

EXXONMOBIL CANADA LTD.

EL 1165A HAMPDEN K-41 DRILLING DISCHARGES FOLLOW-UP PROGRAM 2022 REPORT

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EL 1165A HAMPDEN
K-41 DRILLING
DISCHARGES
FOLLOW-UP PROGRAM
2022 REPORT

EXXONMOBIL CANADA LTD.

FINAL

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APPENDICES

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ABBREVIATIONS

C-NLOPB	Canada-Newfoundland & Labrador Offshore Petroleum Board
CEA	Canadian Environmental Assessment Agency
EIS	Environmental impact statement
EL	Exploration license
EMCL	ExxonMobil Canada Limited
ESRI	Environmental Systems Research Institute
HD	High definition
HiPAP	High Precision Acoustic Positioning System
MODU	Mobile offshore drilling unit
NAD 83	North American Datum 1983
NAFO	Northwest Atlantic Fisheries Organization
ROV	Remotely operated vehicle
SBM	Synthetic-based mud
sp.	Species
Stdev.	Standard deviation
UTM	Universal Transverse Mercator
WBM	Water-based mud

Units

%	percent
cm	centimeters
Ind.	individual
km	kilometers
m	meters
mm	millimeters
n	number

1 INTRODUCTION

WSP E & I Canada Limited (formerly Wood), was contracted by ExxonMobil Canada Limited (ExxonMobil) to conduct a post-drilling benthic survey at the Hampden K-41 wellsite within Exploration Licence (EL) EL 1165A formerly EL 1134 (Figure 1-1, EMCL 2019a, b). This survey is part of the follow-up monitoring program for fish and fish habitat as set out in the Eastern Newfoundland Offshore Exploration Drilling Project Environment Impact Statement (EIS) (EMCL 2017) as well as requirements set out in the *Canadian Environmental Assessment Act* (2012) Decision Statement (CEA Agency 2019).

1.1 DRILL CUTTINGS MODELLING

A drill cuttings model was used to predict the extent of released water-based muds (WBM) and synthetic-based muds (SBM) (Amec Foster Wheeler 2017, Wood 2018). This model predicts the accumulation and extent of cuttings at the time of release. To account for variable environmental conditions throughout the year, four seasonal models were combined into one model (Wood 2018). From the combined model, discharged cuttings were predicted to drift primarily to the south and southeast with the majority deposited within 1 km from the wellhead (Figure 1-2). During the 2020 drilling program, WBMs were used to drill the top hole. These drilling muds have a larger grain size and are released at the seafloor. WBMs accumulate close to the where they are released and were found within 50 m of the well head. During the 2022 drilling program SBMs were used to drill the well to the desired depth. These drilling muds have a smaller grain size (e.g., clay) and are released at the surface.

1.2 PREVIOUS SURVEYS

The Hampden K-41 wellsite was previously surveyed in 2018 (RPS 2018) as part of the pre-drilling survey. This survey included a visual survey of the benthic habitat using the Millennium 191 remotely operated vehicle (ROV) onboard the MV *Paul A. Sacuta*. A portion of the wellsite was re-surveyed in 2020 as part of the post-drilling monitoring (Wood 2021a, b). The objectives of the 2018 survey were to determine the presence of coral aggregations as defined by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) and implement any mitigations as necessary and record baseline data for describing the fish and fish habitat in the area. The objective of the 2020 post-drilling survey was to fulfill the requirements set out in the EIS and Decision Statement.

The 2018 pre-drilling survey examined a 200 m by 200 m boundary (yellow box, Figure 1-2) around the proposed drill center and transects within the predicted drill cutting footprint (RPS 2018). The survey design did not include an anchor pattern. The Hampden K-41 wellsite is in approximately 1,180 m water depth. At this water depth the mobile offshore drilling unit (MODU) maintained its position using a dynamic positioning system.

The 2020 post-drilling survey was split into two separate surveys. Changes to the drilling program in 2020 meant that the planned drilling program was not fully implemented and only a top hole was drilled. Due to the reduced drilling program, only the 200 by 200 m boundary around the drill centre was surveyed and visually assessed in May 2020 (EMCL 2020, Wood 2021 a, b). It was determined there was a decrease in coral and sponge densities, mainly within 50 m of the drill center where drill cuttings deposition was higher. It was concluded that the drilling activities were within the EIS predictions of the project not resulting in significant adverse environmental effects. Therefore, follow-up requirements of Condition 3.12.2 of the Decision Statement referenced above and Conditions 19 and 20 of OA No. 24020-020-OA06 related to top hole drilling (with regards to verification of drill waste deposition modelling predictions and benthic fauna surveys) were satisfied for the area within 100 m of the drill centre during the 2020 program. The 2022 benthic survey was conducted outside of the completed 2020 survey area.

1.3 SURVEY SCOPE (2022)

In 2022, ExxonMobil returned to the Hampden K-41 wellsite with a MODU and fulfilled the rest of the drilling program. In consultation with the regulators, the 2022 survey would only survey the transects within the predicted drill cutting footprint. The objective of the 2022 post-drilling follow-up program was to meet conditions 3.12.1, 3.12.2, 3.12.2.1, 3.12.2.2, and 3.12.2.3 of the Decision Statement (Table 1-1). This includes verifying the accuracy of the predictions made during the environmental assessment as it pertains to marine fish and fish habitat and determining the effectiveness of the mitigation measures in the predicted drill cutting footprint (CEA Agency 2019).

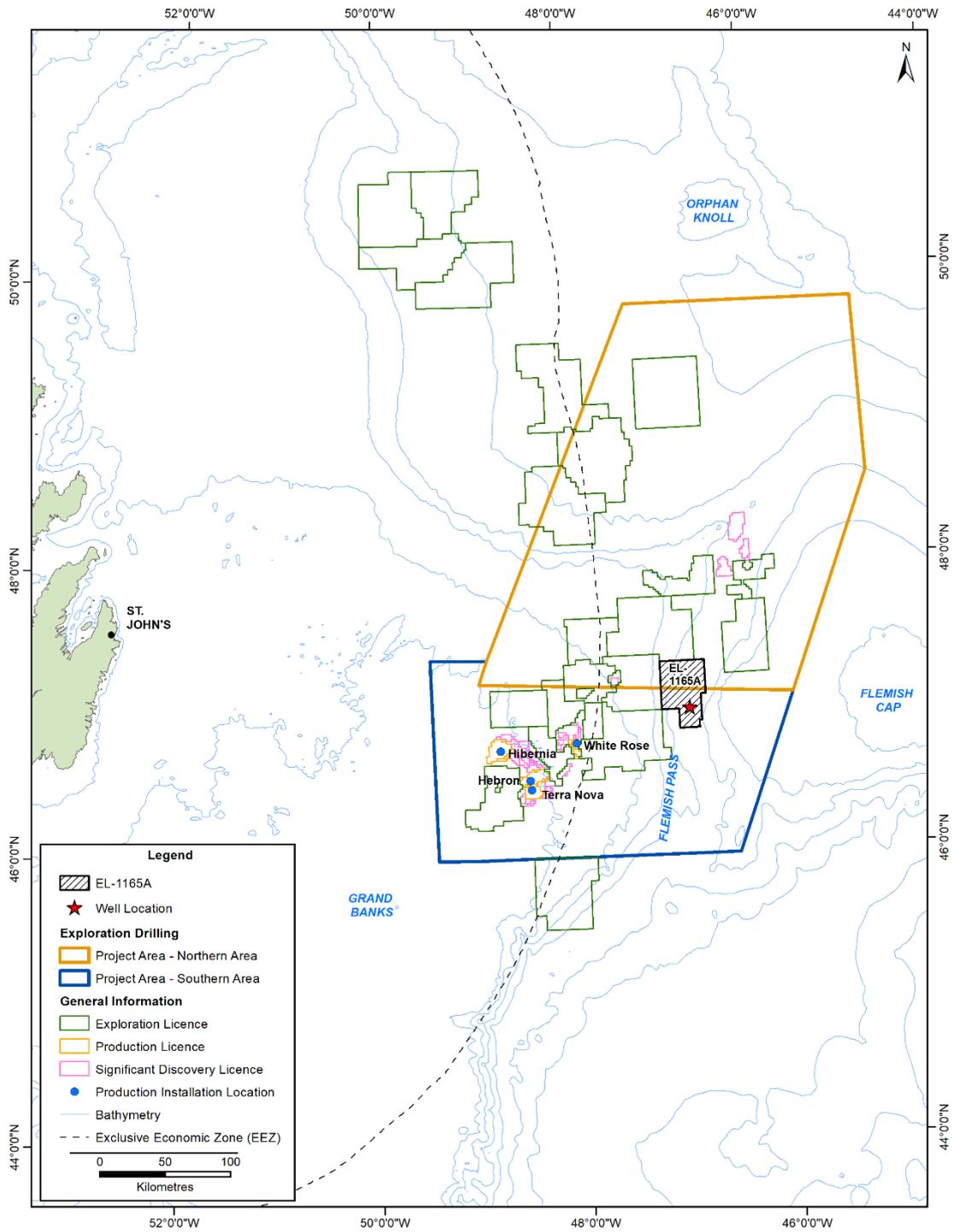


Figure 1-1 Location of EL 1165A Hampden K-41 well.

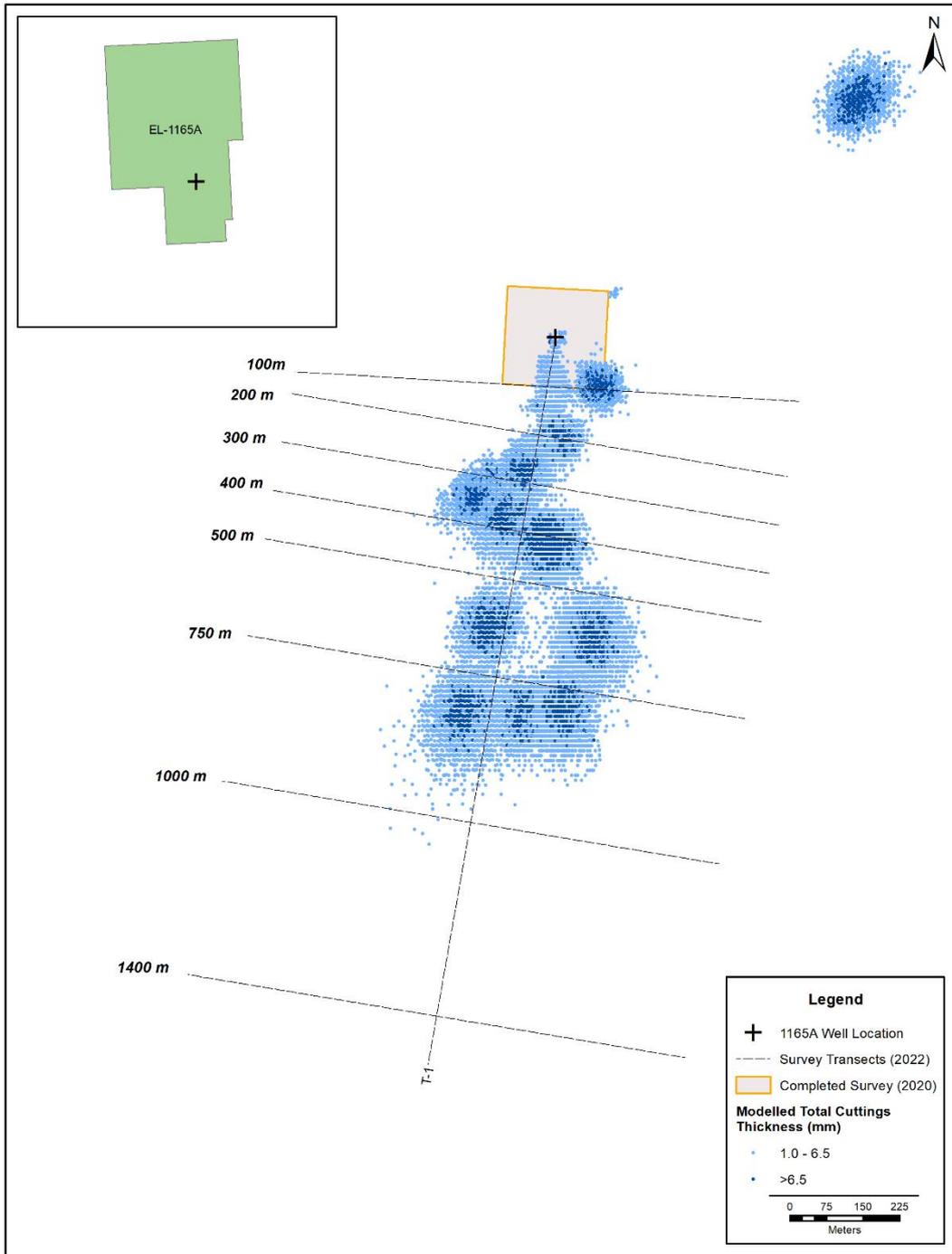


Figure 1-2 Predicted drill cutting footprint (WBM and SBM) all four seasonal models.

Table 1-1 Conditions met by this Survey.

Condition	Condition Details
3.12.1 ^{1,3}	For every well, measure the concentration of synthetic-based drilling fluids retained on discharged drill cuttings as described in the Offshore Waste Treatment Guidelines to verify that the discharge meets, at a minimum, the performance targets set out in the Guidelines and any applicable legislative requirements, and report the results to the Board;
3.12.2 ^{1,2}	For the first well in each exploration licence, and for any well where drilling is undertaken in an area determined by coral and sponge surveys to be sensitive benthic habitat, and for any well located within a special area designated as such due to the presence of sensitive coral and sponge species, or a location near a special area where drill cuttings dispersion modelling predicts that drill cuttings deposition may have adverse effects, develop and implement, in consultation with Fisheries and Oceans Canada and the C-NLOPB, follow-up requirements to verify the accuracy of the environmental assessment and effectiveness of mitigation measures as they pertain to the effects of cuttings discharges on benthic habitat. Follow-up shall include:
3.12.2.1 ^{1,2}	Measurement of sediment deposition extent and thickness post-drilling to verify the drill waste deposition modeling predictions
3.12.2.2 ^{1,2}	Benthic fauna surveys to verify the effectiveness of mitigation measures
3.12.2.3 ^{1,2}	Report the information collected as identified in conditions 3.12.2.1 and 3.12.2.2, including a comparison of modelling results to <i>in situ</i> results, to the C-NLOPB within 60 days following the drilling of the first well in each exploration licence.
<p>¹Complementary follow up data presented this report</p> <p>²Condition met in the previous monitoring reports (Wood 2021a, b).</p> <p>³Condition met as part of EMCL's environmental compliance monitoring</p>	

2 METHODOLOGY

2.1 SYNTHETIC ON CUTTINGS

The concentration of synthetic-based mud was measured to assess whether the discharge met the Offshore Waste Treatment Guidelines (OWTG) (Condition 3.12.1). As part of the OWTG, the concentration of non-aqueous SBM retained on discharged drilling solids from all sources should be measured every 12 hours. This is reported as a mass-weighted rolling 48-hour average calculated in units of oil per 100 grams wet solids. The target for this “synthetic-on-cuttings” (SOC) discharged to sea should not exceed 6.9 g / 100 g oil on wet solids. Cuttings were treated aboard the Stena Forth MODU using cuttings dryer technology and are detailed in a separate report.

2.2 PRE-DRILLING SURVEY DESIGN (2018)

The pre-drilling survey design consisted of a 200 by 200 m box centered around the proposed drill center with 30 horizontal transect lines (200 m in length) running east to west and spaced approximately 7 m apart. The survey also included 1,000 m long transects positioned at 100 m, 200 m, 300 m, 400 m, 500 m, 700 m, 1,000 m, and 1,400 m within the proposed drill cutting footprint (RPS 2018).

2.3 POST-DRILLING SURVEY DESIGN (2020, 2022)

The post-drilling survey pattern was re-surveyed in two parts. The 2020 post-drilling survey collected data in the 200 by 200 m box centered around the wellhead and was composed of 34 horizontal survey lines spaced 6 m apart. In the 2022 post-drilling survey, benthic data was collected in the predicted drill cutting footprint along a series of transects 1,000 m long positioned at 100 m, 200 m, 300 m, 400 m, 500 m, 700 m, 1,000 m, and 1,400 m south-southwest from the drill centre. There was also a single 1,500 m long transect originating from the drill centre and bisecting the cuttings dispersal model footprint.

2.4 POST-DRILLING SURVEY (2022)

The post-drilling survey was conducted from August 20th to August 21st, 2022 onboard the *MV Paul A. Sacuta* using a Millennium 191 remotely operated vehicle (ROV). The ROV was equipped with a forward-facing pan/tilt/zoom high-definition (HD) camera which was used to collect high-definition video during the duration of the survey. Still images of fauna were taken opportunistically. Video and still imagery were used to identify the benthic fauna (including corals and sponges).

ExxonMobil was responsible for chartering the vessel and other support services required to conduct the 2022 survey. Wood provided an onboard biologist who was responsible for the execution of the survey plan and providing direction to the ROV operators to ensure the collection of video and images appropriate for characterizing cold-water corals and sponge groups and general characterization of fish and other invertebrates.

The survey video and imagery were geo-referenced using the ships HiPAP system. The HD video was encoded with a digital overlay that displayed depth (m), coordinates (UTM and NAD83), heading, date and time (Newfoundland Standard Time), and altitude above seafloor. Still images were encoded with a datetime stamp and numbered sequentially. The ROV travelled at an altitude <2 m above the seafloor and an estimated field of view of 3.42 m. Scaling line lasers were spaced 20 cm apart.



Figure 2-1 Millennium 191 ROV used for the 2022 EL 1165A post-drilling survey

2.5 VISUAL ANALYSIS (2018, 2020, 2022)

To address the requirements outlined in Section 1, the pre- and post-drilling survey video data were compared. The following methodology was used to analyze both sets of data. Benthic video imagery was analyzed for surficial geology (primary and secondary substrate types), drill cutting distribution, coral and sponge density, distribution, and condition, as well as invertebrate and fish taxa density and distribution. Survey transects were sectioned into 50 m lengths for analysis.

2.5.1 SURFICIAL SUBSTRATE

The surficial substrate was described by percent coverage of the seafloor for each substrate type present along the 50 m transect sections. Fine grained substrates are the primary substrate for most of the seafloor thus, to depict the distribution of any hard substrates present, the largest substrate observed with the highest percent coverage for each transect section was mapped. Substrate type was determined using the Udden-Wentworth Scale and categorized into a substrate class (Table 2-1) (Wentworth 1922, Kelly et al. 2009). Drill cuttings can be visually distinguished from *in situ* sedimentation (Gates et al. 2017, Cochrane et. al. 2019). Drill cutting locations were noted and mapped. Descriptions were based on *in situ* observations.

2.5.2 CORAL AND SPONGES

Identifying characteristics of a coral or sponge species can be difficult to observe using video or still imagery alone, and a specimen (examined under microscope with a certified taxonomist) is often needed for positive identification. Thus, corals and sponges were identified visually to functional groups using a Northwest Atlantic Fisheries Organization (NAFO) area guide (Kenchington et al. 2015) (Table 2-2). Corals and sponges were enumerated and densities per transect section were geo-referenced and mapped.

The condition of corals and sponges after drilling was completed was also visually assessed. Corals and sponges can be affected by drill cutting deposits in many ways including reduced ability to remove sediment accumulations, withdrawing their polyps for protection, and reduced respiration. The post-drilling survey visually assessed signs of physical effects from drill cutting accumulations on corals and sponges. The condition of corals and sponges included overall health (good (alive), dead, or damaged) or visible sedimentation (presence or absence) were noted (Table 2-3). Descriptions of the condition codes used for corals and sponges are presented in Table 2-3. The methods to assess corals and sponges followed the visual methods described in Liefmann et al. (2018) and Fang et al. (2018), respectively. Liefmann et al. (2018) observed that when exposed to excessive sedimentation, soft corals (*Duva florida*) would contract their polyps for prolonged periods of time (Figure 2-2). Branching corals (*Priminoia resedaeformis*) lost a considerable proportion of their polyps. Fang et al. (2018) examined the effects of drilling discharges on sponges (*Geodia barretti*). In the study the sponges were exposed to three different treatments which physically manifested on the surface of the sponges differently (Figure 2-3). For this survey, any physical observations similar to those in Fang et al., 2018 (e.g., sediment veneer, chemical veneer) were noted.

2.5.3 OTHER TAXA

All other invertebrate taxa were identified to phylum, and fish were identified to functional groups as described in Table 7 of Ollerhead et al. (2017). Taxa abundances were enumerated in each 50 m transect section and reported as densities. While the survey was not specifically to assess presence of Species at Risk (SAR), they were also identified. Representative photos of all taxa groups were taken opportunistically.

Table 2-1 Surficial substrate categories used to categorize benthic environment.

Substrate Class	Substrate Type	Definition
Bedrock		Continuous solid bedrock
Coarse	Boulder	Rocks greater than 250 mm
	Rubble	Rocks ranging from 130 mm to 250 mm
Medium	Cobble	Rocks ranging from 30 mm to 130 mm
	Gravel	Granule size or coarser, 2 mm to 30 mm
Fine	Sand	Fine deposits ranging from 0.06 mm to 2 mm
	Mud	Material encompassing both silt and clay < 0.06 mm
Organic/Detritus		A soft material containing 85 percent or more organic materials
Shells		Calcareous remains of shellfish or invertebrates containing shells

Table 2-2 Coral and sponges functional groups based on Kenchington et al. (2015).

