Newfoundland & Labrador Orphan Basin Exploration Drilling Program

BP Ephesus Pre-Drilling Benthic Fauna (Coral and Sponge) Seabed Survey Report

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Signature Block	Name	Role	Signature / Date
Owner	Dunphy, Robert	Environment Advisor	DocuSigned by: Robert Dunphy 27-Mar-2023
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Revision History

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23/Sep/2022	B01	Allen Sherritt	First draft
19/Oct/2022	B02	Allen Sherritt	Corrected Added Appendix D – an Addendum created by bp to add additional information to supplement section 2 Methodology as per DFO recommendation.
23/Mar/2023	B03	Allen Sherritt	In Appendix D, added update to section 3.1.4 to refer to the video analysis report CN002-EV-REP-600-00017 for sea pen. In Appendix D updated section 3.1.5 and 3.2.3 regarding black coral observations based on DFO feedback.

Operating Management System (OMS) – Sub Elements and Group Essentials

Sub Element	Sub Element Title	Group Essentials
3.6	Environment	
7.1	Regulatory	

Reviewers

Name	Role	Type of Review	Date Reviewed
John Drinkwater	Discipline Lead- HSE&C	General	Sept 19, 2022

BP EPHESUS PRE-DRILLING BENTHIC FAUNA (CORAL & SPONGE) SEABED SURVEY REPORT

EL1145

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BP EPHESUS PRE-DRILLING BENTHIC FAUNA (CORAL & SPONGE) SEABED SURVEY REPORT

EL1145

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Acronyms

ATL	Atlantic Towing Ltd.
BP	BP Canada Energy Group ULC
C-NLOPB	Canada Newfoundland and Labrador Offshore Petroleum Board
DFO	Department of Fisheries and Oceans
EIS	Environmental Impact Study
EL	Exploration License
FOV	Field of View
Pic	Picture
PNET	Predicted No-Effects Threshold
ROV	Remote Operated Vehicle
RPS	RPS Energy Canada Ltd.
SARA	Species at Risk Act

1 INTRODUCTION

In February 2020, BP Canada Energy Group ULC (bp) was released from the CEAA 2012 environmental assessment process, a process initiated in January 2018 to enable bp to conduct exploration drilling in the Orphan Basin located northeast of St. John's, NL. That process culminated with the issuance, by the federal Minister of Environment, of a February 2020 Decision Statement which contained a number of conditions which bp had to address prior to and after drilling. bp plans to drill it's first exploration well, Ephesus, within it's Orphan Basin operated acreage in 2023.

To address some Decision Statement conditions, BP contracted Atlantic Towing Limited. (ATL) to project manage and execute an ROV visual seafloor survey for benthic fauna (i.e., corals and sponges), and other seabed hazards or anomalies, at five potential drilling locations to better understand biological, archaeological, anthropogenic and geologic conditions. The survey was conducted inside the bp Exploration License (EL) 1145 from the ATL vessel Atlantic Condor, it commenced on June 17, 2022 and was completed on June 23, 2022. The primary purpose of the survey was to identify any habitat-forming corals or sponges or any other environmentally sensitive features which could require additional mitigation measures to ensure their protection or to minimize risks to drilling operations.

RPS Energy Canada Ltd. (RPS), was contracted to support the project with the provisions of Biologists and Marine Mammal Seabird Observers.

BP conducted drilling mud and cuttings dispersion modelling as presented in the BP Newfoundland Orphan Basin Exploration Drilling Program EIS. Additional modeling was conducted to validate the original result using a revised wellsite location which was used as the basis for the proposed survey.

The survey plan for each prospective well location was designed based on the results of cuttings dispersion modeling of the 1.5mm and 6.5mm PNET thresholds and incorporated standard and recognized mitigation measures to manage potential environmental risks.

This report also includes:

- Presence and distribution of coral and sponge functional/morphological groups.
- Surficial substrate observations.
- General observations of marine fish and other marine invertebrate species.
- Other observations (e.g., trawl marks); and anthropogenic/archaeologic remnants

The survey location is shown below in Figure 1.

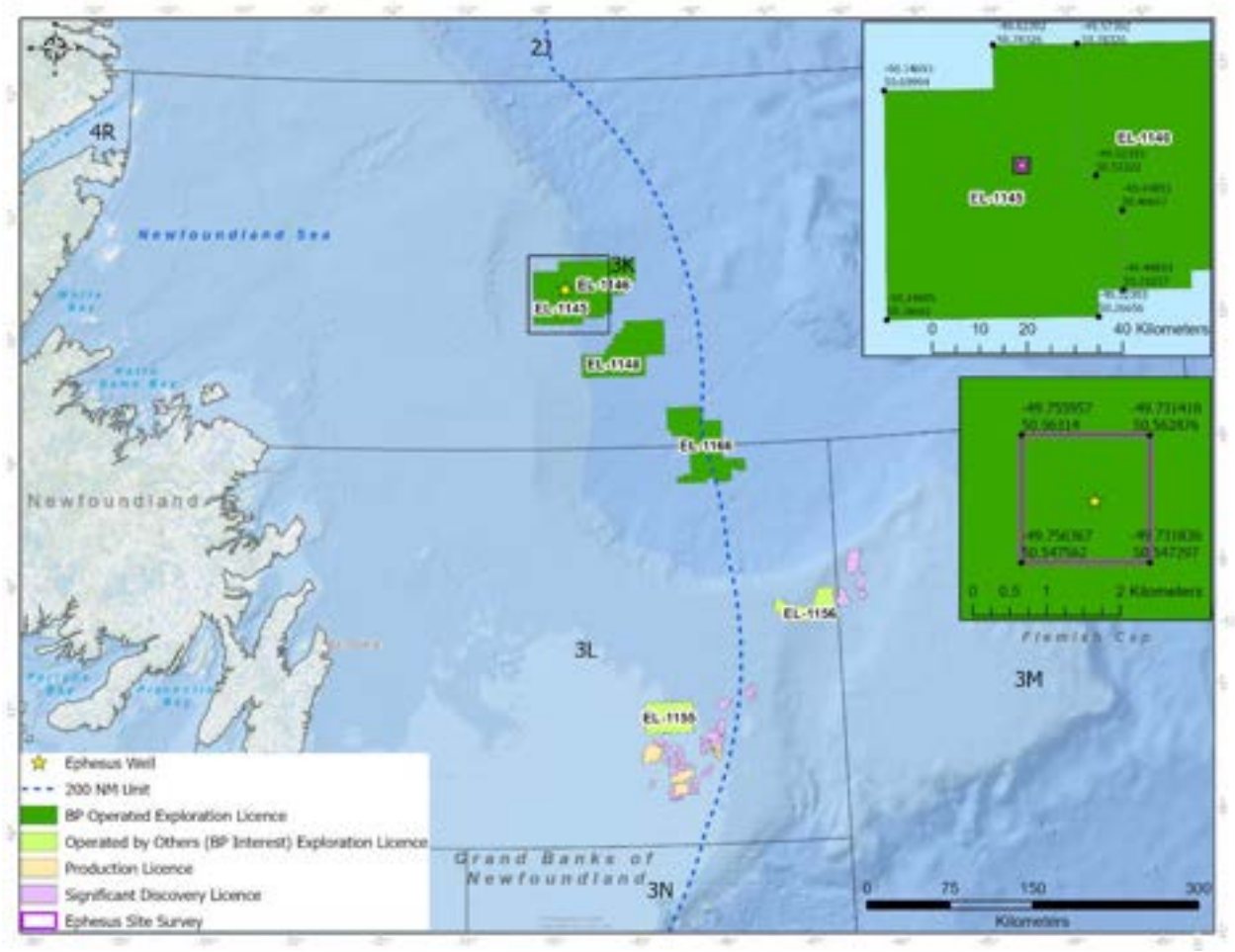


Figure 1: Benthic Fauna Survey Location

2 METHODS

Five well sites were surveyed within EL 1145 in the Orphan Basin between June 18 – June 23, 2022, utilizing the survey vessel Atlantic Condor. The five well site are listed in Table 1.

The Atlantic Condor (Pic 1) is a Canadian-built UT-A177726 755LN PSV, providing subsea / Inspection Repair Maintenance vessel services since it was purpose built in 2010 to support production projects offshore Nova Scotia and Newfoundland. The Atlantic Condor was equipped with an Oceaneering Magnum Plus 170 hp heavy work class (WROV) system operated by Oceaneering (Pic 2) as well as an Ocean Pro HD camera. UTEC provided onboard positioning survey systems and RPS supported environmental planning, Marine Mammal Seabird Observers and Biologists.

The ROV was used to collect video and still imagery along a pre-determined survey design plan. Survey transects lines varied between ~450 m to ~1200 m in length.

RPS marine biologists (24/7 coverage) were responsible for providing direction to ROV operators to ensure the collection of appropriate benthic video imagery for this assessment that meets C-NLOPB DFO guidance criteria including characterization of sessile benthic fauna and substrate. RPS also provided trained and experienced observers for marine mammal and seabird observations. Daily update reports were sent to bp detailing project activities and survey progress.

Picture 1: Atlantic Condor

Picture 2: Oceaneering Magnum Heavy Work Class ROV

2.1 BP Seabed Survey Plan

The survey plan for the project is described in bp document CN002-EV-PLN-600-00006 B03 dated June 8, 2022. The intent of the survey was to conduct an imagery-based seabed survey at potential drilling locations on EL 1145 to confirm the absence of shipwrecks, debris on the seafloor, unexploded ordnance, and sensitive environmental features, such as habitat-forming corals or species at risk. The survey design was based on the most recent cuttings dispersion model predictions.

The ROV survey plan included thirty-seven (37) primary lines that covered five (5) well locations shown below in Figure 2. Primary lines were spaced thirty meters (30m) apart and run on a northeastern trend. These primary lines consisted of a series of video transects of the following lengths: 600 m (3 lines), 820 m (3 lines), 1070 m (20 lines), 1170 m (2 lines) and 1270 m (9 lines). Ten (10) additional infill lines were run parallel to primary lines in the area of F-94 primary well, re-spud, and alternate well locations. The additional lines were approximately 460 m long and spaced thirty meters (30 m) apart at an offset of fifteen meters (15 m) from the primary lines. A wagon wheel format survey was completed at <1m altitude over the 5 proposed locations shown below in Table 1.

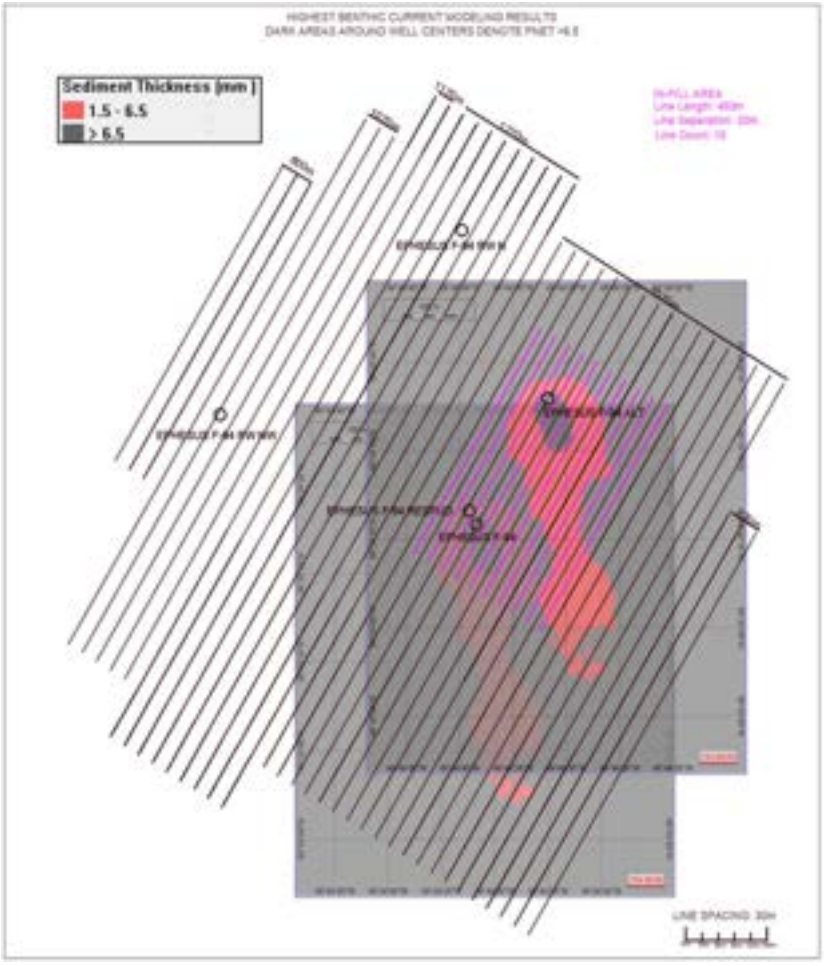


Figure 2: Survey Plan

2.1.1 Well Locations

Table 1: Well Locations

Well Locations	Easting (X)	Northing (Y)
Primary Well Location	589103.00	5601092.00
Re-Spud Location	589089.00	5601117.00
Alternate Location	589235.00	5601313.00
NW Relief Well Location	589235.00	5601285.00
North Relief Well Location	589076.00	5601609.00

*ESG: 32622 WGS84 / 22N meters

3 RESULTS

3.1 Observations and Classifications

3.1.1 Seabed Survey Parameters

The ROV survey plan included thirty-seven (37) main lines that covered the five (5) well locations. The lines were spaced thirty meters (30m) apart. At each of the 5 potential drilling locations, six 15m transects centred on the well sites were surveyed and an additional ten (10) lines were surveyed in the vicinity of the primary well, re-spud, and alternate locations. These additional infill lines were approximately 460m long and were spaced thirty meters (30m) apart at an offset of fifteen meters (15m) from the main lines. The total area surveyed was 58km (58,392 m) and water depths ranged from 1331-1345m. The actual survey completed is shown below in Figure 3.

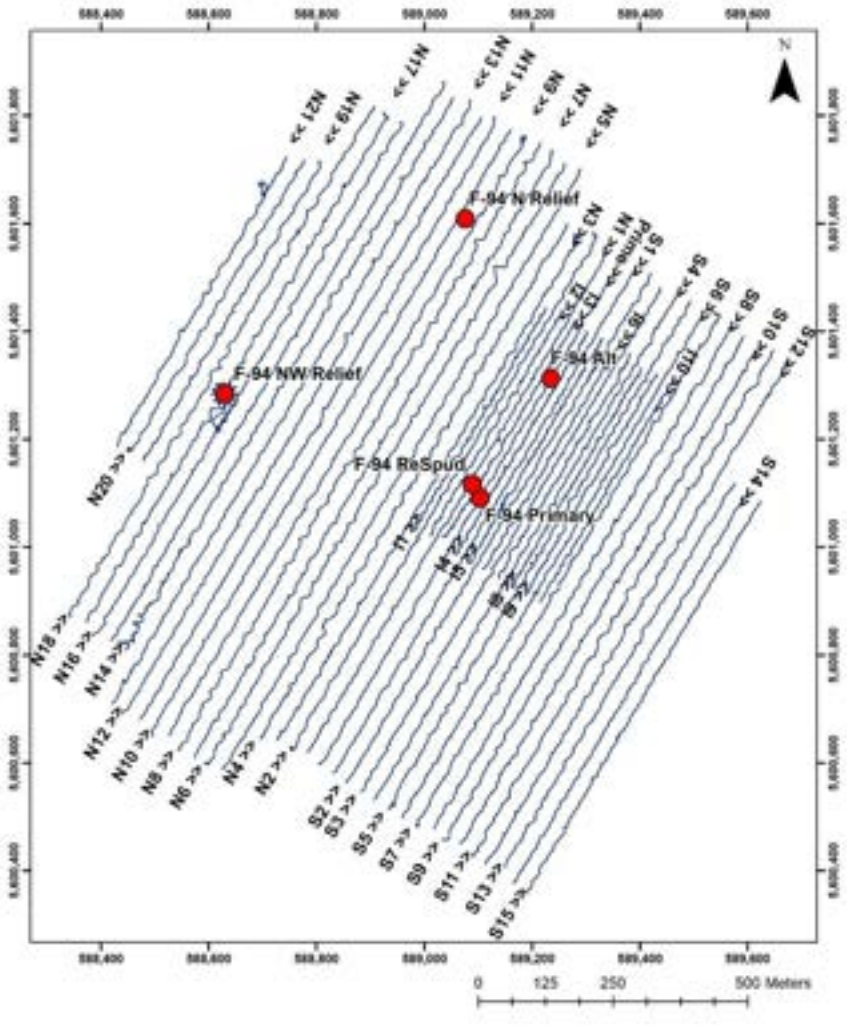


Figure 3: Actual Survey Tracklines

3.1.2 Benthic Fauna

The Benthic fauna observed was comprised of sea pens, cold water corals, sponges, sea anemones, fish and sea stars. The substrate throughout the survey area consisted of fine mud, sand and rocky substrates of various sizes. A total of 2336 observations of coral, sponges and sea pens were recorded during the survey. Total abundance (all species combined) was estimated to be 7098 individuals. Note that 'observations' are defined as the number of recorded instances, and 'abundance' refers to the number of individuals.

3.1.3 Macrofauna Characterization:

Macrofauna were identified to species when possible or to the closest taxonomic level to species. Due to the potential difficulties resulting from poor visibility, coral and sponge taxa were placed into functional groups according to E. Kenchington et al. 2015.

Taxonomic identification was dependant on quality of imagery from ROV and visibility of prominent characteristics.

Corals were assigned to one of five functional groups shown in Table 2. Sponges were assigned to one of six functional groups shown in Table 2. These functional groupings are based on size, shape, and distinguishing features.

Table 2: Coral Functional Groups

Order	Functional Group	Example Taxa
Antipatharia	Black	Stichopathes
Alcyonacea	Branching	Acanella spp
Alcyonacea	Soft	Anthomastus
Pennatulacea	Sea Pen	Pennatula
Scleractinia	Hard	Flabellum

Corals were identified using the following morphological criteria: soft corals (Alcyonacea) are characterized by lacking a hard structure and are flexible and fleshy in appearance. Black corals are large branching or whip like in shape, with small firm polyps. In the event black coral skeleton is exposed, it is black or brown in colour. Branching corals appear as larger and usually brighter in colour. They have a firm skeleton that that is bushy or fan like. Sea pens are solitary, erect and anchor in fine substrate. Hard corals exhibit a hard calcareous skeleton and are a solitary species that resembles a cup whereas the other colonial morphologies form a branching network.

The six sponge morphological groups are subdivided into the general shapes they present (Table 3). Although there are six morphological groupings, the stalked grouping was not identified during this survey.

Table 3: Sponge Morphological Groups

Order	Functional Group	Example Taxa
Demospongiae	Solid/Massive	Forcepia
Demospongiae	Leaf/Vase-Shaped	Axinellidae spp
Demospongiae	Round with Projections	Craniella
Hexactinellida	Thin-Walled, Complex	Asconema foliata
Demospongiae	Stalked	Stylocordyla borealis
Various	Other	Hymedesmia

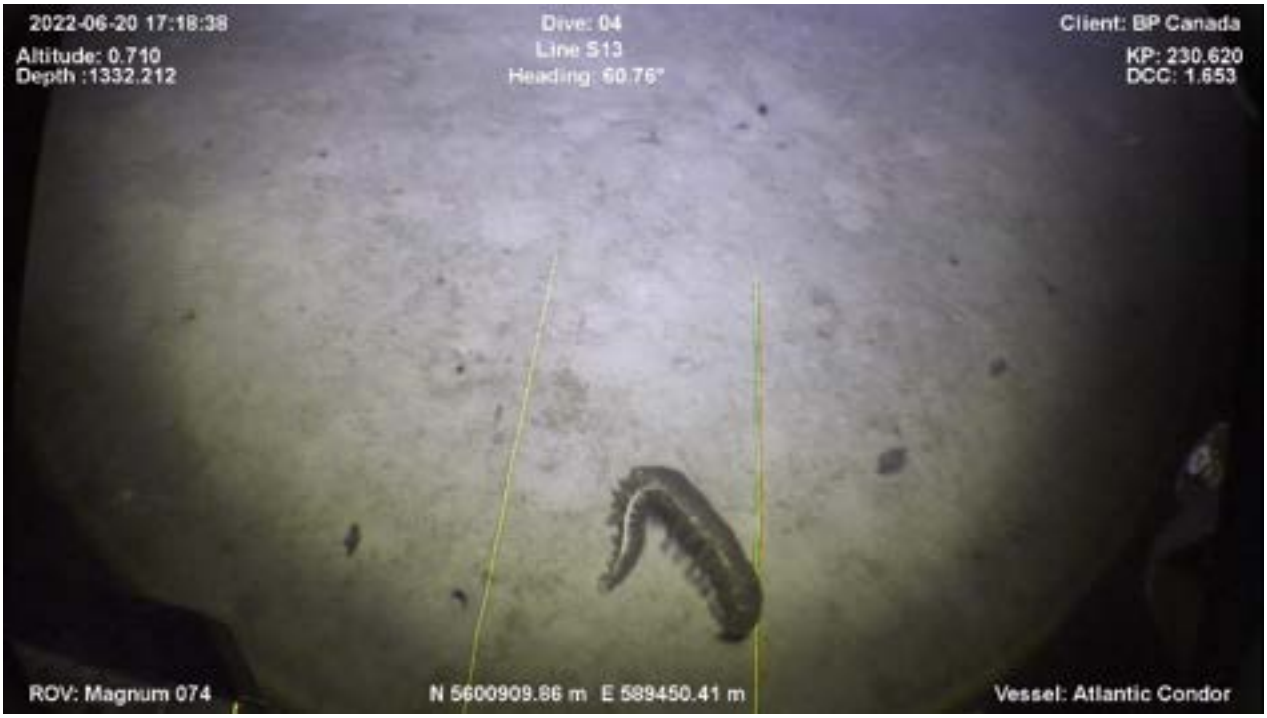
Sponges were identified using the following morphological criteria: Thin walled/complex sponges have spicules that are usually intricate mesh like patterns often known as glass sponge. Leaf/Vase shaped are fleshy anchored to a hard substrate. Solid /massive sponges are fairly compact and round or irregular shaped. Round with projection sponges is distinct and papillae looking with visible openings at the end. Stalked sponges have the bulk of their tissue centered around a stalk or stem. Other sponges can have a variety of body types from finger shaped, bladder encrusting etc.

