SB 440V No. 7 – Q709	**Cable type: TI 3x1x185**		**Cable no.: 871-2641\43**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS320-630, 3P									
Q0A	Control Voltage (Power on lamp)		3			6				
Q1A	Spare		3			250				
Q2A	Socket	11h	3			125				
Q3A	Socket	11h	3			63				
Q4A	Socket	11h	3			63				
Q5A	Socket	11h	3			32				
Q6A	Socket	11h	3			32				

DISTRIBUTION MDDB4-B – 230V AFT OF CAROUSEL PS U.CRANE FOOT			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63011
Supply from: ROV SB 230V – Q203	**Cable type: TI 3x35**		**Cable no.: 871-2645**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0B	Contol Voltage (Power on lamp)		1			6C				
Q1B	Socket	9h	3			63C				
Q2B	Socket	9h	3			32C				
Q3B	Socket	9h	3			16C				
Q4B	Socket	6h	1			63C				
Q5B	Socket	6h	1			32C				
Q6B	Socket	6h	1			32C				
Q7B	Socket	6h	1			16C				
Q8B	Socket	6h	1			16C				

DISTRIBUTION MDDB4-C – 110V AFT OF CAROUSEL SB TWEEN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63012
Supply from: ROV SB 110V – Q203	**Cable type: TI 3x16**		**Cable no.: 871-2646**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0C	Control Voltage (Power on lamp)		1			6C				
Q1C	Socket	4h	3			32C				
Q2C	Socket	4h	3			16C				
Q3C	Socket	4h	1			16C				
Q4C	Socket	4h	1			16C				

DISTRIBUTION MDDB5-A – 440V FWD OF CAROUSEL PS MAIN DK.

Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63013

Supply from: ROV SB 440V No. 3 – Q301 | **Cable type: TI 3x1x185** | **Cable no.: 871-2651\53**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS320-630, 3P									
Q0A	Control Voltage (Power on lamp)		3			6				
Q1A	Spare		3			250				
Q2A	Socket	11h	3			125				
Q3A	Socket	11h	3			63				
Q4A	Socket	11h	3			63				
Q5A	Socket	11h	3			32				
Q6A	Socket	11h	3			32				

DISTRIBUTION MDDB5-B – 230V FWD OF CAROUSEL PS MAIN DK.

Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63014

Supply from: ROV SB 230V – Q105 | **Cable type: TI 3x35** | **Cable no.: 871-2655**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0B	Control Voltage (Power on lamp)		1			6C				
Q1B	Socket	9h	3			63C				
Q2B	Socket	9h	3			32C				
Q3B	Socket	9h	3			16C				
Q4B	Socket	6h	1			63C				
Q5B	Socket	6h	1			32C				
Q6B	Socket	6h	1			32C				
Q7B	Socket	6h	1			16C				
Q8B	Socket	6h	1			16C				
Q9B	Cabinet heating		1			16C				

DISTRIBUTION MDDB5-C – 110V FWD. OF CAROUSEL PS MAIN DK.

Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63015

Supply from: ROV SB 110V – Q105 | **Cable type: TI 3x16** | **Cable no.: 871-2656**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0C	Control Voltage (Power on lamp)		1			6C				
Q1C	Socket	4h	1			32C				
Q2C	Socket	4h	3			16C				
Q3C	Socket	4h	1			16C				
Q4C	Socket	4h	1			16C				

DISTRIBUTION MDDB6-A – 440V FWD OF CAROUSEL SB MAIN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891- 63016
Supply from: ROV SB 440V No. 5 – Q501	**Cable type: TI 3x1x185**		**Cable no.: 871-2661\63**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS320-630, 3P									
Q0A	Control Voltage (Power on lamp)		3			6				
Q1A	Spare		3			400				
Q2A	Socket	11h	3			125				
Q3A	Socket	11h	3			63				
Q4A	Socket	11h	3			63				
Q5A	Socket	11h	3			32				
Q6A	Socket	11h	3			32				
Q7A	Spare		3			250				

DISTRIBUTION MDDB6-B – 230V FWD OF CAROUSEL SB MAIN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891– 63017
Supply from: ROV SB 230V – Q205	**Cable type: TI 3x35**		**Cable no.: 871-2665**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0B	Control Voltage (Power on lamp)		1			6C				
Q1B	Socket	9h	3			63C				
Q2B	Socket	9h	3			32C				
Q3B	Socket	9h	3			16C				
Q4B	Socket	6h	1			63C				
Q5B	Socket	6h	1			32C				
Q6B	Socket	6h	1			32C				
Q7B	Socket	6h	1			16C				
Q8B	Socket	6h	1			16C				
Q9B	Cabinet heating		1			16C				

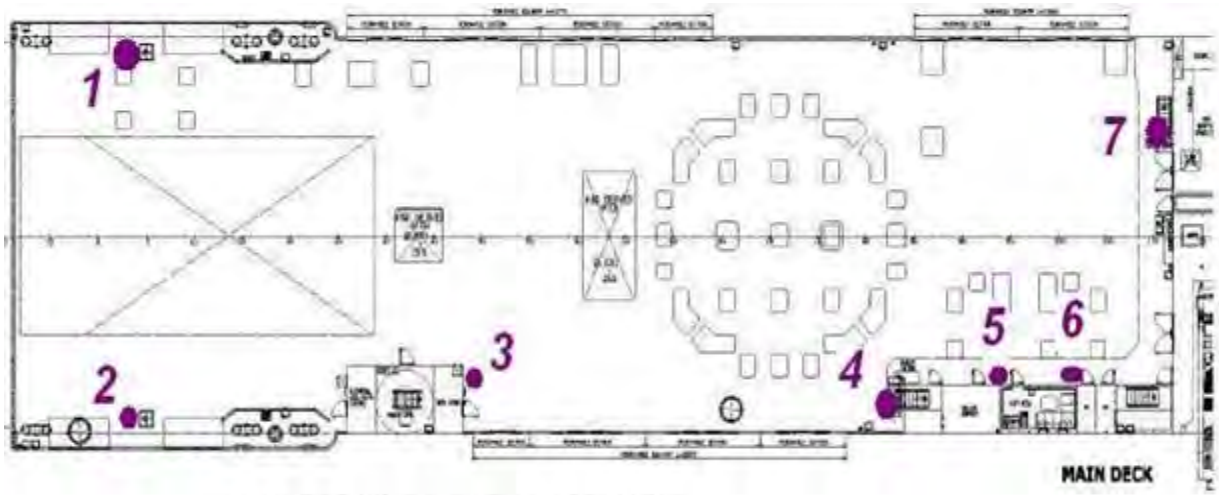
DISTRIBUTION MDDB6-C – 110V FWD OF CAROUSEL SB MAIN DK.			
Date: 24.10.08 Rev. no.: Rev. date:	Fuse: Merlin Gerin Type: C60H *Cabinet:*		Customer: Fosen Mek. Verkst. Build no.: 81 File no.: 81-891 - 63018
Supply from: ROV SB 110V – Q205	**Cable type: TI 3x16**		**Cable no.: 871-2666**

No	Circuit list	Item	Ph	Load		Fuse	Cable			Rev.
				kW	A	A	mm²	Type	No.	
S0	Lastskillebryter INS100, 3P									
Q0C	Control Voltage (Power on lamp)		1			6C				
Q1C	Socket	4h	1			32C				
Q2C	Socket	4h	3			16C				
Q3C	Socket	4h	1			16C				
Q4C	Socket	4h	1			16C				

WORKING AIR, FUEL OIL & WATER SUPPLY

3.1 Working air

There are seven locations with working air supplies on deck. These positions are highlighted on the deck plan below. On some locations more than one connection is possible.



Working air supply

Pos 1 and 2- have regular ball valve with no connection installed, pipes are ½" size.
Pos 6 and 7- have also ball valve with 1 ¼" regular pipe fitting.

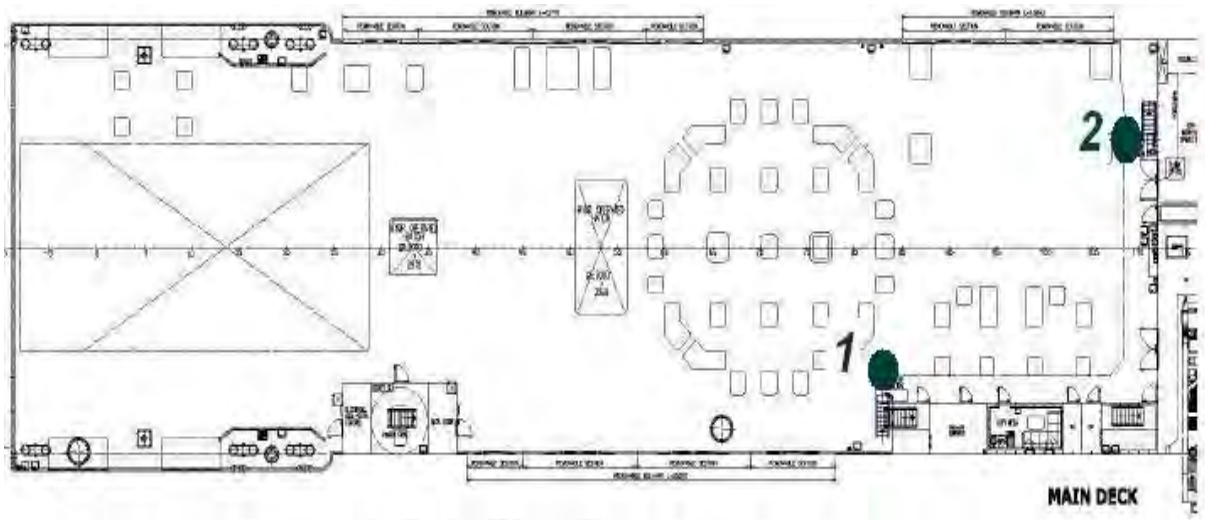
Working Air				
No of outlets	**Location**	**Connection**	**Capacity**	**Use**
1	No.1	½" Female connection	7 -8 bar @ 700m³/ hour	free
0	No.1	No connection installed at this moment	7-8 bar @ 700m³/ hour	free
1	No.2	½" Female connection	7 -8 bar @ 700m³/ hour	free
0	No.2	No connection installed at this moment	7-8 bar @ 700m³/ hour	free
1	No.3	½" Female quick connection	7 -8 bar @ 700m³/ hour	free
1	No.4	½" Female quick connection	7-8 bar @ 700m³/ hour	free
1	No.5	½" Female quick connection	7 -8 bar @ 700m³/ hour	free
2	No.6	½" Female quick connection	7 -8 bar @ 700m³/ hour	free
2	No. 7	½" Female quick connection	7-8 bar @ 700m³/ hour	free

1 x air compressor 7 bar, 150 m³/ hour
Maker: Tamrotor Marine Compressors AS, type: TMC-20 SA-7,5 EANA

2 x air compressor 7-8 bar, 700m³ /hour
Maker: Tamrotor Marine Compressors AS, type: TMC 85-8 EWNA

3.2 Fuel Oil Filling

There are two FO filling points in the main deck



F.O Fillings

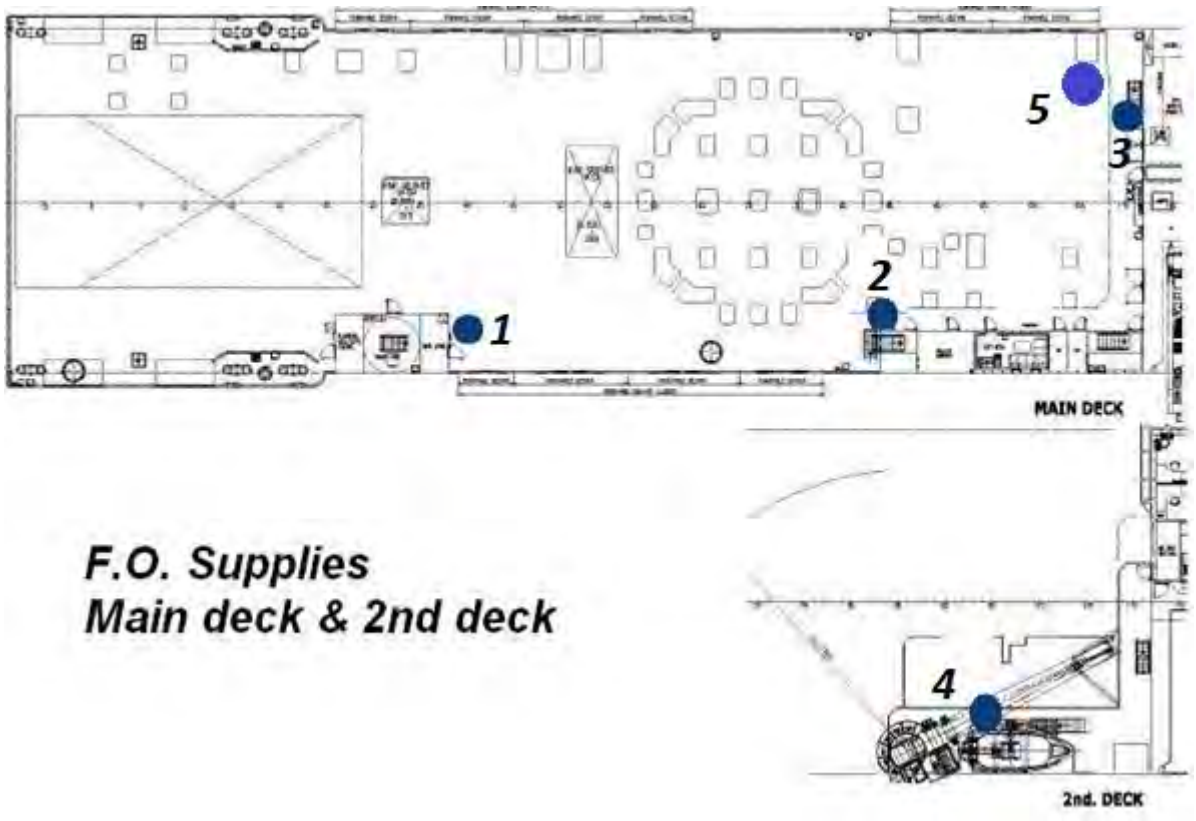
Fuel Oil Supply				
No of connection	**Location**	**Connection**	**Capacity**	**Use**
1	No. 1 Stbd side main deck	DN 125	200 m3/h	marine
1	No.2 port side aft of accommodation	DN 125	200 m3/h	marine

Connection: DN 124
Flow rate: 200m3/h
Pressure 2,5 Bar
Quality: Gas oil DMA

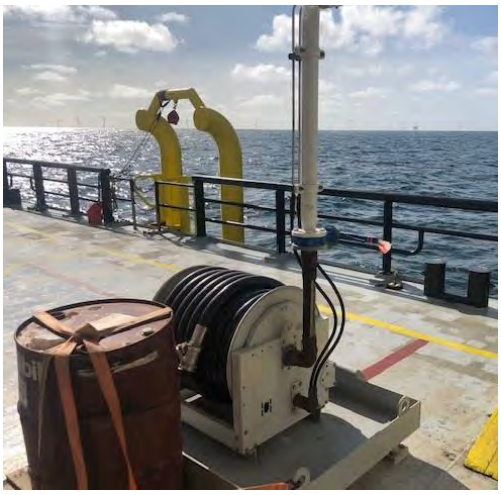
Filling No.1 starboard side, ref drawing above

3.3 Fuel Oil Supply

Locations 1, 3 and 4 are the fuel oil supply locations. Location 2 is sealed. Location 5 is for CTV refueling.