Coral Functional Groups	Sponge Functional Groups
Soft Corals (Alcyonacea)	Solid / Massive
Black Corals (Antipatharia)	Leaf / Vase Shaped
Hard Corals (Scleractinia)	Round with Projections
Branching Corals (Alcyonacea)	Thin-walled, Complex
Sea Pens (Pennatulacea)	Stalked
	Other (e.g., encrusting sponge, finger sponge)

Table 2-3 Coral and sponge condition classifications with descriptions.

Coral Condition		Sponge Condition	
Condition	Description	Condition	Description
Health: Good (G)	Coral is oriented upright (or expected orientation for species) with polyps extended and not visible sedimentation	Sediment veneer ¹ Presence/absence	Surface of a sponge has a veneer of sedimentation.
Dead (D)	Coral has no visible live polyps or skeleton is completely bare		
Damaged (Dm)	The coral appears in one of the following states: bent over or lying flat on the seafloor, covered by accumulated sediment, a percentage of polyps are missing, or the polyps are withdrawn and appear closed.		

¹ Fine-grained sediment veneers naturally occur on sponges thus natural and drill cutting sedimentation would co-occur. Differences between the two are difficult to distinguish at such small grain sizes thus, a distinction was not made between natural and drill cutting sediment veneers

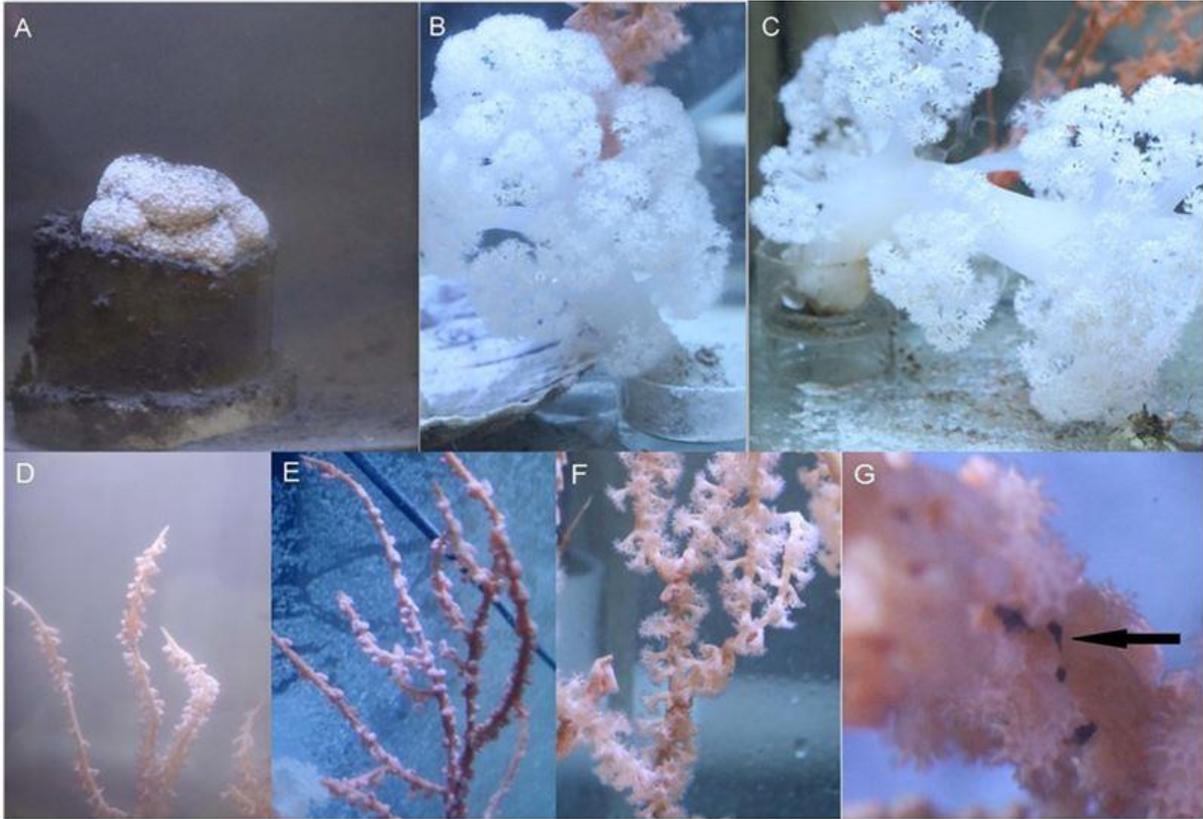


Figure 2-2 Examples of exposure treatments on *Duva florida* (A, B, C) and *Primnoa resedaeformis* (D-G): A) Mine tailings sedimentation, B) Glass bead treatment, C) Control, D) Mine tailings sedimentation, E) Glass bead treatment, F) Control, G) Mine tailing accumulation captured in the mucus layer. (Source: Liefmann et al. 2018)



Figure 2-3 Examples of exposure treatments on *Geodia barretti*: control (Con), suspended natural sediment (Sed), bentonite (Ben), barite (Bar) (Source: Fang et al. 2018).

2.6 MAPPING

The data for each transect were plotted using GIS software ArcGIS 10.8.1 (ESRI 2020) in NAD83 UTM datum zone 23. During the survey, fixes were taken for start and end of each transect.

3 RESULTS

The following are the results from the drill cutting dispersion area collected during the 2022 post-drilling survey with comparisons to the 2018 pre-drilling survey. The total distance covered for both surveys varies slightly (Table 3-1). In 2022, data along a single 1,500 m-long transect bisecting the predicted dispersion model was collected to better describe the extent of the drill cuttings dispersion. This transect was not run in the pre-drilling survey. Additionally, following the completion of the pre-drilling survey, the videos for transect line T-1400 and the second video for T-400 were corrupted and non-recoverable. The results from the adjacent transects will be used for comparison where there are data gaps. The faunal density data per transect section for the 2022 post-drilling survey is presented in Appendix A.

Table 3-1 Pre- and Post-Survey parameters.

Survey	No. of Transects	No. of Transect Sections	Distance Covered (m)	Field of View (m)	Section Length (m)	Laser Distance (cm)
2018	8	131	6,550	2	50	10
2022	9	190	9,500	3.42	50	20

3.1 SYNTHETIC OIL CUTTINGS

The concentration of SOC discharged to sea after treatment aboard the *Stena Forth* was measured every 12 hours and reported as a mass-weight rolling 48-hour average (Figure 3-1). The highest concentration was reported on July 18th, 2022 was 3.35 g of oil per 100 g of wet solids. The OWTG limit for SOC of 6.9 g/100g is shown in Figure 3-1, and was not exceeded as part of this drilling program. Secondary mitigations of transporting cuttings with SOC exceedances to shore for additional treatment was not needed. Treated cuttings were released near the surface close to the MODU.

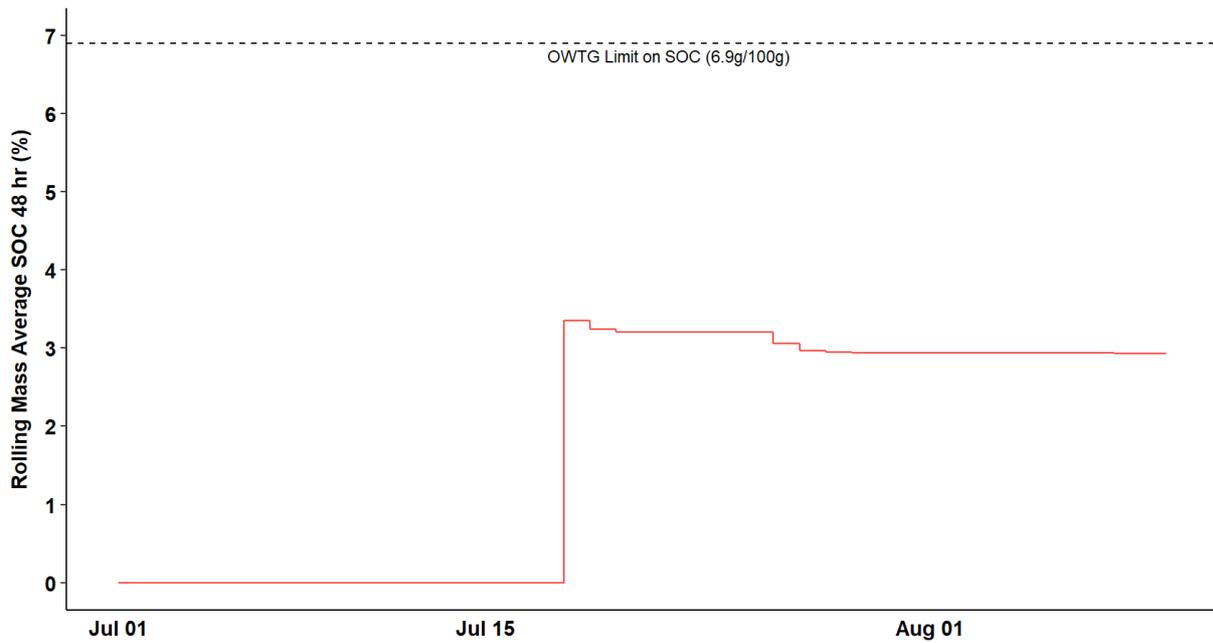


Figure 3-1 Synthetic on Cuttings (SOC) concentration (g of oil per 100 g wet solids, or %) discharged to sea after treatment aboard the Stena Forth from July 1, to August 10, 2022.

3.2 SURFICIAL SUBSTRATE

The primary substrate category observed in both the pre- and post-drilling surveys was fine substrate (mostly mud) with sporadic coarse (boulders and rubble) and medium (cobble and gravel) substrate (Figure 3-2, Figure 3-3). For the post-drilling survey, the surficial substrate observed within the survey area consisted of 87.9% fine substrate, 9.3% coarse, and 2.7% medium. The pre-drilling survey was similar, with 90.6% fine substrate, 7.2% coarse, and 2.1% medium.

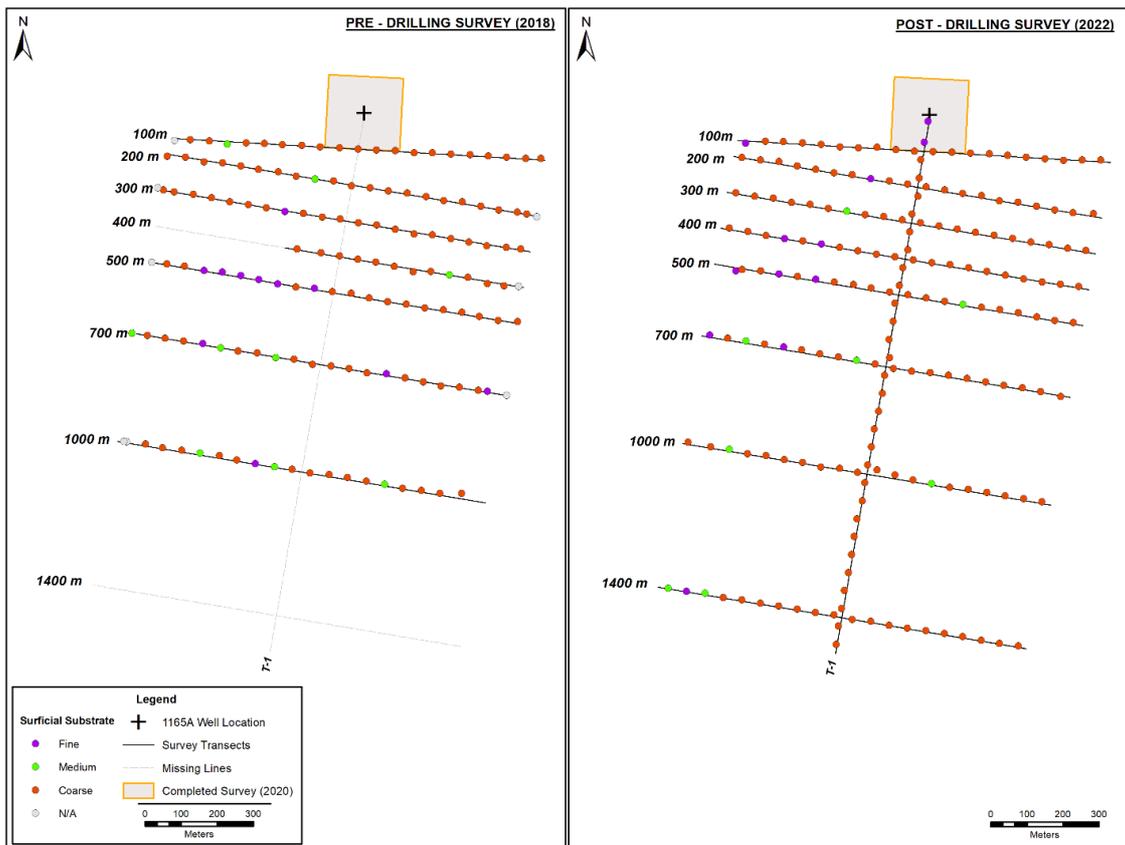


Figure 3-2 Distribution of largest substrate class present observed in the pre-drilling survey (2018) and in the post-drilling survey (2022).

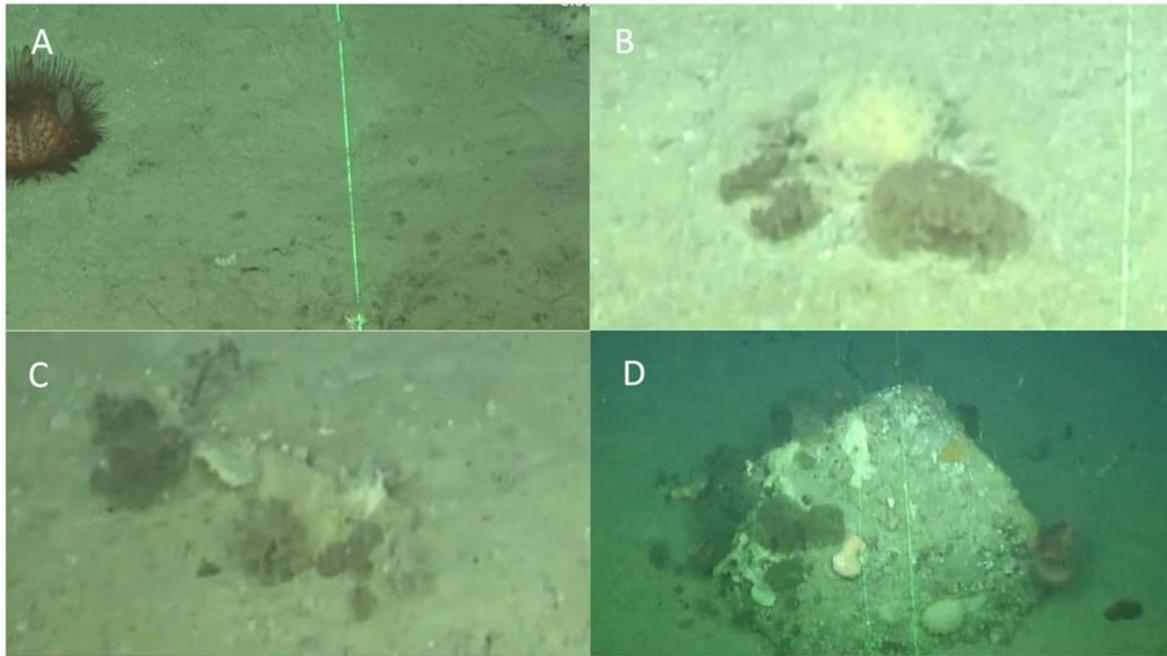


Figure 3-3 Representative photo of substrate categories observed at Hampden K-41: A) fine substrate, B) medium (cobble), C) coarse (rubble), D) coarse (boulder).

3.3 DRILL CUTTINGS DISPERSION

During the 2020 post-drilling survey, drill cuttings were observed within a 100 m radius of the well centre. These drill cuttings were subject to local near-bottom currents for over a year. Observations from the 2022 post-drilling survey include these re-distributed cuttings. Data collected along the 1,500 m transect that originated at the drill centre allowed for the observations of previously detected cuttings piles within the completed 2020 survey. The drilling muds used in 2022 were SBMs which are smaller in grain size compared to WBMs and released near the waterline. The deposition of SBM cuttings within the drill target area is predicted to be negligible (<0.1 mm) due to the drift of particles released at the surface before reaching the seafloor in ~1,200 m water depth. The drill cuttings model (June seasonal model) depicted in Figure 3-4 shows the predicted dispersion of both WBM and SBM although only SBM was used for this drilling campaign.

The drill cuttings were visibly distinct from seafloor sediments in color, texture, and particle size. Drill cuttings were observed in three types of distributions (Figure 3-4, Figure 3-5):

- Patchy distribution was defined as occasional observations of drill cuttings <2m² in extent and >2 m apart,
- Dis-continuous distribution is where drill cuttings occurred either more frequently and/or in patches >2 m² in size and/or less than <2 m apart,
- Continuous distribution is where drill cuttings are continuous, in a drill cuttings pile, or patches are <1 m apart.

Prior to drilling, the fine-grained sediment appeared uniform (Figure 3-5 C). The drill cuttings differed from seafloor sediments in color, texture, and particle size. All three cutting descriptions were observed at Hampden K-41 mainly along survey line T-1 (Figure 3-4). Continuous cuttings were present at the drill centre along line T-1 and extended out to approximately line T-100 (Figure 3-4, Figure 3-5 A). Discontinuous cuttings are present at the edge of the continuous cuttings pile along line T-1, and to the middle portion of line T-100 (Figure 3-4, Figure 3-5 B). Patchy cuttings, in varying density and size, were present throughout all surveyed lines (Figure 3-4). These cuttings were most commonly found in the form of small white and grey clumps forming a “checkerboard” pattern when dense (Figure 3-5 D), or a star-like pattern at lower densities (Figure 3-5 F), though larger clumps were present at lower densities (Figure 3-5 F). While these accumulations were > 1.5 mm, due to their clumping nature it is unlikely they had any burial and smothering effects on benthic organisms. However, the cuttings accumulations may still cause some damage to benthic organisms.

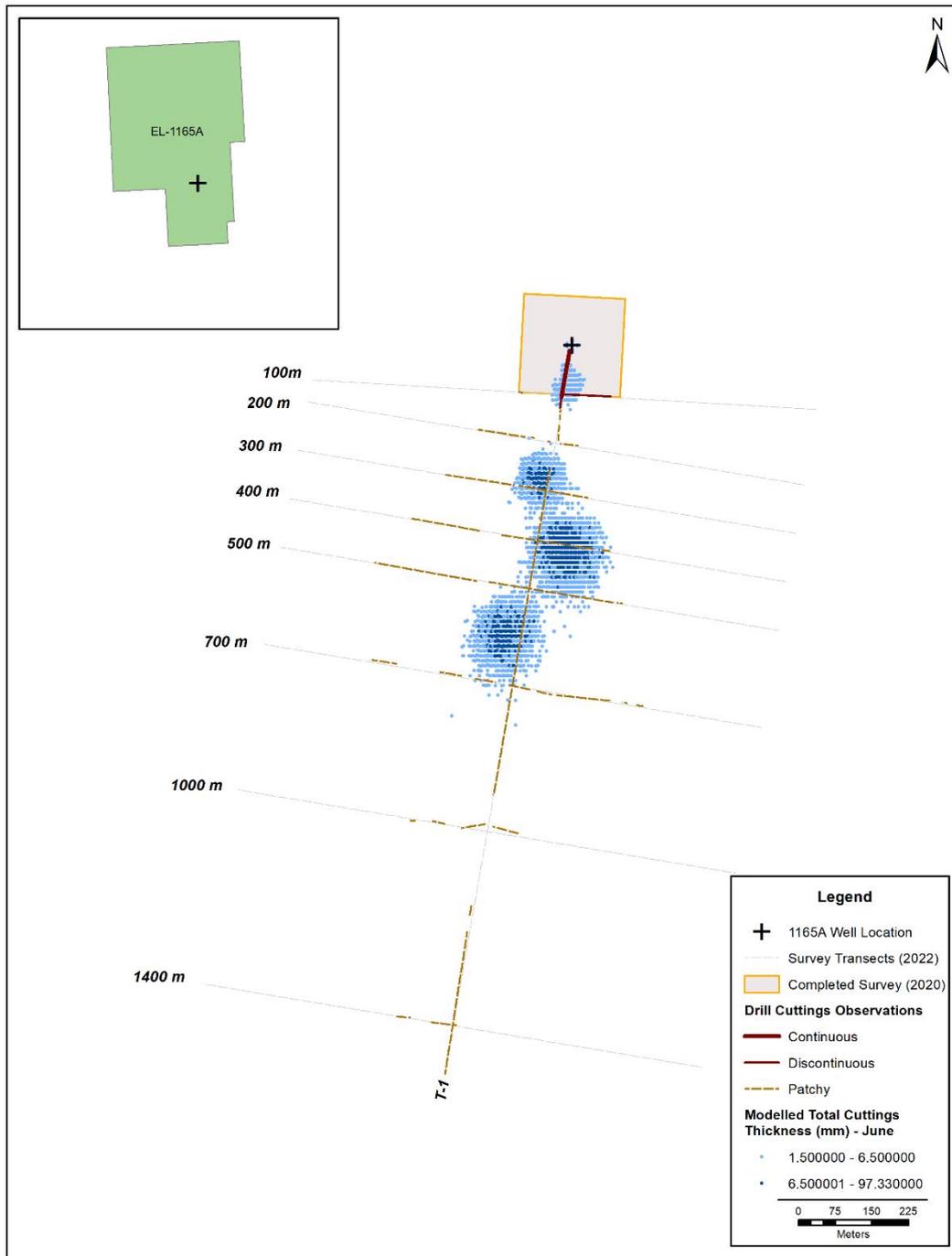


Figure 3-4 Distribution of drill cutting observations in relation to the predicted drill cutting footprint for June seasonal model.