3.1.4 Sea Pens

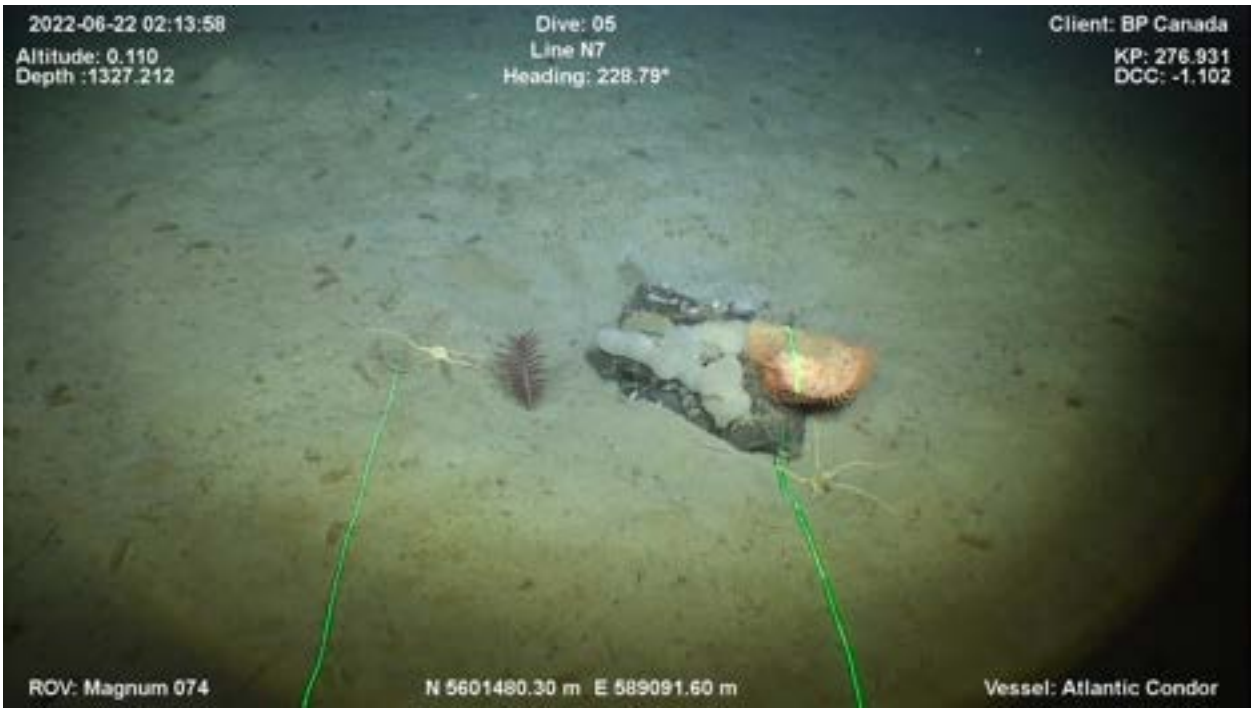
Sea pens appeared to be the dominant coral group in EL1145 occurring in high abundances throughout the survey area and therefore not all individuals could be recorded as observations. Six species of sea pens were observed: *Pennatula*, which was the more abundant species, as well as *Anthoptilum grandiflorum*, *Halipteris, Halipteris finmarchica, Distichoptilum gracile, and Ombellula*.

3.1.4.1 Photos – Sea Pens

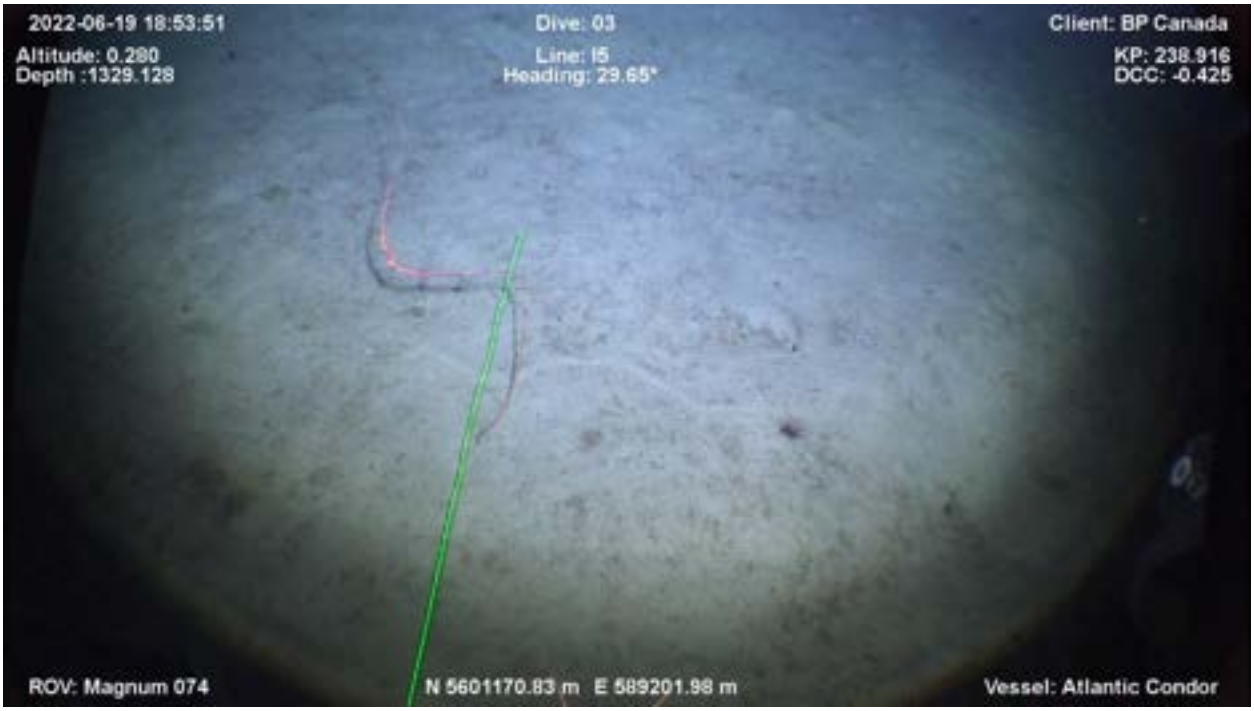
The following photos are examples of sea pens observed during the seabed survey.



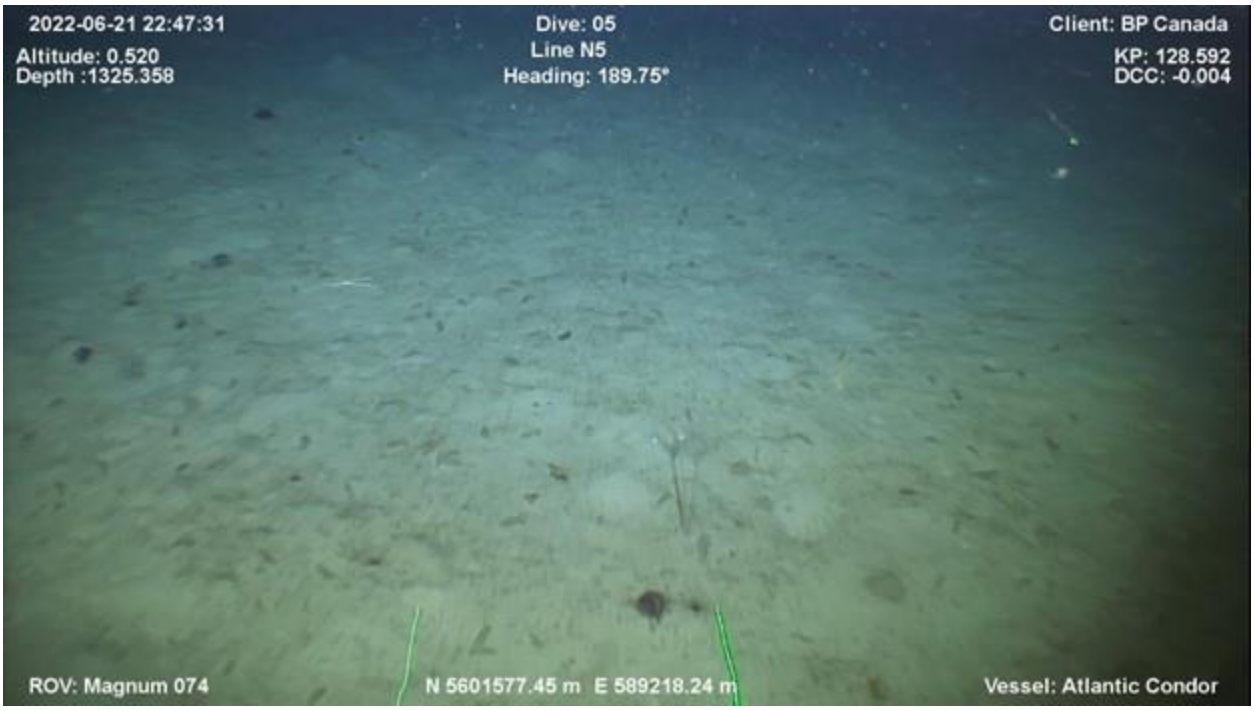
Picture 3: Sea pen, *Anthoptilum grandiflorum*



Picture 4: **Sea pen, *Pennatula* (middle), with glass sponge (*Asconema foliate*), venus fly trap anemone and brittle stars**



Picture 5: **Sea pen, *Halipteris finmarchica*, with a ceriantharian anemone**



Picture 6: Sea pens, *Ombellula*, with a *pennatula* in front

3.1.5 Corals (Other than Sea Pens)

Seven species of cold-water corals, aside from the sea pens were observed. Six under class (Octocorallia: Alcyonacae) were recorded in the survey area namely, Acanella arbuscula, Acanthogorgia armata, Anthomastus, Duva, Gersemia, Radicipes gracilis and one under class (Hexacorallia: Antipatharia), the Stichopathes.

The black coral data below was updated after DFO provided feedback on their review of the ROV video in March 2023. See Appendix D for details.

~~Stichopathes, Black Corals were observed on four transects, four were observed to be in good condition and one dead, all in the fine mud substrate. The dead black coral on transect I3 was 107 meters NNE of the primary well site. (Table 4).~~

~~Table 4: Location of Black Corals from Primary Well~~

~~Transect~~	~~Family~~	~~Condition~~	~~Primary Well X~~	~~Primary Well Y~~	~~Range to Primary (meters)~~	~~Azimuth to Primary~~
~~I3~~	~~Black Coral~~	~~Dead~~	~~589103~~	~~5601092~~	~~106.9729012~~	~~203.09450343593~~
~~N5~~	~~Black Coral~~	~~Good~~	~~589103~~	~~5601092~~	~~447.4193632~~	~~191.32349419943~~
~~N17~~	~~Black Coral~~	~~Good~~	~~589103~~	~~5601092~~	~~562.4626915~~	~~145.48916861316~~
~~N18~~	~~Black Coral~~	~~Good~~	~~589103~~	~~5601092~~	~~645.7426816~~	~~87.761697949974~~

~~Observations are defined as the number of recorded instances and total abundance refers to the total number of individuals. A total of 1985 observations were recorded from a total of 6666 individuals. See Table 5 for corals and sea pen observations and abundance per genus / species.~~

Table 5: Number of Observations and Total Abundance of Corals

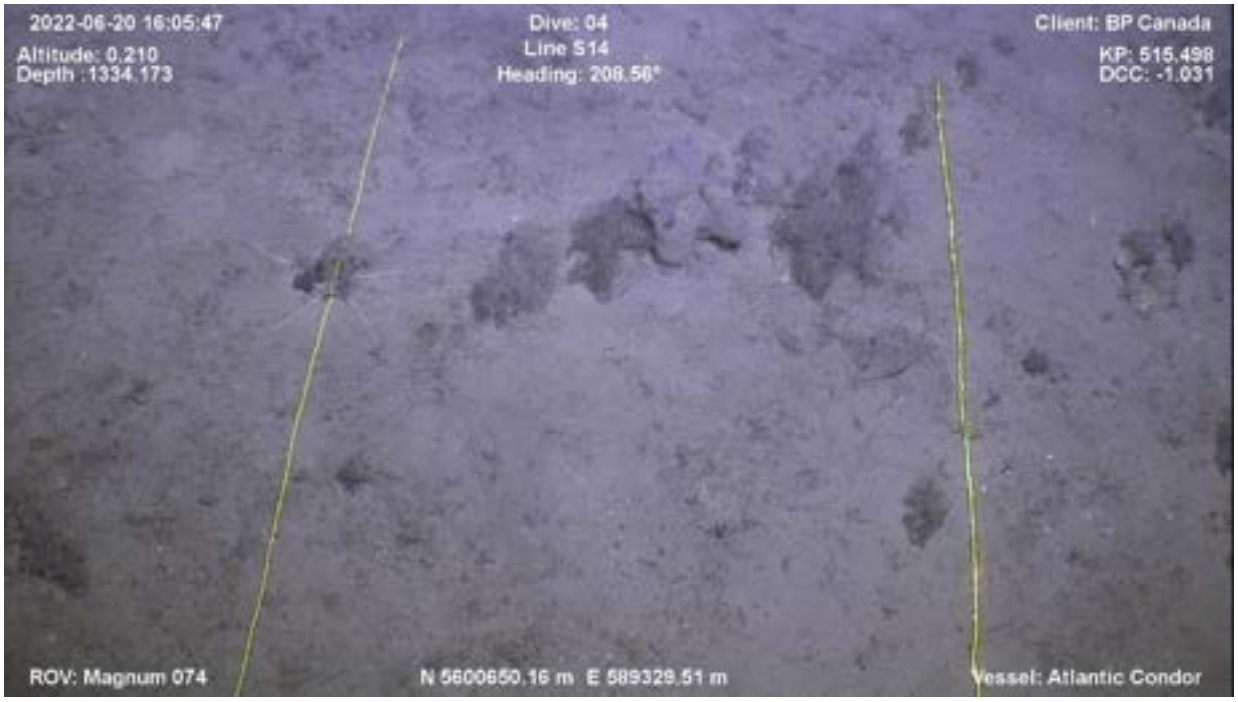
Genus or Species Name	#Observations	Total Abundance
Acanella arbuscula	1477	2107
Acanthogorgia armata	6	8
Anthomastus	77	170
Anthoptilum grandiflorum	5	9
Distichoptilum gracile	7	7
Duva	9	21
Funiculina quadrangularis	7	7
Gersemia	13	40
Halipteris	46	47
Ombellula	2	2
Pennatula*	299	<4198
Radicipes gracilis	10	14
~~Stichopathes~~	~~4~~	~~5~~
Unknown	23	31

**Pennatula were abundant throughout the survey area and therefore not consistently recorded as observations or individuals*

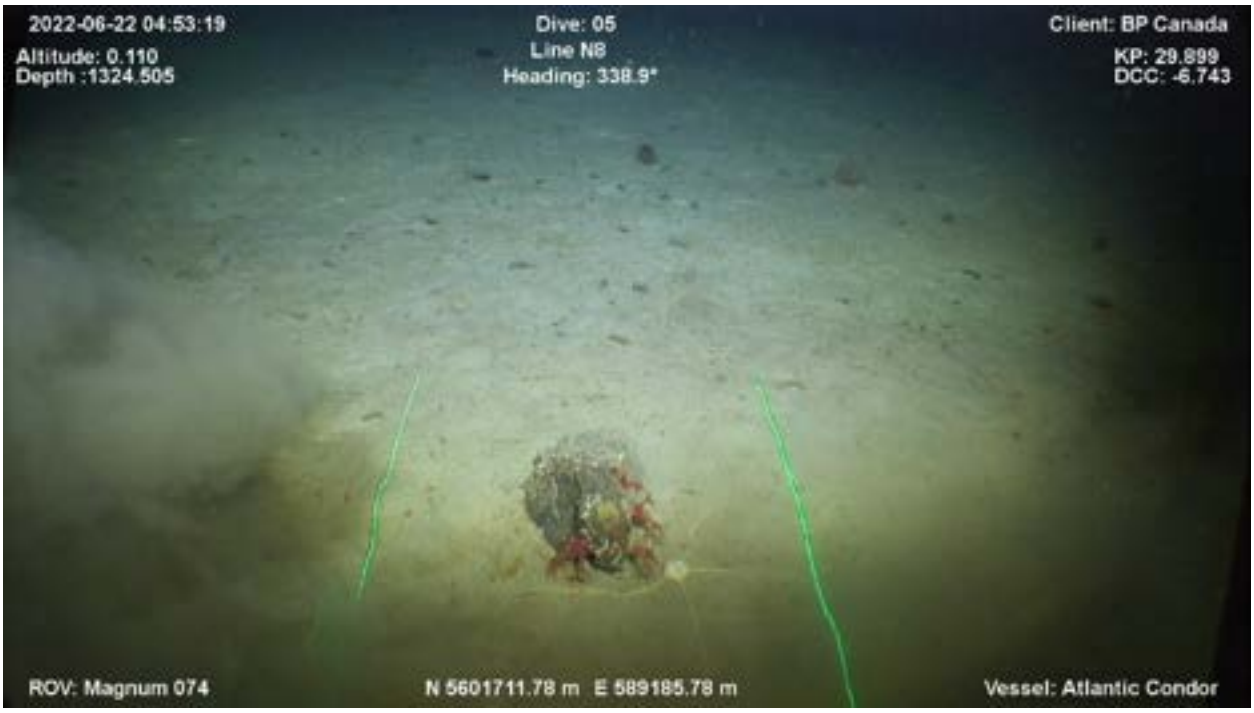
3.1.5.1 Photos - Corals

The following photos are examples of corals in the area surveyed.