F.O Supply No. 4, ref drawing above



F.O. Supply No.5. ref drawing above.

Fuel Oil Supply				
No of outlets	**Location**	**Connection**	**Capacity**	**Use**
1	No.1 In front of Main crane pedestal		2m³/ hr	Free
1	No.2 Outside duty mess	DN 20 Flange	2m³/ hr	Free
1	No.3 Port side, aft of accommodation	Dispensing nozzle	2m³/ hr	Free
1	No.4 Stbd side on 2nd deck, w/ FRC	Dispensing nozzle	2m³/ hr	Free
1	No.5 Port side, aft of accommodation	Todo twist lock 2”	Appr 30m³/ hr	Free

3.4 Sea Water

Sea water can be supplied to deck through own supply pump and the firefighting system. These outlets are located at positions around the main deck as shown below:

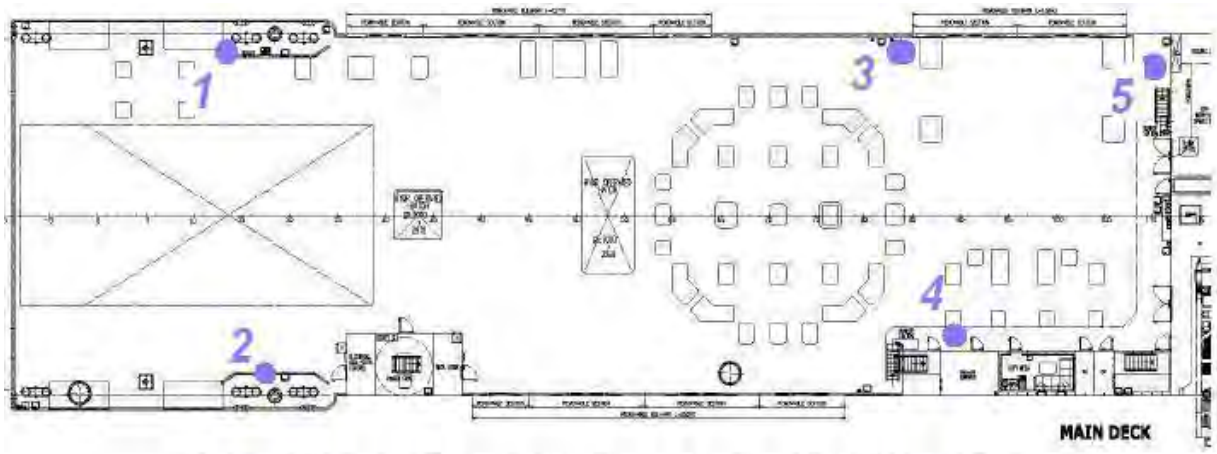
Sea Water Outlets

Sea Water				
No of outlets	**Location**	**Connection**	**Capacity**	**Use**
1	No.1 aft deck port side	DN 50	15 m3/h	Free
1	No.2 aft deck stbd side	DN 50	15 m3/h	Free
1	No.3 aft deck, crane pedestal	DN 50	15 m3/h	Free
1	No.4 main deck, stbd side aft of superstructure	DN 50	15 m3/h	Free

No.4 main deck, stbd side aft of superstructure

No.2 aft deck stbd side

Fire hydrants



SeaWater Outlets from Fire hydrants

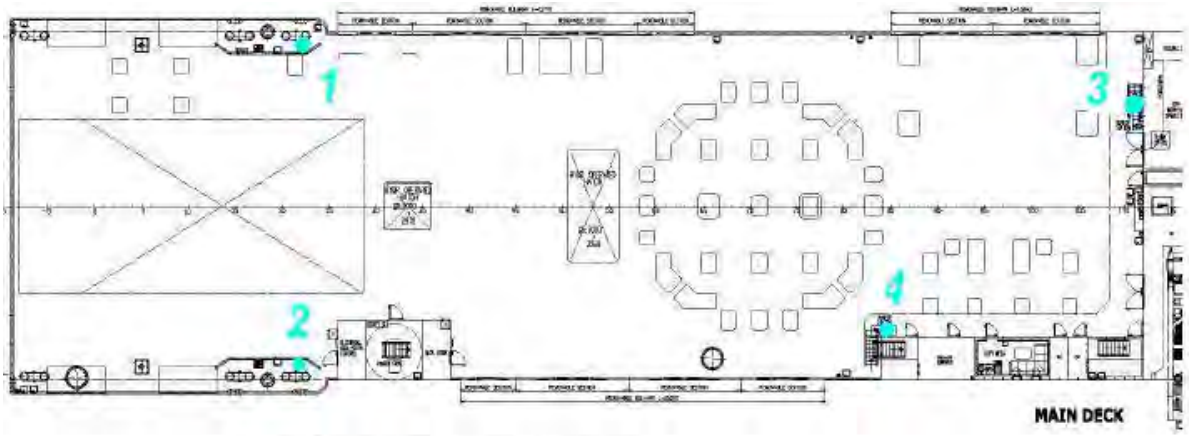
Sea Water from Fire Hydrants				
No of outlets	**Location**	**Connection**	**Capacity**	**Use**
5	Main Deck		124m^3/ hr 7 bar	Free

Project/Client are to supply their own hoses, connections, nozzles etc. if they will use sea water from the vessel fire hydrants, vessel fire hoses and nozzles are lifesaving equipment and will not be used by Project/Client.
The fire pumps are not intended to be running for a long period of time unless in an emergency.

3.5 Fresh Water & Potable water

Outlets:
There is one potable water tap on deck. The tap is located in the main crane starboard side of the ship.

Fillings:

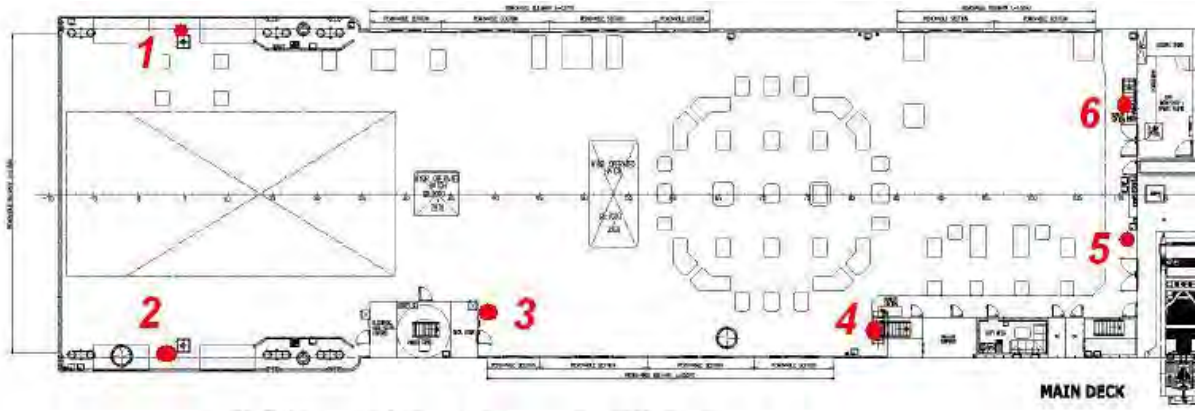


Potwater fillings

No of filling	Location	Capacity
1	No.1 aft deck PS, only for filling Hi-fog tank 12 port	Max 120m³/h on connections 1 & 2 together
1	No.2 aft deck SB, only for filling Hi-fog tank 12 port	Max 120 m³/h on connections 1 & 2 together
1	No.3 aft of accom. PS, for vessel Potable water	Max 120 m³/h on connections 3 &4 together
1	No.4 SB aft of superstructure, for vessel potable water	Max 120 m³/h on connections 3 &4 together

3.6 HP washer

There are six locations for the high-pressure washer on deck. They are located around on the Main deck and are easily accessible.
High pressure washing unit installed; Nilfisk Alto: HPC 7P (18 L/min - 180 bar)