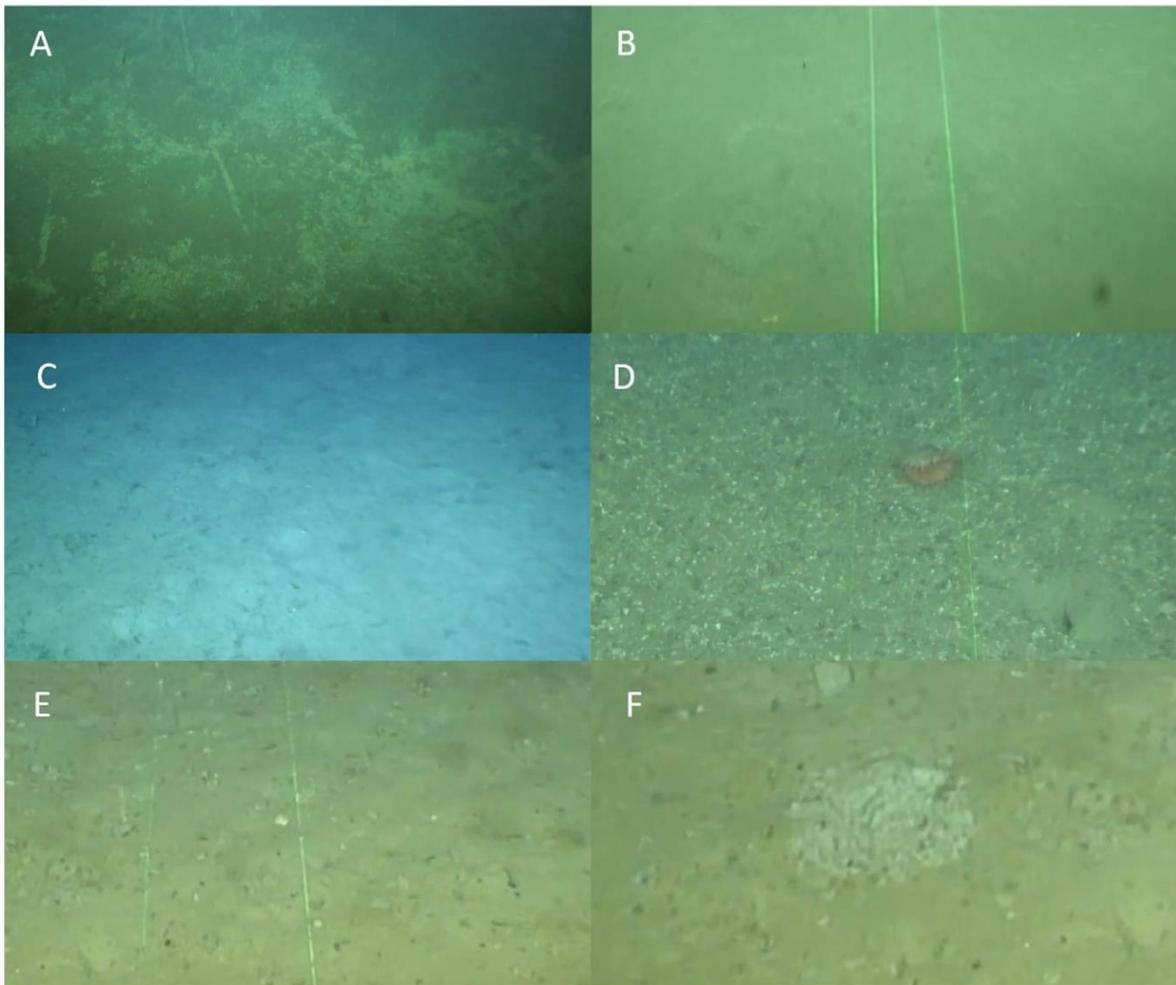


Figure 3-5 Representative photos of cuttings categories: A) continuous cuttings (drill cutting pile by well head), B) discontinuous cuttings, C) baseline seafloor on line T-400 (2018), D) dense patchy cuttings on line T-400 (2022), E) thin patchy cuttings, and F) a clump surrounded by patchy cuttings. Lasers are 20 cm apart.

3.4 CORALS AND SPONGES

3.4.1 CORAL FUNCTIONAL GROUPS

Four coral functional groups (soft coral, sea pen, branching coral, and stony coral) were observed throughout the post-drilling survey area (Figure 3-6). These coral groups were also observed in the pre-drilling survey. Table 3-2 compares the densities observed for all four functional groups before and after drilling and Figure 3-7 to Figure 3-10 illustrate the distributions. A total of 11,839 individual corals were observed in the post-drilling survey compared to a total of 6,655 individual corals in the pre-drilling survey. While the data was standardized to individuals observed per m², differences in densities are likely due to more of the seafloor being surveyed in the post-drilling survey (addition of T-1) and a larger field of view and not necessarily a project-related effect. Sea pens and soft corals were the most abundant functional groups in both the pre- and post-surveys (Table 3-2). The most

observed species of sea pen were *Anthoptilum* sp. and *Halipteris* sp. and the most abundant group of soft corals were Nephtheids.

The density ranges of sea pens were similar between the surveys with densities observed in the pre-survey between 0.02 ind./m² (excluding zero) and 0.65 ind./m², and densities in the post-survey between 0.029 ind./m² (excluding zero) and 0.778 ind./m² (Table 3-2). The highest densities (0.246 ind./m² to 0.778 ind./m²) occurred to the east of T-1 in both the pre- and post-drilling surveys (Figure 3-7). This pattern was observed in all the transects from T-100 to T-1400. The average density of sea pens decreased by 16% between the pre- (0.231 ind./m²) and post-surveys (0.193 ind./m²). This is likely due to differences in field of view which resulted in more corals being observed in the post-drilling survey than the pre-drilling survey.

Soft corals densities in the pre-drilling survey ranged between 0.01 ind./m² to 0.79 ind./m² and ranged between 0.006 ind./m² to 0.439 ind./m² in the post-drilling survey. Similarly, to sea pens, the highest densities of soft corals were mainly to the northeast of T-1 (Figure 3-8). Soft corals were present in every transect section in the post-survey analysis except for the two sections in the drill cuttings pile. The average density of soft corals decreased by 42% between the pre- (0.259 ind./m²) and post-surveys (0.15 ind./m²).

Branching corals were observed throughout the survey area (both pre- and post-) and comprised mainly of *Acanella* sp. Densities in the post-drilling survey ranged between 0.006 ind./m² to 0.07 ind./m², whereas they ranged from 0.01 ind./m² to 0.05 ind./m² in the pre-drilling survey. The highest densities that occurred were scattered throughout the survey area (Figure 3-9). Few transect sections in the post-drilling survey did not have at least one branching coral present as opposed to the pre-drilling survey which had several. The average density of branching corals increased by 47% between the pre- (0.011 ind./m²) and post-surveys (0.021 ind./m²).

There was no difference between the pre- and post-drilling stony coral densities. The average density was <0.001 ind./m² for both surveys.

In addition to density and distribution, coral condition was also noted. Table 3-3 shows a summary of pre- and post-drilling survey visually observed coral conditions and Figure 3-11 depicts the distribution of coral condition. In both surveys, the overall condition for corals were "Good" (99.5% of corals observed in the 2022 survey and 97.2% in 2018). Due to variations in coordinates, it can be difficult to identify the same coral on the seafloor between surveys.

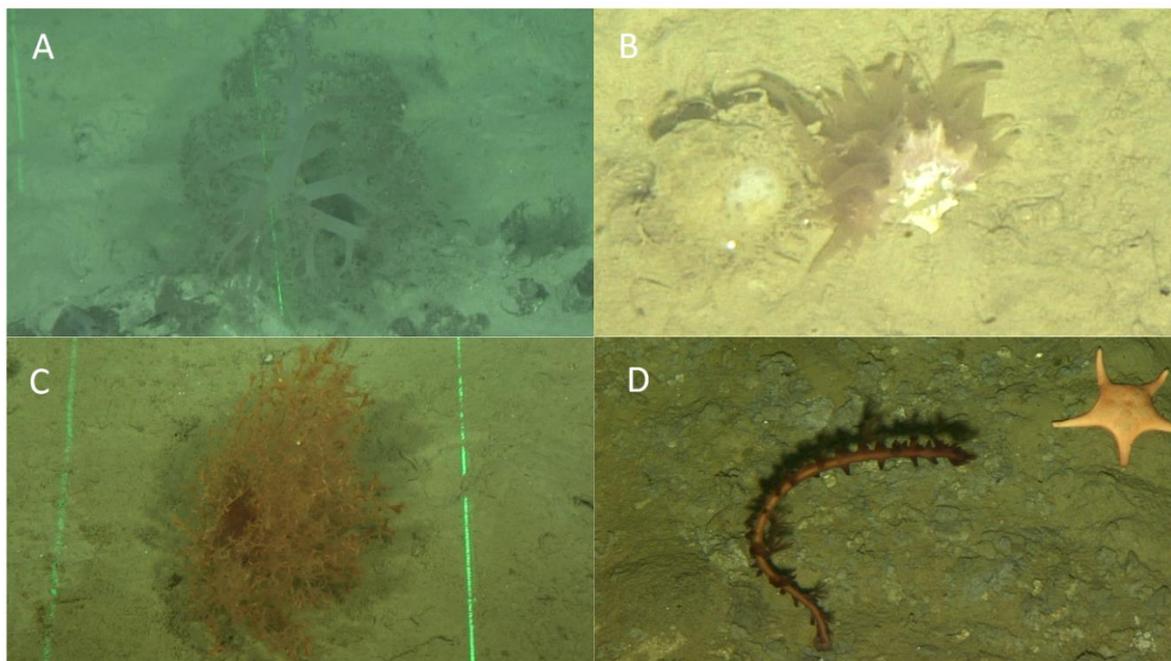


Figure 3-6 Representative photos of each coral functional group: A) Soft coral (*Nephtheid*), B) Stony coral (*Flabellum* sp.), C) Branching coral (*Acanella* sp.), D) Sea pen (*Anthoptilum* sp.). Lasers are 20 cm apart.

Table 3-2 Summary statistics for coral functional groups within the dispersion area survey.

Taxa Group	Year	Mean	St. dev.	Median	Min ¹	Max
Soft Corals	2018	0.259	0.173	0.23	0.01	0.79
	2022	0.150	0.088	0.149	0.006	0.439
Stony Corals	2018	<0.001	0.001	0	0.01	0.01
	2022	<0.001	0.001	0	0.006	0.006
Branching Corals	2018	0.011	0.011	0.01	0.01	0.05
	2022	0.021	0.013	0.023	0.006	0.07
Sea Pens	2018	0.231	0.132	0.20	0.02	0.65
	2022	0.193	0.116	0.158	0.029	0.778

Total number of survey sections: 2018 (n=133), 2022 (n=190).
Sections were 50 m linear distance with an average width of 3.42 m.
¹Minimum density is the lowest non-zero value.
2018: Soft Coral n= 3,439 ind., Stony Coral n= 2, Branching Coral n= 147 ind., Sea Pen n=3,067 ind.
2022: Soft Coral n= 4,859 ind., Stony Coral n= 8, Branching Coral n= 686 ind., Sea Pen n=6, 286 ind.

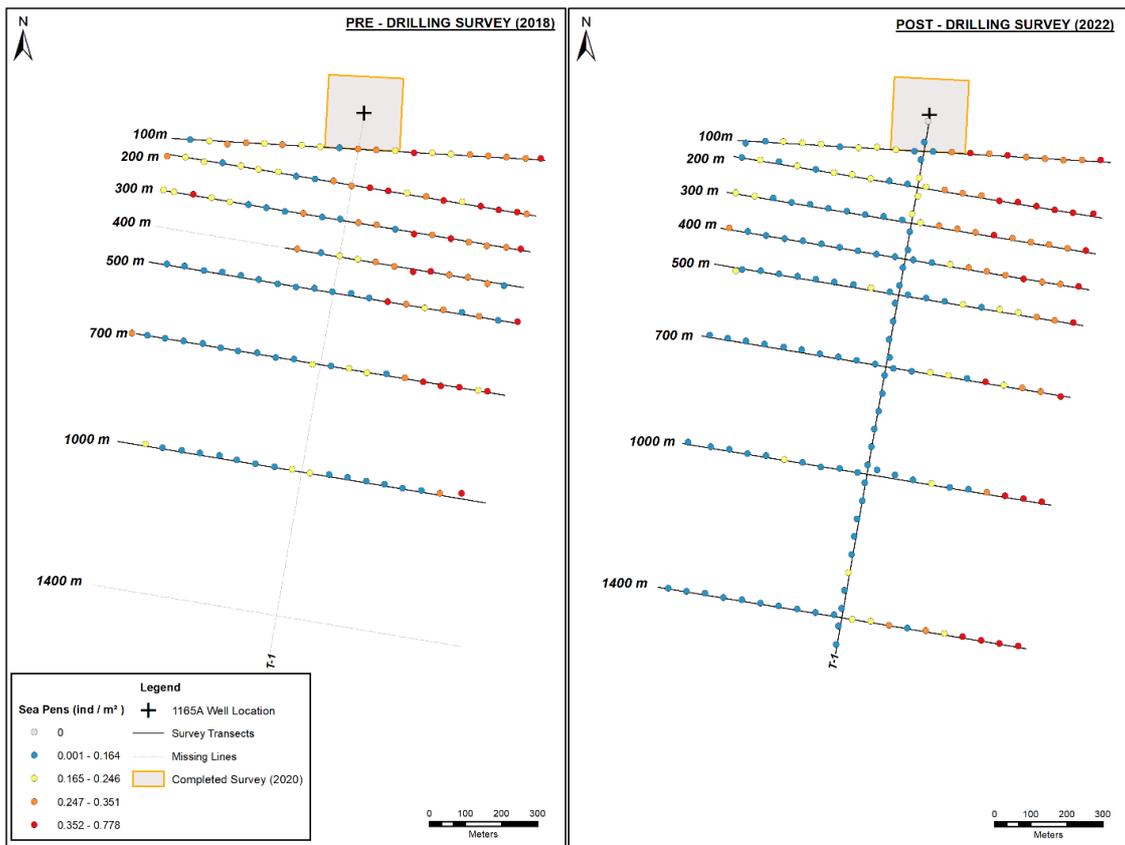


Figure 3-7 Distribution of sea pen densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

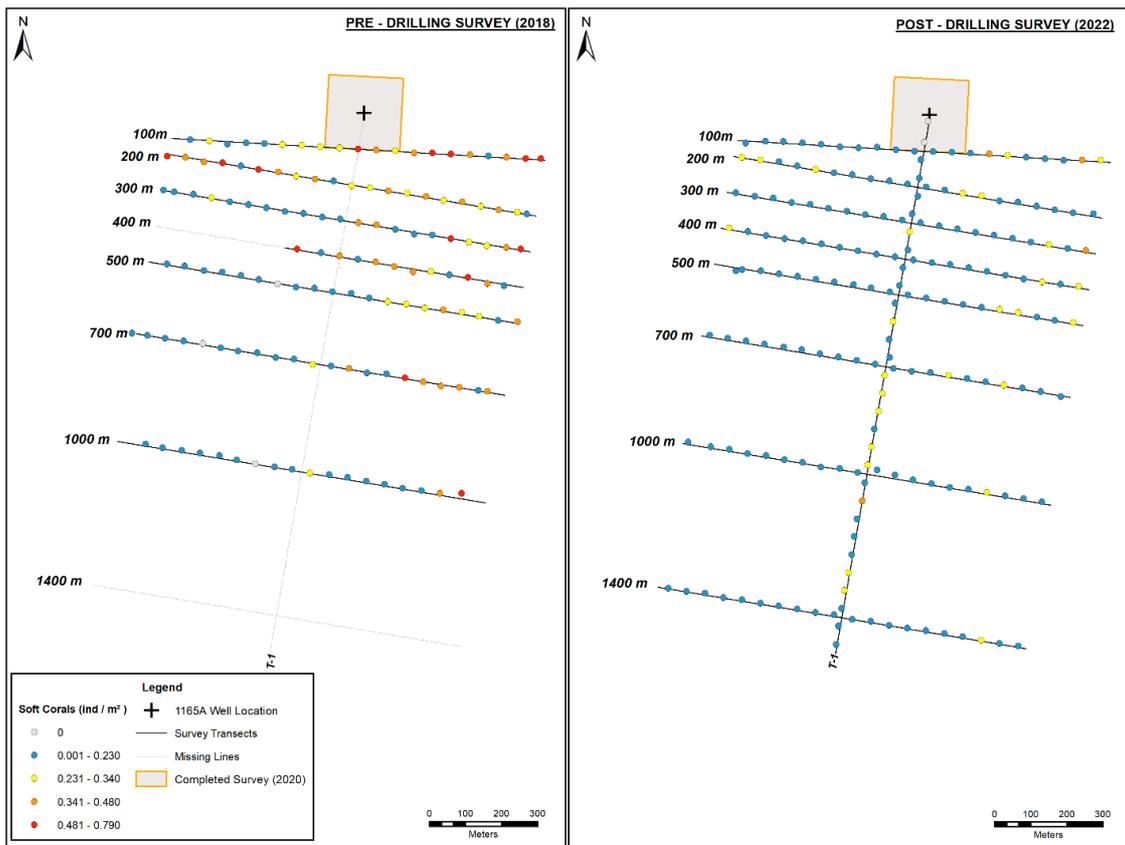


Figure 3-8 Distribution of soft coral densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

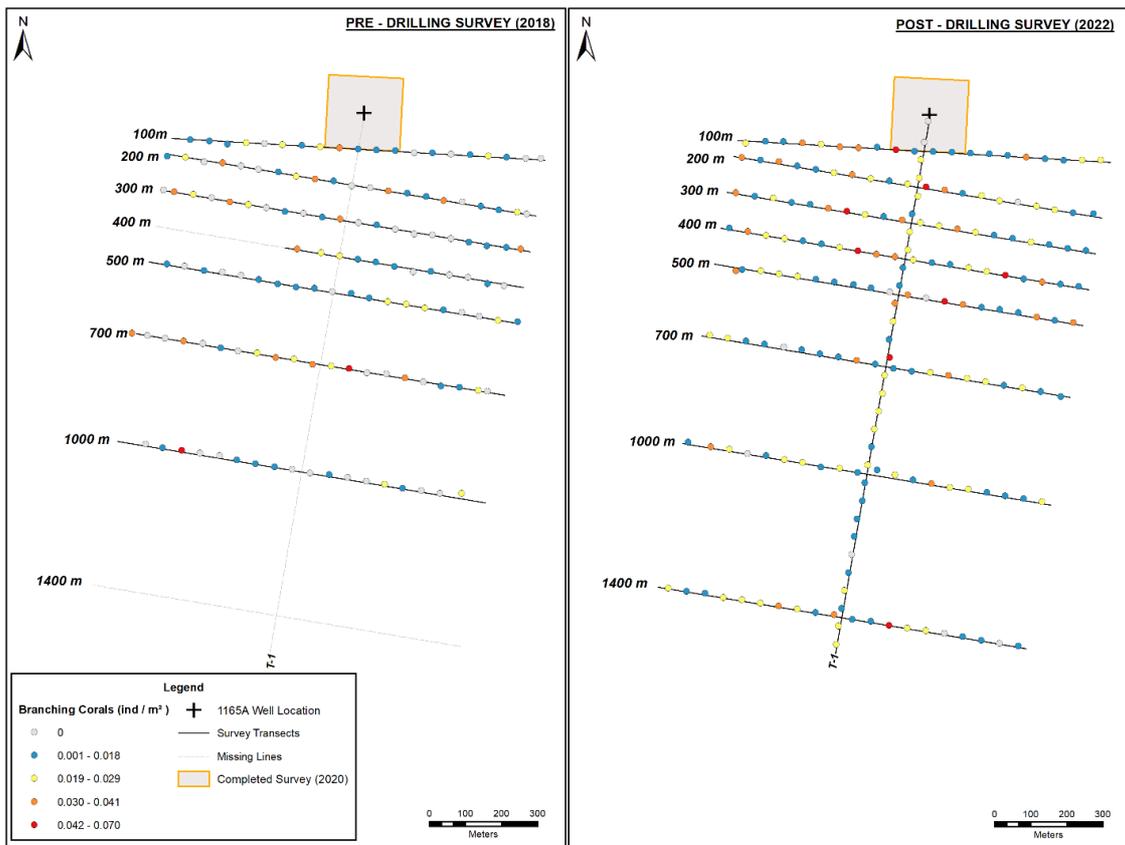


Figure 3-9 Distribution of branching coral densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