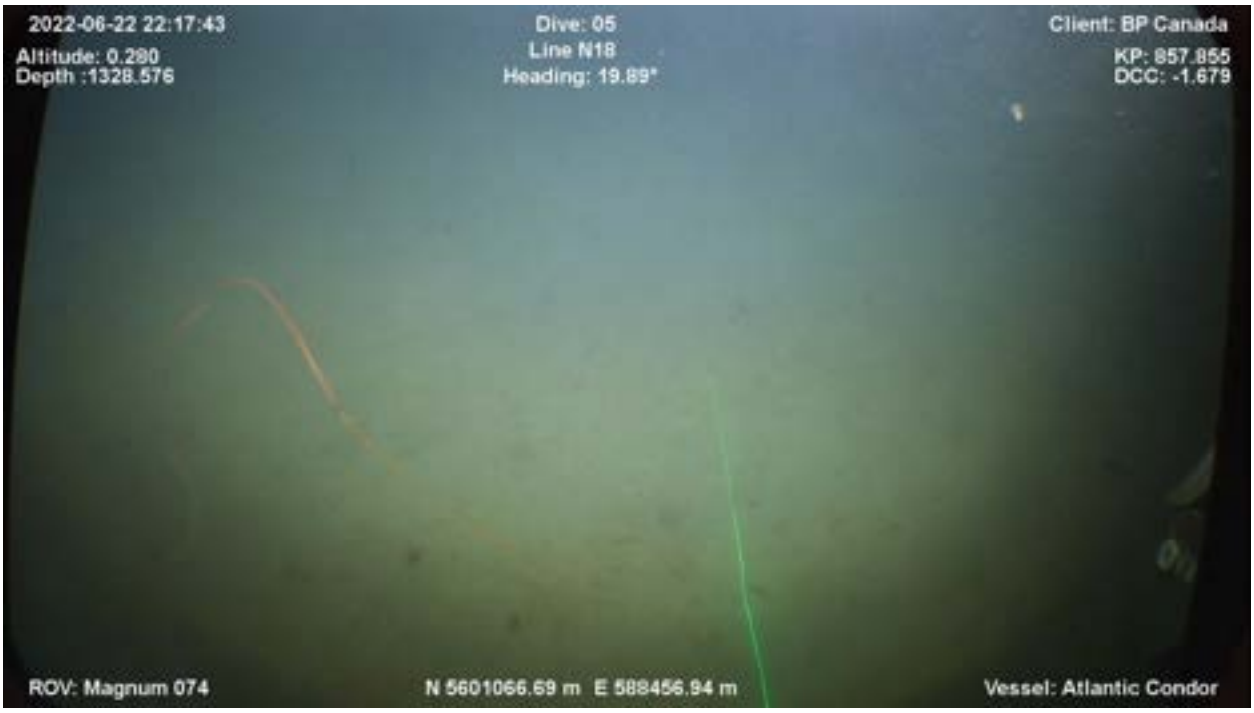
Picture 7: Branching coral *Acanella arbuscula* coral (right) with a brittle star (left of coral), *pennatula* (middle) and blue antimora (left)



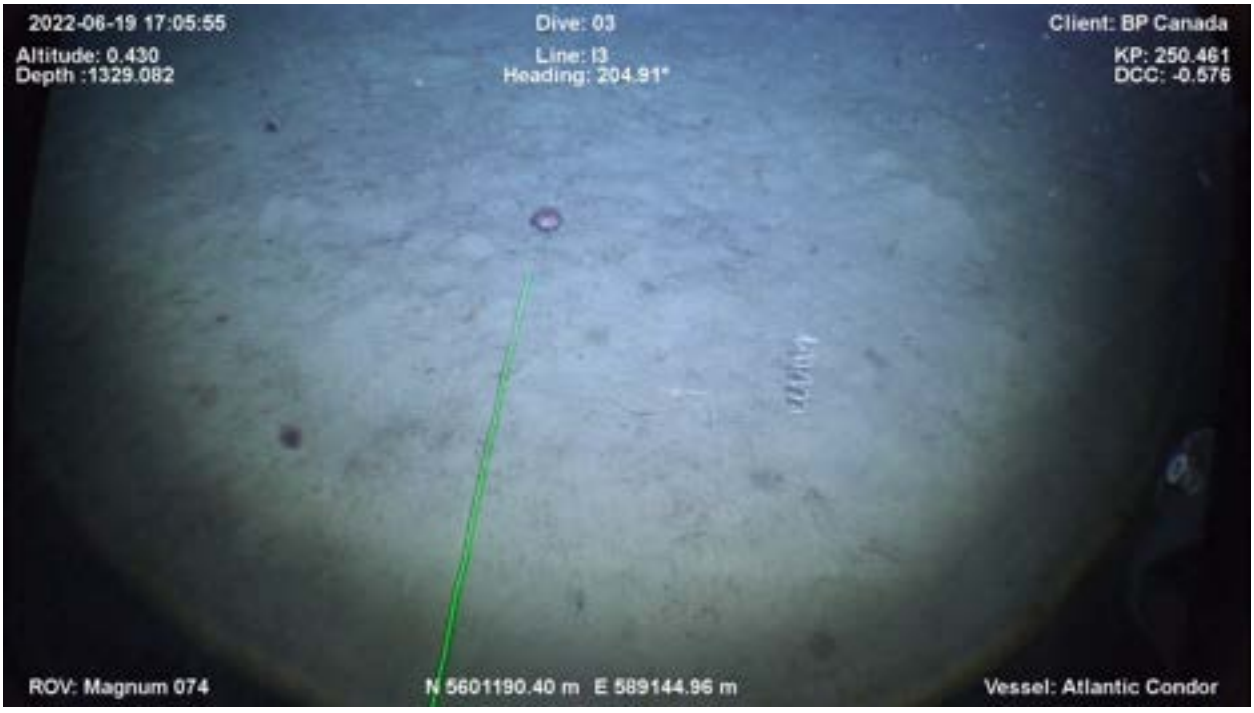
Picture 8: **Soft coral gersemia in fine mud, with a glass sponge (*Asconema foliate*) (middle) in the middle and a brittle star (left)**



Picture 9: **Soft coral *Athomastus* on a boulder, a brittle star (right), *Acanella arbruscula* (back right) and ceriantharian anemone.**



Picture 10: Black coral *Stichopathes* on fine mud substrate and ceriantharian anemone



Picture 11: Black coral (dead) *Stichopathes* (right) on fine mud substrate with *pennatula* (left), a sea urchin (middle back) and a brittle sea star (middle front).

3.1.6 Sponges

A total of eight sponge species were recorded during the survey. One under class (Hexactinellida: Lyssacinosida) namely, *Asconema foliate.* Six were under class (Demospongiae) namely, *Biemna variantia, Craniella, Hymedesmia, Polymastia, Stelletta and Thenea* and one under class (Poecilosclerida), namely *Forcepia*. There were 351 observations of sponges with 432 individuals observed in total. See Table 6 below for additional details on numbers of observations and abundance. Observations are defined as the number of recorded instances and total abundance refers to the total number of individuals.

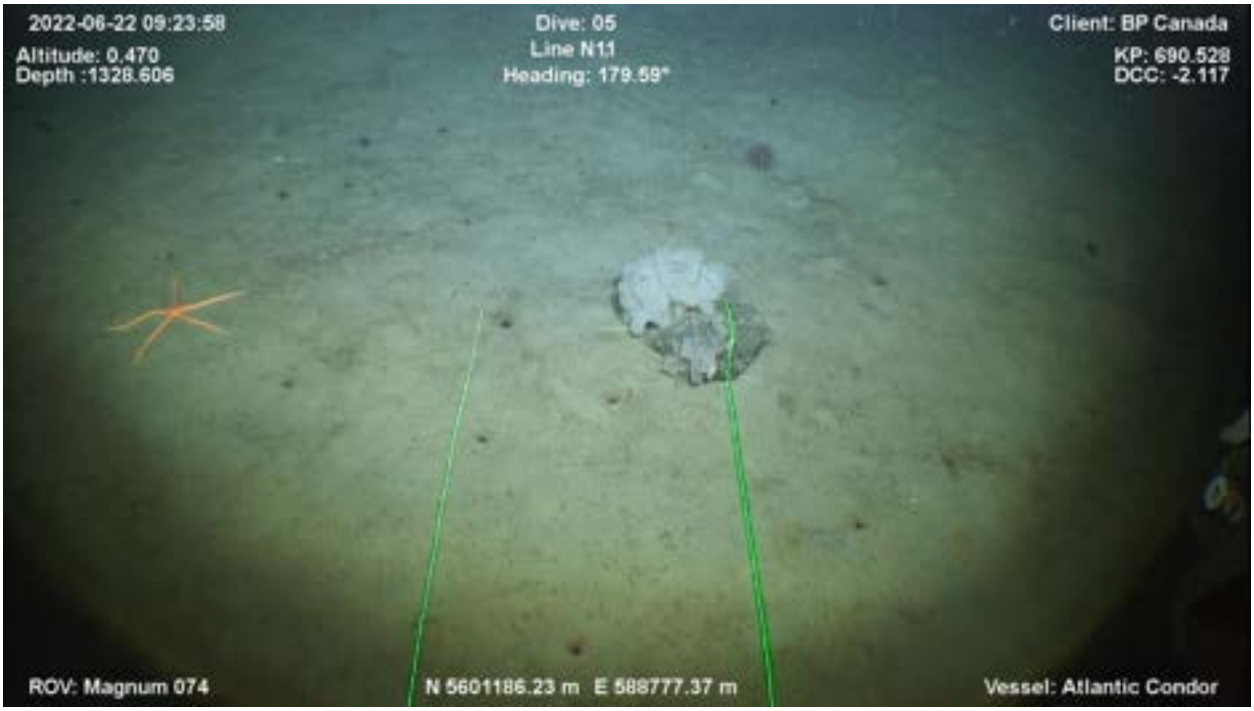
Table 6: Number of Observations and Total Abundance of Sponges

Genus or Species Name	#Observations	Total Abundance
Asconema foliata	182	208
Biemna variantia	1	1
Craniella	23	42
Forcepia	9	14
Hymedesmiidae	1	1
Polymastia	10	12
Stelletta	3	3
Thenea	1	5
Unknown	121	146

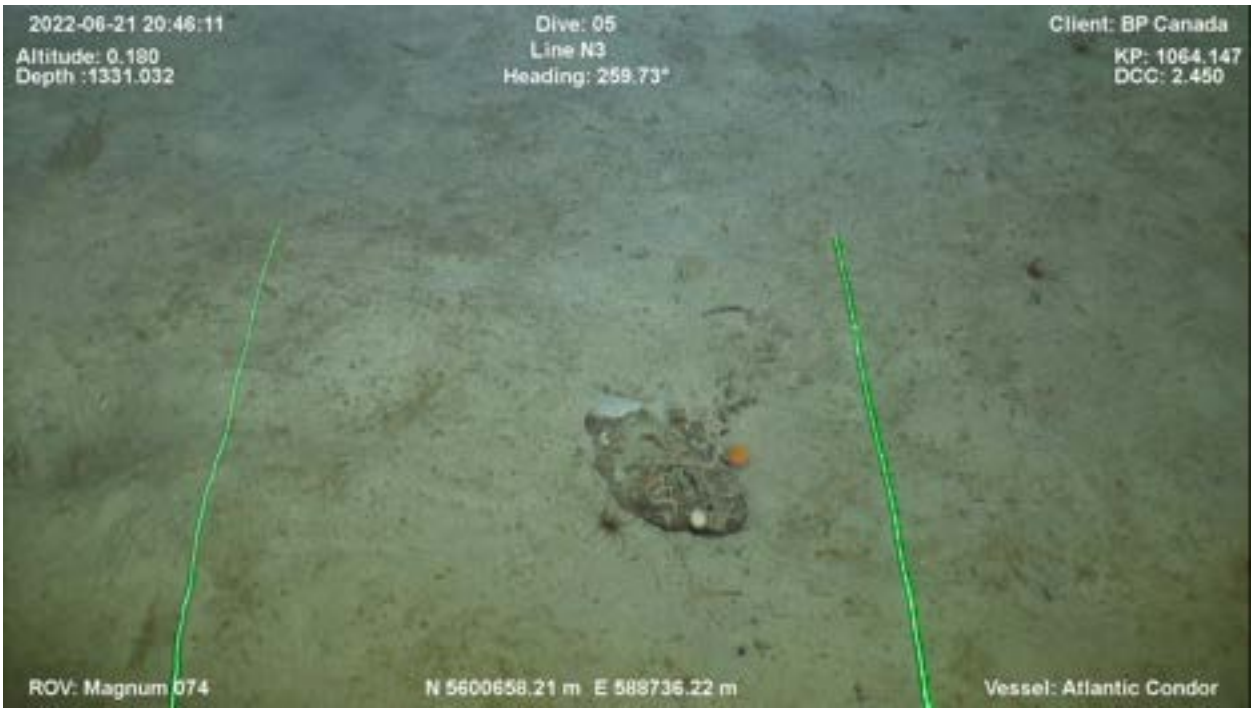
3.1.6.1 Photos - Sponges

The following photos are examples of sponges observed during seabed survey.

Picture 12: Round with projection, *Craniella* sponge with *Anthomastus* soft coral (red) and *Polymastia* spp (left)



Picture 13: ***Asconema foliata*** **(thin-walled/complex) sponge with** ***Pennatula*** **(behind), sea star (left) and ceriantharian anemones.**



Picture 14: ***Polymastia spp.*** **(round with projections) sponge (back orange) with ceriantharian anemones (on fine mud front and behind)** ***craniella*** **sponge (front right) (left) and encrusting white sponge (left).**

3.1.7 Other Megafauna

A variety of fish species and other megafauna were also recorded during the seabed survey.

Some species include Northern wolffish (*Anarhichas denticulatus*), grenadier (Sub-family: *Macrourinae*), blue antimoral (*Antimora rostrata*) red hake (*Urophycis chuss*), Abyssal skates (*Rajella bathyphila*), as well as a Jensen's skate (*Amblyraja jenseni*), various sea stars such as brittle stars and Northern sun stars, porcupine crabs (*Neolithodes grimaldii*), octopuses thought to be from the genus *Bathypolypus*, or family Bathypolypodidae, squids, shrimp and small fish and eels.

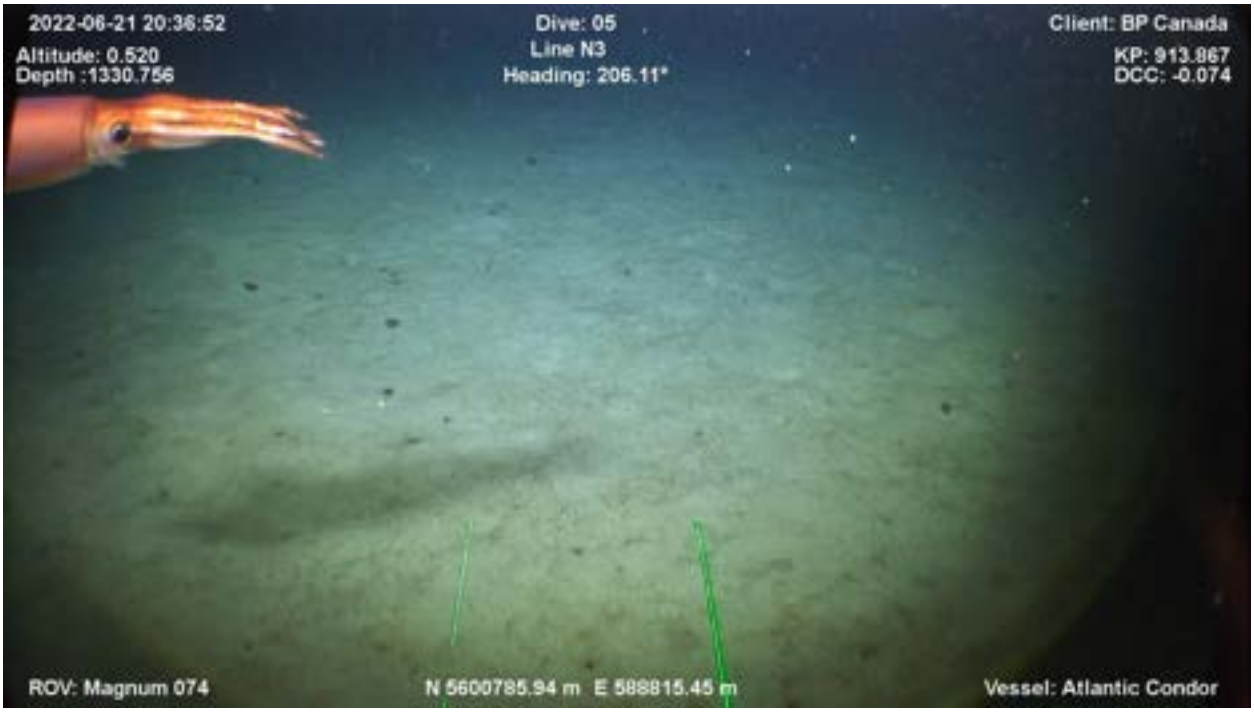
The Northern Wolffish were seen, but not limited to, infill lines 2 and 9, the Prime line and S13.

Megafauna were identified to species when possible or to the closest taxonomic level to species without compromising the confidence level of probability of the taxonomy. Megafauna observations were opportunistic as they were not the subject of the survey and therefore not recorded on a consistent basis rather noted for presence and existence in the survey area.

3.1.7.1 Photos - Mobile Megafauna

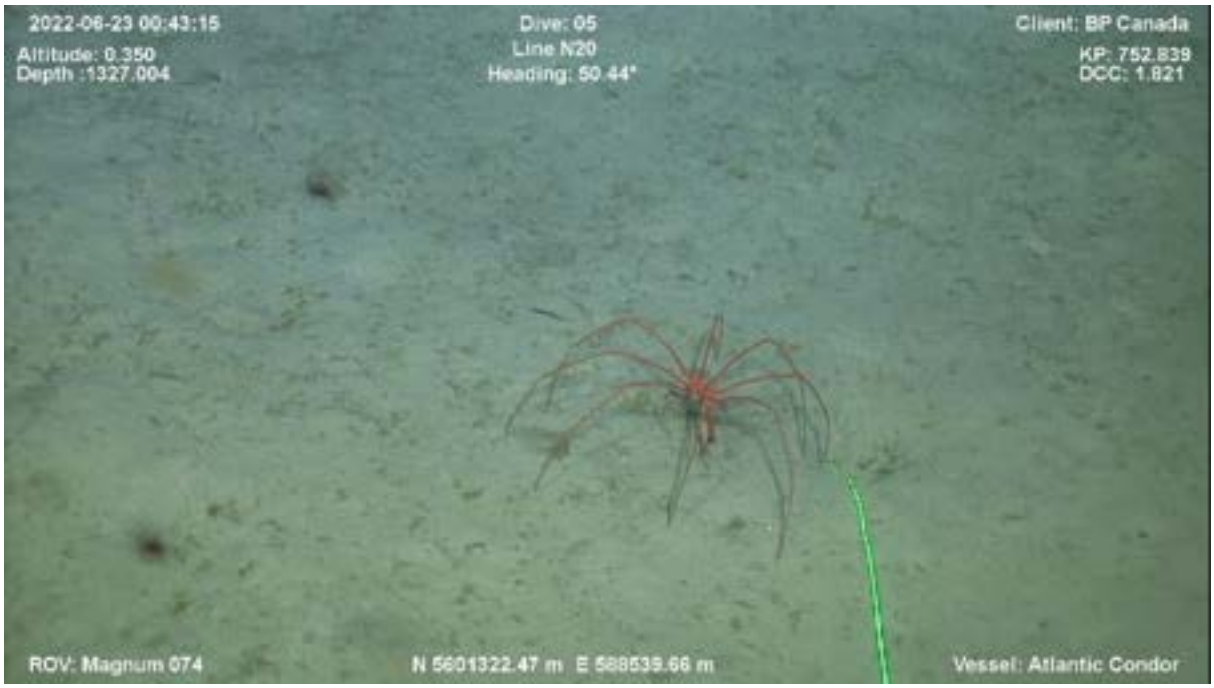
The following are examples of mobile megafauna observed during the 2022 Orphan Basin EL1145 seabed ROV video survey.

Picture 15: Top left, Red hake (*Urophycis chuss*), top right Grenadier (Sub-family: Macrourinae), bottom left Atlantic Wolffish (*Anarhichas lupus*), bottom right Blue antimora (*Antimora rostrata*)



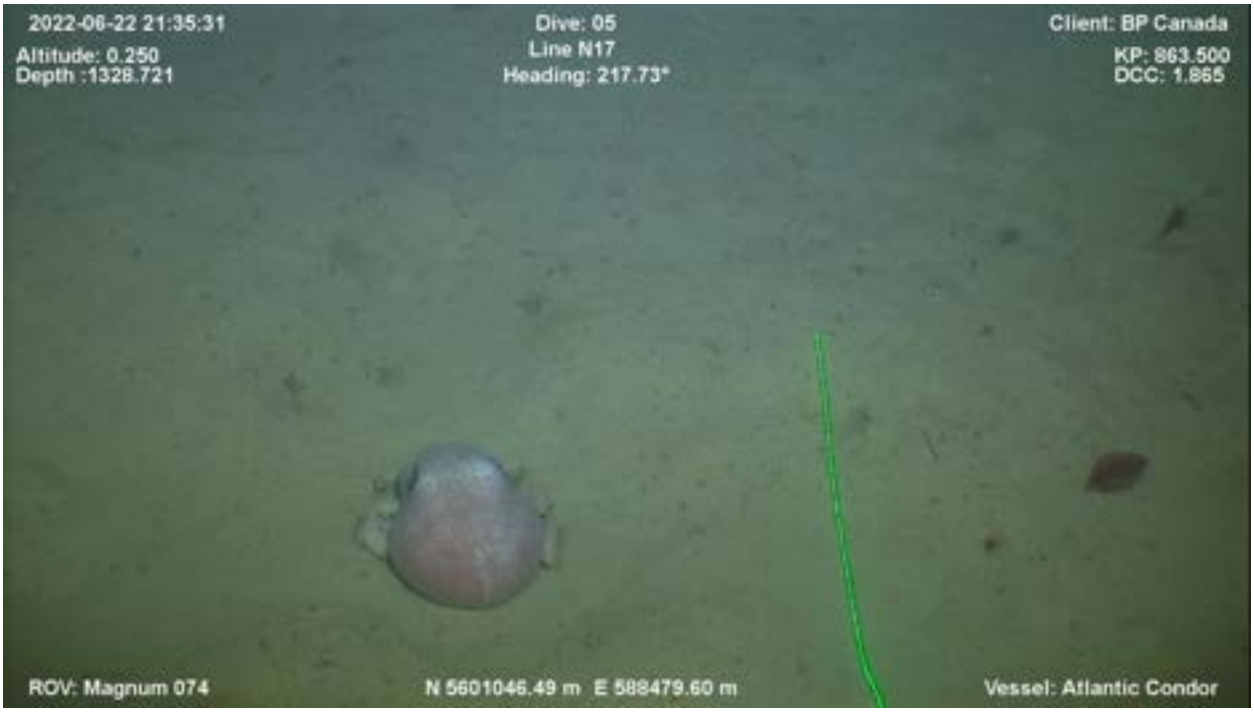
Picture 16: Squid spp

Picture 17: Porcupine crab (*Neolithodes grimaldii*) with *pennatula,* ceriantharian anemones and an unknown organism