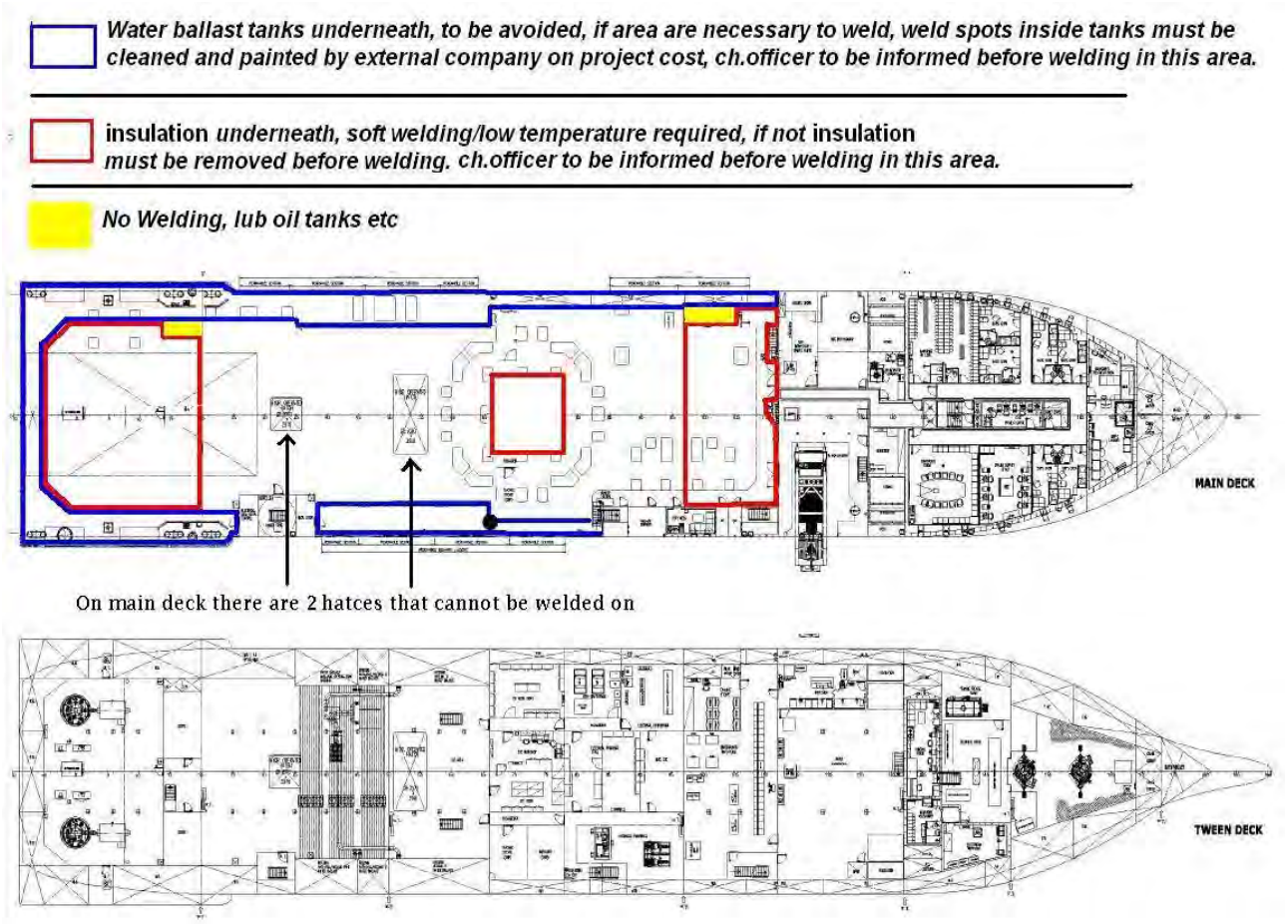


HP washer Connections

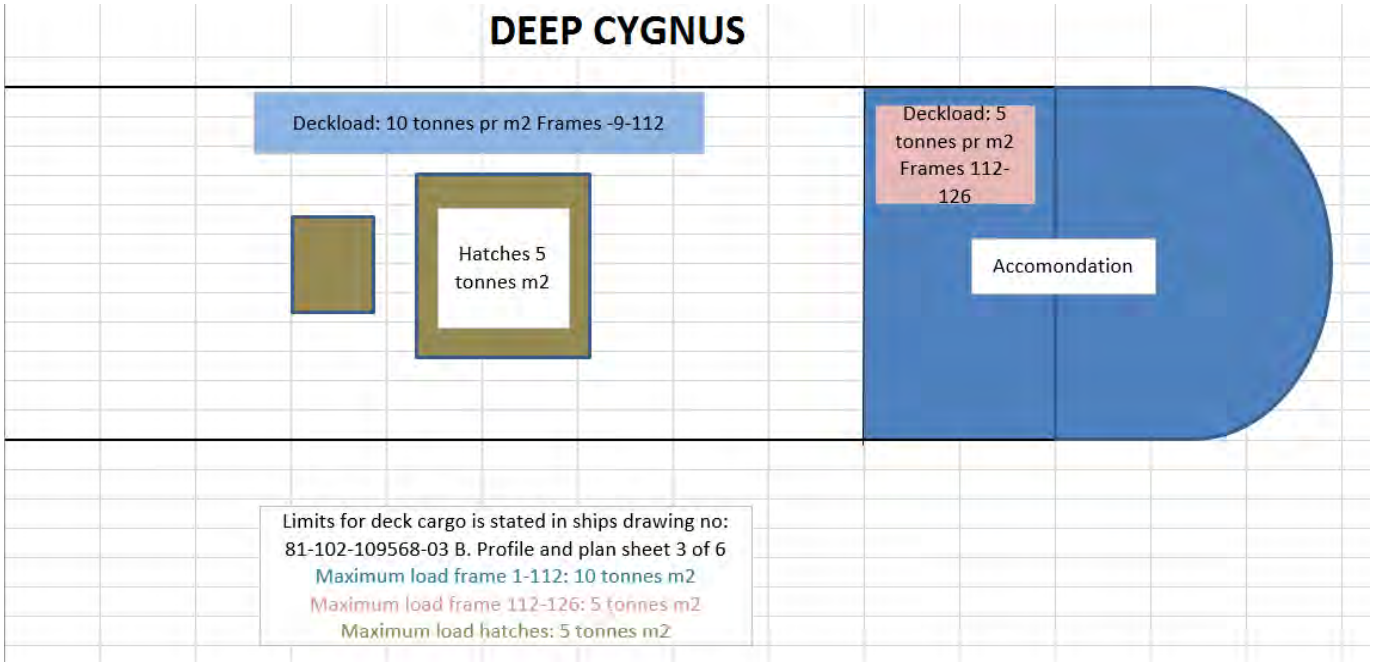
HP Washer connection

4.0 DECK WORKING AREAS

4.1 No welding- and caution areas



4.2 Deck load drawing



5.0 CRANES

5.1 MacGregor Offshore Knuckle Jib Crane

Crane specifics

Hydramarine Offshore Knuckle Jib Crane

Type: HMC 3568 LKO 250-35 (750-20)(1000-15)(1500-10)(200-36) AHC

2.1 Operation Environment:

Area classification:	Safe zone
Description:	Offshore/Marine environment, open deck
Operation temperature range:	-20 - + 55 degrees C
Max. Operational wind speed:	24 m/s
Max list/trim conditions:	5+2 degrees
Offlead angles:	Acc to DNV lifting appliances

2.2 Design Regulations

Design standard:	Det Norske Veritas, Lifting appliances 1994 NS3472 Stålstrukturer EN 13852-1 – General purpose offshore crane (partly)

Dynamic factor: 1.4 on crane and 2.0 on pedestal/slew arrangement:
The crane is designed with a general crane dynamic factor of 1.4 and a foudation/slew ring dynamic factor of 2.0 according to DNV requirement for offshore crane.

2.3 Main Performance Data

Crane

– Lifting range (max radius):
25 ton - 35 m
75 ton - 20 m
100 ton - 15 m
150 ton - 10 m
20 ton - 36 m (Whip winch)

– Luffing speed (0 -max. angle)
Main jib = 100 sec.
Knuckle jib = 80 sec.

– Slew
Ring diameter =3568 mm
Slew sector, unlimited =360 deg
0-1-0.5 RPM (0 - 15 - 35m)
Max list/trim combined 5+2 degrees

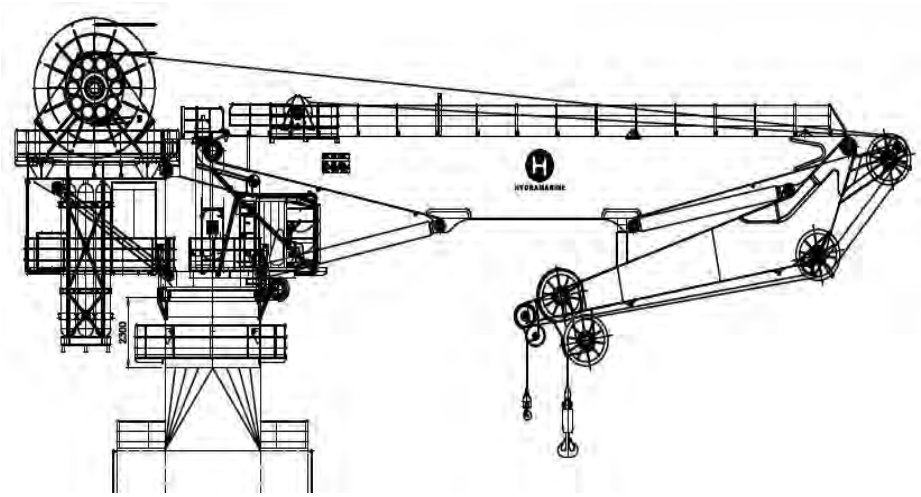
Minimum working radius: ~6 m

Main winch

– Wire
Diameter = 77 mm
Hook travel length = 2000 m
Wire length =2100 m **(original lenght)**

– Drum (lebus)
Diameter = Ø 2297 mm
Width = 1610 mm
– Hook (Double)
Weight =3000 kg

– Motor/gear
Number = 16



Main Hook Active Heave Compensation (AHC) capacity, 0-150 ton AHC mode:
Max top wire tension, single line during AHC: 0-150 ton

Performance case 1:

Heave period:	10 sec
Nominal displacement:	+/- 3.2 m (6.4 m total motion)
Max acceleration:	1.8 m/s^2
Max compensation speed:	2.0 m/s

Whip winch lifting capacity:

Hook travel length:	200 meters
Total wire length included:	250 meters
Max single line lift capacity:	SWL 250kN (20 metric tons) on outer lay (full drum) at 36 meter outreach
Hoisting speed:	0-10 ton @0-120m/min, 10-20 ton, 0-60/min
Min working radius:	Approx 6 meters
Aux wire diameter:	Ø 32 mm
Aux wire type:	Non rotating, galvanized type
Constant tension control:	From cabin; CT on/off and tension setting
Emergency pay out function:	AOPS & MOPS
Personnel lift capacity:	12 T

Boom system performance

Knuckle jib topping speed:	Approx. ~80 sec (stepless variable speed)
Main jib topping speed:	Approx. ~100 sec (stepless variable speed)
Cylinder bearings:	Fork eye on all cylinder ends, Steel spherical bearing

Required electric power supply

El. motor power, main	3x690V/60 Hz
Main motor enclosure:	IP 55
El. motor power consumption, max	3x870kW(S6-40%) S-D
Divided main supply	3x870kW+1x140kW
Motor starting method:	Star / Delta start, (Starter included in crane system)
Auxiliary power supply:	3ph/230VAC / 15kW (To slipring for transfer to crane) (For aux. functions when main power is off)

Operation of crane

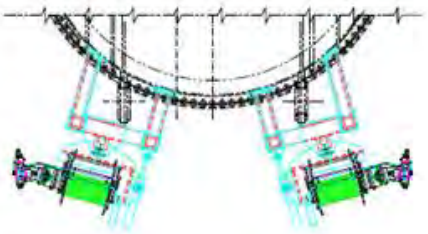
Type of control system:	Electronic servo operated control valve system
Operation location:	Electronic joy stick levers fitted at operators chair in cabin
Control and monitoring functions:	Siemens PLC based system with graphic user interface

Hydraulic luffing/knuckle jib cylinders:

Number of main jib cylinders:	2
Number of knuckle jib cylinders:	2
Type of cylinders:	Double acting marine type
Bearings:	Spherical bearings with sealing system
Cylinder rod:	High grade steel material + hard chrome plated

Tugger winches 2 off

Single line SWL:	40kN (4 tons) at outer layer w 60m on drum)
Winch drum capacity:	60m
Wire length included in delivery:	60m
Constant tension:	0-4 ton stepless variable
Hoisting speed, single line:	0-60 m/min
Wire rope:	Ø 16mm
Wire output angle:	Adjustable from crane cabin (+/- 30 deg.)



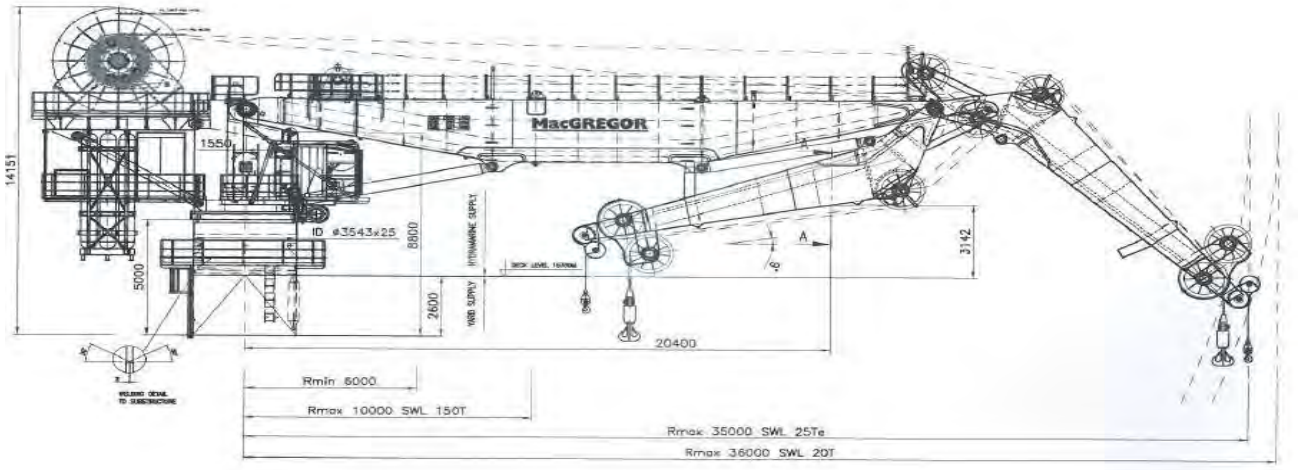
HPU data:

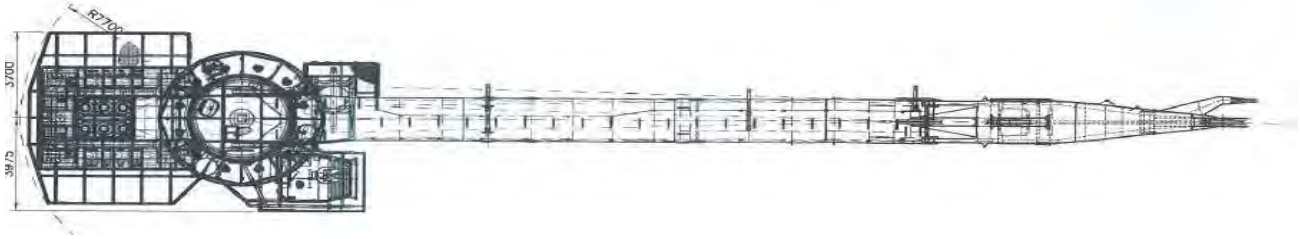
– Dimensions:
Reservoir volume =~6700 litres

Power consumption:

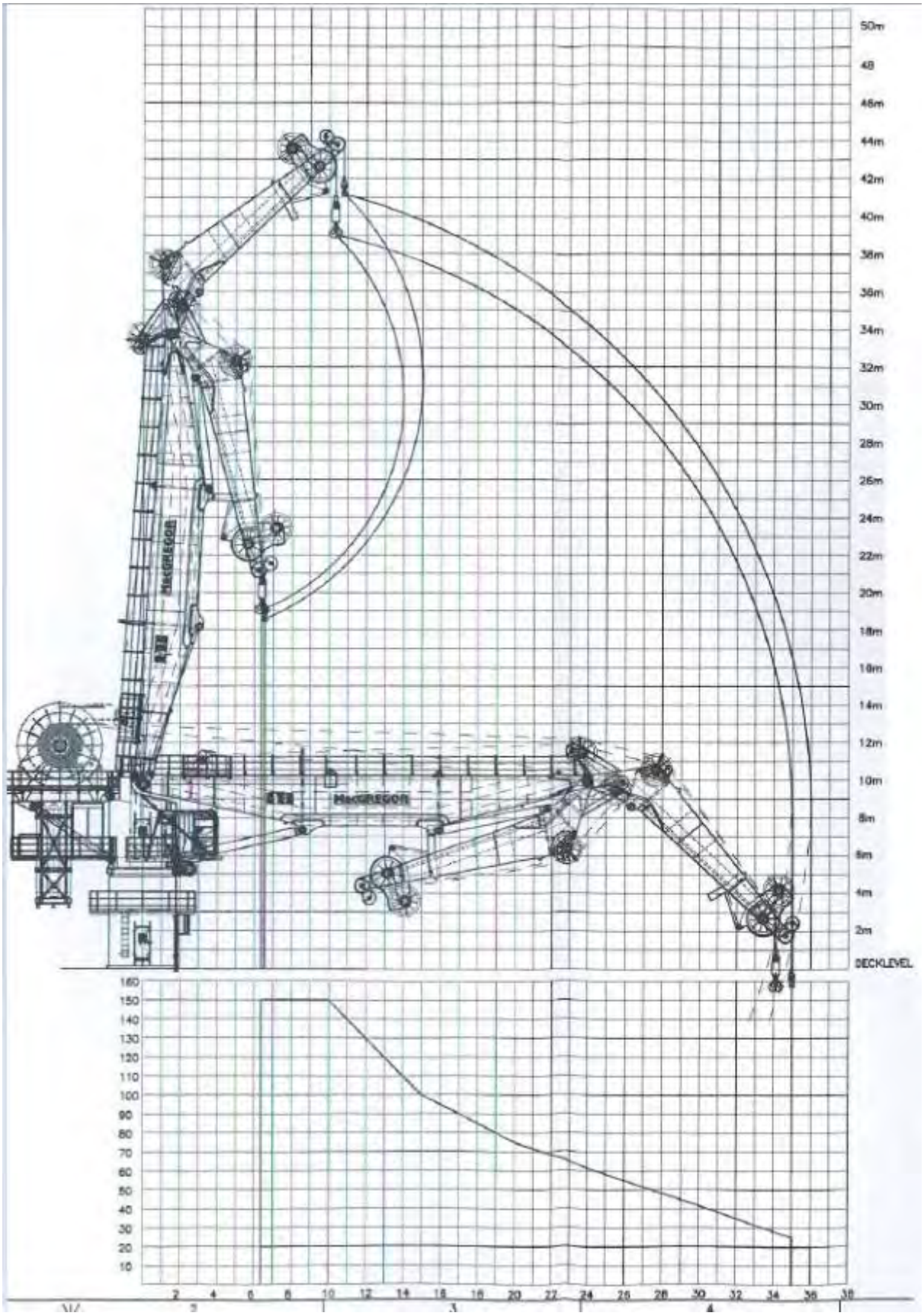
Oil cooler motors:	4x3,5kW
Circulation/Feeding motor:	1x63kW
CJC motor:	1x0,5kW
Emergency HPU motor:	1x50kW
Servo pump motor:	1x61kW

150T MacGregor Crane General arrangement



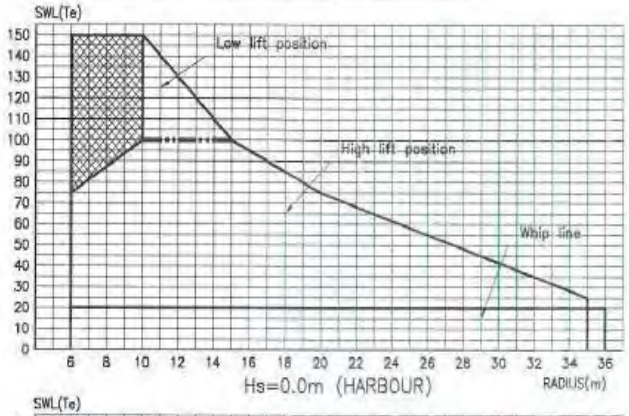


150T MacGregor Crane load diagram

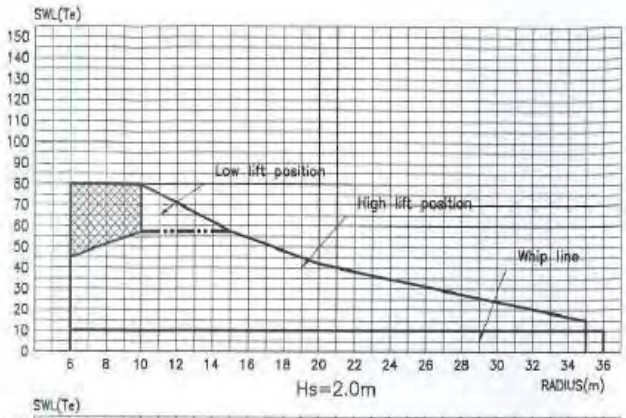


150T MacGregor Crane load radius diagram

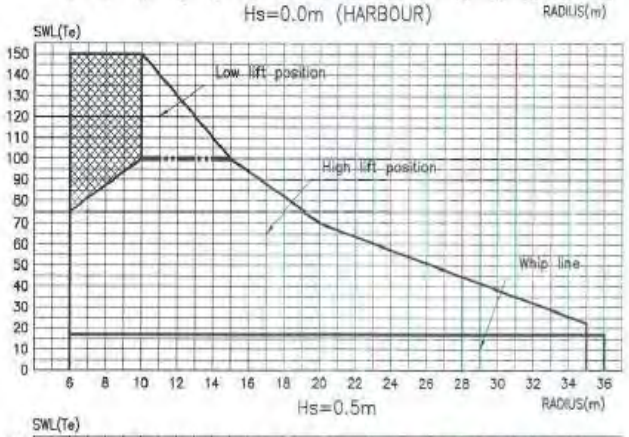
	Hs=0.0m	Hs=0.5m	Hs=1.0m	Hs=2.0m	Hs=3.0m	Hs=4.0m
R1=6m	150.0	150.0	130.0	80.0	55.0	40.0
R2=10m	150.0	150.0	130.0	80.0	55.0	40.0
R3=15m	100.0	100.0	85.0	57.5	42.5	32.0
R4=20m	75.0	70.0	57.0	42.0	32.0	25.0
R5=35m	25.0	22.5	20.0	15.0	12.5	10.0
R6=36m	20.0	17.0	14.0	10.0	7.5	6.0



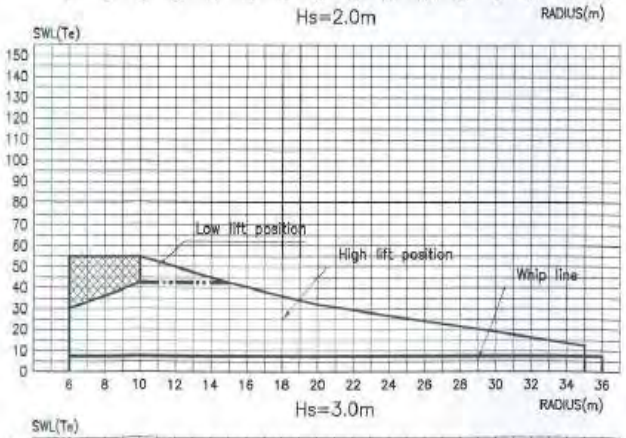
Hs=0.0m (HARBOUR)



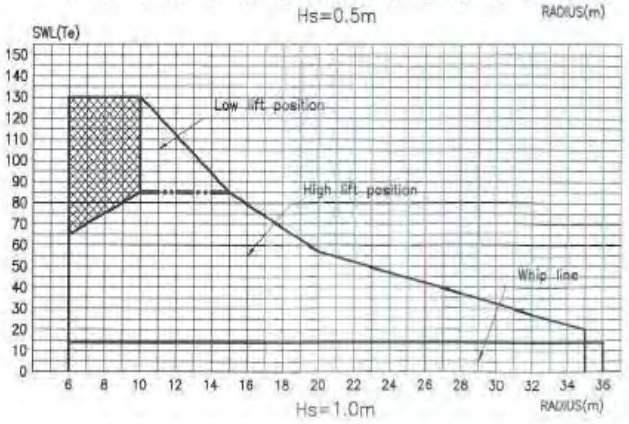
Hs=2.0m



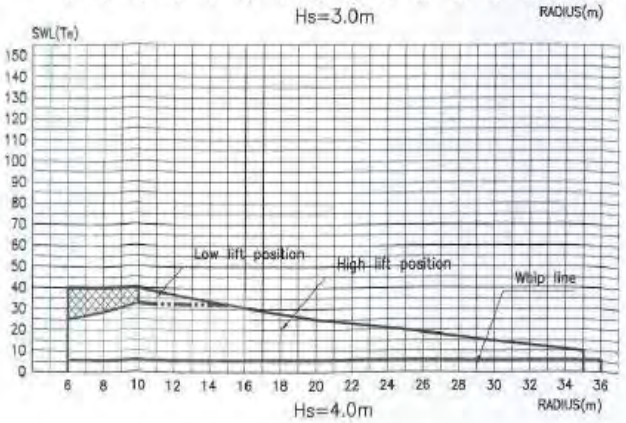
Hs=0.5m



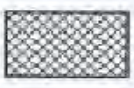
Hs=3.0m



Hs=1.0m



Hs=4.0m



– CONTACT BETWEEN JIBS REQUIRED

NOTE:

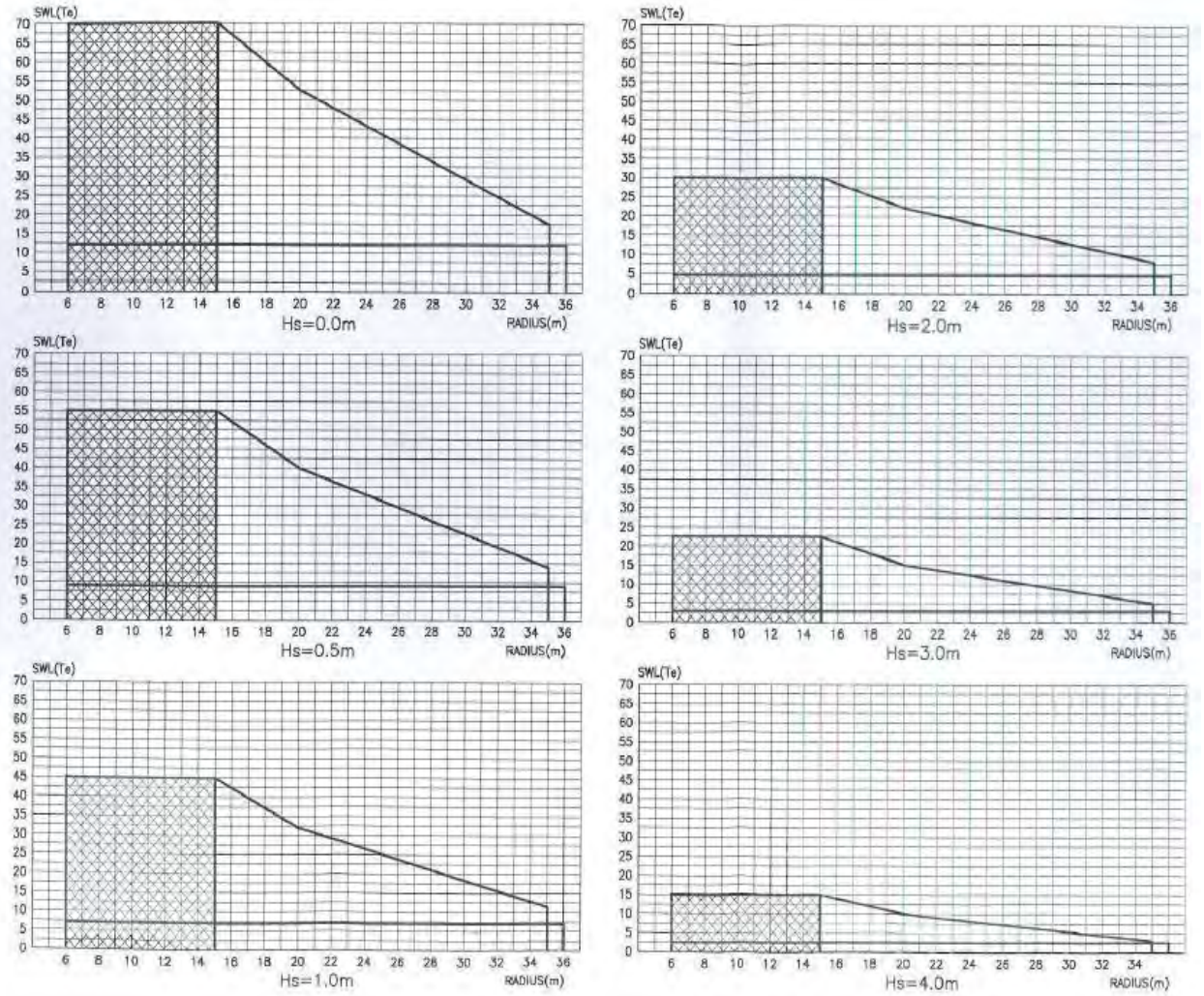
– THIS CURVES ARE VALID FOR CRANE OPERATION IN OPEN SEA. SEPARATE CALCULATIONS TO BE DONE WHEN ENTERING SEAWATER.

– NO LOAD TO BE LIFTED WITH KNUCKLE JIB CYLINDERS IN TENSION.

– SHIP HEADING AGAINST WAVES ±30°

150T MacGregor Crane ship to ship diagram

	Hs=0.0m	Hs=0.5m	Hs=1.0m	Hs=2.0m	Hs=3.0m	Hs=4.0m
R1=15m	70.0	55.0	45.0	30.0	22.5	15.0
R2=20m	52.5	40.0	32.0	22.0	15.0	10.0
R3=35m	17.5	14.0	11.5	8.0	5.0	3.0
R4=36m	12.0	9.0	7.0	4.5	3.0	2.5



– OUT OF THE WORKING AREA

NOTE:

SHIP-TO-SHIP LIFTING IS RESTRICTED TO "HIGH LIFT POSITIONS" AND FOR LIFTING RADII NOT SMALLER THAN 15 M.