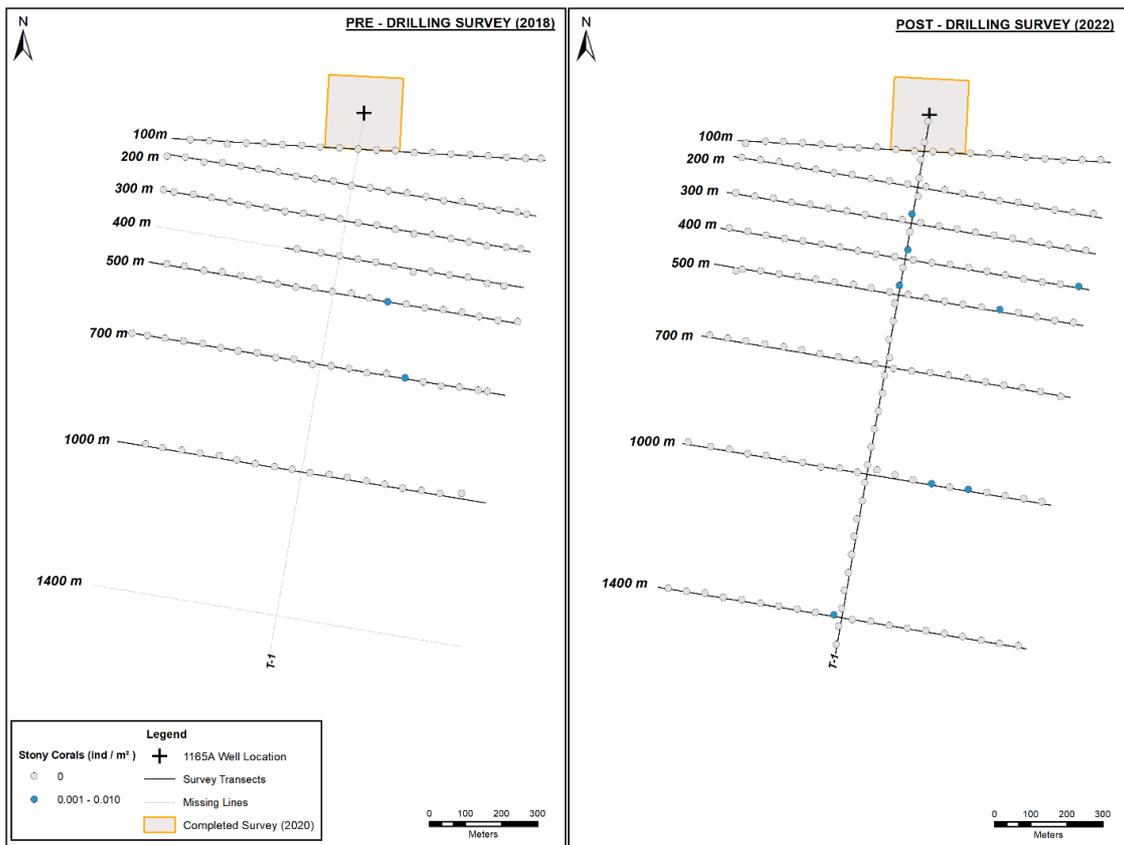


Figure 3-10 Distribution of stony coral densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

Table 3-3 Summary statistics for coral condition within the dispersion area survey.

Taxa Group	Year	Mean	St.dev.	Median	Min ¹	Max
Good	2018	48.64	27.25	47	5	118
	2022	61.97	30.1	57.5	5	170
Dead	2018	0.02	0.12	0	1	1
	2022	0	0.1	0	1	1
Damaged	2018	1.4	2.24	1	1	12
	2022	0.3	0.7	0	1	4

Total number of survey sections: 2018 (n=133), 2022 (n=190).
Sections were 50 m linear distance with an average width of 3.42 m.
¹Minimum density is the lowest non-zero value.
2018: Good: n=6,469 ind., Dead: n=2 ind., Damaged: n=186 ind.
2022: Good: n=11,774 ind., Dead: n=2 ind., Damaged: n=65 ind.

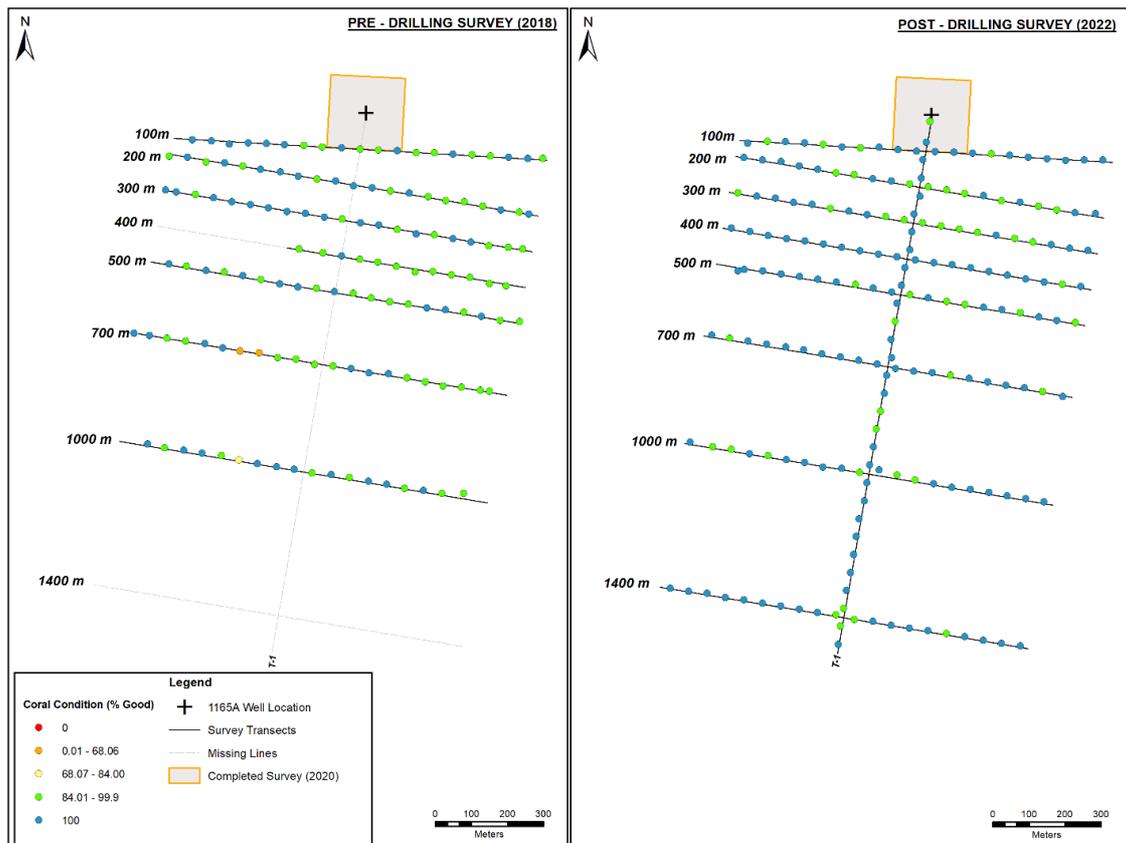


Figure 3-11 Distribution of percent good condition for corals observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

3.4.2 SPONGE MORPHOLOGICAL GROUPS

Sponges from five morphological groups were observed throughout the survey area in both the pre- and post-surveys (Table 3-4, Figure 3-12). In both surveys, the most observed sponge morphological group was solid/massive followed by round with projections, and leaf/vase shaped. Stalked and thin-walled/complex sponges were also observed in low numbers.

In the post-drilling survey solid/massive sponges ranged in densities from 0.018 ind./m² to 1.649 ind./m² (Table 3-4). This was similar to the densities observed in the pre-drilling survey which ranged between 0.01 ind./m² to 2.28 ind./m². The average density between the pre- (0.361 ind./m²) and post- drilling surveys (0.367 ind./m²) were very similar. The highest densities in both the pre- and post-drilling surveys occurred mainly to the west of T-1 (Figure 3-13).

The density range for leaf/vase shaped sponges was slightly larger in the post-drilling survey compared to the pre-drilling survey and the distribution varied between surveys (Figure 3-14). In the pre-drilling survey leaf/vase sponge density ranged between 0.01 ind./m² to 0.45 ind./m² in the post-drilling survey they ranged between 0.006 ind./m² to 0.889 ind./m². The average density increased by 76% between the surveys. Similarly, to the solid/massive sponges, the highest densities of

leaf/vase sponges in the post-drilling survey occurred to the west of T-1. However, in the pre-drilling survey, densities had a fairly even distribution throughout the survey area.

The morphological group round with projections (Figure 3-15), was observed throughout the survey area. Densities were comparatively low both in the pre- and post-surveys with no change in the average density (0.001 ind./m²) (Table 3-4) and were evenly distributed among transects. Thin-walled, complex and stalked sponge groups were also comparatively less abundant in the area for both survey years and sparsely distributed (Figure 3-16, Figure 3-17).

Sponge condition was assessed visually for both pre- and post-drilling surveys (Table 3-5). In both the pre- and post-drilling surveys, most of the sponges observed had a sediment veneer on their surface. Of the sponges observed in the post-drilling survey, 85% had a sediment veneer or were covered compared to 74% in the pre-drilling survey. The distribution of sponge conditions with sediment veneer present is presented in Figure 3-18. Sediment veneers can occur naturally and do not necessarily indicate drill cuttings or impact the overall health of a sponge.

Table 3-4 Summary statistics for sponge morphological groups within the dispersion area survey.

Taxa Group	Year	Mean	St. dev.	Median	Min	Max
Solid / Massive	2018	0.361	0.357	0.24	0.01	2.28
	2022	0.367	0.331	0.24	0.018	1.649
Leaf / Vase Shaped	2018	0.029	0.054	0.01	0.01	0.45
	2022	0.124	0.119	0.088	0.006	0.889
Round with Projections	2018	0.017	0.019	0.01	0.01	0.12
	2022	0.01	0.009	0.006	0.006	0.047
Thin-Walled, Complex	2018	0.001	0.003	0	0.01	0.01
	2022	0.001	0.003	0	0.006	0.023
Stalked	2018	0.001	0.003	0	0.01	0.01
	2022	0.001	0.003	0	0.006	0.018
Total number of survey sections: 2018 (n=133), 2022 (n=190). Sections were 50 m linear distance with an average width of 3.42 m. ¹ Minimum density is the lowest non-zero value.						

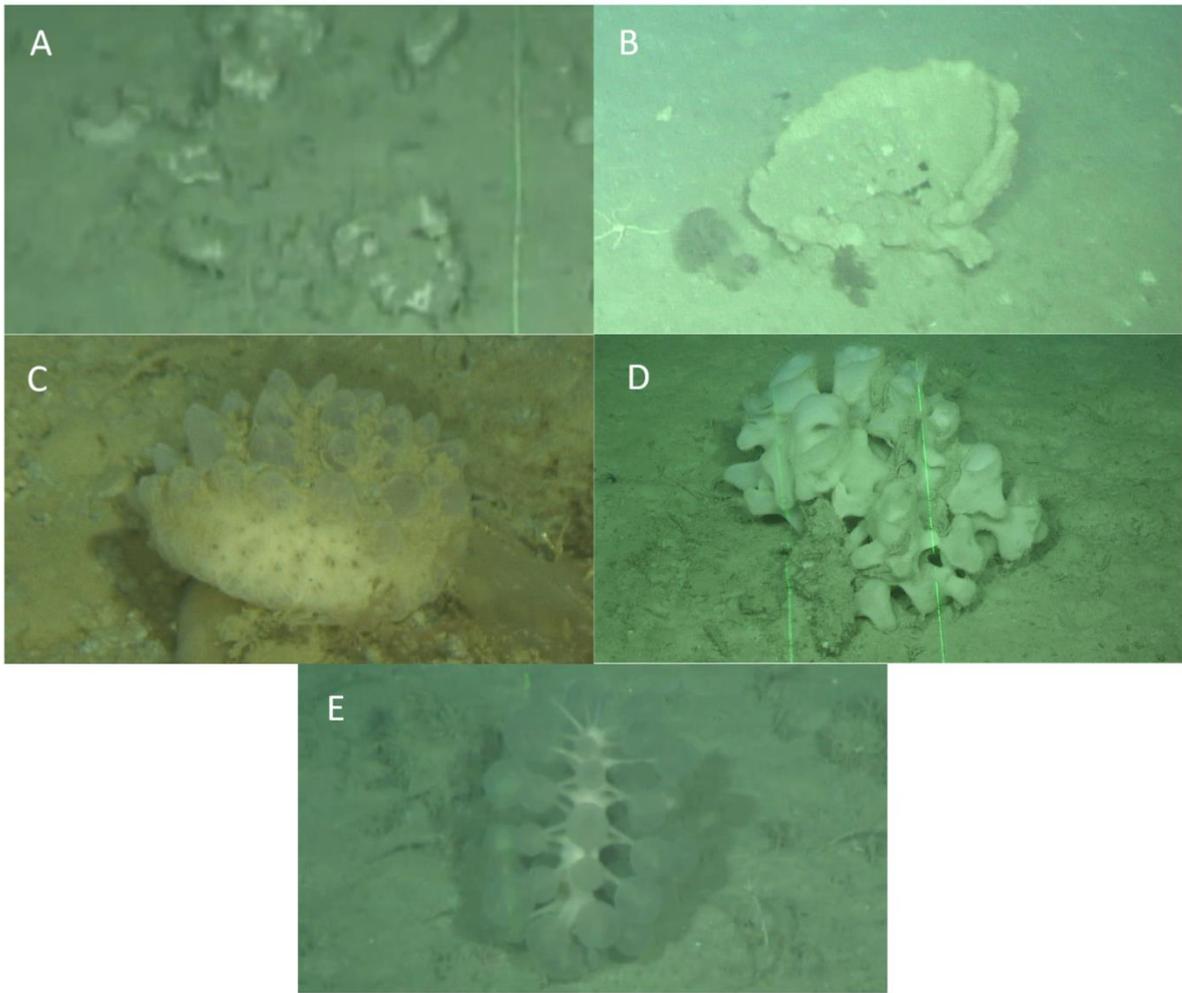


Figure 3-12 Representative photos from each sponge morphological group: A) solid/massive sponge, B) leaf/fan shaped, C) round with projections, D) Thin-walled/complex, E) Stalked. Green lasers are 20 cm apart.

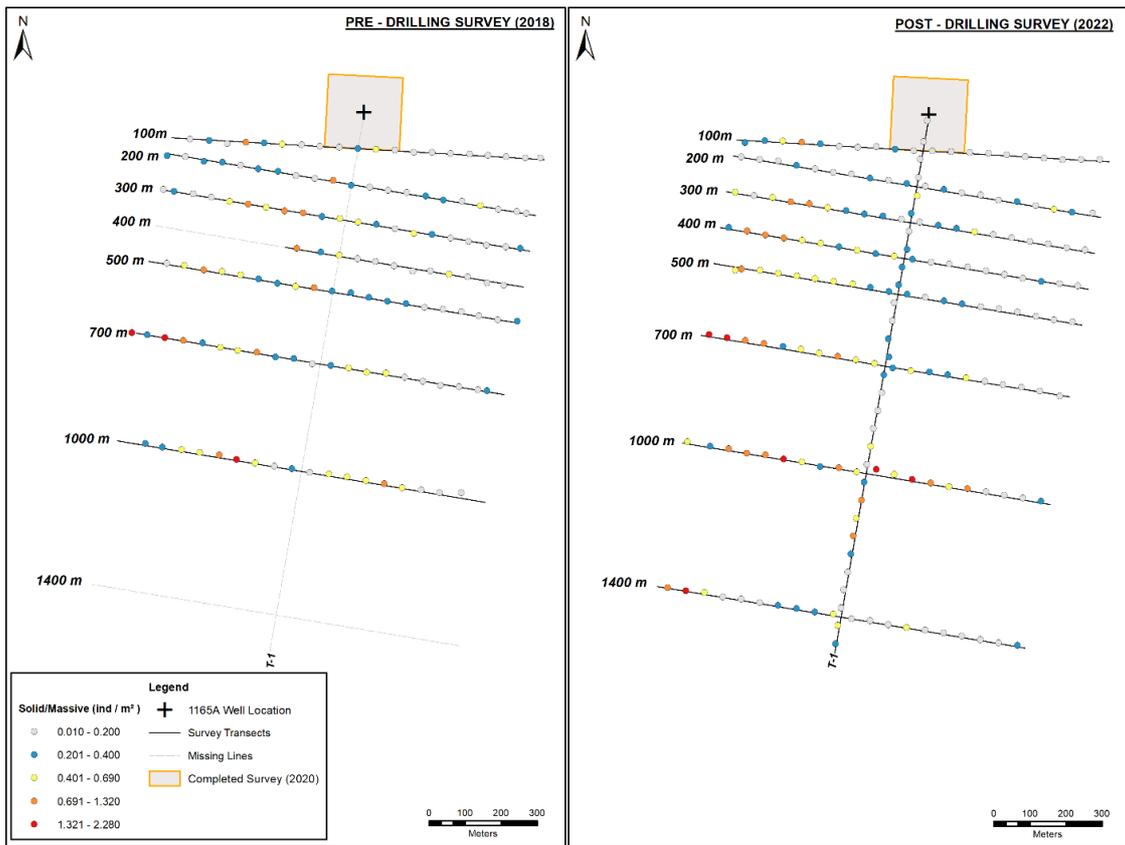


Figure 3-13 Distribution of solid/massive sponge densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

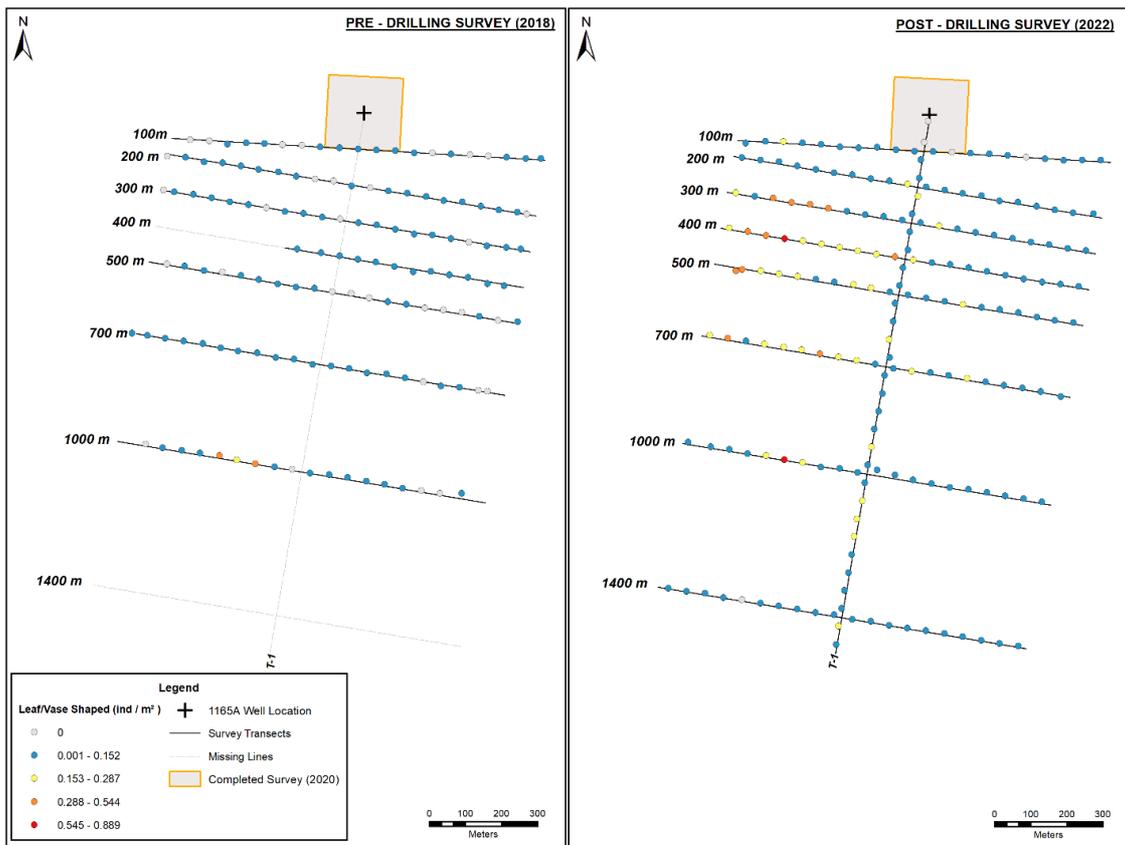


Figure 3-14 Distribution of leaf/vase sponge densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