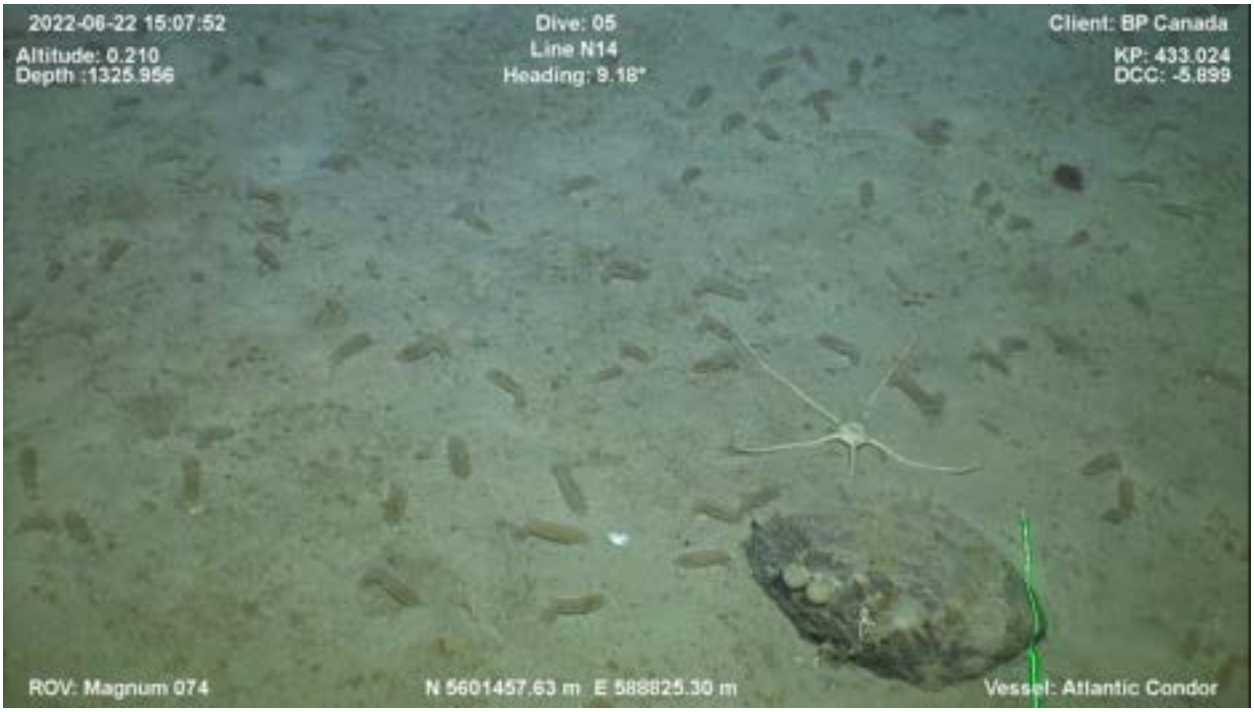


Picture 18: Sea spider from the order pantopoda with ceriantharian anemones

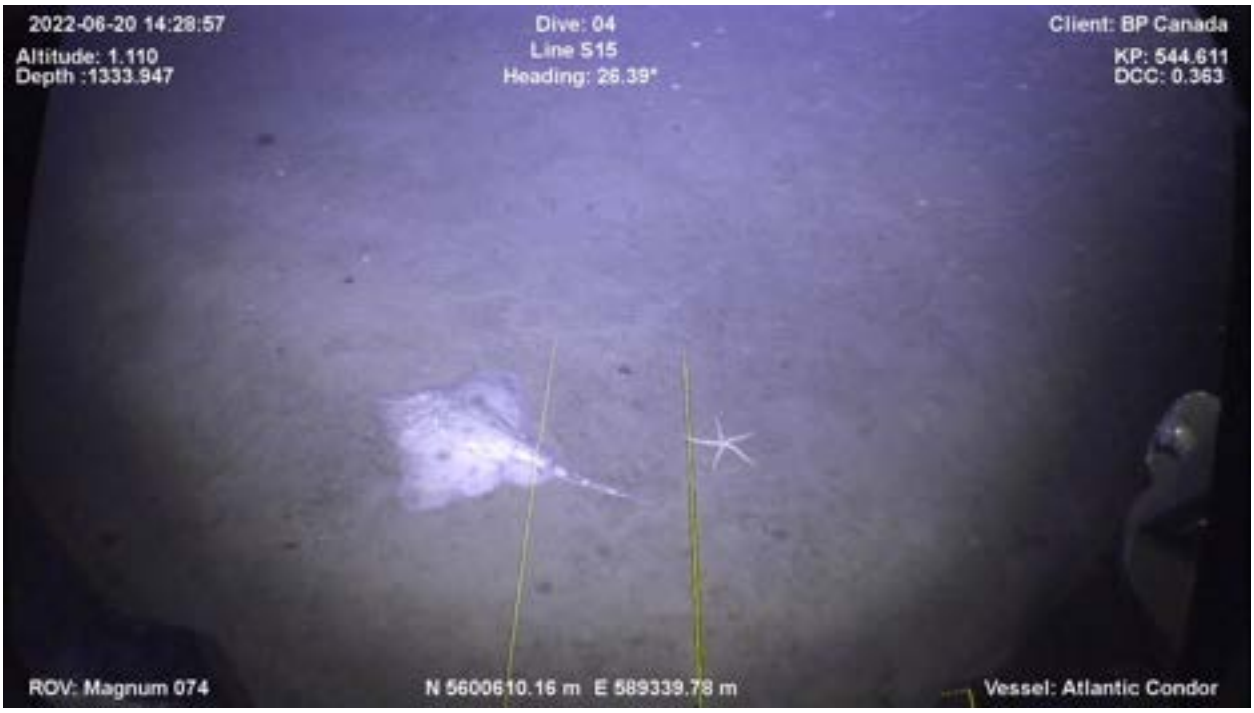
Picture 19: Octopus thought to be from the genus *Bathypolypus* with ceriantharian anemones



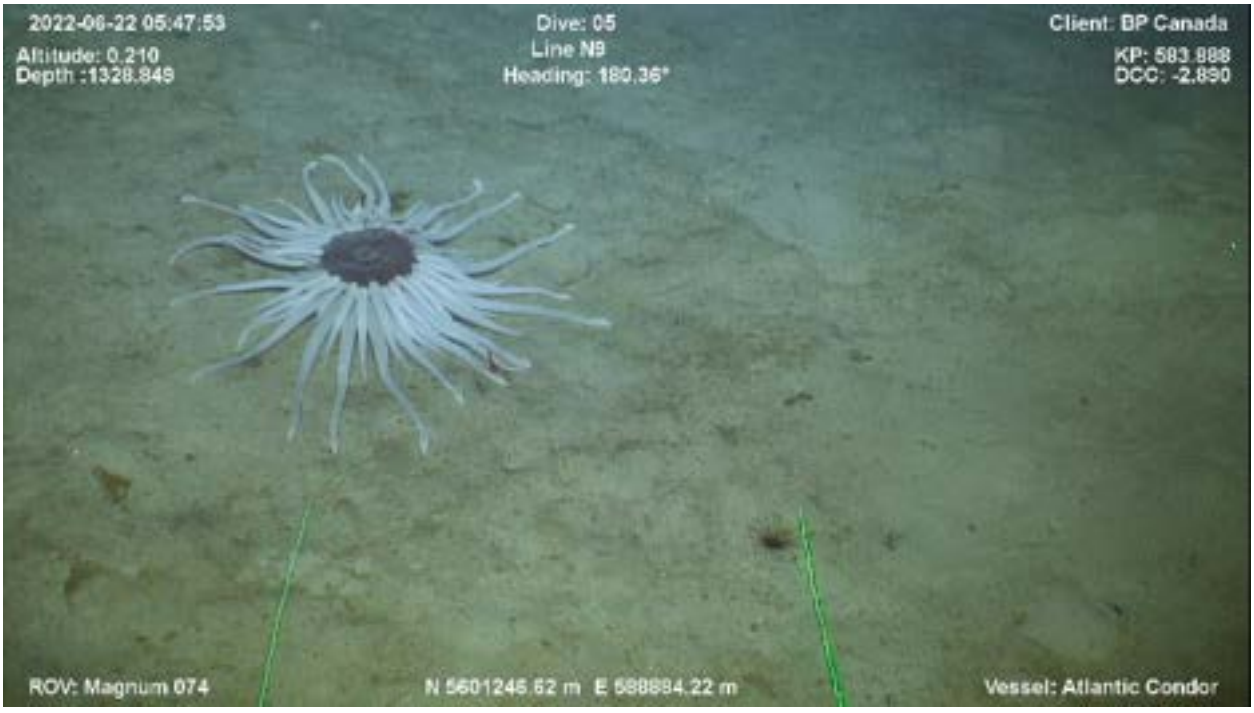
Picture 20: Octopus in a depression thought to be from the genus *Bathypolypus* with *pennatula* (right)



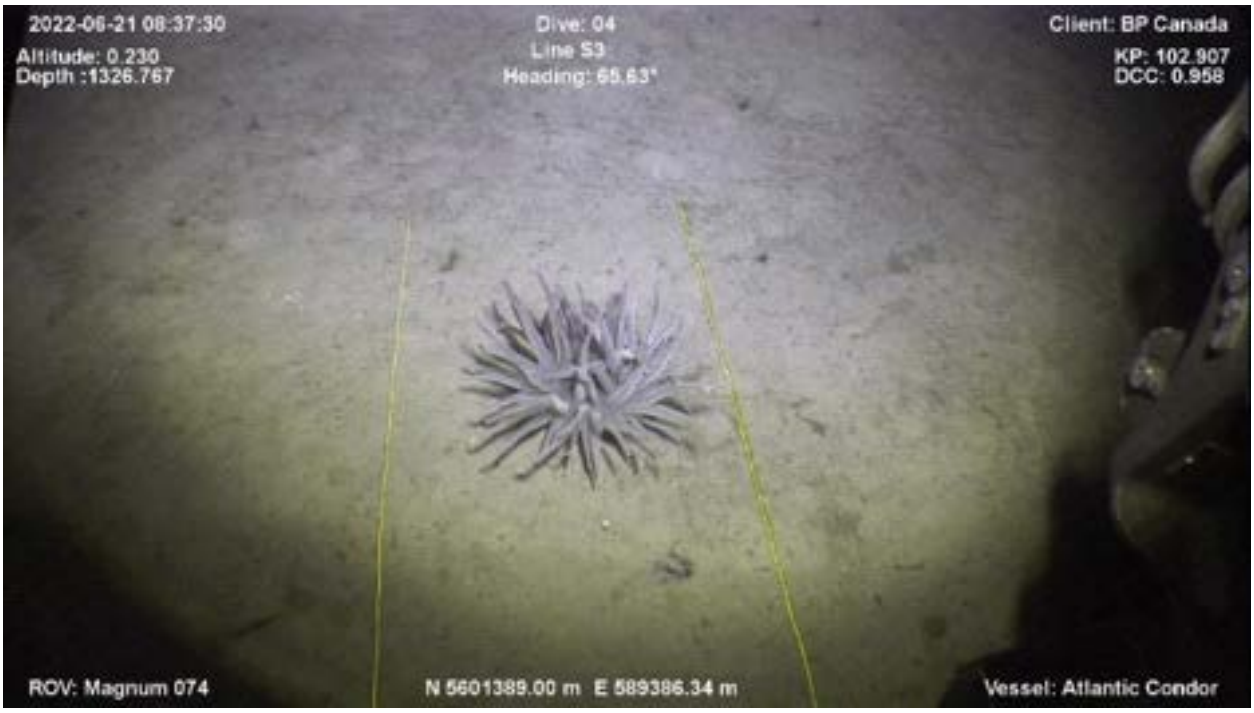
Picture 21: Unknown spp. Thought to be from the family Dendronotidae and possibly genus *Dendronotus* which includes sea slugs, nudibranchs, marine gastropod molluscs. Also contains *craniella* sponge and a brittle sea star



Picture 22: Jensen skate (*Amblyraja jenseni*) with a sea star

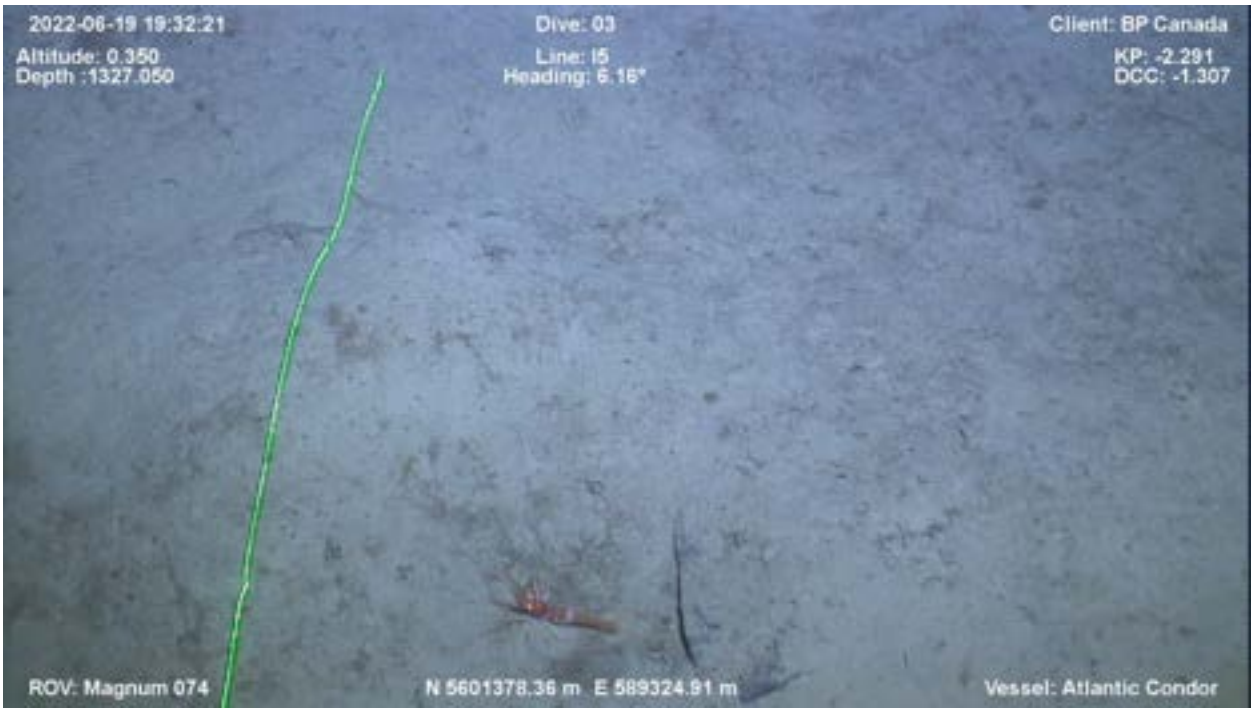


Picture 23: Deep Sea anemone found throughout the survey on EL1145

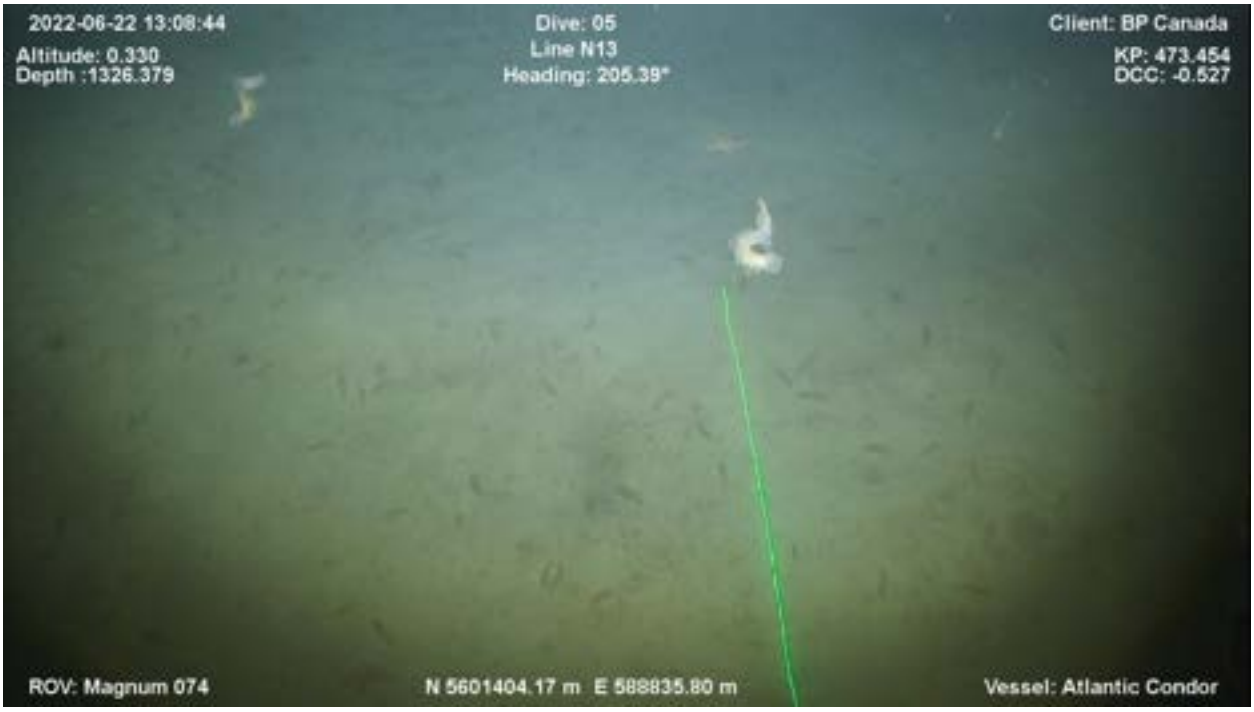


Picture 24: Deep Sea anemone found throughout the survey on EL1145

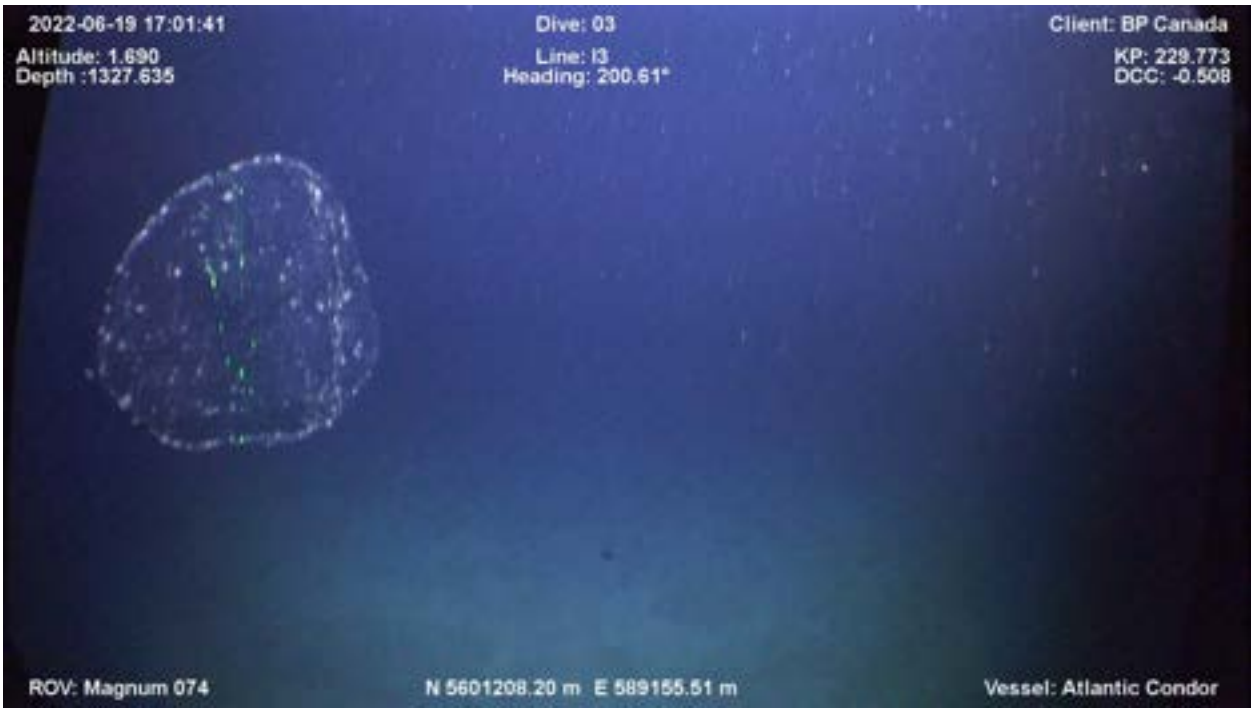
Picture 25: Deep Sea anemone found throughout the survey on EL1145



Picture 26: Shrimp spp found on infill lines of the seabed survey



Picture 27: Unknown species in water column, same as ones found on ocean floor in picture 21. Thought to be from family dendronotus - sea slugs, nudibranchs, and marine gastropod mollusc



Picture 28: Comb jelly seen on transect I3

Picture 29: Unknown species of jellyfish at the primary well site

3.1.8 Habitat Characterization

3.1.8.1 Surficial Geology

Seabed surface substrates were determined visually using the Wentworth-Udden particle scale (Kelly et al, 2009, Wentworth 1922), shown below in Table 7. The identification of substrate was based on observations of ROV video alone, as no samples were taken to confirm composition and official grain size measurements.

RPS utilized the observations of substrate type to generate a 5 m bin raster map of the seabed using the "Topo to Raster" function in ArcGIS (Sheet 1) Appendix A. This map shows coarse to medium grained substrate (Gravel, Cobble, Rubble, Boulder) as yellow and fine-grained substrate (Sand or Mud) as grey.

Table 7: Substrate Categories for Benthic Substrate

Substrate Class	Substrate Type	Definition of particle size class
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 0.06m 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

3.1.8.2 Habitat and Distribution of Fauna

RPS then overlaid the Coral/Sponge observation locations from the offshore survey over the substrate raster to produce Sheet 2, Appendix A. The distribution of coral and sponge observations on (Sheet 2) suggests that corals generally show an affinity for fine-grained substrate as their habitat while sponges have a partiality for coarse grained substrate for habitat.