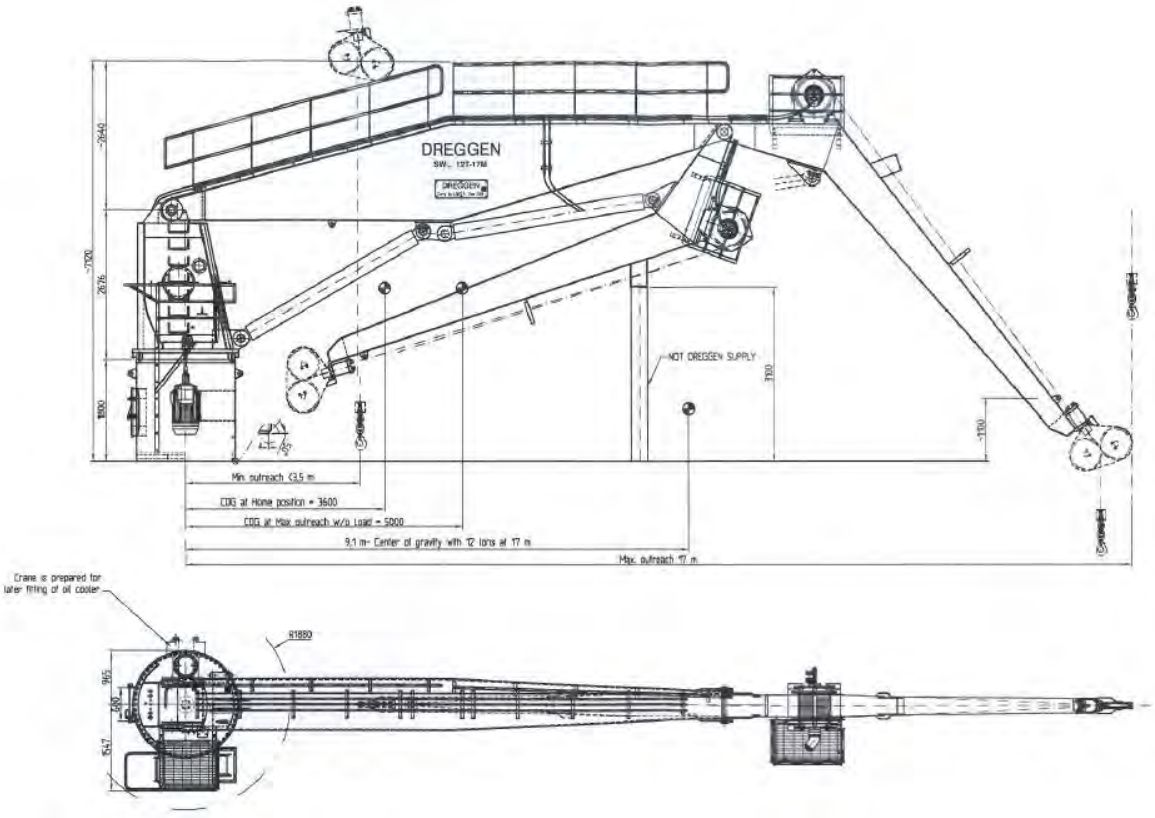
SHIP HEADING AGAINST WAVES ±30°

5.2 Dreggen Deck crane 12 T

Hydraulic/Electrical operated jib crane, type: DK220-12T-17M, Electro hydraulic knuckle boom deck crane.

Operation:		
SWL	12,0	Ton
MAX OUTREACH, horizontal jib	17	m
MIN OUTREACH	3,5	m
HOOK SPEED, full load	0-20	m/min
HOOK SPEED, no load	0-20	m/min
HEIGHT OF LIFT (hook travel)	50	m
SLEWING SECTOR, continuously	360	Deg
SLEWING SPEED	0-1,0	Rpm
HEEL / TRIM	5 / 2	Deg
LUFFING TIME, average up/down	60	Sec
WEIGHT OF CRANE, approx.	20,0	Ton
POWER CONSUMPTION, motor rating S6-40%	95	kW
MAIN ELECTRIC SUPPLY	400V-50HZ-3PH	

NOTE! Speeds, weight and power consumption are approximate within +/- 5%



Tug Vessels

7 Fish Island | New Bedford, MA 02740 | USA
P: +1.774.202.9292
E: info@41northoffshore.com

“BUCKY”

Hailing Port	New Bedford, Massachusetts
Designer & Builder	Main Iron Works
Year Built	1976
Flag & Compliance	United States | Jones Act
USCG Official Number	577554
Trade	Coastwise Unrestricted | Registry
Classifications	USCG Subchapter 'M'
Call Sign	WDJ6818
Service	Shallow Water | Harbor | Towing
Dimensions	
Gross Tonnage	64
Net Tonnage	43
Displacement – Loaded	101.5 LT
Displacement – Light	80 LT
Registered Length	54’
Registered Breadth	22’ 1”
Registered Depth	7’ 1”
Length Overall with Rubber	57’
Breadth Overall with Rubber	23’ 6”
Draft - Loaded	6’ 6”
Draft - Light	5’ 9”
Height of Eye	19’
Air Draft	37’
Capacities	
Fuel	5,148 Gallons
Lube Oil	126 Gallons
Hydraulic Oil	126 Gallons
Potable Water	1,135 Gallons
Propulsion	
Main Engines	Two (2) x Caterpillar 3406B
Brake HP / Engine	480
Total Brake HP	960
Reduction Gears	Twin Disc MG-5114DC
Reduction Gear Ratio	4.17:1
Shafts	4”
Propellers	52” x 36” | 4 Blade Stainless Steel
Auxiliary Power	
Engines	Two (2) x Caterpillar 3054
Power	Two (2) x 40 kW, 60 Hz, 208V
Bollard Pull	
Ahead	12.9 ST
Astern	8.5 ST
Deck Machinery	
Towing Winch	Pullmaster | H35
Towing Winch Rigging	1,000’ of 1 1/8” | 6 x 19 wire rope
Push Winches	Pullmaster | M12
Push Winch Rigging	115’ of 7/8” | Plasma 12
Anchor	Danforth | 100 Lbs
Range	12.5 Days Tending, 7.5 Days Towing
Fire Monitor	
Pump	One (1) x 110 gpm
Stations	2
Fire Detection	Three (3)
Fire Suppression	Two (2) | Fixed 50 LB CO_2
Navigation Equipment	VHF, Radar, GPS, AIS, Auto-Pilot
Accommodations	(4) Berths, Head, Galley, Shower

7 Fish Island | New Bedford, MA 02740 | USA
P: +1.774.202.9292
E: info@41northoffshore.com

“KODIAK”

Hailing Port	New Bedford, Massachusetts
Designer	Robert W. Long | Seattle, WA
Builder	Jones Tug & Barge Company
Year Built	1977
Flag & Compliance	United States | Jones Act
USCG Official Number	583332
Trade	Coastwise Unrestricted | Registry
Classifications	USCG Subchapter 'M' IMCA CMID, OVID OVIQ3
Call Sign	WDJ2946
Service	Harbor | Towing | Anchor Handling
Dimensions	
Gross Tonnage	95
Net Tonnage	64
Displacement - Loaded	210 LT
Displacement – Light	144 LT
Registered Length	61’
Registered Breadth	23’
Registered Depth	11’
Length Overall with Rubber	66’
Breadth Overall with Rubber	26’ 6”
Draft - Loaded	11’ 6”
Draft - Light	10’
Height of Eye - Upper	26’
Height of Eye - Lower	18’
Air Draft – Mast Raised	36’
Air Draft - Mast Lowered	28’
Capacities	
Fuel	17,900 Gallons
Lube Oil	400 Gallons
Hydraulic Oil	400 Gallons
Potable Water	1,700 Gallons
Waste Oil	200 Gallons

Propulsion	
Main Engines	Two (2) Detroit Diesel 12V149
Brake HP / Engine	700
Total Brake HP	1,400
Total Effective HP	1,800
Reduction Gears	Twin Disc MG-520
Reduction Gear Ratio	5.04:1
Shafts	5”
Propellers	59” x 59” | 4 Blade Stainless Steel
Nozzles	Type 19
Auxiliary Power	
Engines	One (1) x Detroit Diesel 6-71 One (1) x Detroit Diesel 4-71
Power	Two (2) x 30 kW, 60 Hz, 208V
Bollard Pull	
Ahead	18.9 ST
Astern	11.2 ST
Deck Machinery	
Winch	Markey | Side x Side Double Drum
Port Drum Rigging	2,000’ of 1 ½” | 6 x 26 wire rope
Starboard Drum Rigging	600’ of 2 ½” | Samson Quantum 12
Stern Roller	12” Diameter
Anchor	Danforth | 200 Lbs
Range	45 Days Tending, 18 Days Towing
Fire Monitor	
Pump	Flomax | 7 ½ HP
Stations	2
Fire Detection	Sea-Fire “Firestop”
Fire Suppression	Halon | 100 Lbs
Navigation Equipment	VHF, Radar, GPS, AIS, Auto-Pilot
Accommodations	(4) Berths, Head, Galley, Shower

Indicative Remedial Rock Installation Vessel

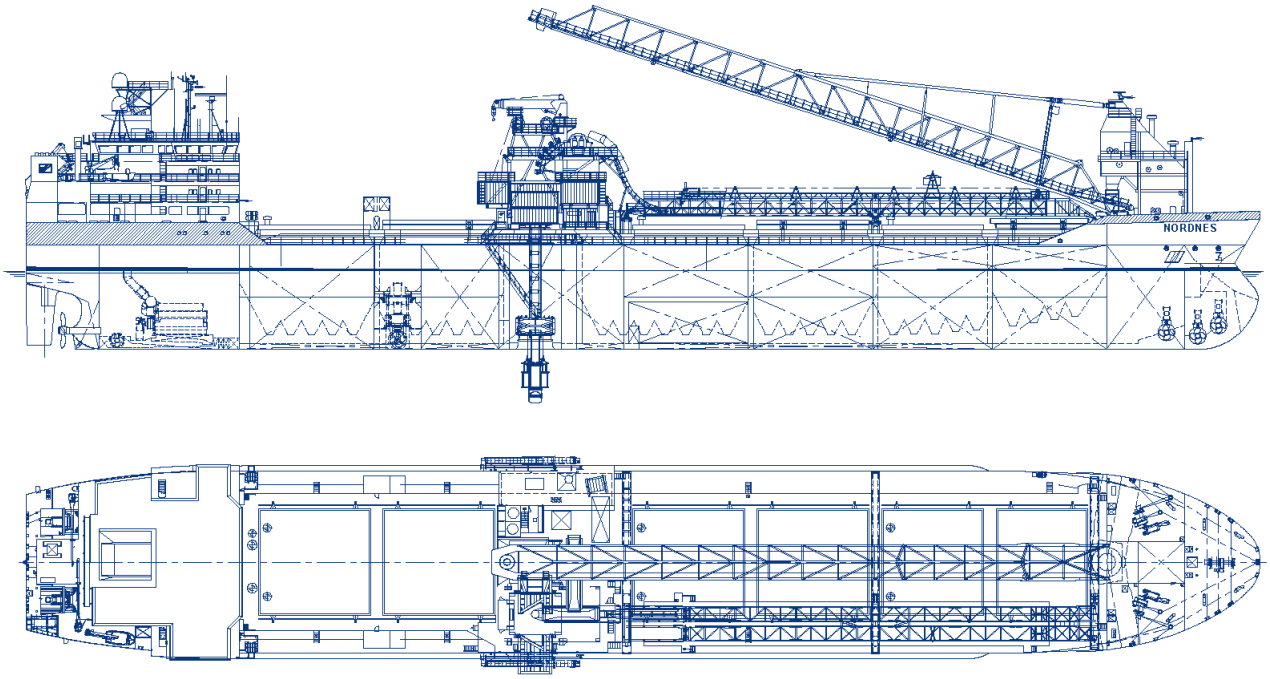
Van Oord

Marine ingenuity

Equipment

Flexible fallpipe vessel **Nordnes**

Van Oord
Marine ingenuity



Nordnes

Name	Nordnes	
Type	Flexible fallpipe vessel	
Classification	Bureau Veritas, I ✠ HULL ✠ MACH ✠ AUT-UMS ✠ DYNAPOS - AM/AT-R-INWATERSURVEY, SDS, MON-SHAFT, Bulk Carrier ESP, Nonhomload (holds 3 and 5 may be empty), Special service - Offshore Supply Vessel, Unrestricted navigation	
Year of construction	2001 - upgrade 2003 and 2005	
Dimensions	Length overall	166.70 m
	Breadth overall	26.23 m
	Moulded depth	14.00 m
	Draught	10.51 m
Loading capacity	Approximately 23,500 tonnes	
Deadweight	26,045 tonnes	
Speed loaded	14 kn	
Propulsion	7,300 kW	
Bow thrusters	2 x 1,200 kW + 1 x 1,500 kW	
Retractable thrusters	2 x 1,700 kW	
Stern thrusters	1 x 1,000 kW	
Total power installed	17,636 kW	
Dynamic positioning	DP Class 2	
Accommodation	54 persons	
Bunkers	Heavy fuel oil	982 m^3
	Marine gas oil	518 m^3
	Fresh water	418 m^3
Flexible fallpipe	ø 1.1 m	
Remotely Operated Vehicle ROV	At the end of the fallpipe 4 x 75 kW	
Installation modus	Fallpipe through moonpool	
Installation depth	Up to 900 m	
Discharge rate	Up to 2,000 t/h	

Contact

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PO Box 8574
3009 AN Rotterdam
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F +31 88 8265010
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I www.vanoord.com

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The Netherlands
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F +31 88 8265210
E area.off@vanoord.com

July 2021

Indicative Safety Vessel

MISTER MARCO

VESSEL INFORMATION

Name	Mister Marco
MMSI	367587070
IMO number	8941042
US REG	1051112
Callsign	WDG9371
Flag	America (USA)
Hull Construction	Steel
Year Built	1997
Length	72.4 ft / 22 metres
Breadth	23 ft / 7 metres
Draft	10.3ft / 3.14 metres
Gross Tonnage	101