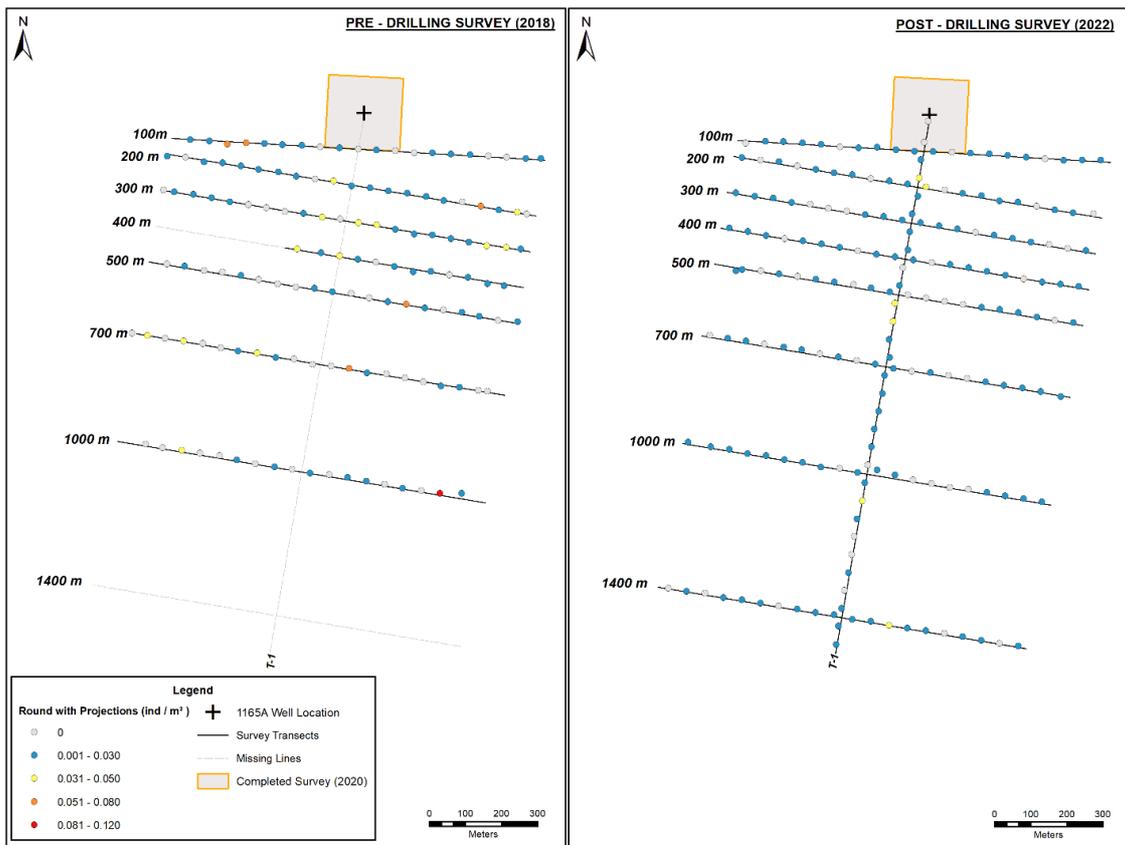


Figure 3-15 Distribution of round with projections sponge densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

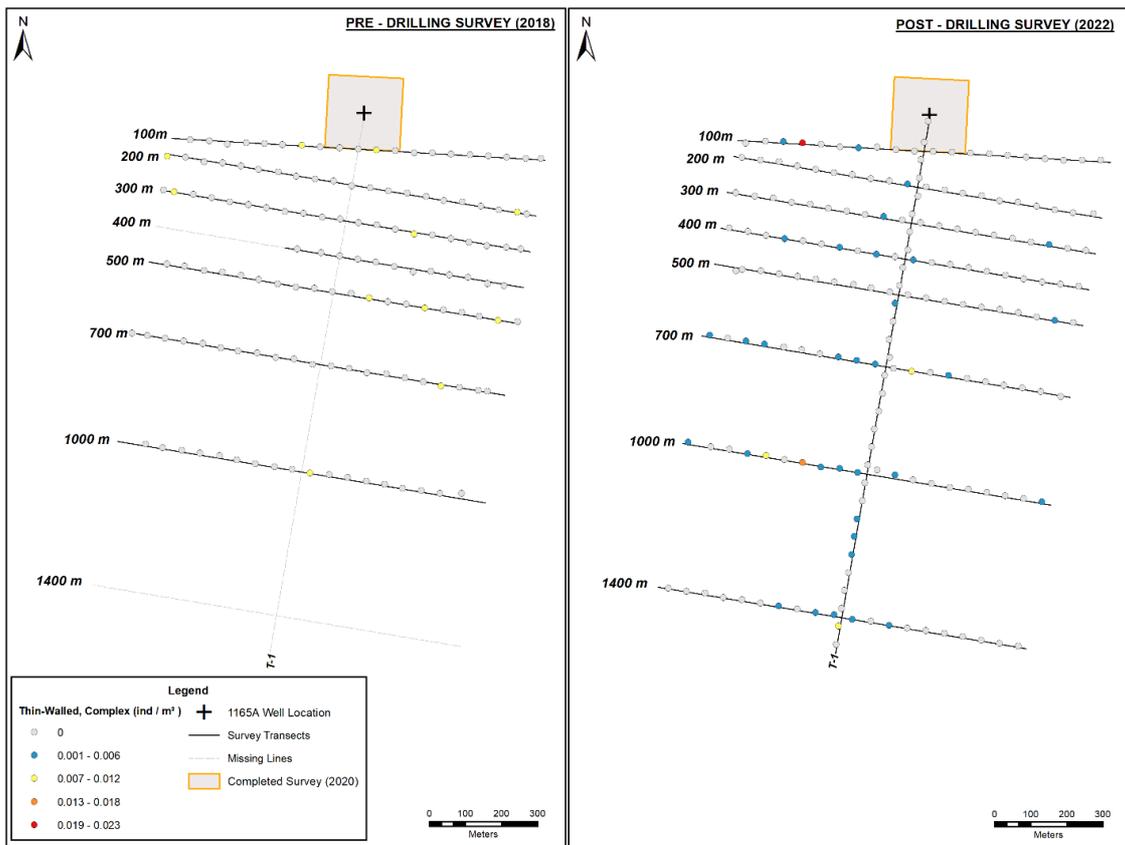


Figure 3-16 Distribution of thin-walled, complex sponge densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

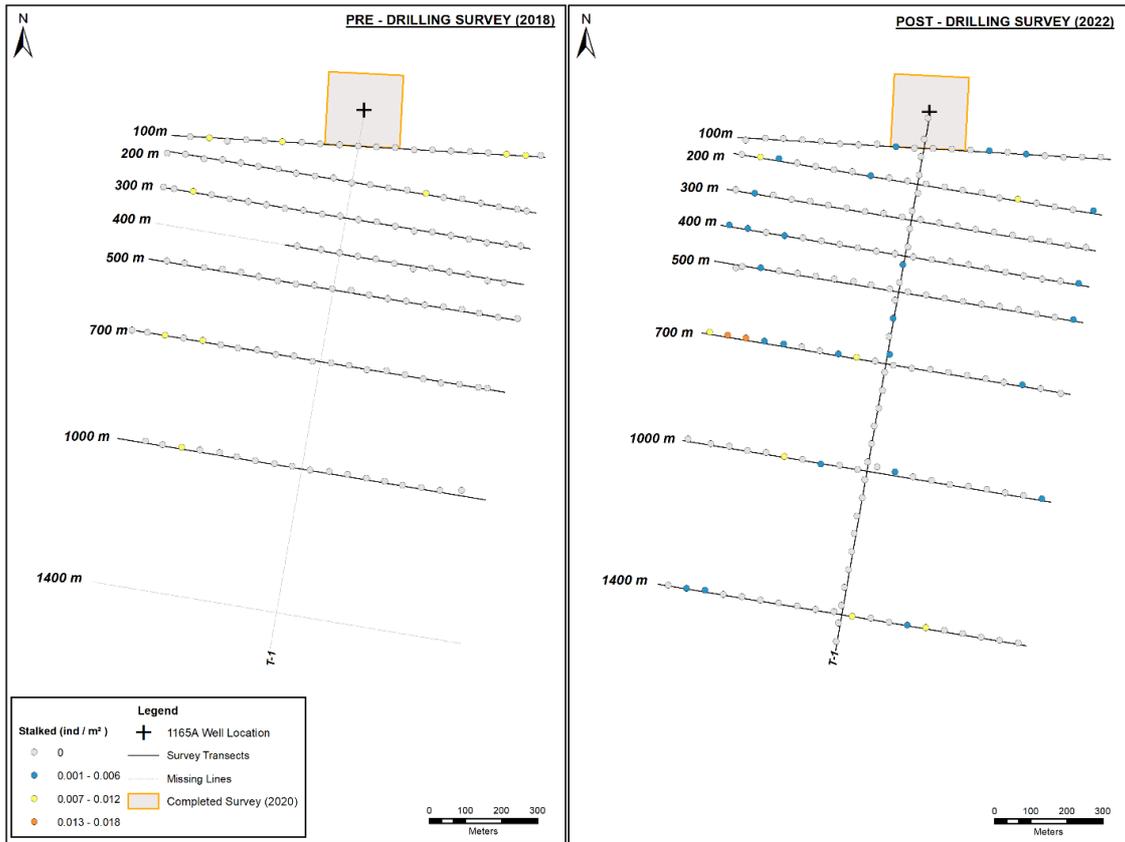


Figure 3-17 Distribution of stalked sponge densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

Table 3-5 Summary statistics for sponge condition within the dispersion area survey.

Taxa Group	Year	Mean	St. dev.	Median	Min	Max
Sediment Veneer Present	2018	38.88	37.98	28	2	234
	2022	85.68	69.88	59	3	431
Sediment Veneer Absent	2018	1.93	2.12	1	1	11
	2022	0.5	1.2	0	1	7

Total number of survey sections: 2018 (n=133), 2022 (n=190).
Sections were 50 m linear distance with an average width of 3.42 m.
¹Minimum density is the lowest non-zero value.
2018: Veneer Present: n= 5, 172 ind., Veneer Absent: n=258 ind.
2022: Veneer Present: n= 16,279 ind., Veneer Absent: n=103 ind.

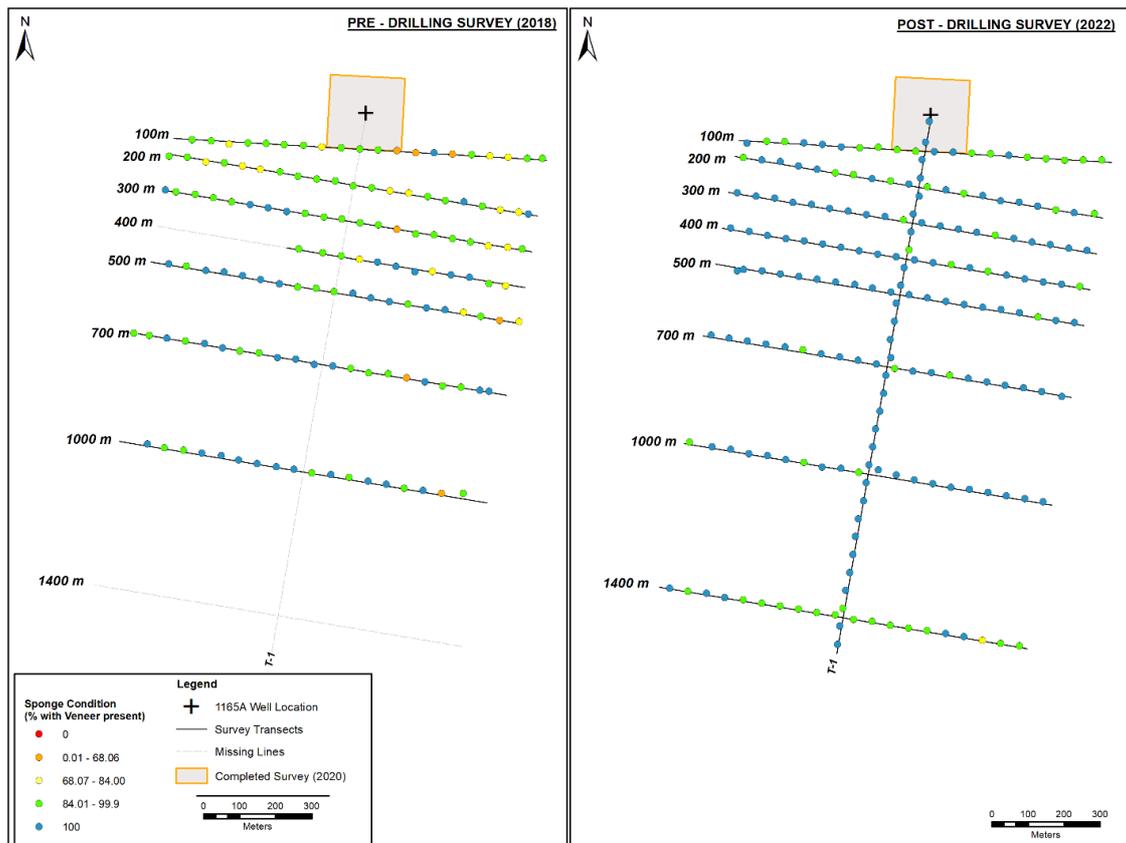


Figure 3-18 Distribution of percent sponges with observed sediment veneer in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

3.5 OTHER TAXA

3.5.1 INVERTEBRATES (NON-CORAL AND SPONGE)

Invertebrate taxa (aside from corals and sponges) were observed throughout the transect lines, though they were absent near the well centre along line T-1 (Figure 3-19, Table 3-6, density maps in Appendix B). Echinoderms were the most commonly observed invertebrate group (up to 0.30 ind./m²) of which sea urchins were the most abundant, followed by sea stars and brittle stars (Figure 3-19 A, Table 3-6). Compared to the pre-drilling survey, the average echinoderm density decreased by 25.5%. Cnidarians (other than corals) were the second most common group (up to 0.21 ind./m²), with sea anemones (mainly cerianthids) as the most abundant taxa (Figure 3-19 B). Average cnidarian density similarly decreased by 28.9% compared to the pre-drilling survey. Brachiopods were the third most common group and were sporadically distributed on hard substrates and only visible when the ROV stopped or flew low (Figure 3-19 D). Molluscs, such as gastropods and cephalopods, were observed in low densities throughout in both surveys (Figure

3-19 C). Other invertebrate taxa observed included arthropods and annelid worms (Figure 3-19 E, F). These taxa were found throughout the survey area in both surveys.

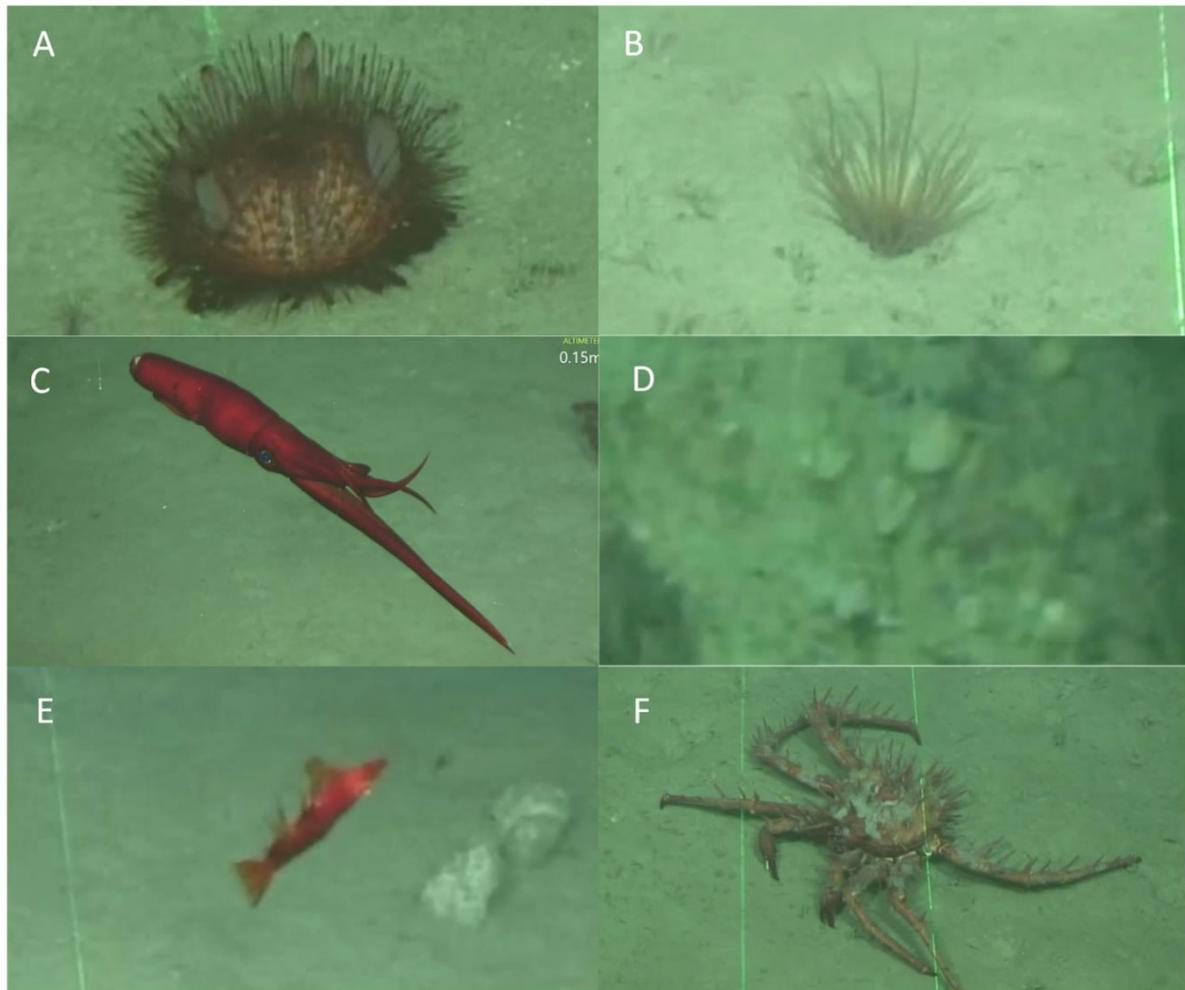


Figure 3-19 Representative invertebrates from each species group: A) sea urchin (echinoderm), B) cerianthid anemone (cnidarian), C) squid (mollusc), D) brachiopods, E) shrimp (arthropod / other invertebrate), and F) porcupine crab (arthropod / other invertebrates). Lasers are 20 cm apart.

Table 3-6 Summary statistics for invertebrate groups (excluding corals and sponges) within the dispersion area survey.

Taxa Group	Year	Mean	St. dev.	Median	Min	Max
Echinoderms	2018	0.239	0.095	0.22	0.05	0.33
	2022	0.178	0.044	0.18	0.02	0.30
Cnidarians	2018	0.114	0.057	0.10	0.02	0.03
	2022	0.081	0.033	0.08	0.01	0.21
Molluscs	2018	0.005	0.008	0	0.01	0.03
	2022	0.005	0.006	0.01	0.01	0.05
Brachiopods	2018	0.036	0.059	0	0.01	0.39
	2022	0.009	0.022	0	0.01	0.13
Other Invertebrates	2018	0.024	0.017	0.02	0.01	0.08

Taxa Group	Year	Mean	St. dev.	Median	Min	Max
	2022	0.018	0.011	0.02	0.01	0.05
Total number of survey sections: 2018 (n=133), 2022 (n=190). Sections were 50 m linear distance with an average width of 3.42 m. ¹ Minimum density is the lowest non-zero value.						

3.5.2 FISH FUNCTIONAL GROUPS

Four fish functional groups were found throughout the transect lines in both the pre- and post-drilling surveys (Table 3-7, Figure 3-20, density maps located in Appendix B). Benthivores were the most commonly observed group in both surveys, with grenadier species as the most abundant taxa followed by rocklings and blue hake (Table 3-7, Figure 3-20 A). Compared to the pre-drilling survey, average benthivore density decreased by 52.5%. Fish unable to be assigned to a functional group, such as poorly seen fish or small juveniles, were classified as “Unknown fish” and were the second most common group overall (Figure 3-20 D). Unknown fish average density decreased by 15.4% compared to the pre-drilling survey. Planktivores, of which lanternfish were the only taxa, were the third most common group (Figure 3-20 C). Small numbers of piscivores such as Greenland halibut and sharks were also observed (Figure 3-20 B).

Table 3-7 Summary statistics for fish functional groups within the dispersion area survey.

Taxa Group	Year	Mean	St. dev.	Median	Min	Max
Benthivores	2018	0.040	0.023	0.04	0.01	0.13
	2022	0.019	0.012	0.02	0.01	0.07
Piscivores	2018	0.001	0.002	0	0.01	0.01
	2022	<0.001	0.001	0	0.01	0.01
Planktivores	2018	0.002	0.004	0	0.01	0.02
	2022	0.004	0.005	0	0.01	0.03
Unknown	2018	0.013	0.016	0.01	0.01	0.09
	2022	0.011	0.008	0.01	0.01	0.04
Total number of survey sections: 2018 (n=133), 2022 (n=190). Sections were 50 m linear distance with an average width of 3.42 m. ¹ Minimum density is the lowest non-zero value. Unknown fish include juveniles and unidentified fish.						