3.1.9 Condition

Coral and sponge conditions were recorded, when possible. The ROV was in constant motion and did not stop. Due to this most conditions were recorded as good or dead. Others, unless clearly visible as bent or covered are left blank as unknown.

Conditions included were good (alive), this is when the organism was clearly in good health. Dead was when the organism was clearly dead, it was white in colour showing only its skeleton. Bent was when the organism was showing damage from far enough away it was seen without having to stop or inspect. Variations of covered were used as poor health. Since the ROV was in constant motion any variation of covered organism was put under one covered column to show poor health. Unknown refers to when the condition was not obvious due to many variables, such as speed of ROV, visibility, height from ROV, distance from ROV. See Table 8 below.

Table 8: Coral and Sponge Condition Descriptions

Condition	Description

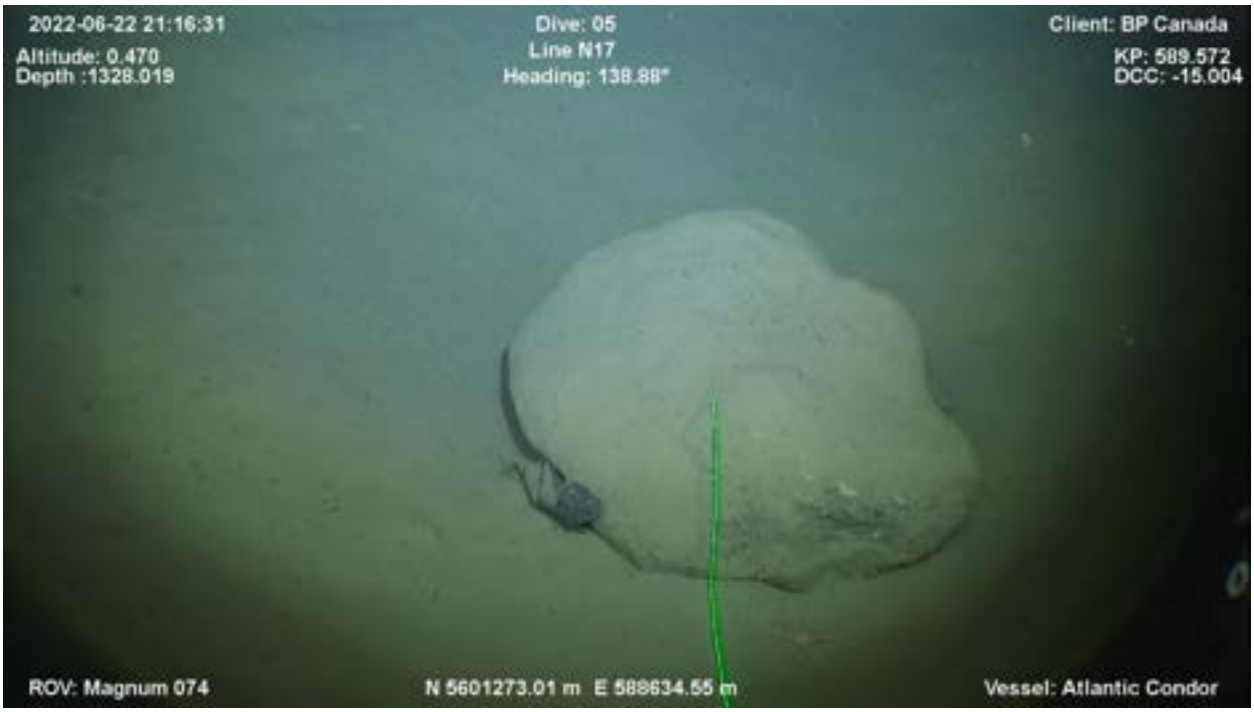
Good	Alive. Upright with no visible sedimentation
Dead	Skeleton left, white in colour usually
Bent	Portion has visible damage, broken, or polyps missing
Covered	Sediment is partially or completely covering the specimen. Poor health
Unknown	If condition was questionable and not visibly good or dead was left blank and therefore unknown

3.1.10 Other Observations

Any anthropogenic, abnormal anomalies or debris observed during the survey were noted. This survey included trench marks, plastic debris, fishing nets, depressions in the ground, and large boulders. Trawl marks were defined as long straight lines that did not appear to be natural in origin. Depressions in the ground were defined as landform that is sunken below the surrounding area.

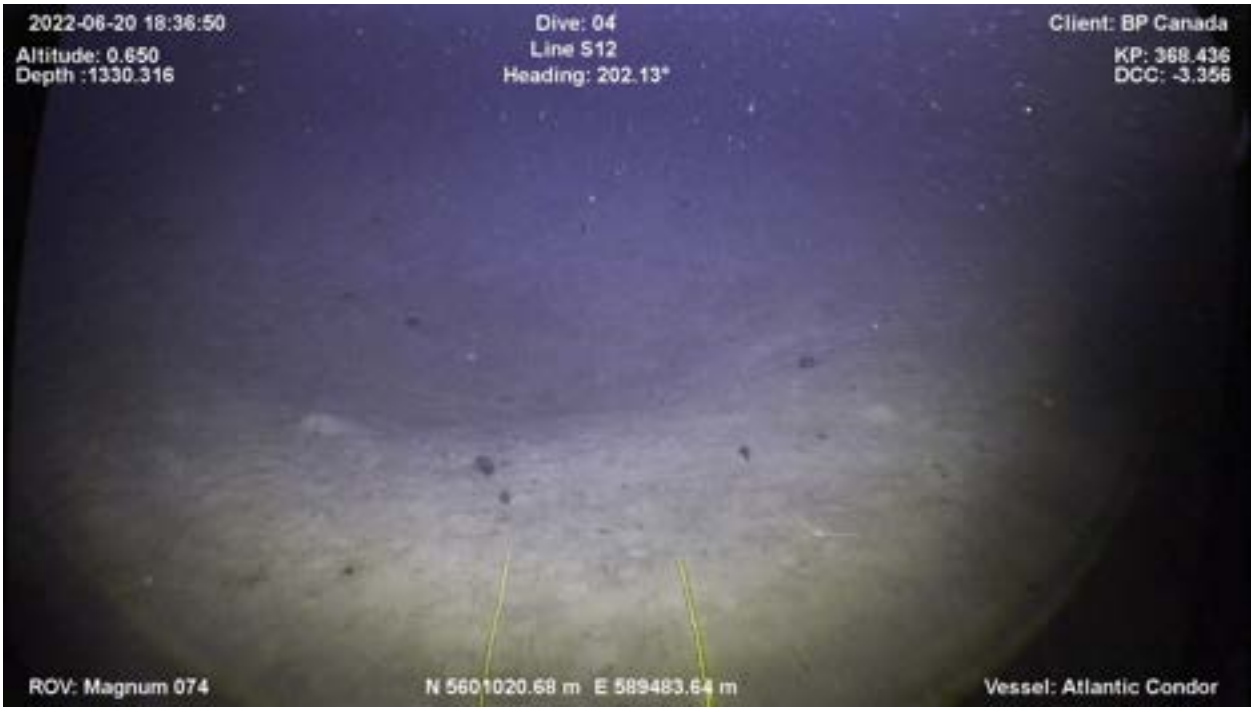
3.1.10.1 Photos

Other observations during the 2022 Orphan Basin EL1145 seabed ROV video survey.

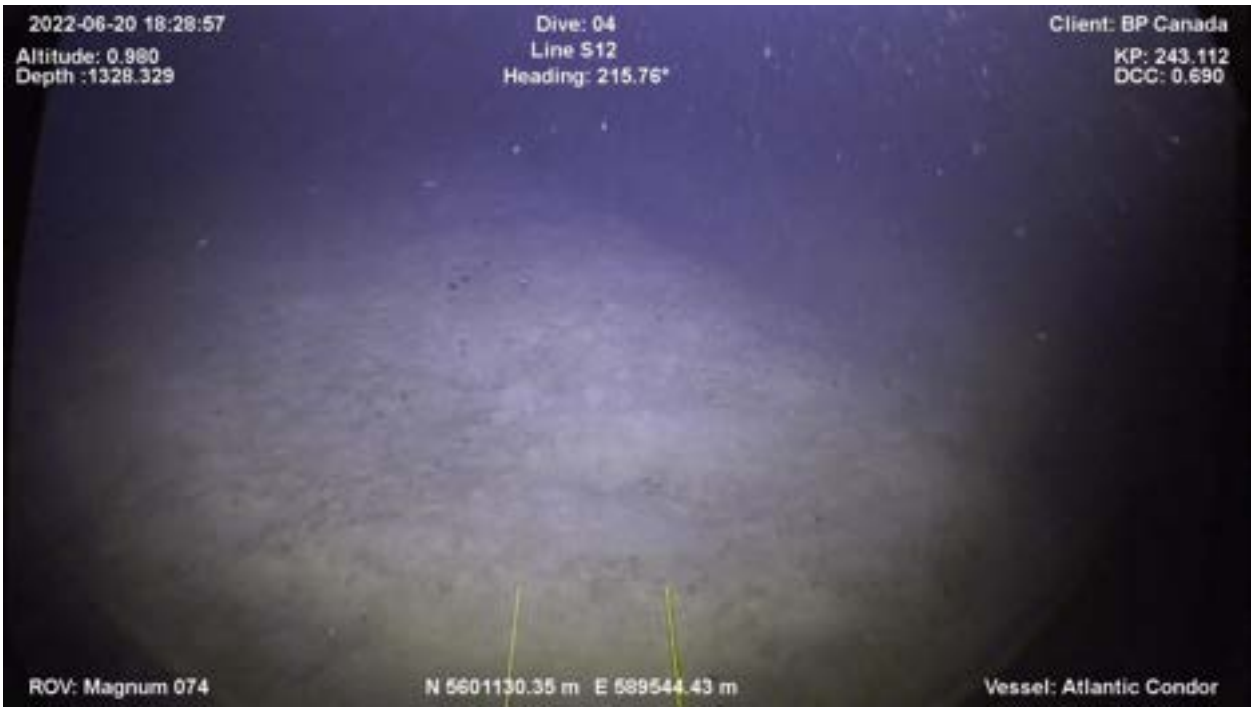


Picture 30: Boulder observed on well site F-94 RW NW

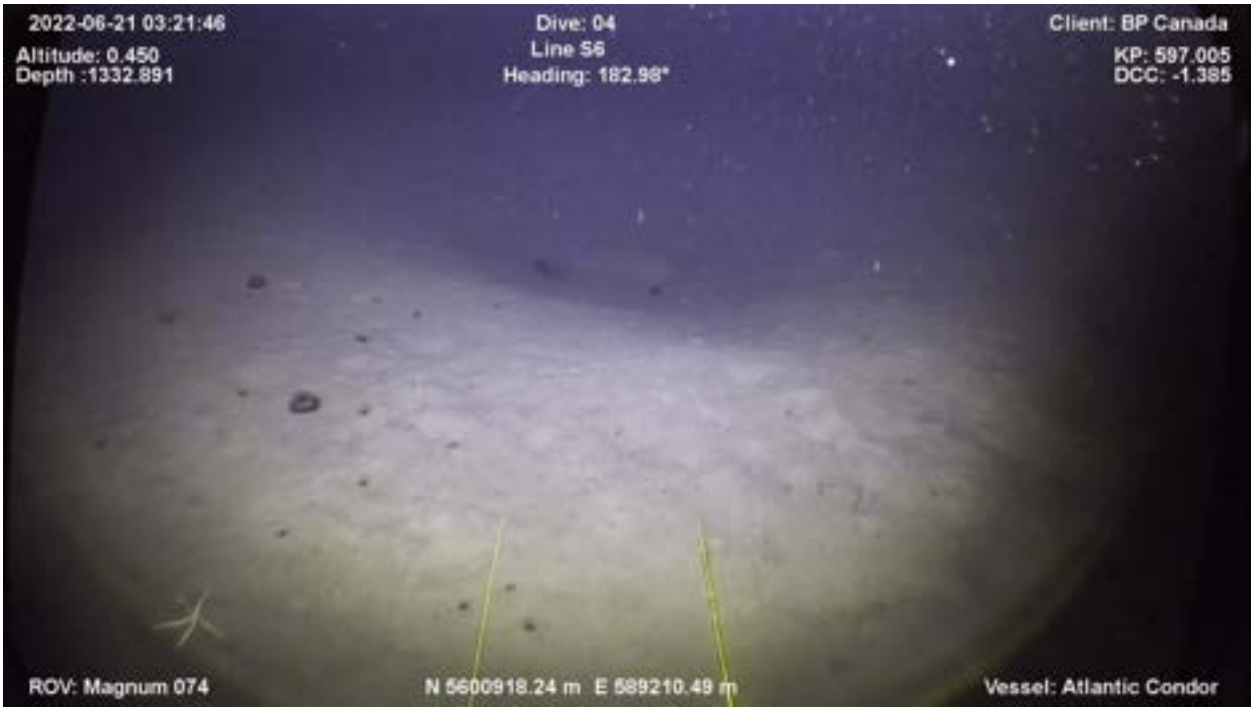
Picture 31: Fishing gear found on transect N6 while on seabed survey at EL1145



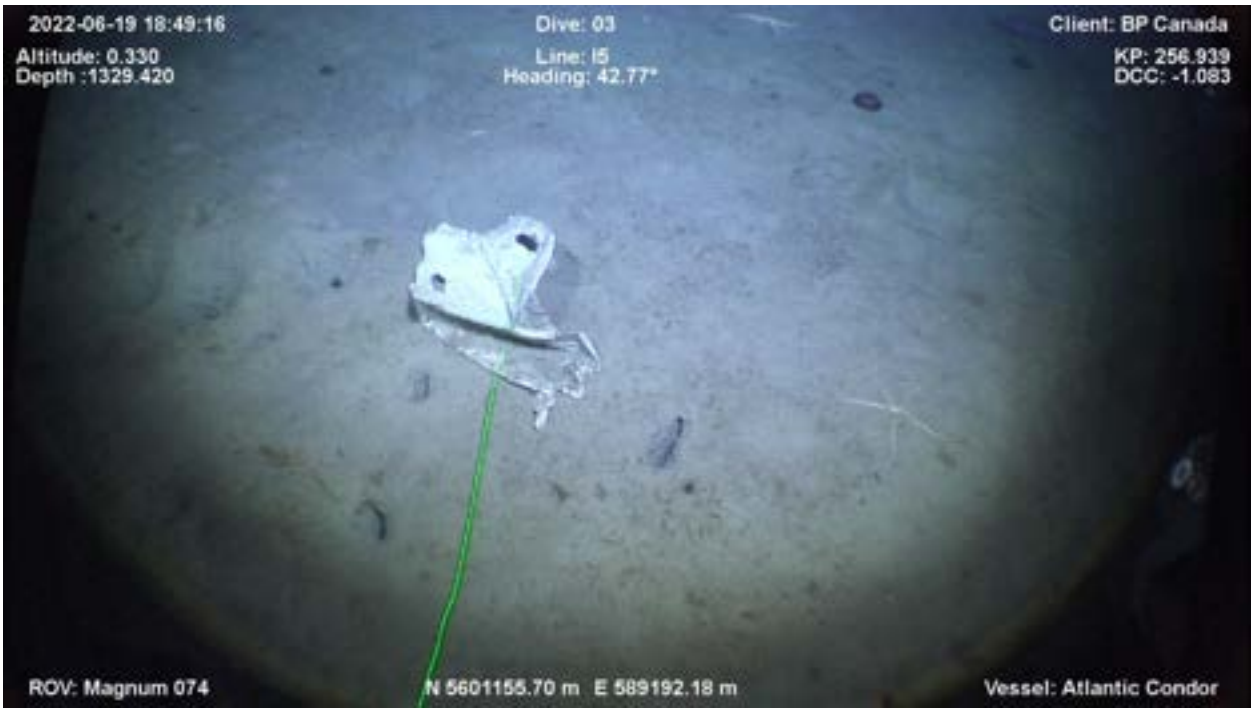
Picture 32: Depression in ground on S12 transect



Picture 33: Trench line on transect S12. Line extends beyond FOV in both directions



Picture 34: Transect line S6 showing a depression approximately three meters long with a boulder in the middle



Picture 35: Transect line I5 showing debris of plastic

3.2 Results Summary

A combined total of 58:41:29 hours (hh:mm:ss) of ROV video covering 97,514.64 m2 for a total of 0.0975 km2 of seafloor were analyzed within EL1145. Seabed Survey Layout

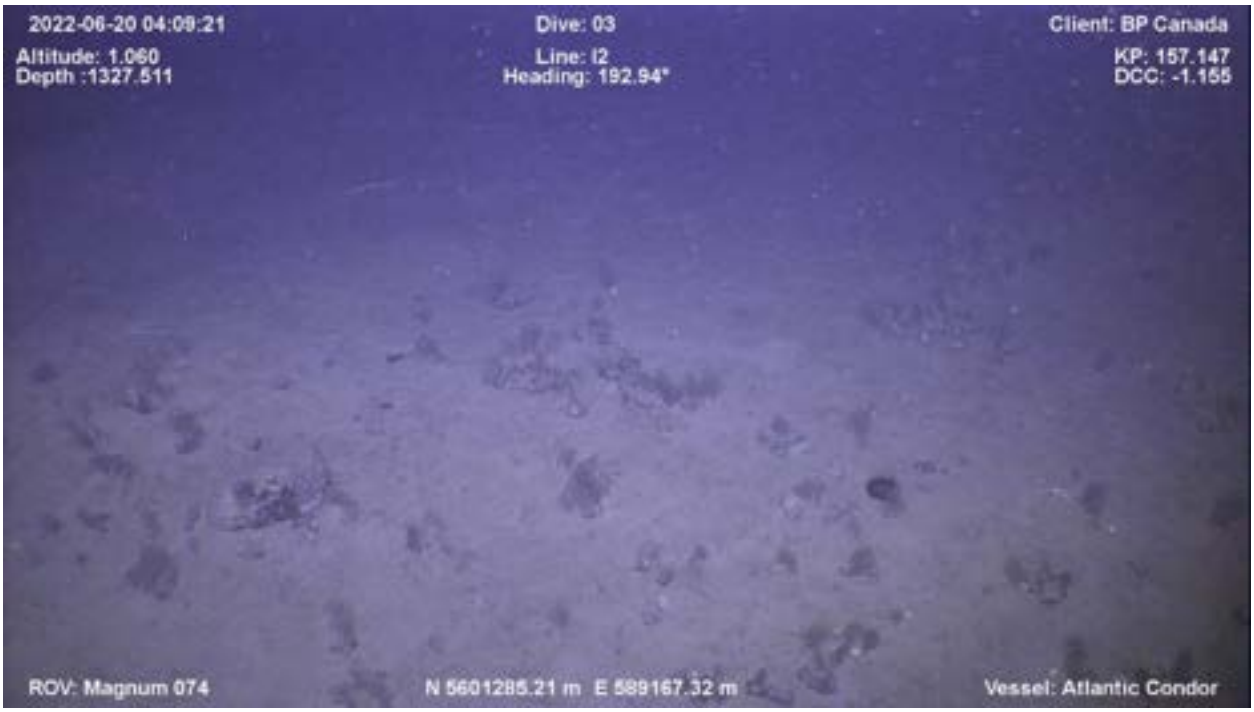
3.2.1 Visibility

Visibility varied due to ROV height above seabed, sediment in the water column, and speed of travel, however there was typically several meters of visibility in front and on either side of the ROV. Generally, the well sites had low visibility after the first of six passes of the 15m transects (i.e., the wagon wheel) on each site. Each pass required a lower altitude for visibility or to leave the well site and come back once the sediment had settled. Attempting a 3-meter altitude for an overall analysis was not conducive for the well site as visibility was too poor at this height to see anything of consequence. After several passes at 0.5 m altitude above seafloor was adopted as it proved to be the best visibility.

3.2.2 Substrate

Most of the survey area (82%) in the EL1145 consisted of fine grained substrate (1915 observations) which includes mud or sand (Sheet 1), Appendix A. Approximately 18% of the seabed was comprised of rocky substrate (Boulders, Cobbles, Small Rocks, Gravels and Rubble). Of the 418 rocky substrate observations, 228 observations were on coarse boulders (rocks greater than 25 cm) and 169 were on coarse rubble (rocks ranging from 13 to 25 cm) leaving 21 observations to be found on rocks ranging 2mm to 13 cm. No exposed bedrock was noted in the surveyed area. There were three observations found on organic / Dertritus matter such as a shell. All three observations were in the North lines.

A relatively higher number of biota were observed occurring on line I2 which also showed a greater abundance of rocky substrate (Picture 36). A total of six species from sponge, sea pen to coral were recorded in this area (*Pennatula, Acanella arbuscula, Acanthogorgia armata, Duva and/or gersemia, and anthomastus*). Some coral and sponge were recorded as unknown or down to morphological / functional group. This area also contained anemones and megafauna such as fish and brittle stars. This area is approximately 250 meters Northeast of the primary well. It is unknown how far this extends as we were limited to the field of view on the transect line.