CAPACITIES

Top Speed	9 knots
Optimal Operational Speed	7 knots
Standby Speed	3 knots
Fuel Oil Capacity	9,000 us gallons / 34,068 litres
Lube Oil Capacity	250 us gallons/ 946 litres
Hydraulic Oil Capacity	300 us gallons / 1,135 litres
Fresh Water Capacity	400 us gallons / 1,514 litres
Operational Endurance	10 days

CREW & ACCOMMODATION

Operational Capacity	Skipper, Mate and 3 Crew
Captain's Cabin	N/A
Number of Berths	Yes x5
Additional Accommodation	N/A
Galley & Messroom	Yes
Washing Machine & Dryer	No
Shower & WC	Yes

ELECTRONICS

Radar with ARPA	Yes (Furuno)
Radar	Yes (Furuno)
Navigational Plotters	Yes (Windplot)
VHF	Yes x2
MF / HF GMDSS	N/A
AIS	Yes
DGPS	Yes
Echo-sounder	Yes
Gyro / Sat Compass	N/A
V-Sat Satellite Broadband	N/A
Defibrillator	N/A
SOLAS liferaft	Yes

MACHINERY

Deck Machinery	N/A
Propulsion Arrangement	Main engine: Caterpillar 3408 Transmission: Twin disc Propeller Arrangement: Single screw
Extra Equipment Fitted	Auxiliary power: 1x 40kw generator

Pull Tug Vessel

MISTER MARCO

VESSEL INFORMATION

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Radar	Yes (Furuno)
Navigational Plotters	Yes (Windplot)
VHF	Yes x2
MF / HF GMDSS	N/A
AIS	Yes
DGPS	Yes
Echo-sounder	Yes
Gyro / Sat Compass	N/A
V-Sat Satellite Broadband	N/A
Defibrillator	N/A
SOLAS liferaft	Yes

MACHINERY

Deck Machinery	N/A
Propulsion Arrangement	Main engine: Caterpillar 3408 Transmission: Twin disc Propeller Arrangement: Single screw
Extra Equipment Fitted	Auxiliary power: 1x 40kw generator

Pull Tug Vessel

BATTERY-HYBRID AHTS

Low Emissions, Low Fuel Consumption
Jones Act, U.S. Flagged

Main Particulars

LENGTH OVERALL	265.1 ft	80.8 m
BEAM OVERALL	51.8 ft	15.8 m
DEPTH	19.0 ft	5.8 m
LOADED DRAFT	15.4 ft	4.7 m
DEADWEIGHT	2,300 Lt	2,337 Mt
TONNAGE (ITC) GRT	2,174	
TONNAGE (ITC) NRT	814	

BATTERY HYBRIDIZATION & ECO

INTEGRATED LEVIATHAN™ 2MWh ENERGY STORAGE SYSTEM
FUEL COST AND EMISSIONS REDUCTION
ENGINE MAINTENANCE REDUCTION
ABILITY TO EXPAND BATTERY CAPACITY TO ENABLE FULL-ELECTRIC OPERATION
ZERO EMISSIONS AT PORT WITH BATTERY (COLD-IRON)
CHARGE FROM OFFSHORE WIND OR SHORE POWER
NEXT-GEN SAFE BATTERY TECHNOLOGY
HIGH-PERFORMANCE HULL PAINT & HULL MODS FOR REDUCED FUEL CONSUMPTION

Capacities

FUEL OIL	140,011 USG	530 m³	
POTABLE WATER	99,857 USG	378 m³	
DRILL WATER	186,770 USG	707 m³	
WATER BALLAST	186,770 USG	707 m³	
LIQUID STORAGE	215,300 USG	815 m³	5,126 BBLs
BRINE	101,706 USG	385 m³	2,422 BBLs
LFL/METHANOL	101,706 USG	385 m³	

Discharge Rates

FUEL OIL	26,417 USG/hr.	100 m³/hr.
POTABLE WATER	26,417 USG/hr.	100 m³/hr.
DRILL WATER	26,417 USG/hr.	100 m³/hr.
LIQUID STORAGE	59,967 USG/hr.	227 m³/hr.
LFL/METHANOL	19,813 USG/hr.	75 m³/hr.

Machinery

MAIN ENGINES	Caterpillar 3 x 3516B & 1 x 3516C
MAIN GENERATORS	3 x 1,825 kW, 1 x 2,100 kW, 690 V, 60 Hz, 3 Ø
AUX. GENERATOR	1 x 425 kW, 690 V, 60 Hz, 3 Ø
TOTAL INSTALLED POWER	10,728 HP / 8015 kW
EMERGENCY GENERATOR	1 x 175 kW, 480 V, 60 Hz, 3 Ø
BOW THRUSTER #1	Brunvoll CPP FU63LTC1550, 580 kW
BOW THRUSTER #2	Brunvoll CPP FU63LTC1550, 580 kW
STERN THRUSTER #1	HRP Conventional, 800 BHP, 9 Mt thrust
PROPELLERS	Conventional in nozzles
RUDDERS	Twin independent Fish Tail Rudders

Deck and Anchor Handling

ANCHORS	Rolls Royce 11.5 Mt at 15m/min
CHAIN	2 x 1,846 Kg (439 m x 38 mm Ø chain)
CHAIN CAPACITY	10,594 ft3-300 m3
WINCH MODEL	Rolls Royce Brattvaag, Electro-Hydraulic
LINE PULL	Two Drum Reverse Waterfall 300 Mt
WINCH CAPACITY DRUM #1	76 mm x 2,000 m, (3" x 6,600') each drum
BRAKE CAPACITY	393 Lt, 400 Mt
STORAGE REEL #1	76 mm x 2,000 m, (3" x 6,600') each drum
STORAGE REEL #2	76 mm x 2,000 m, (3" x 6,600') each drum
TUGGER WINCH #1	11 Mt
TUGGER WINCH #2	11 Mt
STERN ROLLER	SWL 350 Mt (16' x 8')
SHARK JAWS	2 x Karmfork 300 Mt
TOWING PINS	2 Pair x Karmøy hyd w/ locking flaps
UTILITY CRANE	4.4 Mt at 3 meters

Performance

MAXIMUM SPEED	14.3 Knots
CRUISING SPEED	12.0 Knots
ECONOMICAL SPEED	10.0 Knots
BOLLARD PULL	120 MT

Cargo Deck

TONNAGE	1,600.3 Lt	1,626.0 Mt
STRENGTH	1,024.1 Lb/ft²	5.0 Mt/m²
LENGTH	160.8 ft	49.0 m
WIDTH	42.7 ft	13.0 m
CLEAR AREA	6,835.1 ft²	635.0 m²

Accommodation

CABINS	16
BERTHS	38
SINGLE CABINS	2
DOUBLE CABINS	12
4 PERSON CABINS	2
CREW MESS	1
OFFICES	1
CHANGE ROOM	1
LOUNGES	2
HOSPITAL	1

Rescue Capabilities

FRC	MP 660 Springer, Full SOLAS, 6.6 m, 6 person, 32-34 Kt max speed, diesel waterjet propulsion

Electronics & Controls

DYNAMIC POSITIONING	Class 2
DP SYSTEM	Converteam
DP REFERENCE #1	2 x C-NAV 3050 (GLONASS)
DP REFERENCE #2	1 x Cyscan
GYROS	2 x TSS Meridian
ECDIS	Coasta l Navigator
RADAR #1	1 x S Band ARPA
RADAR #2	1 x X Band ARPA
GMDSS	Area A3

Special Equipment

SURVIVAL CRAFT	6 x 25 person inflatable liferafts
MUD TANK CIRCULATION	Flygt Agitators (2) per tank
CRANE #1	Technorane TC10-24-40 rated at 4,422 kg @ 6.09m and 1,367 kg @ 12.19m
ROV CAPABILITIES	OCEANEERING - MILLENIUM PLUS ROV (150 HP) SPREAD c
ROV POWER SUPPLY	400A, 300A, 60A, 40A AND 30A, 3phase, 480V
CONTAINER SUPPLY	8 x 30A and 1x 80A, 480V, 3Ø, 60Hz 2 x 32A, 220V
BALLAST WATER TREATMENT SYSTEM	Erma First oneTANK

Documentation

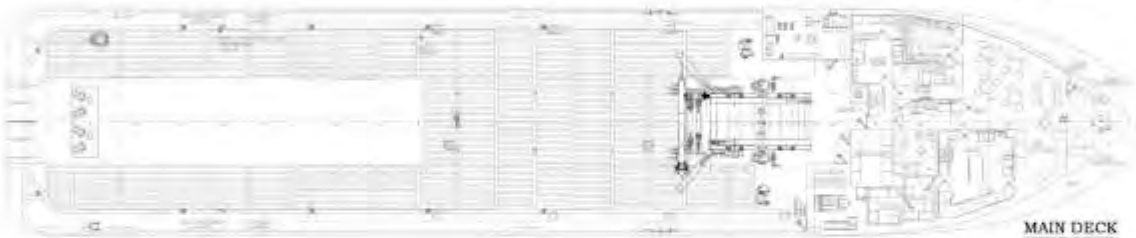
CLASS	ABS ✠A1, Towing Vessel, Offshore Support Vessel, ®, AMS, ✠OPS-2, UWILD, SOLAS
FLAG	USA, Jones Act Compliant
USCG	OSV, SubCh L & I Vessel
BUILD YEAR	2007

Fleetzero

BATTERY-HYBRID AHTS

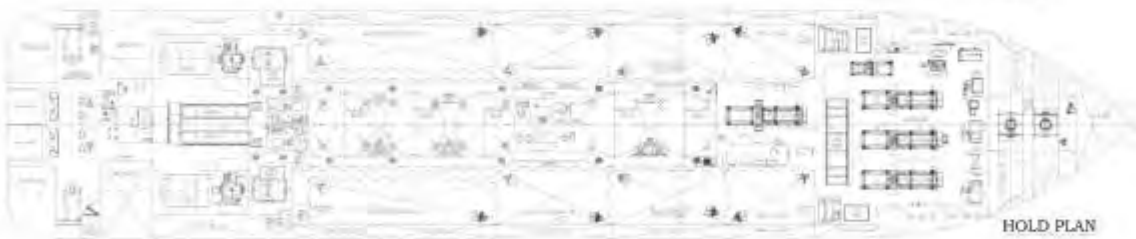
Low Emissions, Low Fuel Consumption
Jones Act, U.S. Flagged

FOCSLE DECK



MAIN DECK

E.R. FLAT



HOLD PLAN

Fleetzero

Survey Vessel

MARC ROBERT

The Marc Robert is outfitted with an R2Sonic 2024 multibeam echosounder (MBES) and an Applanix POS MV position and IMU. The Marc Robert is capable of high-resolution hydrographic and marine geophysical surveys. Successfully completed projects include offshore wind cable installation projects, geophysical surveys, terminal inspections, dredging, and U.S. Navy projects.

General:
Name: Marc Robert
Owner: Steele Associates Marine Consultants
Builder: Metal Shark
Model: USCG Defiant 29
Crew Capacity: Four
Operating Range: Coastal waters within 20-miles from safe refuge

Dimensions:
Length Overall: 31.7-ft
Beam: 8.5-ft
Draft: 3.0-ft

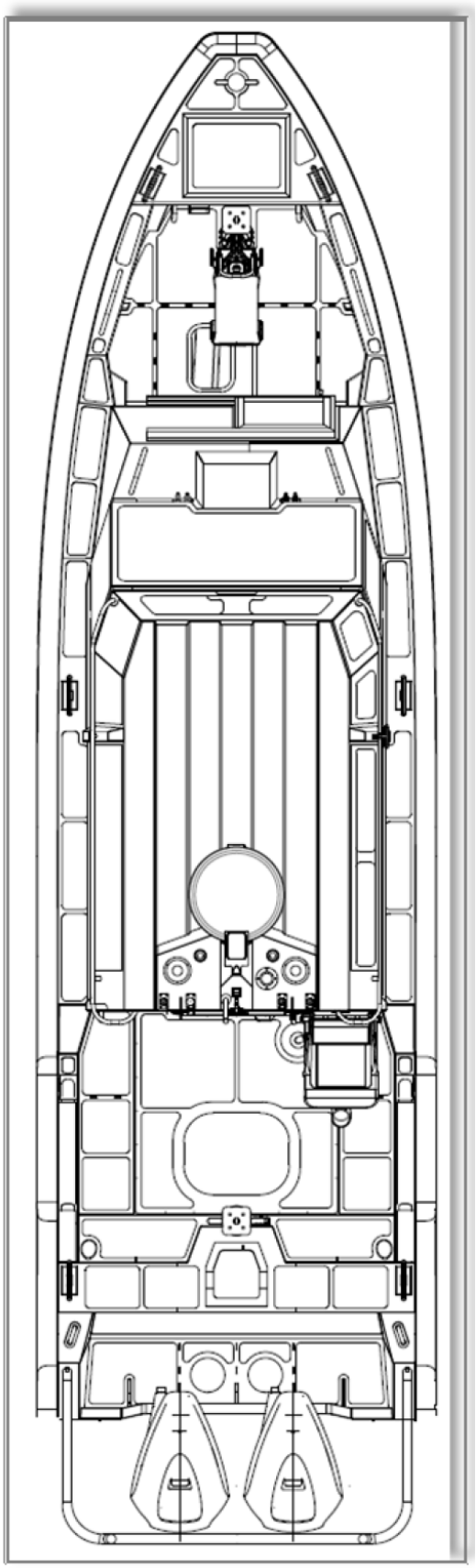
Machinery:
Propulsion: Twin-Mercury 350 HP four stroke
Power: 1000 or 2000-watt generator
Davit: 150-LB winch

Navigation Electronics:
Simrad EVO Plotters, Radar, Sounder, AIS, Autopilot, VHF marine radios

Survey Electronics:
Hypack and Hysweep Software
R2Sonic 2024 Multibeam Sonar
Applanix POS MV Position and IMU
Coda Octopus F175 IMU
Trimble SPS855 RTK Receiver
AML Speed of Sound Profiler
Universal Sonar Mount

Steele Associates Marine Consultants, LLC
94 Gifford Street
Falmouth, MA 02540
Office: 508.540.0001

Line Drawing:



Appendix D – Revolution Wind Anchoring Plan (Rhode Island State Waters)

Revolution Wind Export Cable | Rhode Island Waters Anchoring Plan

Submitted for Agency Review

OCTOBER 2023 (v4)

Table of Contents

List of Tables

1.0 Introduction

Revolution Wind, LLC (Revolution Wind) (formerly DWW Rev I, LLC), a 50/50 joint venture between Orsted North America Inc. (Orsted NA)[1] and Eversource Investment, LLC (Eversource), proposes to construct and operate the Revolution Wind Farm Project (hereinafter referred to as the Project). The purpose of the Project is to provide clean, reliable offshore wind energy that will increase the amount and availability of renewable energy to New England consumers while creating the opportunity to displace electricity generated by fossil fuel-powered plants and offering substantial economic and environmental benefits to the New England region. Massachusetts, Rhode Island, Connecticut, and New York have adopted substantial renewable portfolio standards and clean energy targets to address issues associated with climate change, highlighting the current and future demand for this Project. In response to this expressed need and demand, Rhode Island and Connecticut have awarded Revolution Wind five Power Purchase Agreements (PPAs) to-date, totaling 704 MW of generation capacity. The Project will fulfill Revolution Wind's obligations to both Connecticut and Rhode Island in accordance with the PPAs and provide substantial environmental and economic benefits.