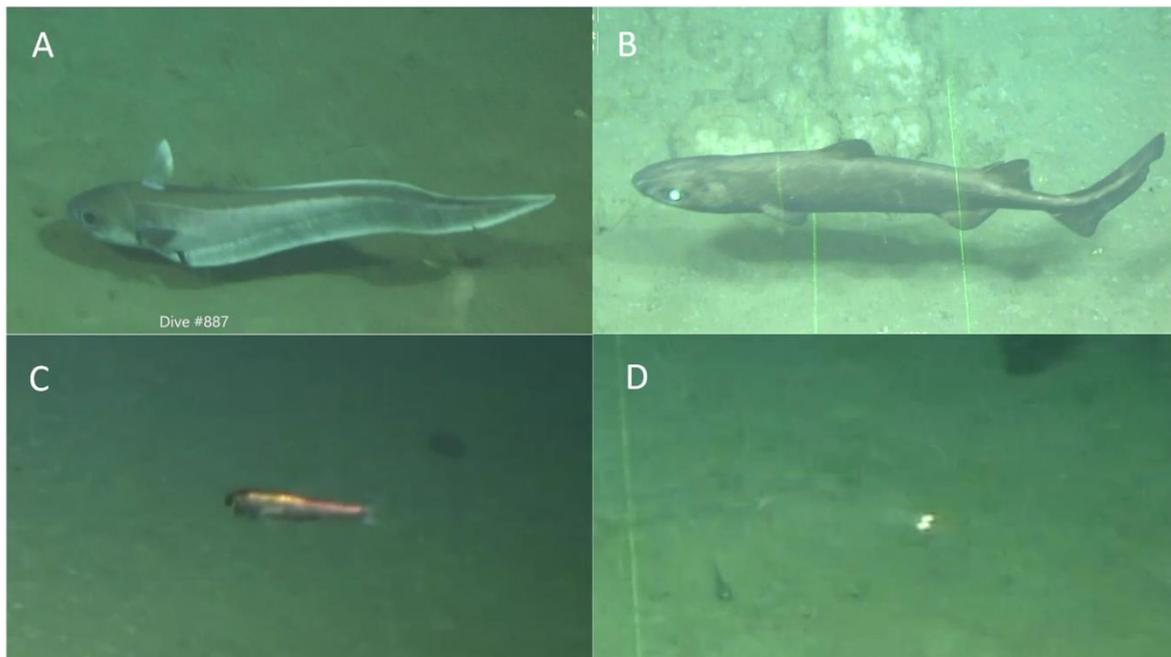


Figure 3-20 Representative fish species from each functional group: A) grenadier (benthivore), B) black dogfish shark (piscivore), C) lanternfish (planktivore), and D) unknown fish. Lasers are 20 cm apart.

3.6 ASSESSMENT OF MODEL PREDICTIONS

Survey results were comparable to the June seasonal combined drill cuttings model (Figure 3-4). The June seasonal model was used as it represents the summer conditions and drilling occurred in the summer. The model predicted that accumulations of drill cuttings >1.5 mm mainly towards the southwest with some patches extending to the east and west. The drill cuttings observed after the 2022 drilling program mainly followed this trajectory. While the model had cuttings at the time of release extending to about 700 m from the drill center, patchy clumps of drill cuttings were sparsely distributed to 1,400 m from the centre. Drill cuttings from the 2020 drill campaign were subject to local bottom currents that change throughout the year and could account for the discrepancies in the modelled versus *in situ* observations. The drill cuttings pile was still visibly mounded adjacent to the wellhead in the 2022 survey. As in the previous 2020 survey, drill cuttings observed further from the wellhead were patchy and discontinuous in nature. The combined seasonal and drill cutting model for the Hampden K-41 wellsite closely matches the *in-situ* observations.

4 SUMMARY AND CONCLUSIONS

Based on the results summarized above, some general conclusions can be drawn related to the Conditions 3.12.2.2, and 3.12.2.3 of the Decision Statement. The specific conditions and the determination are provided below.

Condition 3.12.1 – *for every well, measure the concentration of synthetic-based drilling fluids retained on discharged drill cuttings as described in the Offshore Waste Treatment Guidelines to verify that the discharge meets, at a minimum, the performance targets set out in the Guidelines and any applicable legislative requirements, and report the results to the Board;*

- The OWTG specifies that SOC levels should not exceed 6.9 g/100 g oil on wet solids. As detailed in Section 3.1, the highest reported level from the drilling unit was 3.35 g/100 g oil on wet solids. Therefore, the discharges meet the performance targets set out in the OWTG and addresses Condition 3.12.1 of the decision statement.

Condition 3.12.2.1 - *Measurement of sediment deposition extent and thickness post drilling to verify the drill waste deposition modeling predictions;*

- This condition for the area adjacent to the well centre is discussed in the EL1165A Drill Cutting Monitoring Report (Wood 2021a). The report concluded that the majority of the cuttings observed were within 50 m of the drill center. For the drilling dispersion area (2022 survey), drill cuttings were observed within the survey area in low accumulations. These cuttings were subject to a year of bottom currents between surveys. The model predicts the distribution of cuttings at the time of release.

Condition 3.12.2.2 - *Benthic fauna surveys to verify the effectiveness of mitigation measures;*

- Mitigations implemented to reduce the potential harm from drilling activities to deep-sea corals included identifying coral clusters which was completed in 2018 (RPS 2018, EMCL 2019b). Other mitigations include assessing the presence and condition of corals within the survey area post-drilling and assess whether these results change the conclusion of the original environmental assessment. It was determined from the 2020 post-drilling survey report concluded that effects from drilling activities within the 200 m x 200 m survey grid were within the EIS predictions. Results from the 2022 post-drilling survey in the predicted drilling dispersion area were compared to the 2018 pre-drilling survey observations made the same area. Differences in densities of corals and sponges (i.e., more sessile species) between the pre-and post-surveys were small. Observed changes are likely due to differences in the amount of benthic data available for comparison (6.55 km from 2018 compared to 9.5 km from 2022). In transects with corals present, their overall condition was considered good (e.g., upright, polyps extended, and without visible sedimentation) for both the 2018 and 2022 observations. Sponge condition was characterized by the presence or absence of a sediment veneer. In 2022, there was a slight increase of sponges observed with a veneer (increase from 74% to 85%), however over 70% of sponges in both surveys (2018 and 2022) had sediment veneers which is indicative of mainly natural sedimentation present. With the similarity in coral and sponge densities and distributions in the pre- and post- drilling surveys and the overall coral condition being good in both surveys (2018 and

2022), it is therefore concluded that the drilling activities observed were within the EIS predictions of the project not resulting in significant adverse environmental effects.

Condition 3.12.2.3 – *Report the information collected as identified in conditions 3.12.2.1 and 3.12.2.2, including a comparison of modelling results to in situ results, to the C-NLOPB within 60 days following the drilling of the first well in each exploration licence.*

- As described in the preceding sections of this report, the pre-drilling survey results were compared to in situ post-drilling survey results and found that the 2022 survey further confirms the effects to corals and sponges from drilling activities were mainly limited to within 50 m of the drill center.

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APPENDIX

A POST-DRILLING VIDEO OBSERVATION DATA

APPENDIX

Table A-1 Observations for transects 100, 200, and 300 (all sections)

Line	Section	Date	Time Start	Time End	Start Northing	Start Easting	End Northing	End Easting	Area	Fine	Medium	Coarse	Coal Content	Sponge Veneer Present Percent	Soft Corals	Black Corals	Hard Corals	Branching corals	Sea Pens	Total Coral	Solid_Massive	Leaf_Shaped	Round with Projections	Thin_Walled	Stalked	Other	Total Sponge	Echinoderms	Cnidarians	Molluscs	Brachiopods	Other Invertebrates	Benthivores	Piscivores	Planktivores	Unknown Fishes		
T100-1	1	21/08/2022	14:31:00	14:34:47	357788.6	5207749.4	357841.6	5207753.1	171	100			100.000	100.000	0.041	0.000	0.000	0.029	0.158	0.238	0.386	0.099	0.000	0.000	0.000	0.000	0.485	0.164	0.111	0.006	0.000	0.018	0.000	0.000	0.018	0.006		
T100-2	2	21/08/2022	14:34:47	14:37:36	357841.6	5207753.1	357890.1	5207750.9	171	90			100.000	96.078	0.199	0.000	0.000	0.018	0.152	0.368	0.211	0.070	0.018	0.000	0.000	0.000	0.298	0.164	0.088	0.006	0.000	0.006	0.018	0.000	0.006	0.000	0.000	
T100-3	3	21/08/2022	14:37:36	14:40:25	357890.1	5207750.9	357941.3	5207746.5	171	90			100.000	95.575	0.181	0.000	0.000	0.018	0.246	0.444	0.456	0.175	0.023	0.006	0.000	0.000	0.561	0.140	0.076	0.006	0.000	0.006	0.012	0.000	0.006	0.000	0.000	
T100-4	4	21/08/2022	14:40:25	14:44:34	357941.3	5207746.5	357990.8	5207746.5	171	95	5		100.000	100.000	0.076	0.000	0.000	0.035	0.181	0.292	0.325	0.076	0.012	0.023	0.000	0.000	0.936	0.152	0.064	0.000	0.000	0.018	0.023	0.000	0.006	0.006		
T100-5	5	21/08/2022	14:44:34	14:46:47	357990.8	5207746.5	358040.6	5207732.9	171	95	5		98.333	100.000	0.146	0.000	0.000	0.023	0.181	0.351	0.333	0.058	0.012	0.000	0.000	0.404	0.146	0.076	0.000	0.000	0.006	0.006	0.006	0.006	0.012	0.000	0.006	
T100-6	6	21/08/2022	14:46:47	14:49:35	358040.6	5207732.9	358090.4	5207729.3	171	95	5		100.000	100.000	0.105	0.000	0.000	0.041	0.129	0.275	0.146	0.082	0.000	0.000	0.000	0.000	0.228	0.187	0.082	0.012	0.000	0.012	0.006	0.000	0.000	0.018	0.000	
T100-7	7	21/08/2022	14:49:35	14:52:22	358090.4	5207729.3	358140.3	5207729.3	171	95	5		97.917	97.143	0.070	0.000	0.000	0.035	0.175	0.281	0.082	0.111	0.006	0.006	0.000	0.000	0.205	0.193	0.058	0.000	0.000	0.006	0.006	0.006	0.000	0.012	0.000	0.012
T100-8	8	21/08/2022	14:52:22	14:55:11	358140.3	5207729.3	358190.3	5207721.4	171	90			100.000	96.078	0.199	0.000	0.000	0.012	0.240	0.450	0.199	0.088	0.012	0.000	0.000	0.000	0.298	0.175	0.105	0.000	0.135	0.006	0.023	0.000	0.006	0.000	0.006	
T100-9	9	21/08/2022	14:55:11	14:57:59	358190.3	5207721.4	358239.9	5207715.9	171	95	5		100.000	94.915	0.094	0.000	0.000	0.058	0.211	0.363	0.263	0.053	0.023	0.000	0.006	0.000	0.345	0.152	0.058	0.000	0.000	0.018	0.012	0.000	0.000	0.000	0.000	
T100-10	10	21/08/2022	14:57:59	15:00:36	358239.9	5207715.9	358289.9	5207716.6	171	95	5		100.000	96.429	0.053	0.000	0.000	0.006	0.152	0.211	0.351	0.056	0.006	0.000	0.000	0.000	0.164	0.064	0.006	0.006	0.000	0.012	0.023	0.000	0.000	0.000	0.012	
T100-11	11	21/08/2022	15:00:36	15:03:21	358289.9	5207716.6	358339.6	5207711.1	171	95	5		100.000	100.000	0.082	0.000	0.000	0.018	0.076	0.175	0.187	0.140	0.012	0.000	0.000	0.000	0.339	0.099	0.000	0.000	0.000	0.023	0.006	0.000	0.000	0.000	0.006	
T100-12	12	21/08/2022	15:03:21	15:06:02	358339.6	5207711.1	358389.3	5207707.1	171	90			100.000	100.000	0.228	0.000	0.000	0.012	0.281	0.520	0.070	0.010	0.023	0.000	0.000	0.000	0.070	0.123	0.105	0.000	0.000	0.000	0.012	0.018	0.000	0.006	0.006	
T100-13	13	21/08/2022	15:06:02	15:08:48	358389.3	5207707.1	358439.6	5207704.2	171	90			100.000	84.211	0.211	0.000	0.000	0.018	0.398	0.626	0.070	0.018	0.023	0.000	0.000	0.000	0.111	0.123	0.105	0.000	0.000	0.007	0.018	0.018	0.000	0.006	0.006	
T100-14	14	21/08/2022	15:08:48	15:11:28	358439.6	5207704.2	358489.7	5207698.9	171	80	20		99.242	97.500	0.427	0.000	0.000	0.006	0.339	0.772	0.158	0.053	0.018	0.000	0.006	0.006	0.234	0.170	0.053	0.000	0.135	0.006	0.006	0.000	0.000	0.012	0.000	
T100-15	15	21/08/2022	15:11:28	15:14:11	358489.7	5207698.9	358538.5	5207692.9	171	95	5		100.000	100.000	0.263	0.000	0.000	0.006	0.398	0.626	0.053	0.023	0.012	0.000	0.000	0.000	0.088	0.105	0.094	0.000	0.006	0.006	0.006	0.000	0.006	0.000	0.018	0.000
T100-16	16	21/08/2022	15:14:11	15:17:00	358538.5	5207692.9	358588.4	5207687.1	171	95	5		100.000	90.000	0.123	0.000	0.000	0.041	0.251	0.515	0.035	0.000	0.018	0.000	0.006	0.000	0.058	0.164	0.099	0.000	0.000	0.006	0.023	0.000	0.000	0.012	0.000	
T100-17	17	21/08/2022	15:17:00	15:19:44	358588.4	5207687.1	358637.9	5207681.6	171	90			100.000	93.333	0.193	0.000	0.000	0.012	0.351	0.456	0.082	0.006	0.000	0.000	0.000	0.000	0.088	0.135	0.082	0.006	0.029	0.023	0.029	0.000	0.000	0.000		
T100-18	18	21/08/2022	15:19:44	15:22:22	358637.9	5207681.6	358688.4	5207681.4	171	90			100.000	93.750	0.216	0.000	0.000	0.018	0.345	0.579	0.135	0.029	0.023	0.000	0.000	0.000	0.187	0.129	0.105	0.000	0.123	0.006	0.029	0.000	0.006	0.012	0.000	
T100-19	19	21/08/2022	15:22:22	15:24:55	358688.4	5207681.4	358737.5	5207680.2	171	85	15		100.000	96.774	0.345	0.000	0.000	0.029	0.310	0.684	0.129	0.047	0.006	0.000	0.000	0.000	0.181	0.117	0.064	0.000	0.018	0.012	0.006	0.006	0.006	0.012	0.000	
T100-20	20	21/08/2022	15:24:55	15:28:05	358737.5	5207680.2	358787.6	5207670.4	171	80	20		100.000	96.970	0.339	0.000	0.000	0.023	0.503	0.865	0.164	0.023	0.006	0.000	0.000	0.000	0.193	0.117	0.076	0.000	0.053	0.006	0.029	0.000	0.000	0.012	0.000	
T200-1	1	21/08/2022	13:20:30	13:22:50	358765.353	5207524.044	358711.219	5207527.976	171	95	5		100.000	95.455	0.135	0.000	0.000	0.006	0.398	0.538	0.105	0.018	0.000	0.000	0.000	0.000	0.129	0.076	0.012	0.000	0.012	0.000	0.006	0.000	0.006	0.012	0.000	
T200-2	2	21/08/2022	13:22:50	13:25:56	358711.219	5207527.976	358662.475	5207523.246	171	90			100.000	100.000	0.228	0.000	0.000	0.006	0.368	0.602	0.240	0.035	0.006	0.000	0.000	0.000	0.281	0.135	0.023	0.000	0.023	0.006	0.006	0.000	0.000	0.012	0.000	
T200-3	3	21/08/2022	13:25:56	13:28:49	358662.475	5207523.246	358613.433	5207518.676	171	90			100.000	97.980	0.170	0.000	0.000	0.023	0.368	0.579	0.491	0.035	0.012	0.000	0.000	0.000	0.567	0.193	0.088	0.006	0.000	0.006	0.018	0.000	0.006	0.006	0.006	
T200-4	4	21/08/2022	13:28:49	13:31:27	358613.433	5207518.676	358564.651	5207506.26	171	85	15		99.130	100.000	0.164	0.000	0.000	0.023	0.485	0.673	0.123	0.029	0.000	0.000	0.000	0.152	0.135	0.053	0.006	0.082	0.012	0.018	0.000	0.000	0.000	0.000		
T200-5	5	21/08/2022	13:31:27	13:34:15	358564.651	5207506.26	358514.981	5207505.101	171	90			100.000	100.000	0.135	0.000	0.000	0.000	0.398	0.532	0.240	0.058	0.012	0.000	0.012	0.000	0.322	0.076	0.105	0.000	0.000	0.018	0.018	0.000	0.006	0.000		
T200-6	6	21/08/2022	13:34:15	13:37:13	358514.981	5207505.101	358467.323	5207581.405	171	90			99.038	100.000	0.193	0.000	0.000	0.023	0.392	0.608	0.175	0.064	0.006	0.000	0.000	0.000	0.246	0.140	0.099	0.012	0.000	0.006	0.018	0.000	0.000	0.000		
T200-7	7	21/08/2022	13:37:13	13:40:49	358467.323	5207581.405	358417.395	5207587.975	171	85	15		100.000	100.000	0.246	0.000	0.000	0.023	0.310	0.579	0.135	0.041	0.012	0.000	0.000	0.000	0.187	0.193	0.082	0.000	0.047	0.006	0.018	0.000	0.000	0.000		
T200-8	8	21/08/2022	13:40:49	13:45:47	358417.395	5207587.975	358369.365	5207599.016	171	85	15		99.083	94.11																								

APPENDIX

Table A-3 Observations for transects 1000, 1400, and T1 (all sections)