Picture 36: Transect I2 showing variety in substrate and biota

3.2.3 Coral

The genus *Pennatula* were the most abundant of the sea pens (Sheet 3), Appendix A. The functional groups observed during this survey were branching, soft, black, and sea pen. There were 69 observations of 74 individuals of other sea pens observed (Sheet 4), Appendix A. Most sea pens are solitary and found in the fine-grained substrate areas.

Acanella arbuscular of the branching corals, was the most observed cold-water coral with 1477 observations and 2107 individuals. (Sheet 3 and Table 5**).** *A. arbuscular* were found mostly solitary with 1002 observations of the 1477 observations having only one individual. Distribution of all branching corals can be seen in (Sheet 4), Appendix A. ~~Four observations of black corals were seen throughout the survey (Sheet 4) three alive and one dead. All were found in fine grained substrate areas. Black corals were the least observed functional group next to hard coral of which none were found~~. [See Appendix D for details on black corals]

Coral observations were recorded more frequently on fine mud (1505 observations) than on rock (112 observations) as outlined in (Sheet 2, Sheet 3). The fine mud observations were comprised almost entirely of branching corals with 1485 observations. *Acanella arbuscula* had 1471 of the 1486 observations of branching corals in fine mud substrate (Sheet 3), Appendix A. Soft corals comprised of 112 observations throughout the survey (Sheet 4). Almost all soft corals were observed on rocky substate (96 observations

of the 112). While fine mud was the most commonly observed substrate type overall, the abundance of soft corals on rock suggest that rocky substrates (particularly large boulders) provide important habitat for soft corals and other benthic megafauna such as sponges (Sheet 2). Distribution of all corals together can be seen on (Sheet 3).

3.2.4 Sponge

Hexactinellida was the most abundant class of sponge seen with 194 of the 351 observations. The most abundant species of sponge seen was the *Asconema foliate* of the Thin-Walled, Complex morphological group with 182 observations. (Sheet 3 and Table 6)**.** A distribution of all sponges found can be seen on Sheet 3.

Morphological groups found in the seabed survey were thin-walled, complex, solid/massive, other and round with projections (Sheet 4).

Most sponge observations were recorded on a rock substrate with 305 observations of the 351 observations (Sheet 2). There were only 43 observations of sponges that occurred on fine mud. Three observations were found on organic / detritus matter such as a shell. Some of these sponges could also have been on small cobble stones as sometimes the sponge could not be seen clearly due to visibility of the area, speed of the passing ROV, height of ROV, or distance on the field of view from the ROV. When sponges were observed on fine mud there was no large boulder within in the field of view (FOV) of ROV.

The number of observations on a rock substrate suggests that all rock substrates play an important role in sponge habitat. Although there were more observations recorded on rock substrate versus fine mud, there appeared to be no differences in sponge species that were found on either fine mud or rock substrate. This observation also supports that rock is a preferred substrate for sponge habitat.

3.2.5 Megafauna

Multiple megafauna species were observed throughout the survey. These included fish, octopus, squid, jellyfish, crabs, anemone, urchin, skates, sea stars, and some unidentified animals.

Megafauna were not required as part of the survey. Therefore, abundance of individuals and observations are recorded as opportunistic sightings being noted for presence in the survey area.

Brittle stars dominated the mobile fauna within the survey area and were observed on all lines. Urchins were the second most abundant mobile fauna though not as prolific as brittle sea stars. Other sea stars such as the Northern Sun Star and other unknown species were found throughout the survey area.

Grenadier fish and red hake were the most abundant fish observed and eel, and other small fish were seen sporadically. The Blue Antimoral and Northern Wolffish *(Anarhichas denticulatus*) were documented less frequently but were observed in all areas of the survey. The Northern Wolffish is labeled as threatened species under the SARA.

Many anemones such as Venus Fly Trap, Ceriantharian anemone and other unknown species were observed. Anemones were common throughout the survey area with Ceriantharian anemones being the dominant anemone.

Octopus and skates were observed throughout the survey area with the Jensen skate being the most often documented. An Abyssal skate was also observed.

Two observations of Porcupine and Spider crab were made in the northern area of the survey on transects N16 and N20.

On the northern portion of lines N9, N12, N13, N14, a high abundance of an unknown organism occurred (See Picture 27, Section 2.2). These mobile and bottom dwelling animals are thought to belong to the family *dendronotus* which consists of sea slugs, nudibranchs, and marine gastropod mollusc. They were observed in the water column as well as on the seafloor. On the seafloor they appeared in high abundances estimating over 100 individuals over a small area. Identifying organisms without stopping to gather

information can be extremely difficult with deep sea organisms. Organisms were identified to a taxonomic level without compromising the probability.

3.2.6 Observations at Well Sites

3.2.6.1 Substrate

The observations of substrate at the five proposed well sites consisted mainly of fine-grained mud or sand. Thirteen of the eighteen observations made at proposed well sites showed fine grained substrate, while the remaining 5 observations showed rocky substrate (Sheet 1 and Table 9). These observations were conducted within 15 meters of the well sites are referred to as the wagon wheel surveys.

Table 9: Observations of Substrate in the vicinity of Proposed Well Sites

Proposed Well	Fine Grained Substrate Observations	Coarse Substrate Observations
F-94 Primary	1 Fine Grained	2 Coarse Rubble
F-94 ReSpud	3 Fine Grained	
F-94 Alternate	4 Fine Grained	1 Coarse Boulder
F-94 Northern Relief	5 Fine Grained	1 Coarse Boulder
F-94 Northwestern Relief		1 Coarse Boulder

3.2.6.2 Sea Pen

One observation of nine *pennatula* sea pens were observed at Ephesus F-94 Alternative Well. (Sheet 3) and Table 10.

Table 10: Ephesus F-94 Alternate well observation

Genus Species	Description	Abundance	Condition	Substrate
Pennatula	Sea Pens	9	Unknown	fine mud

3.2.6.3 Coral

There were 11 observations of *Acanella arbuscula* (branching coral): one at Ephesus F-94 Primary Well with two individuals, three observations at Ephesus F-94 Respud Well with four individuals, two at Ephesus F-94 Alternative Well with four individuals, and five at Ephesus F-94 Relief Well North with a total of seven individuals (Sheet 3) and Table 11.

There was one observation of *Anthomastus* (soft coral) with three individuals found at Ephesus F-94 Alternative Well (Sheet 3).

Table 11: Ephesus F-94 Primary Well, Respud, Alternate and Relief Well

Well	Genus Species	Description	Abundance	Condition	Substrate
F-94 Primary Well	Acanella aruscula	branching	2	Unknown	fine mud
F-94 Respud	Acanella aruscula	branching	1	Unknown	fine mud
F-94 Respud	Acanella aruscula	branching	1	Unknown	fine mud
F-94 Respud	Acanella aruscula	branching	2	Unknown	fine mud

Well	Genus Species	Description	Abundance	Condition	Substrate
F-94 Relief North	Acanella aruscula	branching	1	Good	fine mud
F-94 Relief North	Acanella aruscula	branching	1	Good	fine mud
F-94 Relief North	Acanella aruscula	branching	1	Good	fine mud
F-94 Relief North	Acanella aruscula	branching	2	Good	fine mud
F-94 Relief North	Acanella aruscula	branching	2	Good	fine mud
F-94 Alt	Acanella aruscula	branching	2	Unknown	fine mud
F-94 Alt	Acanella aruscula	branching	2	Unknown	fine mud
F-94 Alt	Anthomastus	soft coral	3	Unknown	fine mud

3.2.6.4 Sponge

There were two observations of *Asconema foliate*: one at Ephesus F-94 Primary Well and one at Ephesus F-94 Relief Well Northwest (Sheet 3).

One observation of four *craniella* were observed at the Ephesus F-94 Primary Well.

An observation of one *ploymastia* was recorded at Ephesus F-94 Alternative Well.

There was one observation of an unknown encrusting sponge made at Ephesus F-94 Relief Well North. (Sheet 3 and Table 12).

Table 12 Sponges at Ephesus F-94 Primary Well, Alternate and Relief Well North and Relief Well Northwest.

Well	Genus Species	Description	Abundance	Condition	Substrate
F-94 Primary Well	Asconema foliata	Thin-Walled, Complex	1	Unknown	Coarse Rubble
F-94 Primary Well	Craniella	Round with Projections	4	Unknown	Coarse Rubble
F-94 Alt	Polymastia	Round with Projections	1	Good	Coarse Boulder
F-94 Relief Northwest	Asconema foliata	Thin-Walled, Complex	1	Unknown	Coarse Boulder
F-94 Relief North	Unknown encrusting	Other	1	Unknown	fine mud

3.2.6.5 Condition Sea Pen / Coral / Sponge

The overall percentage during the survey found in good condition was 75% with 1752 observations. Unknown conditions were 21% with 491 observations. Any variation of covered represented 2.1% with 48 observations. Completely dead represented 1.81% with 42 observations and bent represented 0.1% with three observations.

Condition is subjective as the ROV didn't stop to inspect corals and sponges.

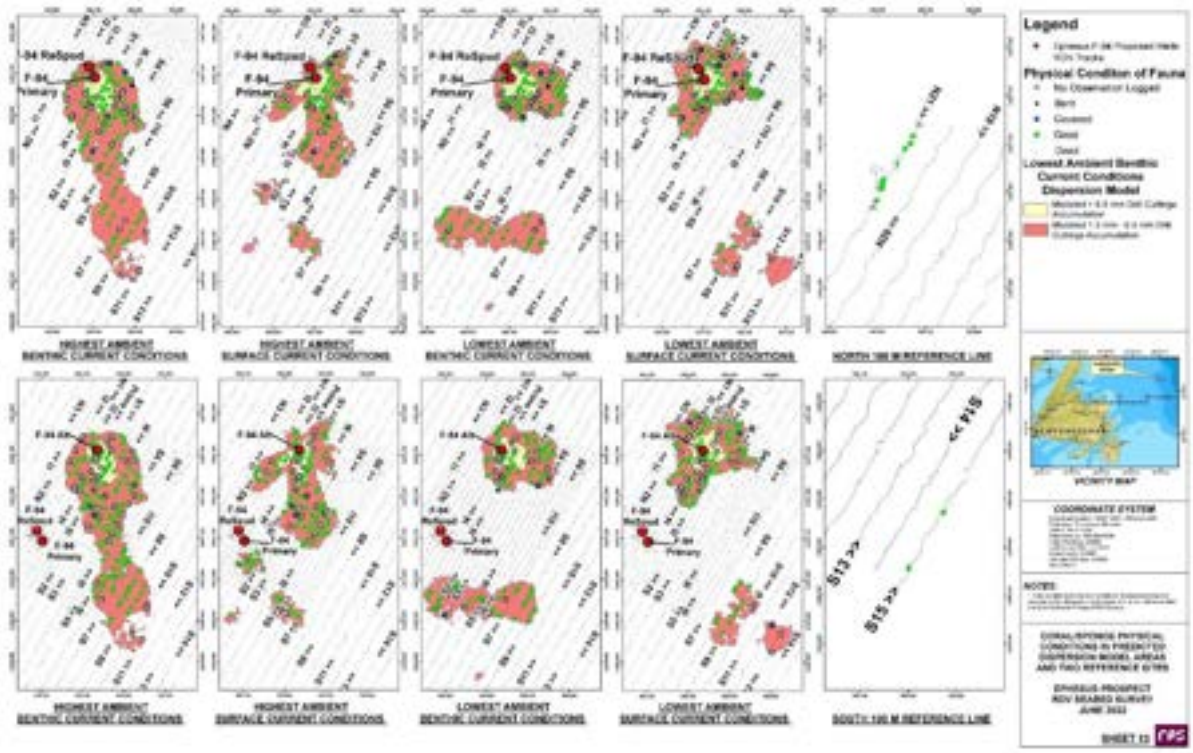
3.2.6.6 Other

Other megafauna recorded were Jelly Fish at Ephesus F-94 Primary Well and an Urchin at Ephesus F-94 Respud Well.

One observation of a boulder was recorded (Sheet 1) at Ephesus F-94 Relief Well Northwest close to the center of the well site.

3.2.7 Surficial Observations of 100-meter Reference Sites

The 100-meter reference sites were completed at the Northern most part of survey line N21 and the Southern most part of S15. (100-meter reference sites are shown in Sheet 13 Appendix A). A copy is shown below.



3.2.7.1 Substrate

There were 24 observations made in the 100-meter reference sites. Survey line S15-REF had three coarse boulder substrate observations and one fine mud substrate observation. On N21 there were two coarse boulder observations and 18 fine substrate observations. On N21, 90% of the observations were on fine substrate with 20% on rocky substrate. On S15, 75% of the observations were on rocky substrate and 25% on fine mud.

3.2.7.2 Sea Pen

In the 100-meter reference section of the N21 transect, one *halipteris* was observed and one observation was taken for 38 individuals of *pennatula*. Condition is not known since there are many without being able to inspect. (Table 13)

Table 13: Sea Pen Observations on 100- meter reference Line N21

Genus Species	Description	Abundance	Condition	Substrate
Pennatula	Sea Pens	38	Unknown	fine mud

3.2.7.3 Coral

There were 11 observations recorded on transect N21 of 15 *Acanella arbuscula* individuals, and one observation of one *duva florida*. On transect S15 one *Acanella arbuscula* was observed. See (Table 14) and (Table 15).

Table 14: Coral Observations on 100- meter reference Line N21

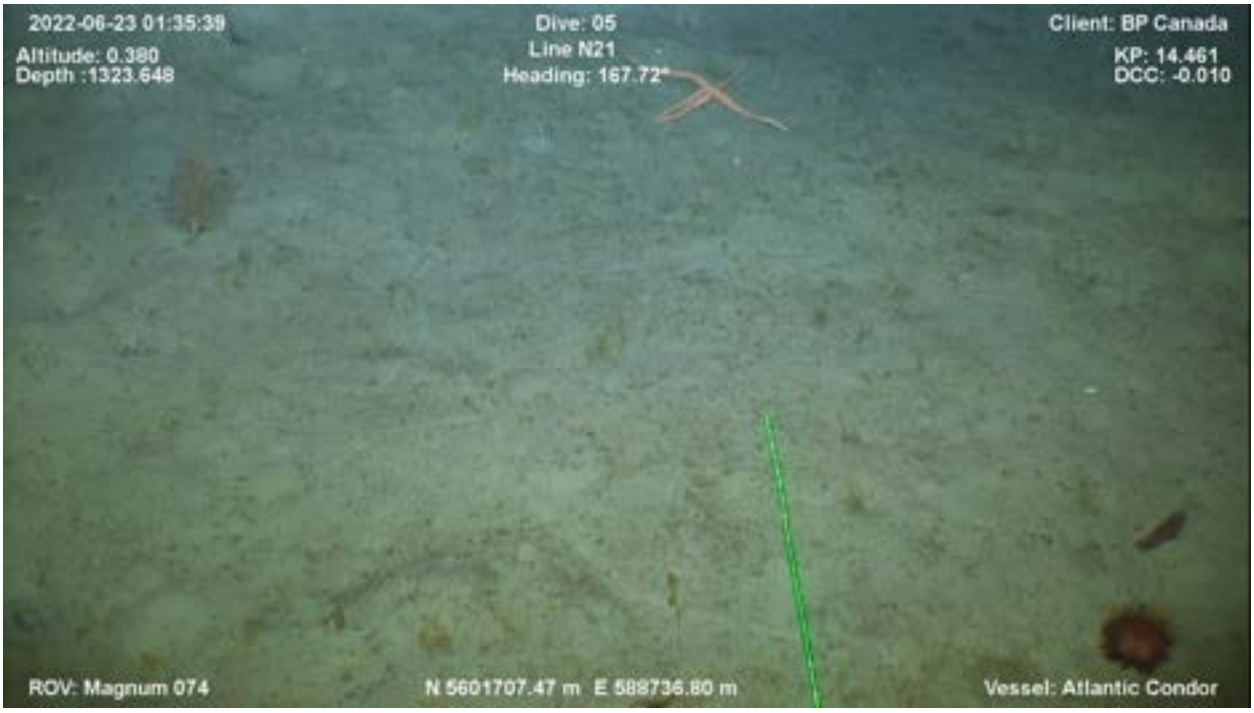
Genus Species	Description	Abundance	Condition	Substrate
Acanella arbuscula	Branching	1	dead	fine mud
Acanella arbuscula	Branching	1	good	fine mud
Acanella arbuscula	Branching	2	good	fine mud
Acanella arbuscula	Branching	1	Unknown	fine mud
Acanella arbuscula	Branching	2	good	fine mud
Acanella arbuscula	Branching	1	dead	fine mud
Acanella arbuscula	Branching	3	good	fine mud
Acanella arbuscula	Branching	1	dead	fine mud
Halipteris	Sea Pens	1	good	fine mud
Acanella arbuscula	Branching	1	good	fine mud
Duva florida	Soft	1	good	fine mud
Acanella arbuscula	Branching	1	dead	fine mud
Acanella arbuscula	Branching	1	good	fine mud

Table 15: Coral Observations on 100-meter reference Line S15

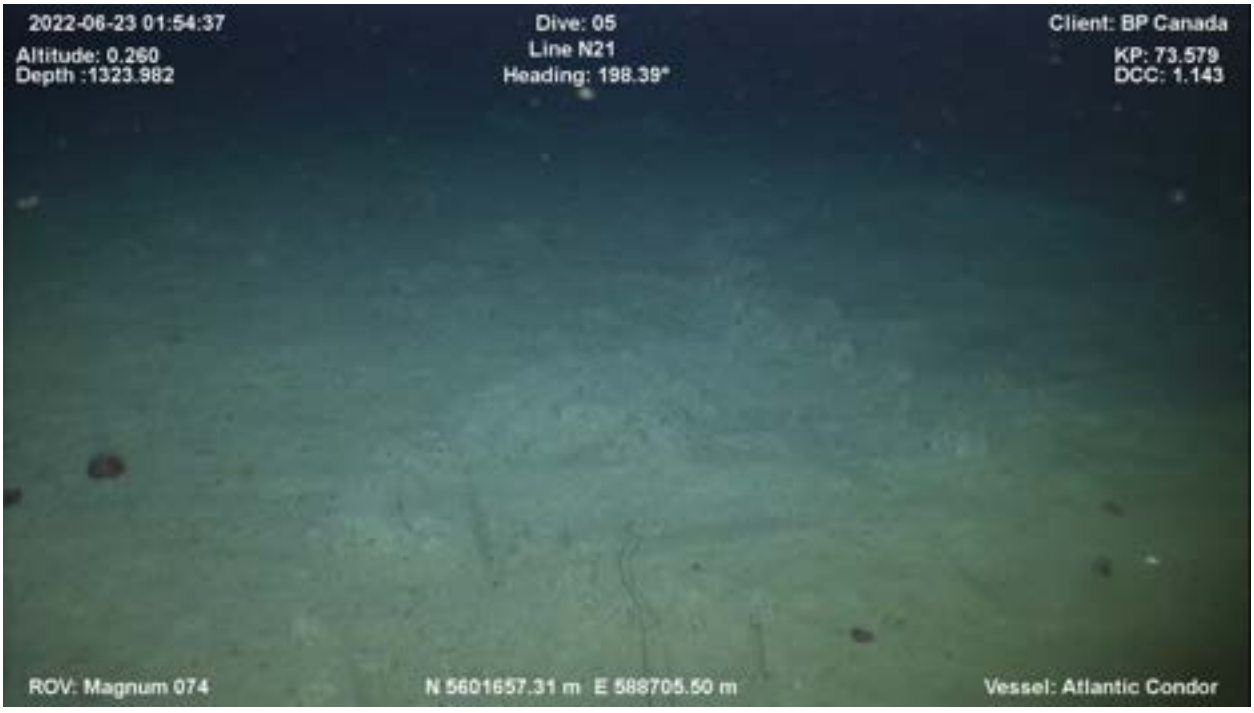
Genus Species	Description	Abundance	Condition	Substrate
Acanella arbuscula	Branching	1	Unknown	fine

3.2.7.4 Photo

Shown below in Picture 37 and Picture 38 Corals observed on reference line N21 and S15.



Picture 37: ***Acanella arbuscula*** **on 100- meter reference line N21**



Picture 38: ***Halipteris*** **on 100-meter reference line N21**

3.2.7.5 Sponge

On the N21 survey 100-meter reference line there were four *Asconema foliate* observed with a total of five individuals. There were two unknown encrusting sponges recorded along the N21 reference site. See Table 16.