Power from the Revolution Wind Farm (RWF) will be delivered to the existing mainland electric grid via the submarine export cable referred to as the Revolution Wind Export Cable (RWEC) in federal waters on the outer continental shelf (RWEC-OCS) and in Rhode Island State waters (RWEC-RI), the Onshore Transmission Cable, the Onshore Substation (OnSS), and the underground right-of-way connecting the OnSS to the Interconnection Facility (ICF).

Revolution Wind has developed the RWEC-RI Anchoring Plan (Plan) for installation of the RWEC-RI and identification of areas restricted for anchoring. This Plan is submitted pursuant to the Revolution Wind Condition 12 of the State of Rhode Island Department of Environmental Management (RIDEM) Water Quality Certificate #21-135 and Dredge Permit Application #DP-21-187 (WQC Permit), and the Rhode Island (RI) Coastal Resources Management Council (CRMC) Category B Assent #B2021-07-005 as described in Table 1 below. The Plan is also submitted to support the review of the Revolution Wind USACE Individual Permit application and is based on a draft permit conditions the USACE provided to Revolution Wind on September 25, 2023 and per subsequent discussion with Ruthann Brien, USACE New England District Regulatory Project Manager, on September 28, 2023, which is provided in Table 1 below.

[1] Note that in October 2018, Deepwater Wind LLC was acquired by Orsted North America Inc

Table 1 Relevant Permit Conditions

Permit Condition	Detail
USACE Draft Condition 2	At least 45 days prior to commencement of work within the 3 nautical mile limit, the permittee shall submit an anchoring plan for USACE and NMFS review and USACE approval. The plan shall delineate areas of complex habitat which are defined as coarse unconsolidated mineral substrates (i.e. substrates containing 5% or greater gravels), rock substrates (e.g. bedrock), and shell substrates (e.g. mussel reef) consistent with CMECS definitions as well as vegetated habitats (e.g. SAV) within or near the export cable corridor. The benthic habitat data with modifiers provided by Revolution Wind (Appendix X2 to the COP), as well as the crosswalk of these to the above NMFS definition of complex habitat (also in Appendix X2 of the COP), will be provided along with individual boulder pick data in maps prepared that also identify areas restricted for anchoring. USACE and NMFS will have 30 calendar days to review and comment. The permittee must address any comments to USACE' satisfaction before construction activities can begin. For areas where complex habitats cannot be fully avoided, the anchoring plan should prioritize avoidance/minimization in order of decreasing density and size of boulders where they are present within areas of complex habitat (as defined above); e.g., the highest priority would be complex habitat with the highest density of large boulders and the lowest priority would be complex habitat with no large boulders. The final anchoring plan must be provided to all construction and support vessels to ensure no anchoring of vessels or other work occurs within these sensitive habitats.
USACE Draft Condition 8	In order to limit benthic impacts, the work within Narragansett Bay shall be performed such that vessels stay afloat at low tide and do not run aground.
WQC Condition 12	The Applicant shall submit a Cable Burial Work Plan for review and approval by DEM at least 90 days prior to the start of construction. The Work Plan shall include elements of the trenching and dredging work in areas within DEM regulatory authority and at a minimum, a detailed schedule, weather and equipment contingency plans, a detailed list of equipment and vessels to be utilized, and a detailed anchoring and spud plan.
CRMC Category B Assent Staff Recommended Stipulation A	The Applicant shall submit a Cable Burial Work Plan for review and approval by the CRMC Council at least 90 days prior to the start of construction of the offshore activities. The Work Plan shall include elements of the trenching and dredging work in areas within CRMC's regulatory authority. The work plan shall include, at a minimum, a detailed schedule, weather and equipment contingency plans, a detailed list of equipment and vessels to be utilized, and a detailed anchoring and spud plan.

The Plan describes anchoring activities in Rhode Island State waters and describes information that will be provided to contractors regarding areas that are restricted from anchoring (i.e., no anchoring areas).

2.0 Anchoring Activities – Construction

Anchoring of vessels within Rhode Island State waters may occur during horizontal directional drilling (HDD) and cable pull-in activities for the Landfall HDD cable installation and installation of the RWEC-RI. Any anchoring will occur within the Project's survey corridor, which is also known as the Area of Potential Effect (APE). The APE is shown on the figures in Appendix A as the RWEC-RI State Waters Envelope and the RWEC-OCS Envelope. However, this plan only includes no anchorage areas in State waters. A separate Anchoring Plan will be developed for no anchorage areas on the Outer Continental Shelf. The figures also depict submerged aquatic vegetation (SAV) areas,[2] complex benthic habitat,[3] sensitive archaeological resources,[4] and unexploded ordnances[5] as no anchorage areas that were mapped within the APE. Submerged aquatic vegetation is shown with a 100-foot buffer, potential unexploded ordnances are shown with a 10-meter exclusion zone, and confirmed unexploded ordnances are shown with exclusion zones relative to their charge weight and water depth.

Revolution Wind will avoid complex benthic habitat to the maximum extent practicable while also considering engineering and other siting constraints. In order to limit benthic impacts, the work within Narragansett Bay will be performed such that vessels stay afloat at low tide and do not run aground. For areas where complex habitats cannot be completely avoided, any anchoring will prioritize avoidance and minimization in order of decreasing density and size of boulders where they are present within complex habitat); e.g., the highest priority would be complex habitat with the highest density of large boulders and the lowest priority would be complex habitat with no large boulders. Boulder pick locations are shown in the figures to assist with this evaluation.[6] Complex benthic habitat is defined below:

› Substrates containing five percent or greater gravel;

[2] Submerged aquatic vegetation mapping was conducted in State waters near the Landfall throughout the APE in September 2020 and a pre-construction SAV survey was completed in the summer of 2023. Revolution Wind will continue to consult with NOAA Fisheries, RIDEM, RI CRMC, and USACE to minimize and avoid impacts to SAV.

[3] Benthic habitat mapping was conducted throughout the APE to support federal consultations to Essential Fish Habitat. Details regarding this assessment are available at https://www.boem.gov/renewable-energy/state-activities/appx2habitatmapping

[4] A marine archaeological resources assessment was conducted throughout the APE in support of Section 106 consultation. Details regarding this assessment are available at https://www.boem.gov/renewable-energy/state-activities/revwind-non-technical-mara. Revolution Wind will maintain a 164-ft (50 m) buffer from all submerged cultural resources (i.e., shipwrecks or potential shipwrecks), including anchoring, to avoid potential adverse effects to these resources.

[5] The locations of the unexploded ordnances were identified during the 2022 unexploded ordnances campaign.

[6] The individual boulder pick locations and boulder fields (which are included in the complex benthic habitat) were mapped during a geophysical survey completed by Fugro in 2020.

› Rock substrates (e.g., bedrock); and

› Shell substrates (e.g., mussel reef).

Revolution Wind will avoid mooring and staging in SAV beds and their 100 ft buffers. The locations of SAV beds and their buffers will be provided to vessel operators. If anchoring occurs within SAV or their buffers, Revolution Wind's Compliance Manager will be notified as soon as practicable.

2.1 Landfall Construction

The RWEC-RI will be installed at the landfall using HDD, which will require two exit pits and two cable ducts. Vessel anchoring may be required for cable installation. If needed, anchoring will occur within the APE and anchors would have a maximum penetration depth of up to 18 ft (5.5 m). In addition, a barge or jack-up vessel may be used at this location to assist the drilling process, handle the duct for pull in, and to help transport the drilling fluids and mud back to an appropriate site for treatment, disposal, and/or reuse. Barges or jack-up vessels may be used for landfall construction within a 100 m area from the center point of the HDD exit pits (see Figure 6in Appendix A). No anchoring will occur within complex habitat, SAV, or their buffers.

2.2 Nearshore RWEC-RI Construction

Dynamic positioning (DP) vessels will generally be used for cable burial of the RWEC-RI. If anchoring during cable installation is necessary, non-DP vessels may anchor anywhere within the APE, which extends beyond the 131-foot (ft) (40 meter [m]) disturbance corridor. Project vessels will employ a variety of anchoring systems, which include a range of size, weight, mooring systems, and penetration depth. In addition, anchoring vessels are anticipated to be utilized for installation of the RWEC-RI between KP 0 to KP 10.5 due to shallower water depth. Anchors associated with cable laying vessels will have a maximum penetration depth of 15 ft (4.6 m), except between KP 0 and 10.5, where maximum anchor penetration depth is up to 18 ft (5.5 m). Jack-up vessels used for installation will include spudcans with an anticipated maximum penetration depth of 52 ft (16 m) or an appropriate depth to ensure the stability of the vessel.

In the event of pull-ahead anchoring, Revolution Wind anticipates using a single anchor approximately 14.8 ft by 18.0 ft (4.5 m by 5.5 m) (approximately 266.4 sf [24.75 sq. m]) for each event and pull-ahead anchoring will be confined to the disturbance corridor. For the RWEC-RI, up to 100 anchor events for each cable (maximum of 200 events) could occur. These maximums account for unforeseen circumstances that could occur during construction (i.e., weather, equipment breakdown, etc.) Pull-ahead anchoring may result in approximately 16 acres of seafloor disturbance within the 131-ft (40-m) -wide disturbance. Seafloor disturbance due to vessel anchorage is considered a temporary impact and will not occur outside of the surveyed area.

Pre-lay grapnel runs will be undertaken along the cable routes to remove any seabed debris along the export cable route. A specialized vessel will tow a grapnel rig along the centerline of each cable to recover any debris to the deck for appropriate licensed disposal ashore. The average penetration depth of the grapnel anchor is 0.5 m and it is approximately 1 m in width.

2.3 Measurement Buoys

Initial Project plans included the possibility of deploying nearshore wave buoys or Acoustic Doppler Current Profilers (ADCPs). However, Revolution Wind will not deploy nearshore wave buoys or ADCPs in Rhode Island State waters.

3.0 Anchoring Activities – Maintenance

Repairs associated with the RWEC-RI may require anchoring. In order to limit benthic impacts, the work within Narragansett Bay will be performed such that vessels stay afloat at low tide and do not run aground. The figures in Attachment A and/or shapefiles or a geodatabase would be provided to contractors so that they can position to avoid impacts to existing buried assets and minimize impacts to complex benthic habitats.

Appendix A – RWEC-RI Anchoring Plan Figures

These figures and/or relevant shapefiles or geodatabase will be provided to the contractors for reference to avoid no-anchorage areas.

Revolution Wind
Rhode Island Anchoring Plan Overview Map

Legend
- Corridor Index

Offshore Envelope
- RWEC-OCS Envelope
- RWEC-RI State Waters Envelope
- Complex Benthic Habitat
- Other No Anchorage Areas
- Confirmed Unexploded Ordnances
- Potential Unexploded Ordnances
- Submerged Aquatic Vegetation 100' Buffer
- Submerged Aquatic Vegetation
- Submerged Aquatic Vegetation Isolated Patch (2023 Survey)

Notes:
1. Anchoring may occur at the horizontal directional drilling landfall location and along the RWEC-RI in State waters. All anchoring will occur within the RWEC-RI State Waters Envelope (Area of Potential Effect).
2. No anchorage areas were identified within complex benthic habitat, potential and confirmed unexploded ordnance, submerged aquatic vegetation areas, and other no anchorage areas.
3. If anchoring is required for emergency or maintenance purposes, vessels will avoid or minimize impacts to areas designated as no anchorage areas.