Line	Section	Date	Time Start	Time End	Start Northing	Start Easting	End Northing	End Easting	Area	Fine	Medium	Coarse	Coral Percent	Sponge Veneer Present Percent	Soft Corals	Black Corals	Hard Corals	Branching corals	Sea Pens	Total Coral	Solid_Massive	Leaf_Vase Shaped	Round with Projections	Thin_Walled	Stalked	Other	Total Sponge	Echinoderms	Cnidarians	Molluscs	Brachiopods	Other Invertebrates	Benthivores	Piscivores	Planktivores	Unknown Fishes
T1000-1	1	20/08/2022	12:47:00	12:51:08	357615	5206932.6	357675.4	5206917.5	171	90			100.000	98.561	0.047	0.000	0.000	0.012	0.135	0.193	0.661	0.135	0.012	0.006	0.000	0.000	0.813	0.216	0.035	0.006	0.000	0.023	0.029	0.000	0.000	0.012
T1000-2	2	20/08/2022	12:51:08	12:54:24	357675.4	5206917.5	357725.0	5206909.9	171	80	10		97.436	100.000	0.099	0.000	0.000	0.041	0.088	0.228	0.322	0.058	0.006	0.000	0.000	0.386	0.181	0.129	0.000	0.000	0.023	0.012	0.000	0.000	0.000	
T1000-3	3	20/08/2022	12:54:24	12:56:41	357725.0	5206909.9	357775.5	5206896.9	171	95	5		92.857	100.000	0.070	0.000	0.000	0.023	0.070	0.164	1.123	0.140	0.006	0.000	0.000	1.269	0.281	0.018	0.006	0.000	0.012	0.006	0.000	0.000	0.000	
T1000-4	4	20/08/2022	12:56:41	12:59:25	357775.5	5206896.9	357822.7	5206890.6	171	95	5		100.000	100.000	0.035	0.000	0.000	0.000	0.029	0.064	0.889	0.146	0.018	0.006	0.000	1.058	0.222	0.047	0.000	0.000	0.000	0.018	0.018	0.000	0.000	0.000
T1000-5	5	20/08/2022	12:59:25	13:02:18	357822.7	5206890.6	357871.4	5206878.1	171	95	5		91.667	100.000	0.047	0.000	0.000	0.006	0.088	0.140	0.789	0.158	0.006	0.012	0.000	0.965	0.234	0.053	0.006	0.000	0.041	0.012	0.000	0.000	0.006	0.006
T1000-6	6	20/08/2022	13:02:18	13:07:59	357871.4	5206878.1	357920.6	5206869.1	171	95	5		100.000	100.000	0.053	0.000	0.000	0.023	0.187	0.263	1.614	0.189	0.006	0.000	0.012	2.520	0.222	0.029	0.006	0.029	0.041	0.041	0.000	0.006	0.006	
T1000-7	7	20/08/2022	13:07:59	13:10:54	357920.6	5206869.1	357968.8	5206855.2	171	95	5		100.000	99.254	0.023	0.000	0.000	0.023	0.099	0.146	0.567	0.193	0.006	0.018	0.000	0.784	0.228	0.105	0.000	0.000	0.018	0.012	0.000	0.000	0.018	
T1000-8	8	20/08/2022	13:10:54	13:13:52	357968.8	5206855.2	358018.8	5206843.3	171	90	10		100.000	100.000	0.076	0.000	0.000	0.023	0.111	0.199	0.228	0.047	0.006	0.006	0.000	0.292	0.251	0.105	0.006	0.000	0.023	0.000	0.000	0.000	0.018	
T1000-9	9	20/08/2022	13:13:52	13:17:04	358018.8	5206843.3	358066.9	5206838.3	171	85	15		100.000	100.000	0.059	0.000	0.000	0.009	0.123	0.251	0.772	0.123	0.000	0.006	0.000	0.901	0.158	0.076	0.000	0.064	0.012	0.029	0.000	0.000	0.012	
T1000-10	10	20/08/2022	13:17:04	13:19:55	358066.9	5206838.3	358119.9	5206844.1	171	90	10		97.561	97.087	0.111	0.000	0.000	0.018	0.111	0.240	0.497	0.082	0.018	0.006	0.000	0.602	0.240	0.058	0.000	0.000	0.035	0.029	0.000	0.012	0.012	
T1000-11	11	20/08/2022	13:19:55	13:23:22	358119.9	5206844.1	358166.7	5206828.9	171	95	5		100.000	100.000	0.111	0.000	0.000	0.012	0.070	0.193	1.339	0.094	0.012	0.000	0.000	1.444	0.222	0.064	0.000	0.000	0.018	0.041	0.000	0.012	0.012	
T1000-12	12	20/08/2022	13:23:22	13:32:05	358166.7	5206828.9	358214.6	5206814.5	171	85	15		97.826	100.000	0.140	0.000	0.000	0.023	0.105	0.269	0.404	0.018	0.012	0.006	0.006	0.444	0.170	0.058	0.029	0.000	0.047	0.029	0.000	0.000	0.012	
T1000-13	13	20/08/2022	13:32:05	13:34:54	358214.6	5206814.5	358263.8	5206803.1	171	95	5		95.652	100.000	0.006	0.000	0.000	0.012	0.117	0.135	1.608	0.070	0.000	0.000	0.000	1.678	0.216	0.076	0.000	0.000	0.023	0.023	0.000	0.000	0.012	
T1000-14	14	20/08/2022	13:34:54	13:38:47	358263.8	5206803.1	358312.6	5206791.6	171	95	5		100.000	100.000	0.035	0.000	0.006	0.041	0.170	0.251	1.246	0.047	0.000	0.000	0.000	1.292	0.240	0.105	0.000	0.000	0.006	0.018	0.000	0.012	0.023	
T1000-15	15	20/08/2022	13:38:47	13:41:39	358312.6	5206791.6	358361.5	5206785.2	171	90	10		100.000	100.000	0.094	0.000	0.000	0.023	0.140	0.257	0.480	0.006	0.000	0.000	0.000	0.485	0.146	0.129	0.000	0.000	0.006	0.018	0.023	0.000	0.006	0.018
T1000-16	16	20/08/2022	13:41:39	13:44:32	358361.5	5206785.2	358411.0	5206775.3	171	95	5		100.000	100.000	0.041	0.000	0.006	0.029	0.152	0.228	1.099	0.041	0.000	0.000	0.000	1.140	0.240	0.029	0.000	0.018	0.035	0.018	0.000	0.006	0.006	
T1000-17	17	20/08/2022	13:44:32	13:47:32	358411.0	5206775.3	358459.3	5206764.3	171	80	20		100.000	100.000	0.263	0.000	0.000	0.012	0.345	0.620	0.117	0.018	0.018	0.000	0.000	0.152	0.164	0.140	0.000	0.000	0.012	0.018	0.000	0.000	0.000	
T1000-18	18	20/08/2022	13:47:32	13:50:27	358459.3	5206764.3	358509.1	5206755.9	171	95	5		100.000	100.000	0.070	0.000	0.000	0.012	0.386	0.567	0.088	0.047	0.012	0.000	0.000	0.146	0.146	0.094	0.000	0.000	0.029	0.029	0.000	0.000	0.012	
T1000-19	19	20/08/2022	13:50:27	13:52:59	358509.1	5206755.9	358557.7	5206746.1	171	90	10		100.000	100.000	0.176	0.000	0.000	0.006	0.386	0.468	0.146	0.012	0.023	0.000	0.000	0.181	0.164	0.111	0.000	0.000	0.023	0.041	0.000	0.006	0.000	
T1000-20	20	20/08/2022	13:52:59	13:56:22	358557.7	5206746.1	358604.8	5206737.9	171	85	15		100.000	100.000	0.216	0.000	0.000	0.023	0.368	0.608	0.257	0.076	0.018	0.006	0.006	0.363	0.175	0.123	0.000	0.041	0.012	0.006	0.000	0.000	0.006	
T1400-1	1	20/08/2022	11:22:00	11:24:06	358530.7	5206343.8	358480.7	5206351.7	171	80	20		100.000	88.889	0.205	0.000	0.000	0.023	0.778	0.994	0.246	0.105	0.018	0.000	0.000	0.368	0.152	0.082	0.000	0.000	0.012	0.006	0.000	0.000	0.000	
T1400-2	2	20/08/2022	11:24:06	11:26:18	358480.7	5206351.7	358431.7	5206361.5	171	80	20		100.000	92.308	0.193	0.000	0.000	0.000	0.468	0.661	0.041	0.035	0.000	0.000	0.000	0.076	0.152	0.064	0.006	0.023	0.035	0.012	0.000	0.006	0.006	
T1400-3	3	20/08/2022	11:26:18	11:28:41	358431.7	5206361.5	358382.3	5206372.7	171	80	20		100.000	74.074	0.316	0.000	0.000	0.006	0.932	0.713	0.076	0.076	0.012	0.000	0.000	0.158	0.193	0.058	0.006	0.023	0.023	0.035	0.006	0.006	0.006	
T1400-4	4	20/08/2022	11:28:41	11:31:09	358382.3	5206372.7	358333.9	5206382.2	171	90	10		100.000	100.000	0.146	0.000	0.000	0.018	0.368	0.532	0.117	0.105	0.012	0.000	0.000	0.234	0.129	0.058	0.018	0.000	0.018	0.018	0.000	0.000	0.018	
T1400-5	5	20/08/2022	11:31:09	11:33:41	358333.9	5206382.2	358284.9	5206391.2	171	90	10		98.611	100.000	0.193	0.000	0.000	0.000	0.228	0.421	0.994	0.076	0.000	0.000	0.000	0.170	0.164	0.058	0.000	0.018	0.012	0.012	0.000	0.000	0.006	
T1400-6	6	20/08/2022	11:33:41	11:36:05	358284.9	5206391.2	358235.5	5206399.2	171	90	10		100.000	97.436	0.199	0.000	0.000	0.029	0.287	0.515	1.111	0.088	0.018	0.000	0.012	0.000	0.228	0.216	0.070	0.000	0.000	0.006	0.006	0.000	0.000	0.018
T1400-7	7	20/08/2022	11:36:05	11:38:34	358235.5	5206399.2	358186.4	5206408.1	171	85	15		100.000	96.203	0.099	0.000	0.000	0.023	0.135	0.257	0.409	0.035	0.012	0.000	0.006	0.462	0.216	0.064	0.006	0.000	0.018	0.018	0.000	0.006	0.000	
T1400-8	8	20/08/2022	11:38:34	11:41:17	358186.4	5206408.1	358138.0	5206420.6	171	90	10		100.000	89.474	0.228	0.000	0.000	0.047	0.263	0.538	0.152	0.029	0.035	0.006	0.000	0.222	0.181	0.088	0.000	0.029	0.000	0.000	0.029	0.000	0.012	
T1400-9	9	20/08/2022	11:41:17	11:43:32	358138.0	5206420.6	358088.4	5206427.2	171	90	10		100.000	96.000	0.123	0.000	0.000	0.012	0.240	0.374																

APPENDIX

B INVERTEBRATE AND FISH DENSITY MAPS



APPENDIX

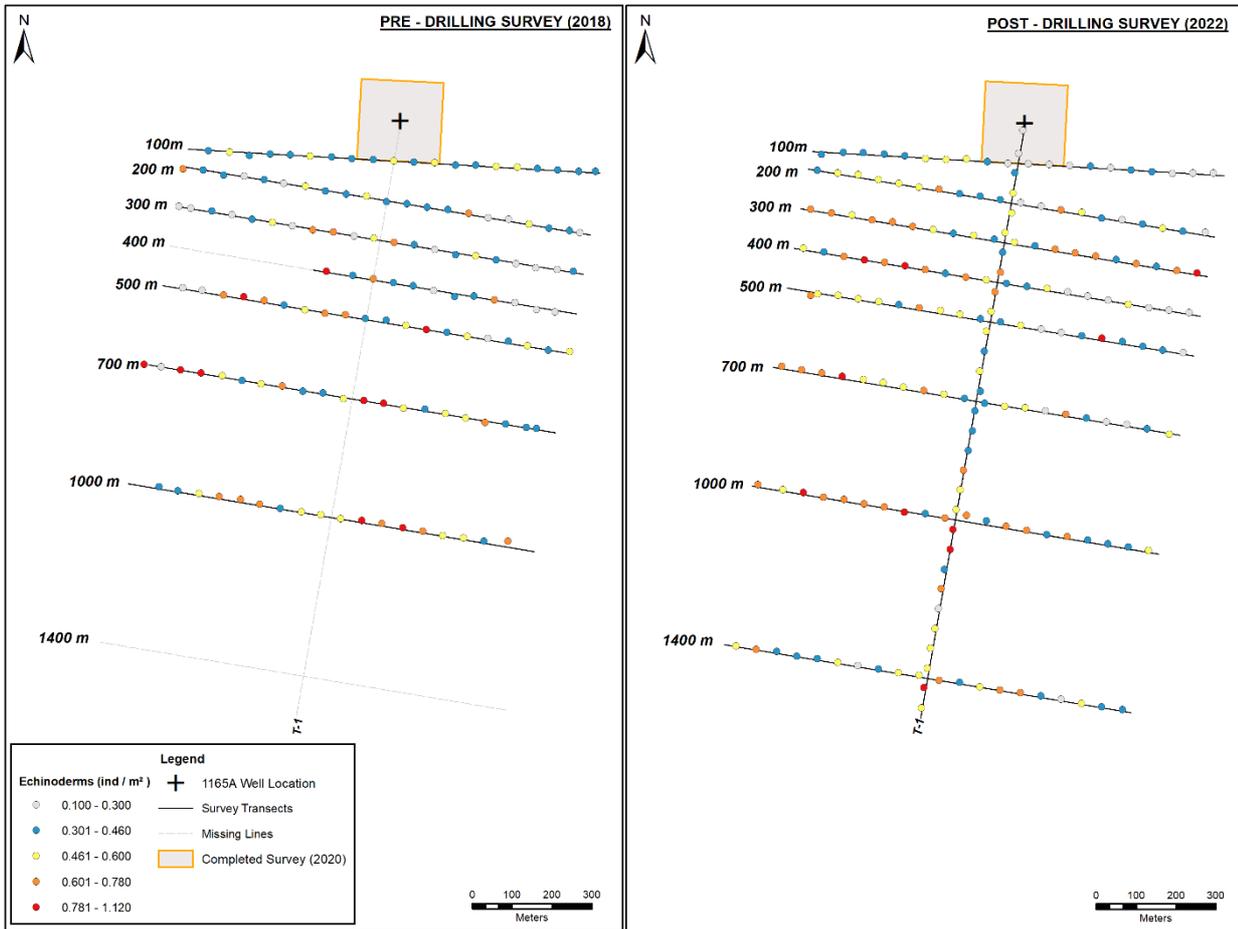


Figure B-1 Distribution of echinoderm densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

APPENDIX

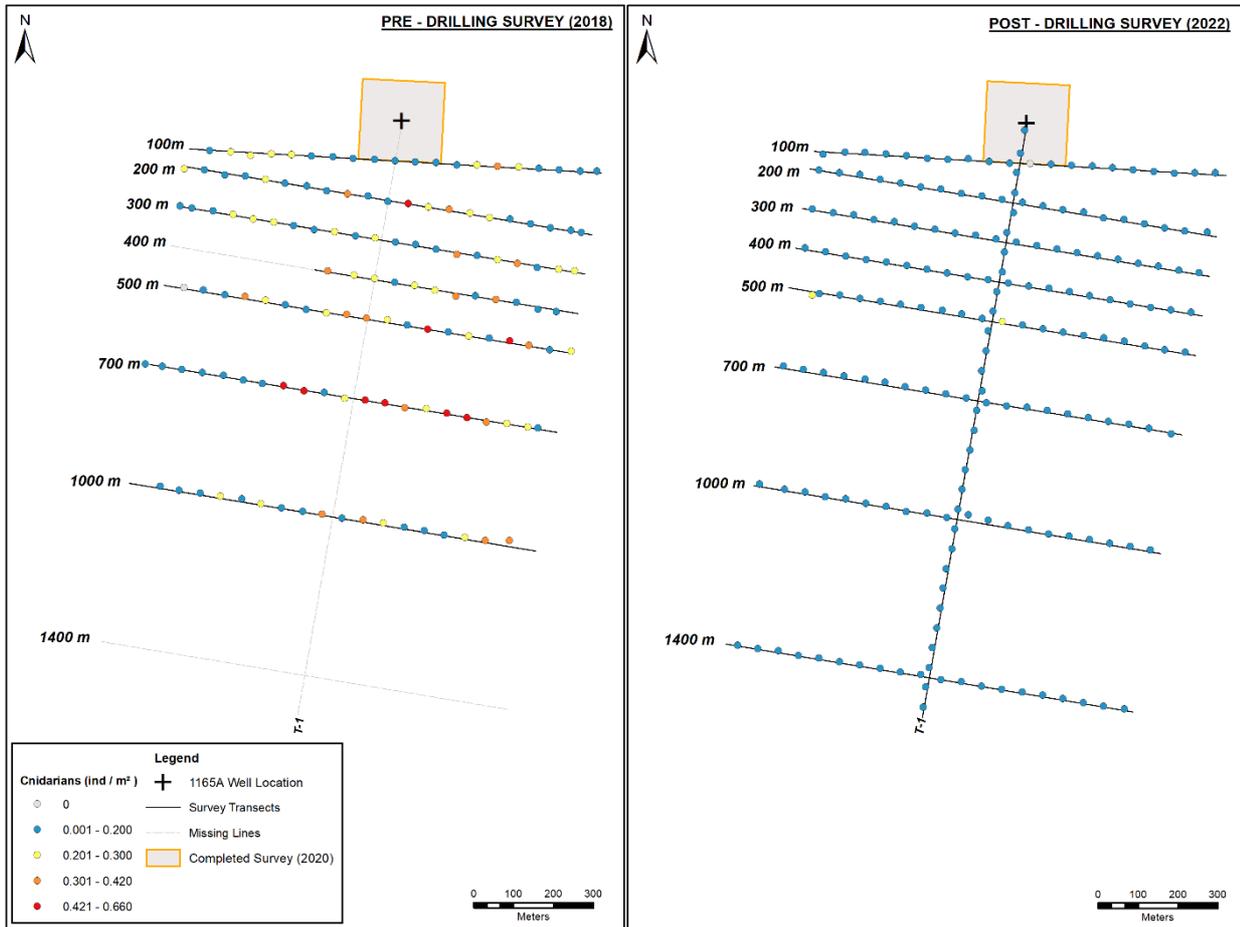


Figure B-2 Distribution of cnidaria (other than corals) densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

APPENDIX

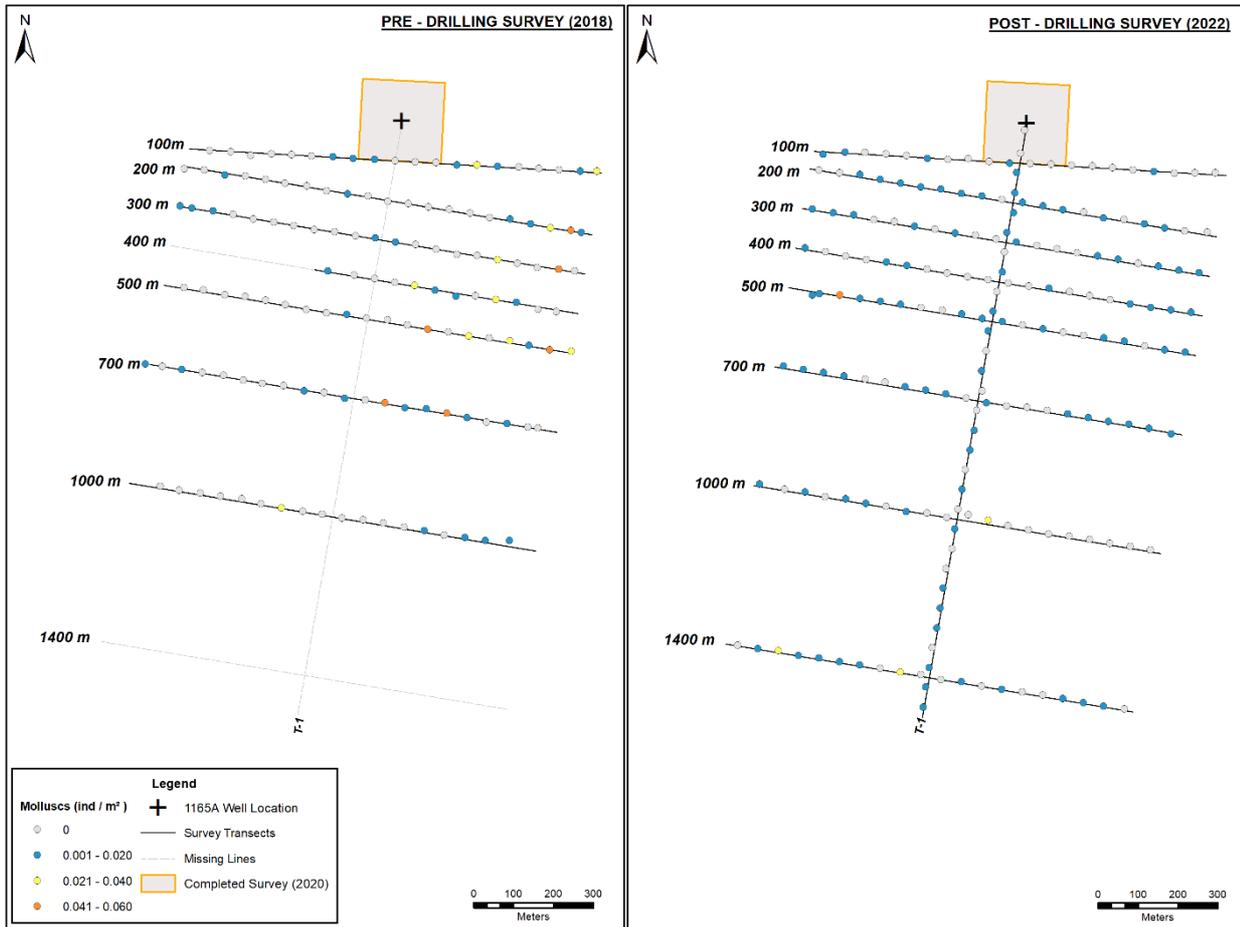


Figure B-3 Distribution of mollusc densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