Table 16: Sponge Observations on 100-meter reference Line N21

Genus Species	Description	Abundance	Condition	Substrate
Asconema foliata	Thin-Walled, Complex	1	good	Coarse rubble
Unknown	Solid / Massive	1	unknown	Coarse rubble
Asconema foliata	Thin-Walled, Complex	2	good	fine mud
Asconema foliata	Thin-Walled, Complex	1	unknown	fine mud
Asconema foliata	Thin-Walled, Complex	1	good	fine mud
Unknown	Solid / Massive	1	unknown	fine mud

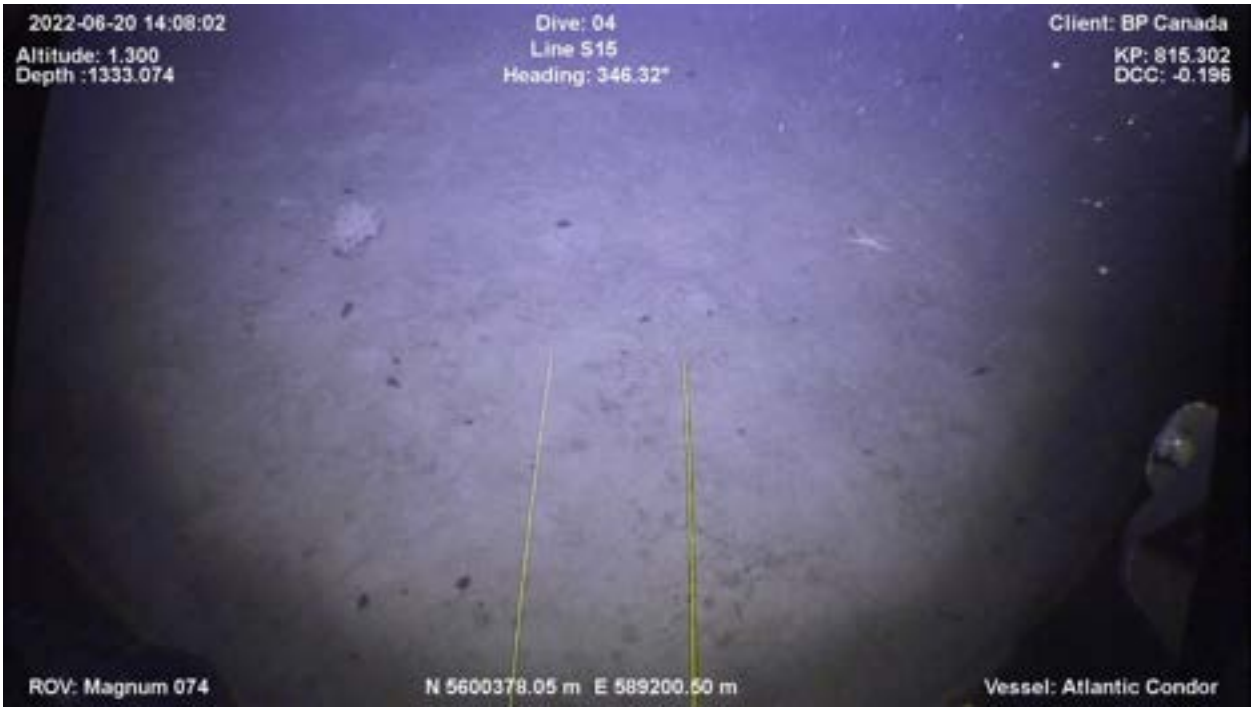
Along the S15 transect there were three sponges observed: two observations of *Asconema foliate*, and one observation of three unknown individuals. See Table 17.

Table 17: Sponge Observations on 100-meter reference Line S15

Genus Species	Description	Abundance	Condition	Substrate
Asconema foliate	Thin-Walled, Complex	1	Good	Coarse Boulder
Asconema foliate	Thin-Walled, Complex	3	Good	Coarse Boulder
Asconema foliate	Thin-Walled, Complex	1	Unknown	Coarse Boulder

3.2.7.6 Photo

Shown below in Picture 39 *Asconema foliate* observed on 100- meter reference line S15.



Picture 39: *Asconema foliata* on 100- meter reference line S15

3.2.7.7 Other

Along both 100-meter reference sites there were multiple species of megafauna seen. Along the 100 meters of S15 a Jensen skate, blue antimora, many brittle stars, and some urchins were observed. Along the N21 100 meters there were brittle stars, blue antimora, starfish, urchins, venus fly trap, and fish observed.

4 CUTTINGS DISPERSION MODEL MAPS

In 2018 a dispersion modelling study was carried out to assess the potential environmental impact of mud and cuttings suspensions and sediment deposition associated with the release of drilling muds and cuttings while conducting an exploration drilling program on offshore exploration licences (ELs) in the Orphan Basin, Newfoundland. The results helped to inform the Environmental Assessment for the Project. Two location scenarios were considered representative of the West Orphan Basin (WOB - 1,360 m water depth) and East Orphan Basin (EOB - 2,785 m water depth). An update to the dispersion model was completed in July 2022 once the actual well site, the Ephesus well, was determined. The updated model reflects the specific well site location, well design and drilling program and was intended to validate the previous 2018 modelling work.

For the proposed spud date period (April to May) the predicted deposition footprint is predominantly towards the south and as expected drill solids deposition thicknesses decrease with increasing distance from the well site. The maximum extent of the 1.5 mm PNET limit is to within 600m (range of 452 to 585) and the maximum extent of the 6.5mm PNET is within 100m (range of 61-89m). These results are very similar to the results observed in the 2018 model.

Eight cuttings dispersion models were generated to illustrate the occurrences of corals and sponges relative to the areas predicted to be subject to both the 1.5 mm and 6.5 mm accumulations. This is to provide some indication of the coral and sponges that could possibly be subject to a smothering effect or otherwise affected.

Appendix A, Sheet 5 through to Sheet 12 reflects maps produced containing overlays of the coral and sponge locations, the survey plot, and the drill cutting dispersion modeling showing the 6.5 mm and 1.5 mm PNET areal coverage.

Coral & Sponge Physical Conditions in Predicted Dispersion Model Areas and two reference sites is show in (Sheet 13) Appendix A.

5 SUMMARY

- ROV seabed video survey was conducted at EL1145 over five well sites encompassing 97,514.64 m2 of survey area. The objective of this seabed survey was to characterize deep-sea corals and sponges along the survey area. The survey was designed to be at altitudes of 1 meter; however, to get proper and accurate video and stills most of the survey was taken around 0.5 meters off the sea floor.
- Most of the substrate recorded were fine mud or sand with lesser amounts of coarse boulder and coarse rubble scattered throughout the survey. Smaller rock substrates were also found in low quantities.
- Evidence of anthropogenic disturbance were occasional within the EL 1145 seabed survey. This included debris, fishing gear and trawls marks.
- The highest abundance of fauna observed in the surveyed area was the *pennatula* sea pen.
- The branching coral *Acanella arbuscula* was the second most seen coral and was mostly observed solitary.
- Both species were found almost entirely on fine mud substrate. They were also observed on every line.
- The soft corals were found almost entirely on rock substrate suggesting that coarse substrate play a key role in their habitat.
- The highest abundance of sponges was the *Asconema foliate.* This species was not always solitary and was seen with other sponges, other *Asconema foliate* or soft corals on the same rock substrate.
- While some sponges were observed on fine substrate the preferred substrate was for sponge habitat was rock. There were no differences in species found on fine mud versus rock suggesting that rock substrates of all sizes play important role in habitat.
- Megafauna were seen throughout the survey and included many fish species such as Red Hake, Blue Antimoral, unknown eels and other small fish, Grenadier, as well as the threatened Northern Wolffish (*Anarhichas denticulatus*).
- Other species seen were Abyssal and Jensen's skate, various sea stars such as Brittle Stars and Northern Sun stars, Porcupine crabs, octopus, squid, and shrimp.
- Species were identified to the taxonomic level without compromising the confidence level of the identification.
- Corals and sponges were observed throughout the surveyed area. No particular area was identified to be substantially different from other areas with respect to the presence of habitat forming corals and sponges or fish including the surveys around each of the well sites. However, one area on line I2 had a relatively higher number of biota observed and also showed a greater abundance of rocky substrate. See Picture 36.
- The overall percentage during the survey found in good condition was 75% with 1752 observations. Unknown conditions were 21% with 491 observations. Any variation of covered represented 2.1% with 48 observations. Completely dead represented 1.81% with 42 observations and bent represented 0.1% with three observations.

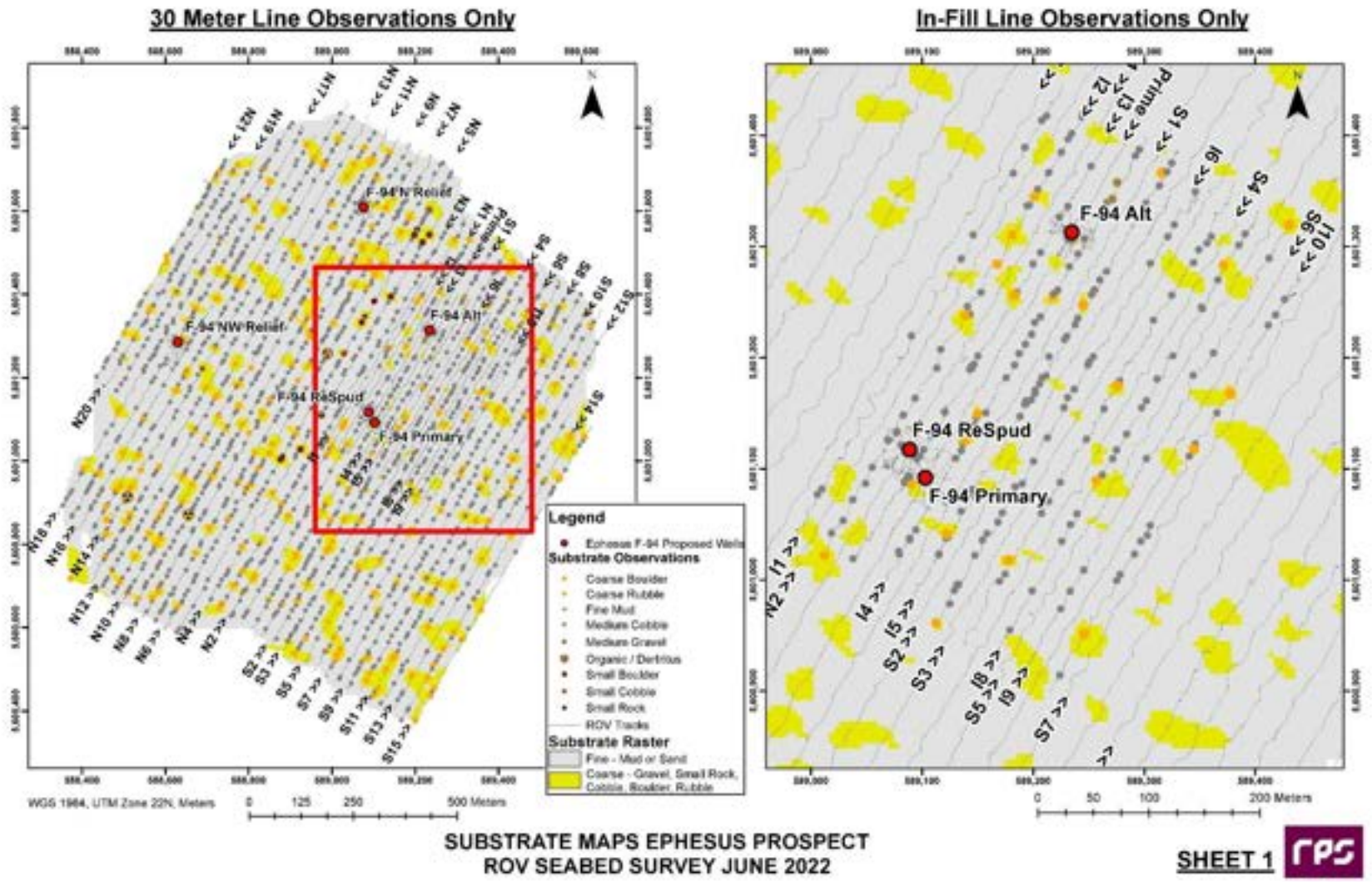
6 REFERENCES

E. Kensington et al. (2015). Coral, Sponge, and Other Vulnerable Marine Ecosystem Indicator Identification Guide, NAFO Area.

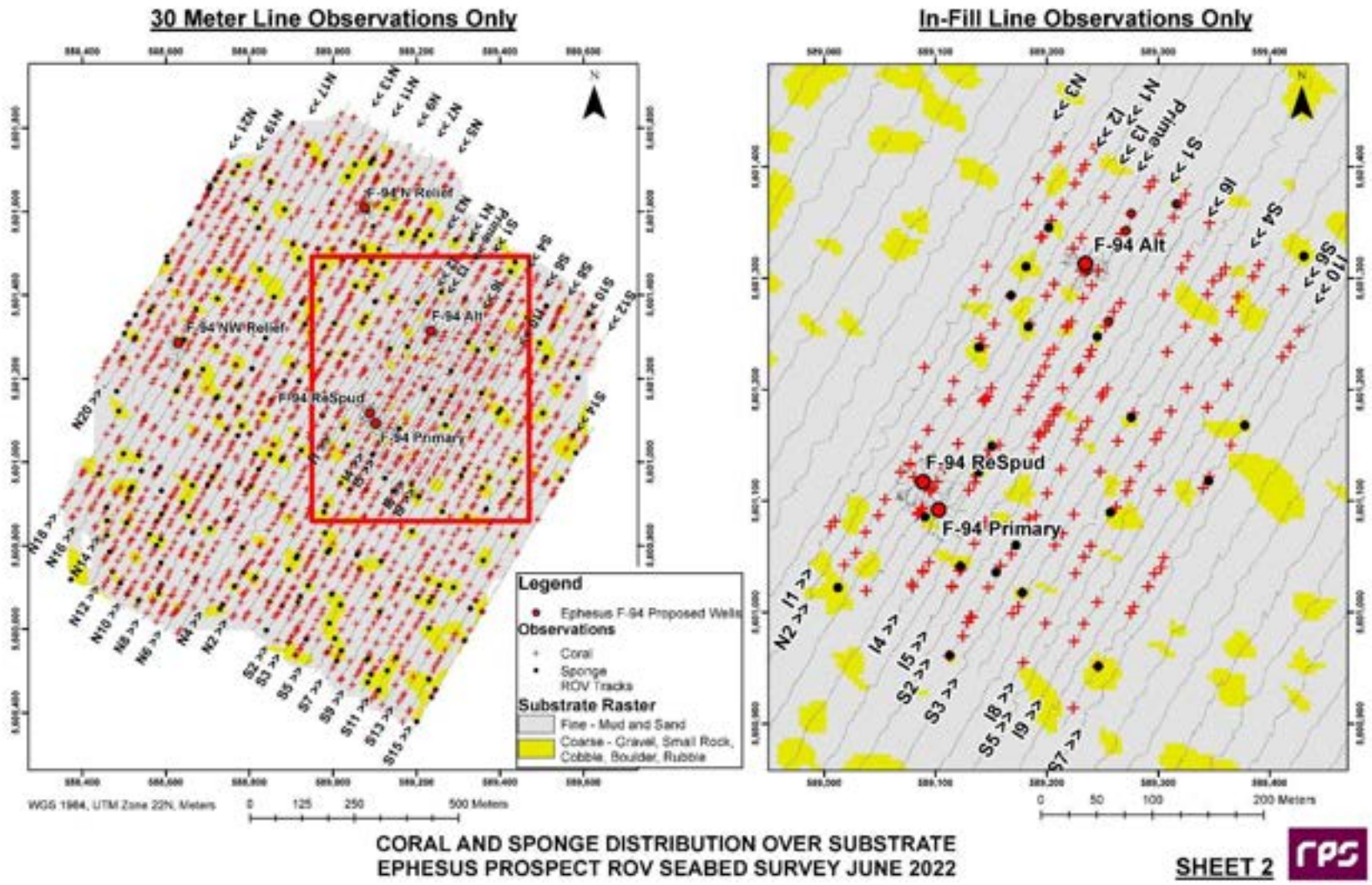
Kelly, J., R. et al. (2009). A System for Characterizing and Quantifying Coastal Marine Habitat in Newfoundland.

Wentworth, C.K. (1922) A Scale of Grade and Class Terms for Clastic Sediments. Journal of Geology, 30, 377-392. https://doi.org/10.1086/622910