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World Topographic Map: University of Rhode Island, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA

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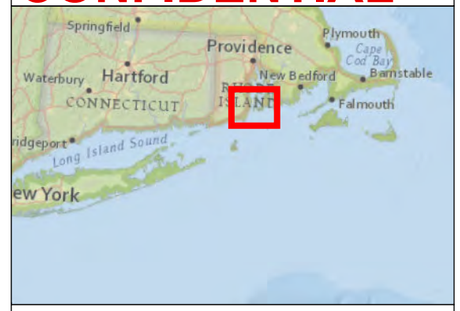

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Date: 10/4/2023
Document no:

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Checked by: S. MOBERG
Approved by: MEGEA

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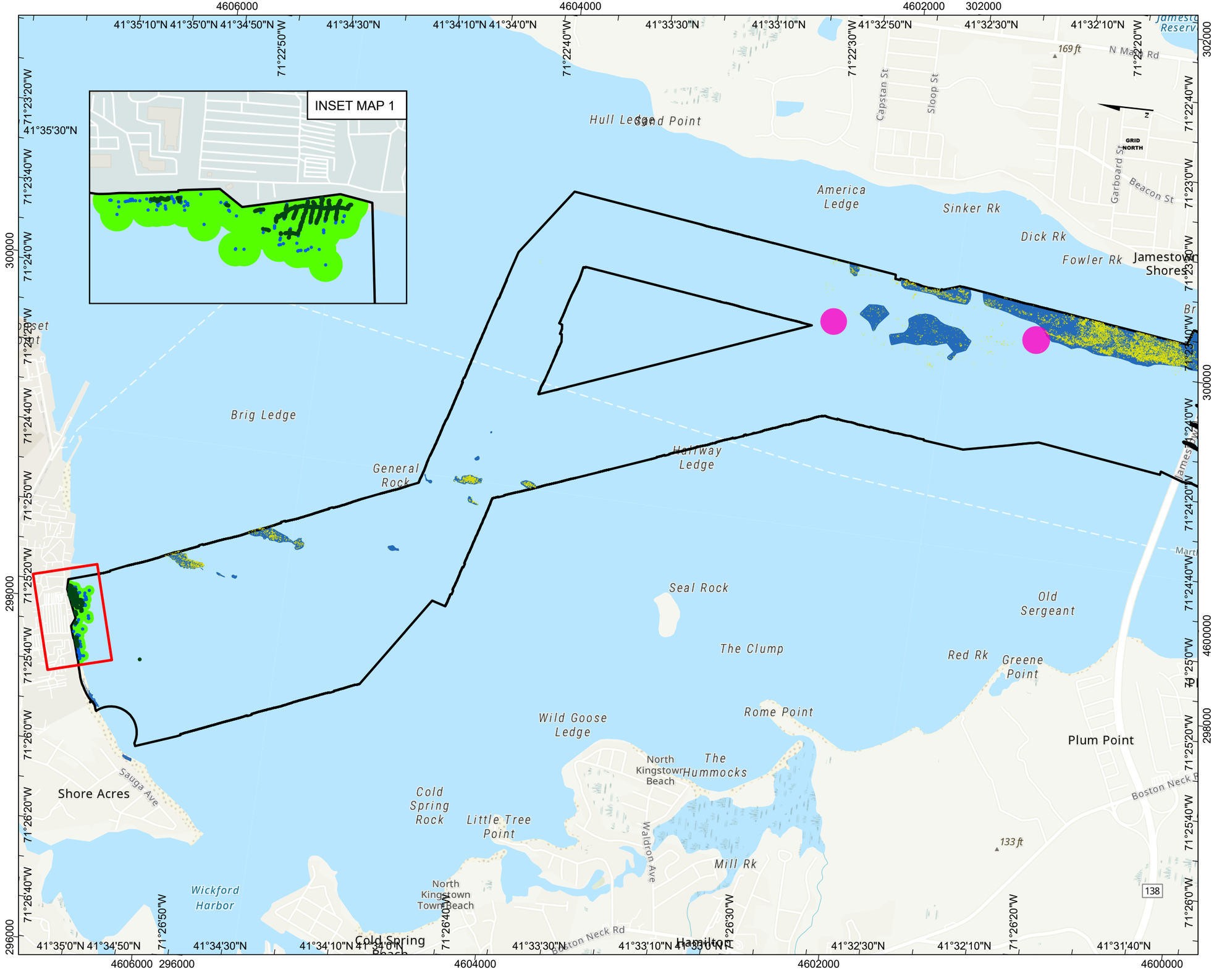

Revolution Wind

Figure 1
Rhode Island Anchoring Plan Corridor Detail Maps

Legend

Offshore Envelope

- RWEC-OCS Envelope
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Figure 2
Rhode Island Anchoring Plan Corridor Detail Maps

Legend

Offshore Envelope

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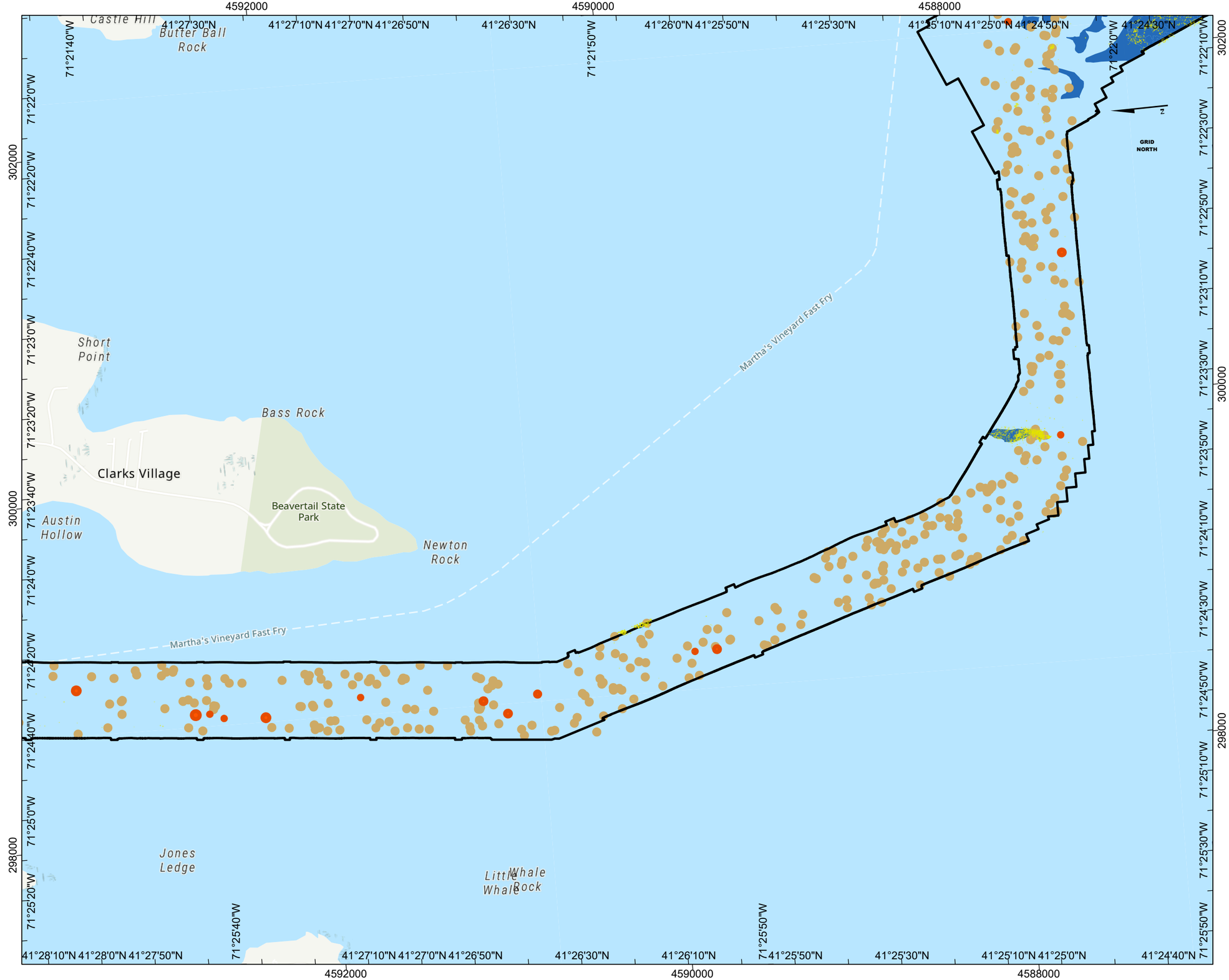
Figure 3
Rhode Island Anchoring Plan
Corridor Detail Maps



Legend

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Figure 4
Rhode Island Anchoring Plan Corridor Detail Maps

Legend

Offshore Envelope

- RWEC-OCS Envelope
- RWEC-RI State Waters Envelope
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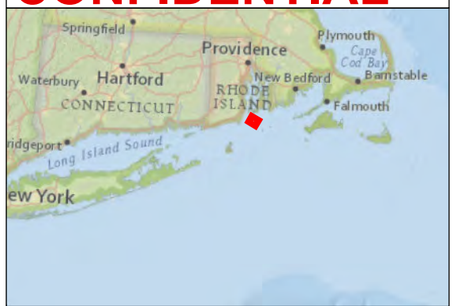

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Figure 5
Rhode Island Anchoring Plan Corridor Detail Maps

Legend

Offshore Envelope

- RWEC-OCS Envelope
- RWEC-RI State Waters Envelope
- Complex Benthic Habitat
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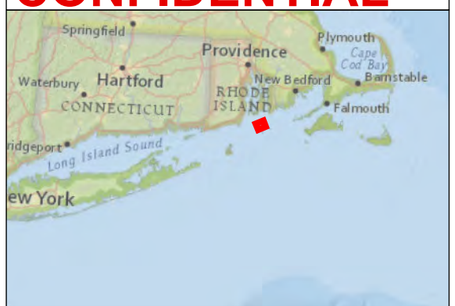

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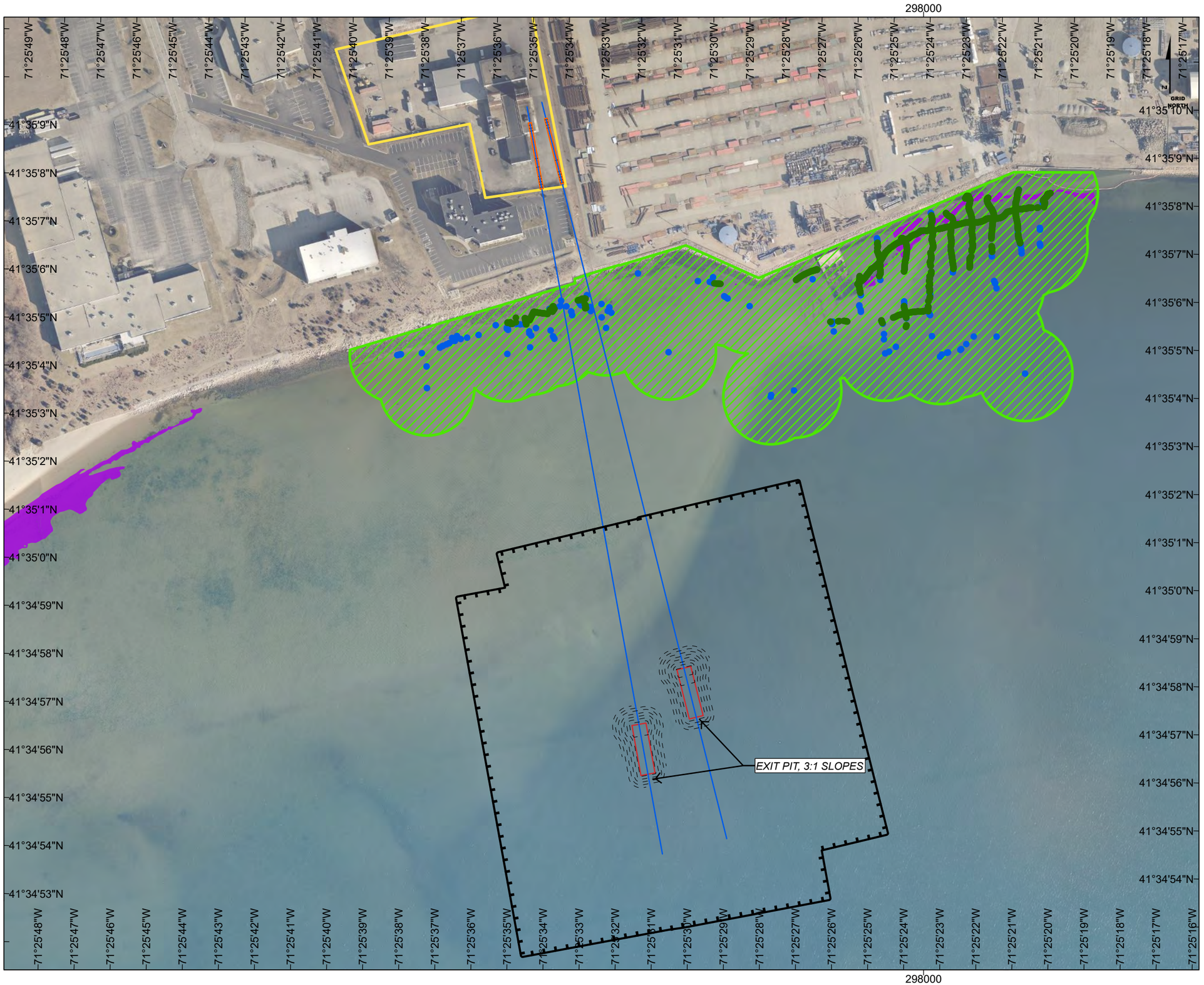

Revolution Wind

Figure 6
Potential HDD Anchorage Area

Legend

- Minor Contour; Major Contour
- Indicative Proposed Cable
- Proposed Entry Pit Area
- Proposed Exit Pit Area
- Proposed Landfall Work Area
- Potential HDD Anchorage Area
- Complex Benthic Habitat
- Submerged Aquatic Vegetation 100' Buffer
- Submerged Aquatic Vegetation (2023 Survey)
- Submerged Aquatic Vegetation Isolated Patch (2023 Survey)

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Rhode Island Aerial Photographs (Spring 2021):
Inspire, June 30, 2021. Benthic Habitats in Rhode Island State Waters Revolution Wind Offshore Wind Farm

Reference system: NAD83 (2011)
Projection: UTM Zone 19N

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Original Date: 06/12/2020
Revised Date: 08/28/2023
Document no:

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