APPENDIX

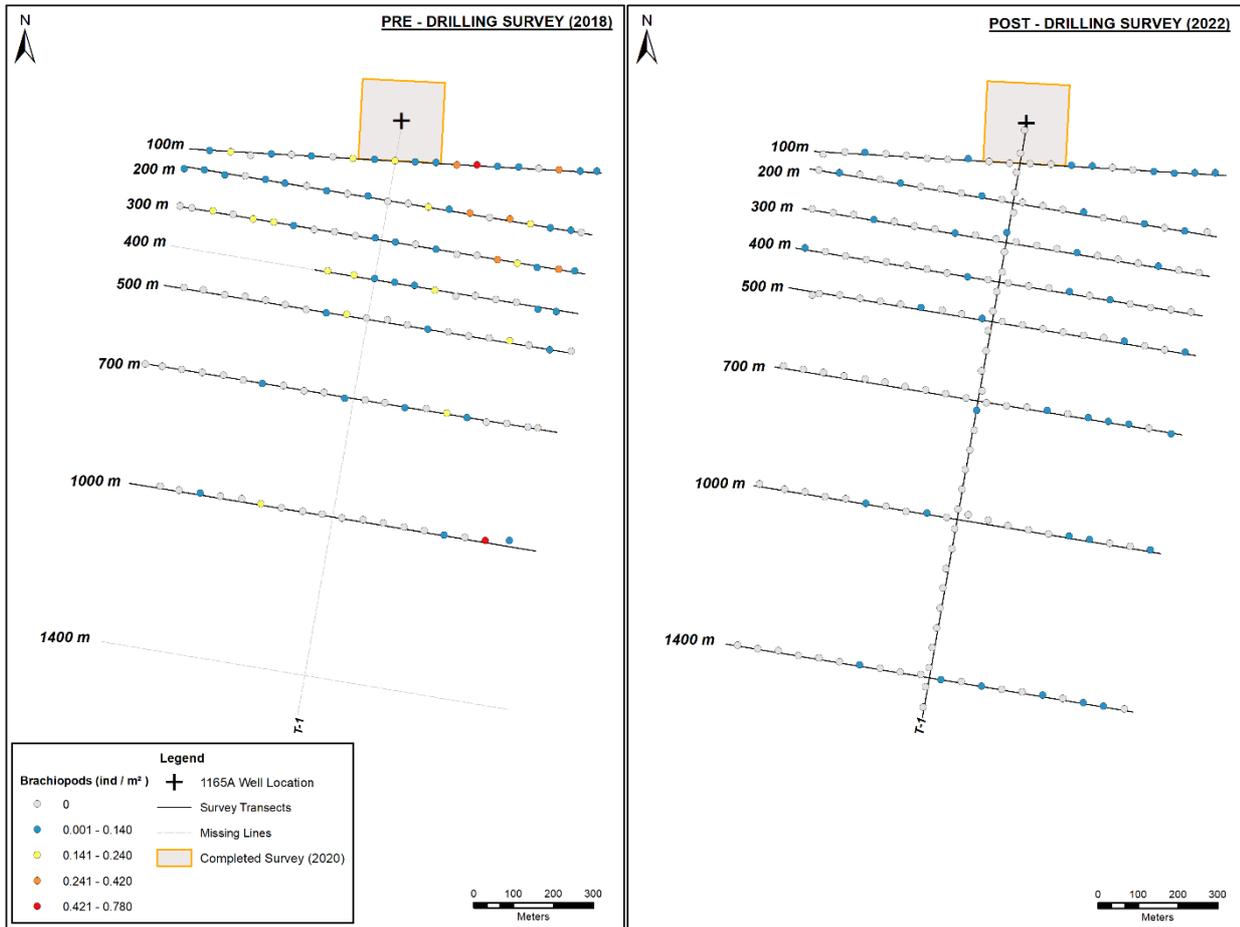


Figure B-4 Distribution of brachiopods densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

APPENDIX

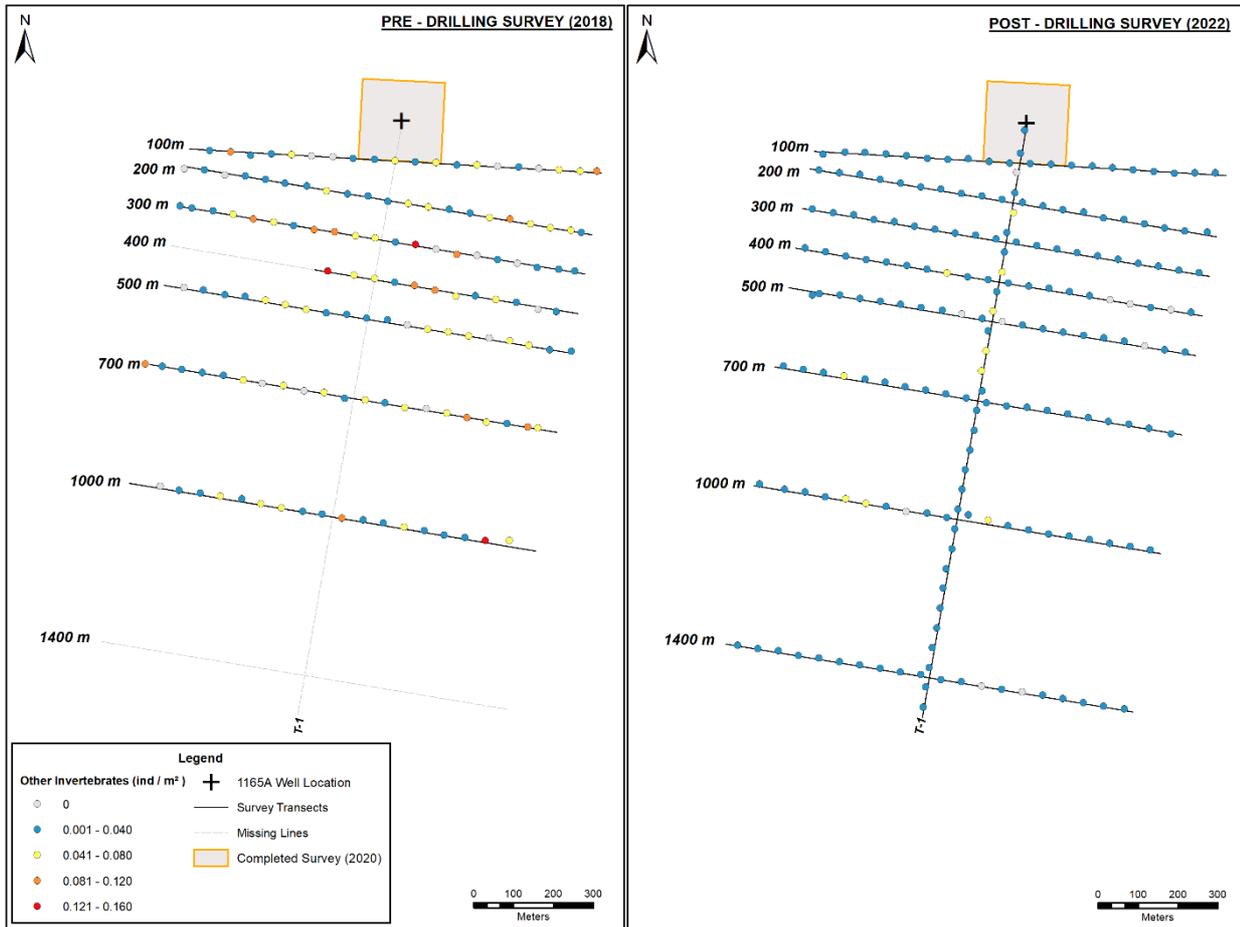


Figure B-5 Distribution of other invertebrate densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

APPENDIX

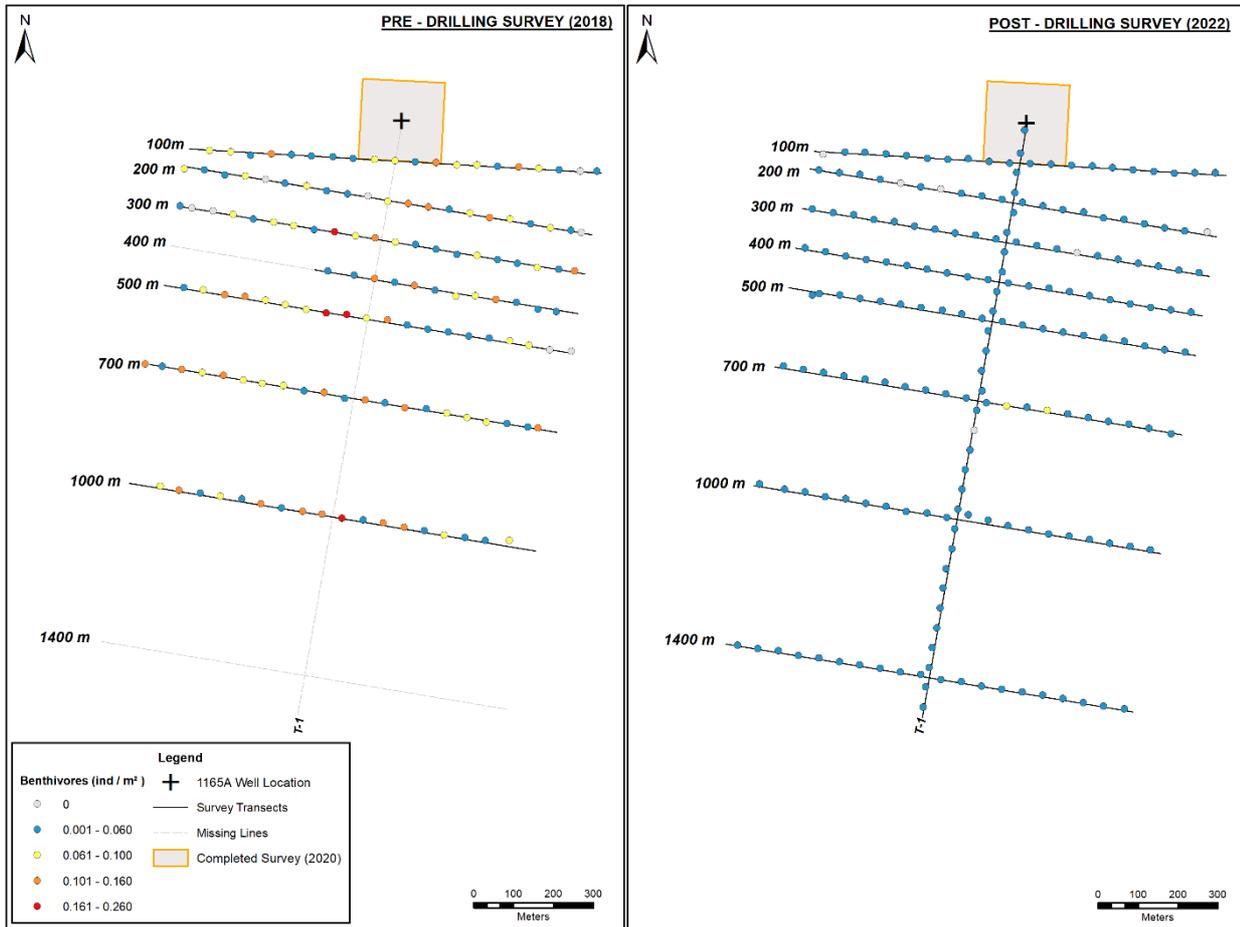


Figure B-6 Distribution of benthivore densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

APPENDIX

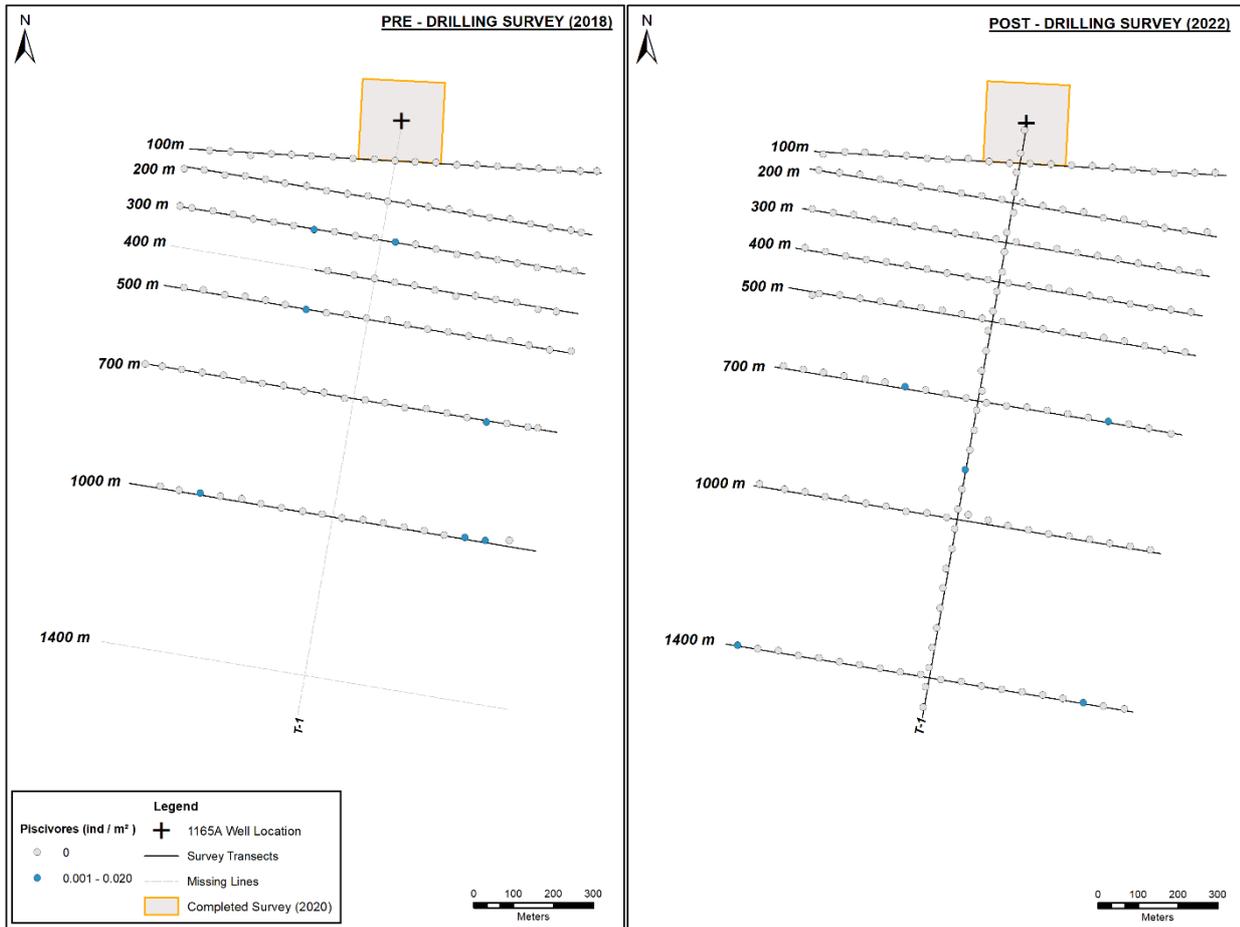


Figure B-7 Distribution of piscivores densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

APPENDIX

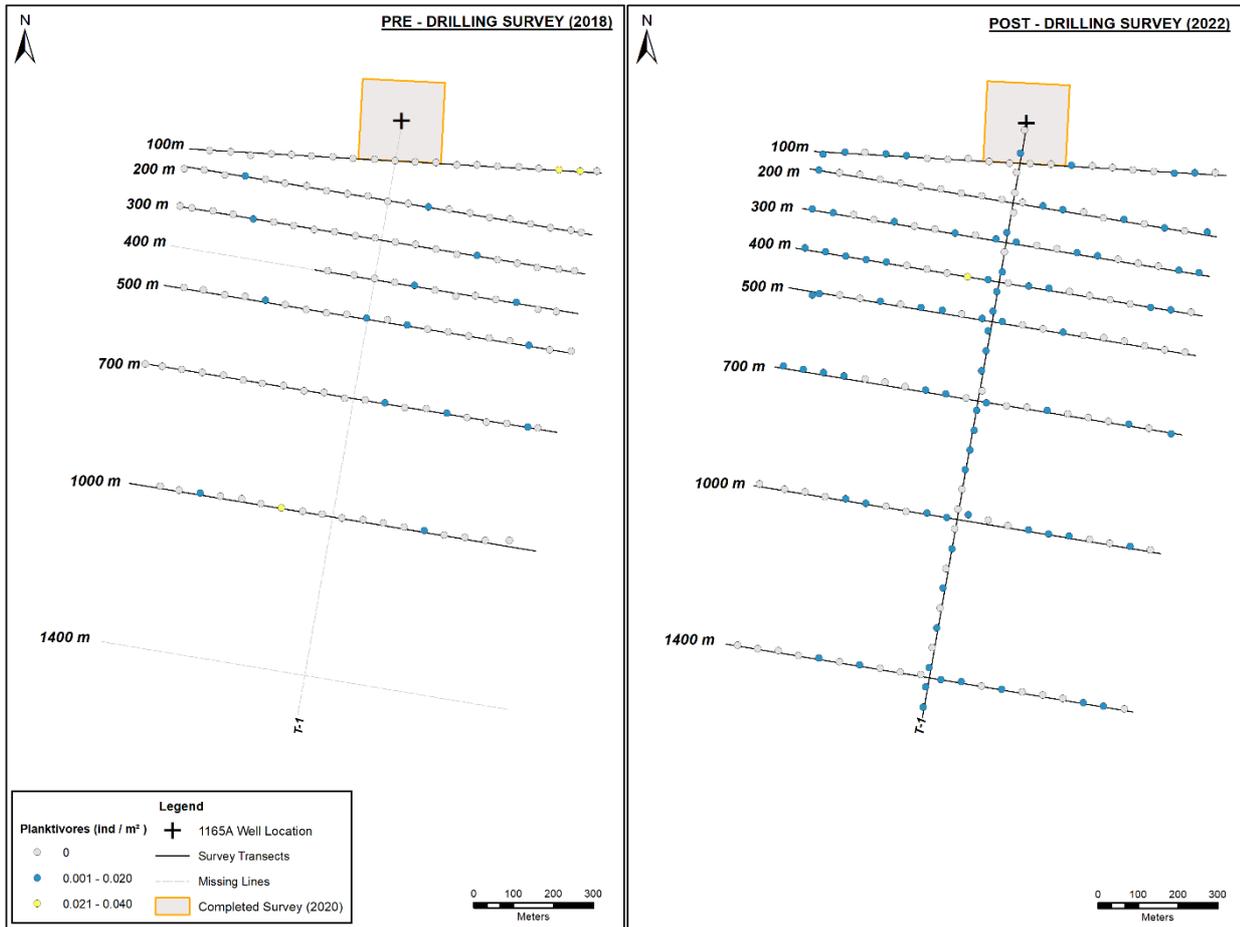


Figure B-8 Distribution of planktivores densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).

APPENDIX

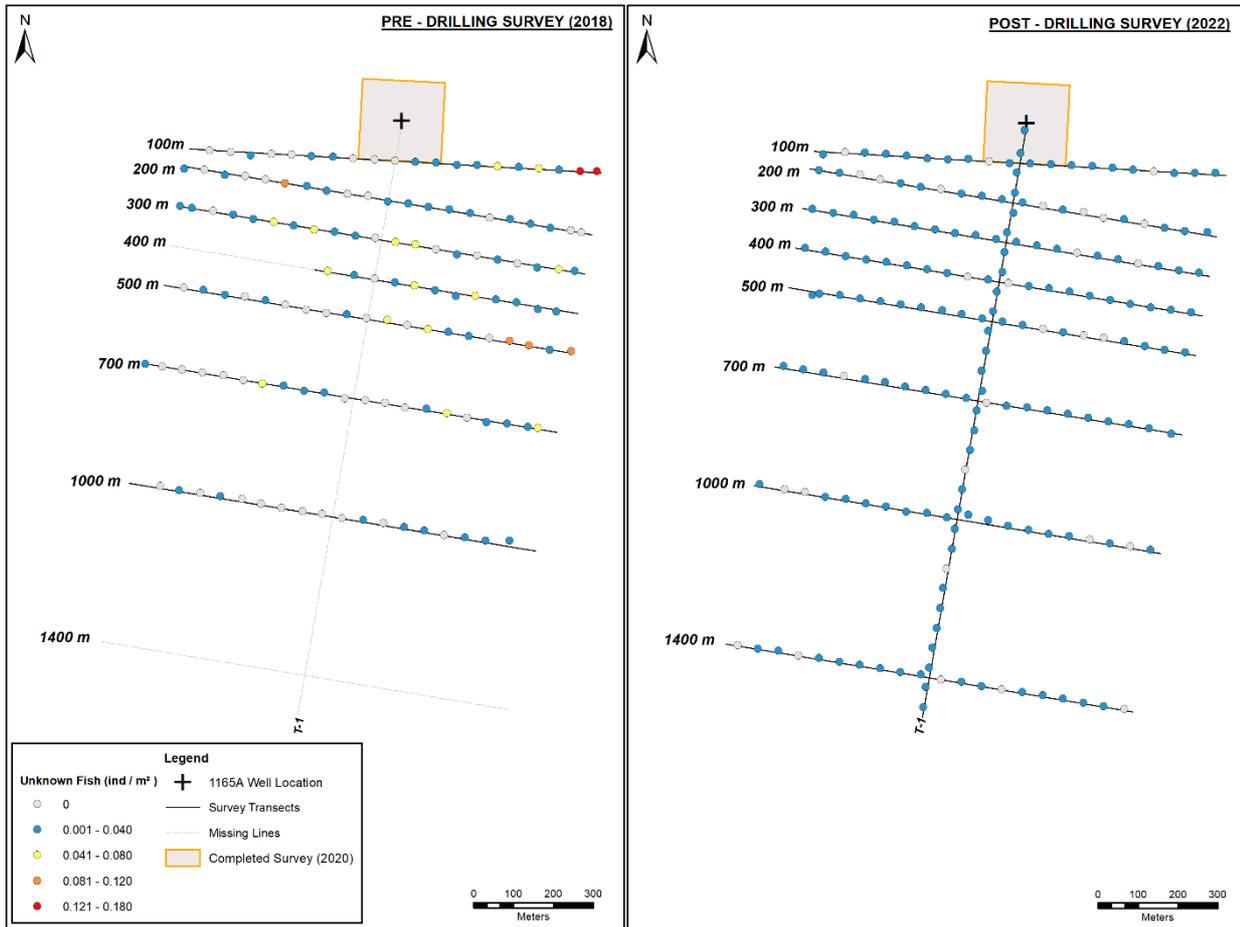


Figure B-9 Distribution of unknown fish densities (ind./m²) observed in the pre-drilling survey (2018) and in the post-drilling survey (2022). (Data from transect T-1400 and half of T-400 in 2018 were not available for re-analysis).