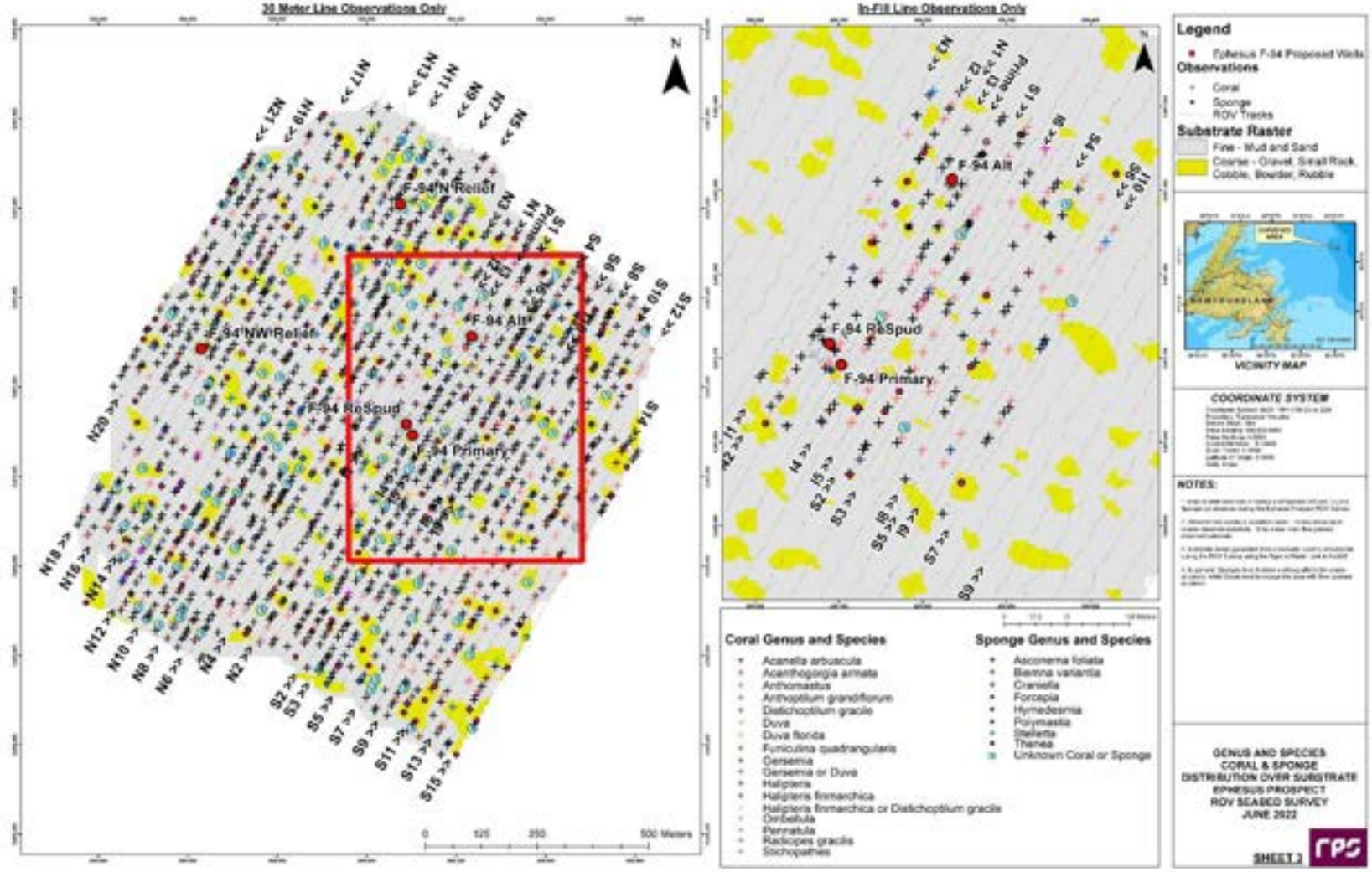
Appendix A
Survey Maps



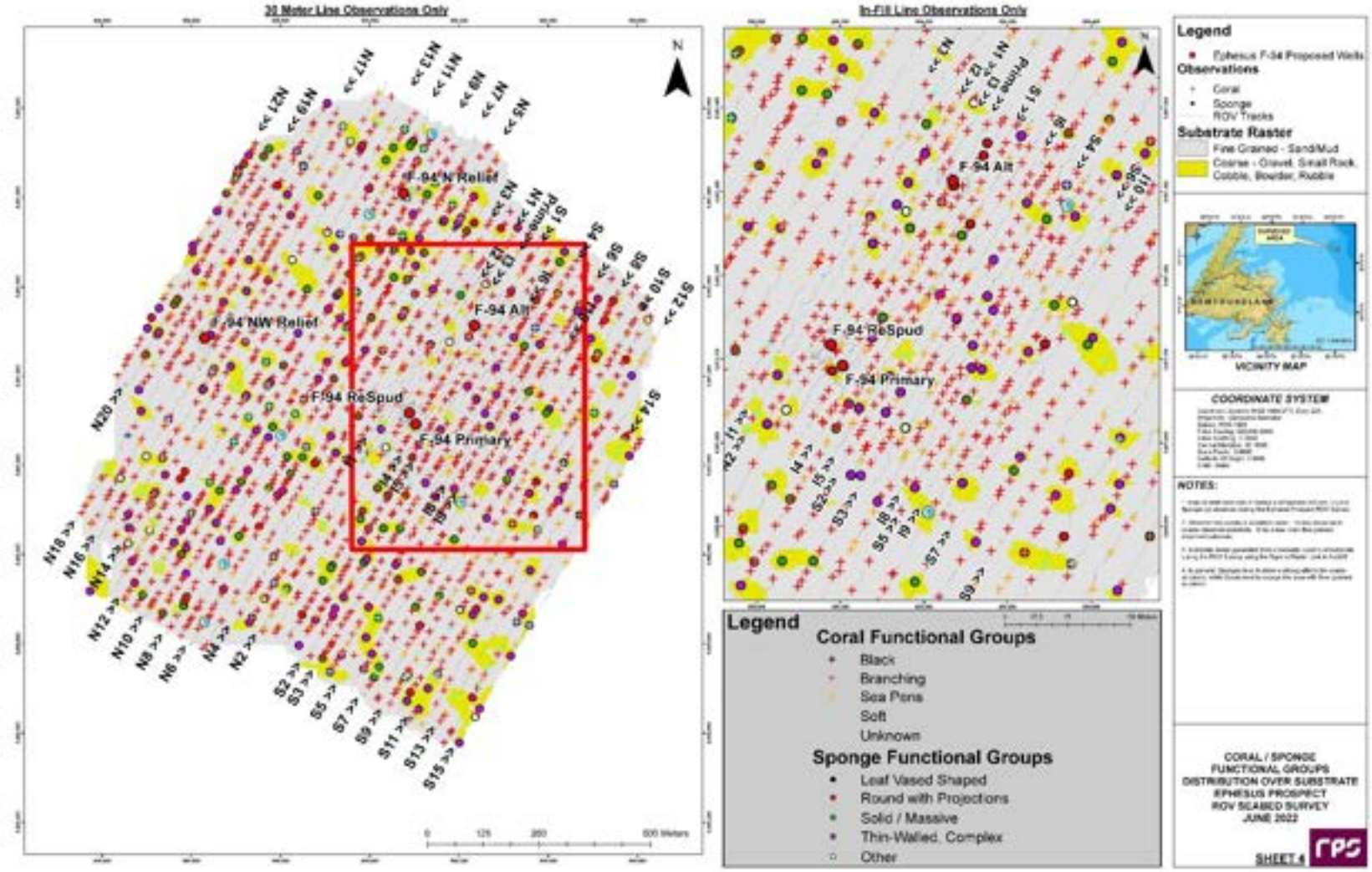
Sheet 1: Substrate Maps



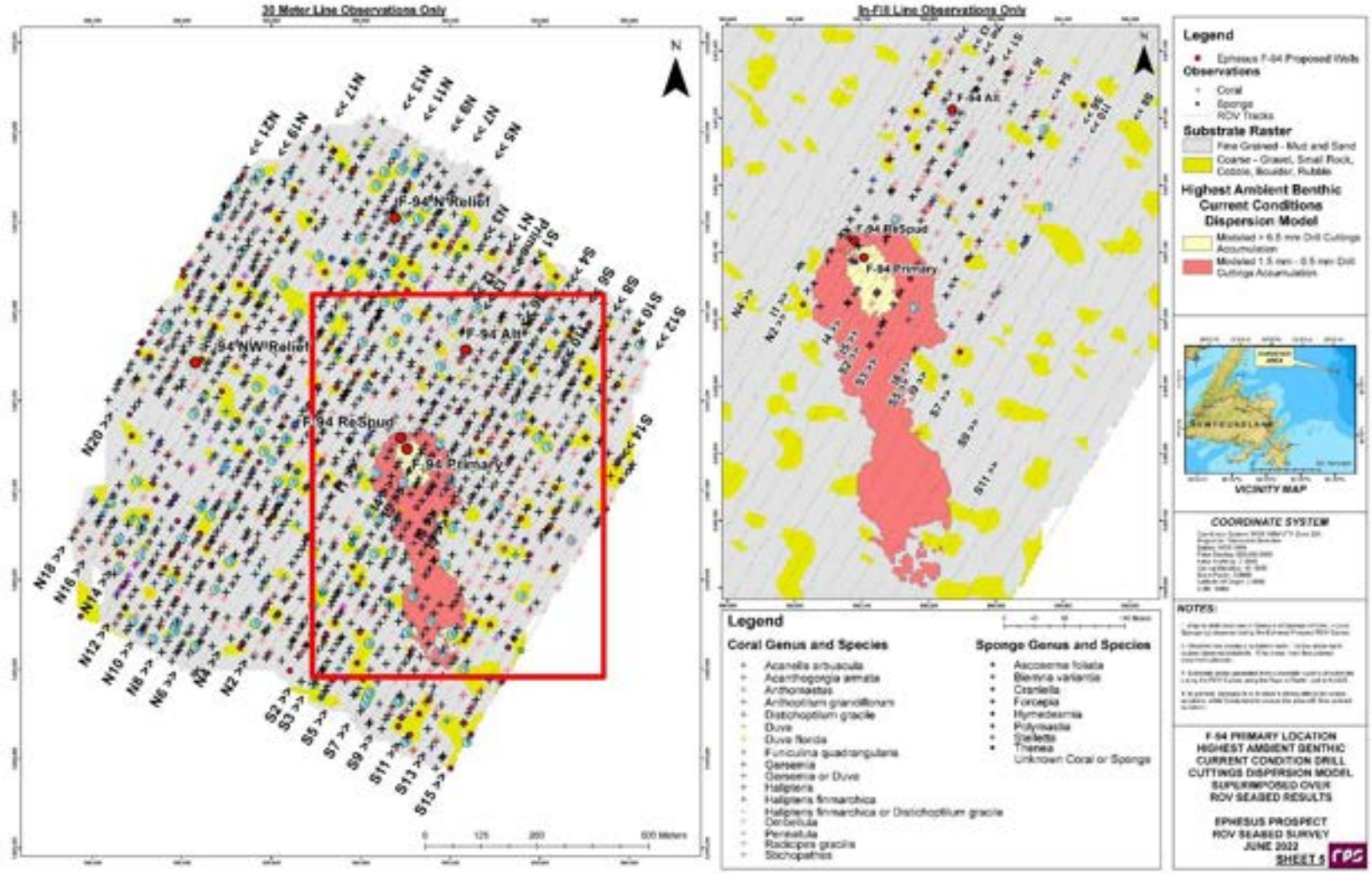
Sheet 2: **Coral & Sponge Distribution over Substrate**



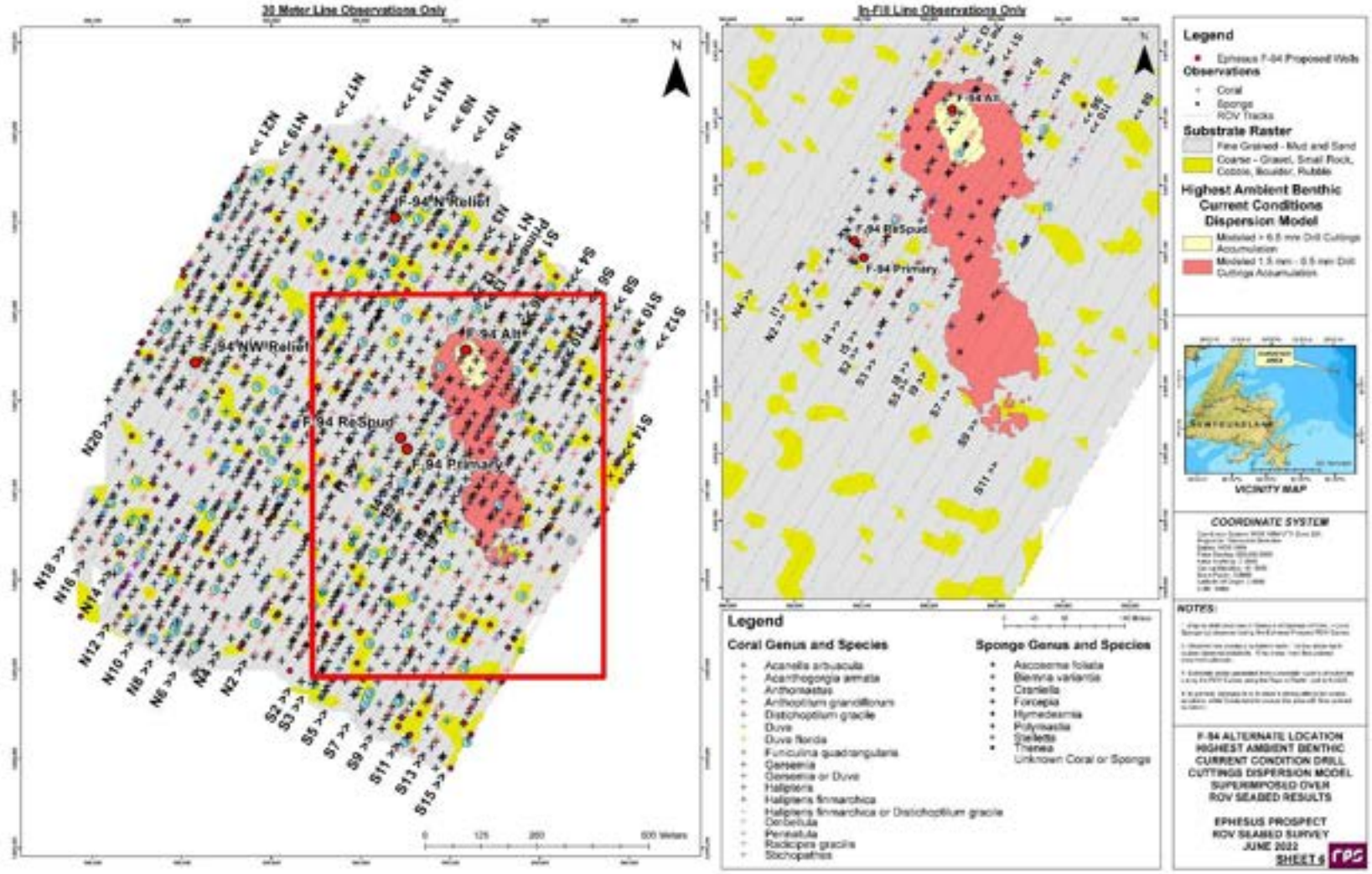
Sheet 3: Genus and Species Coral & Sponge Distribution over Substrate



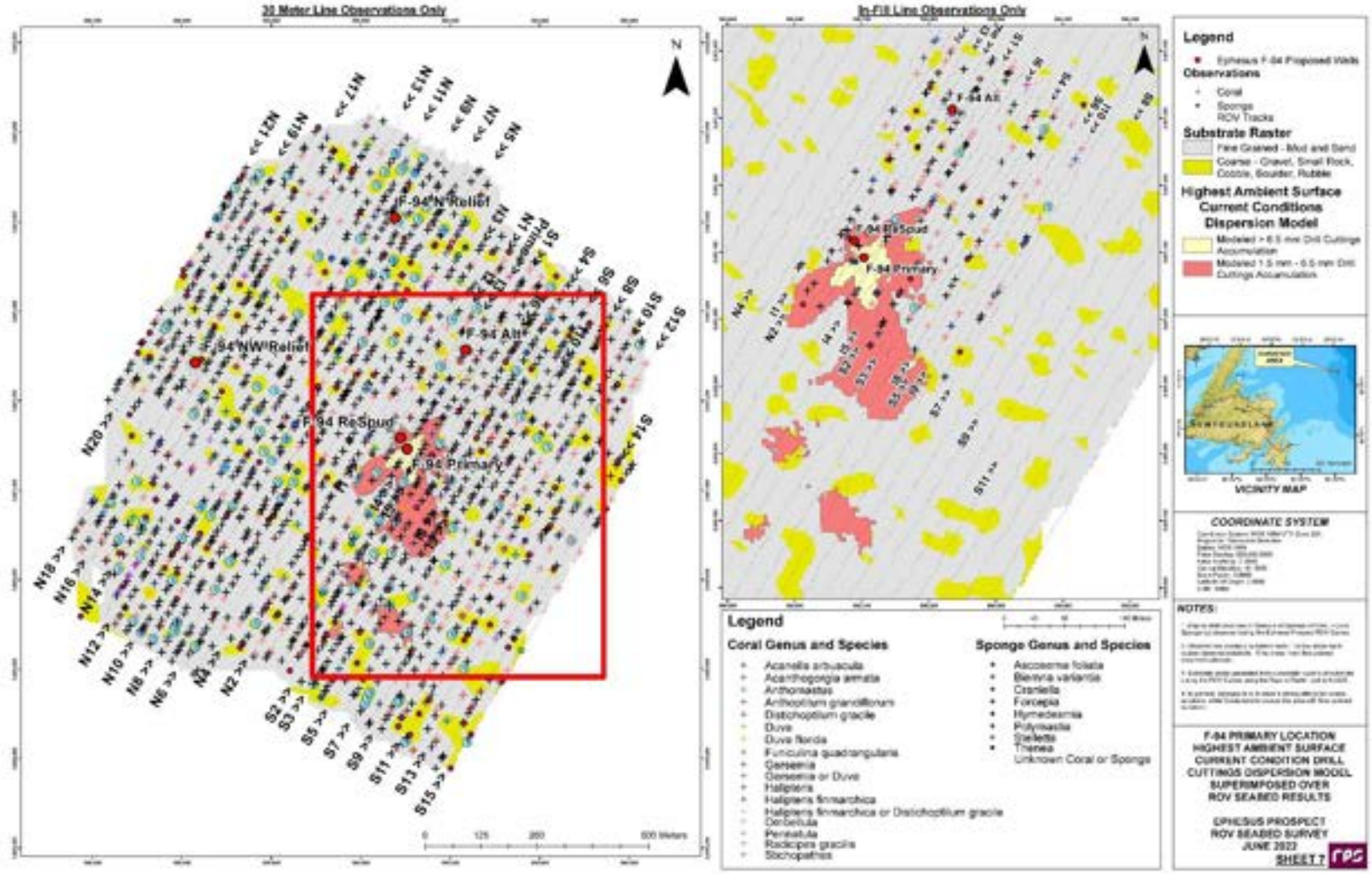
Sheet 4: Coral & Sponge Functional Groups Distribution over Substrate



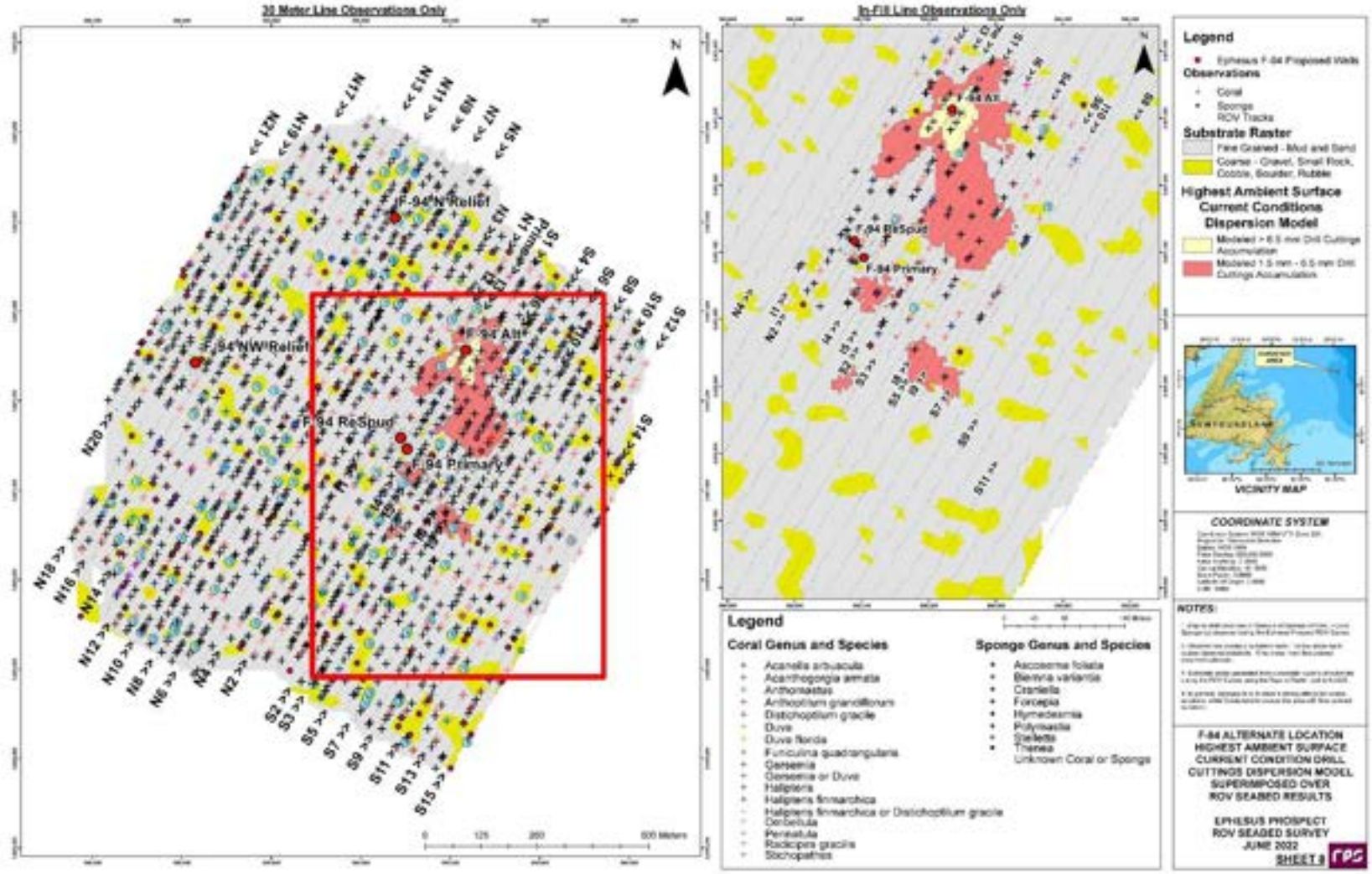
Sheet 5: **F-94 Primary Location Primary Highest Ambient Benthic Current Conditions Drill Cuttings Dispersion Model superimposed over ROV Seabed results**



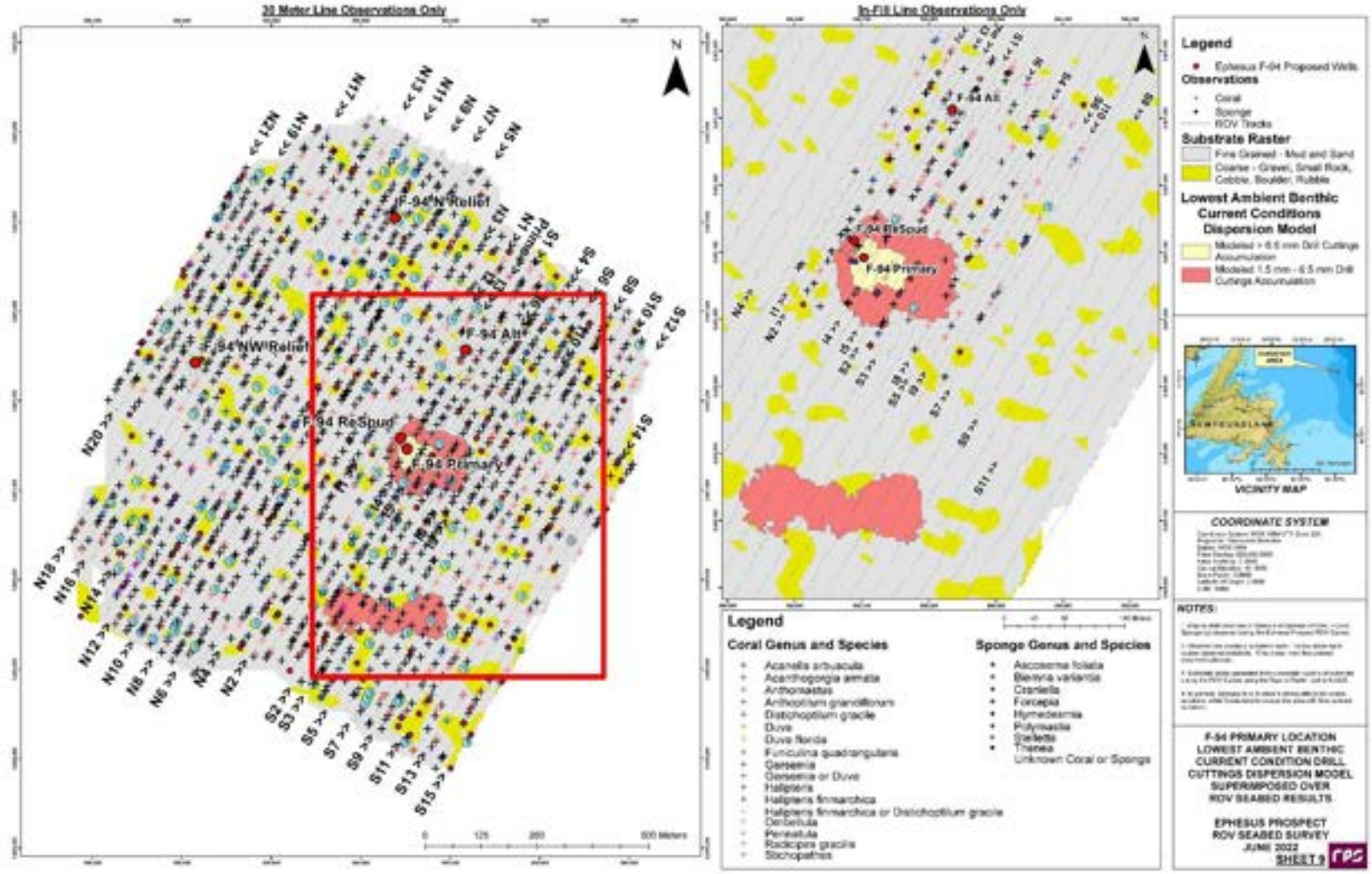
Sheet 6: **F-94 Alternate Location Highest Ambient Benthic Current Condition Drill Cuttings Dispersion Model superimposed over ROV Seabed results**



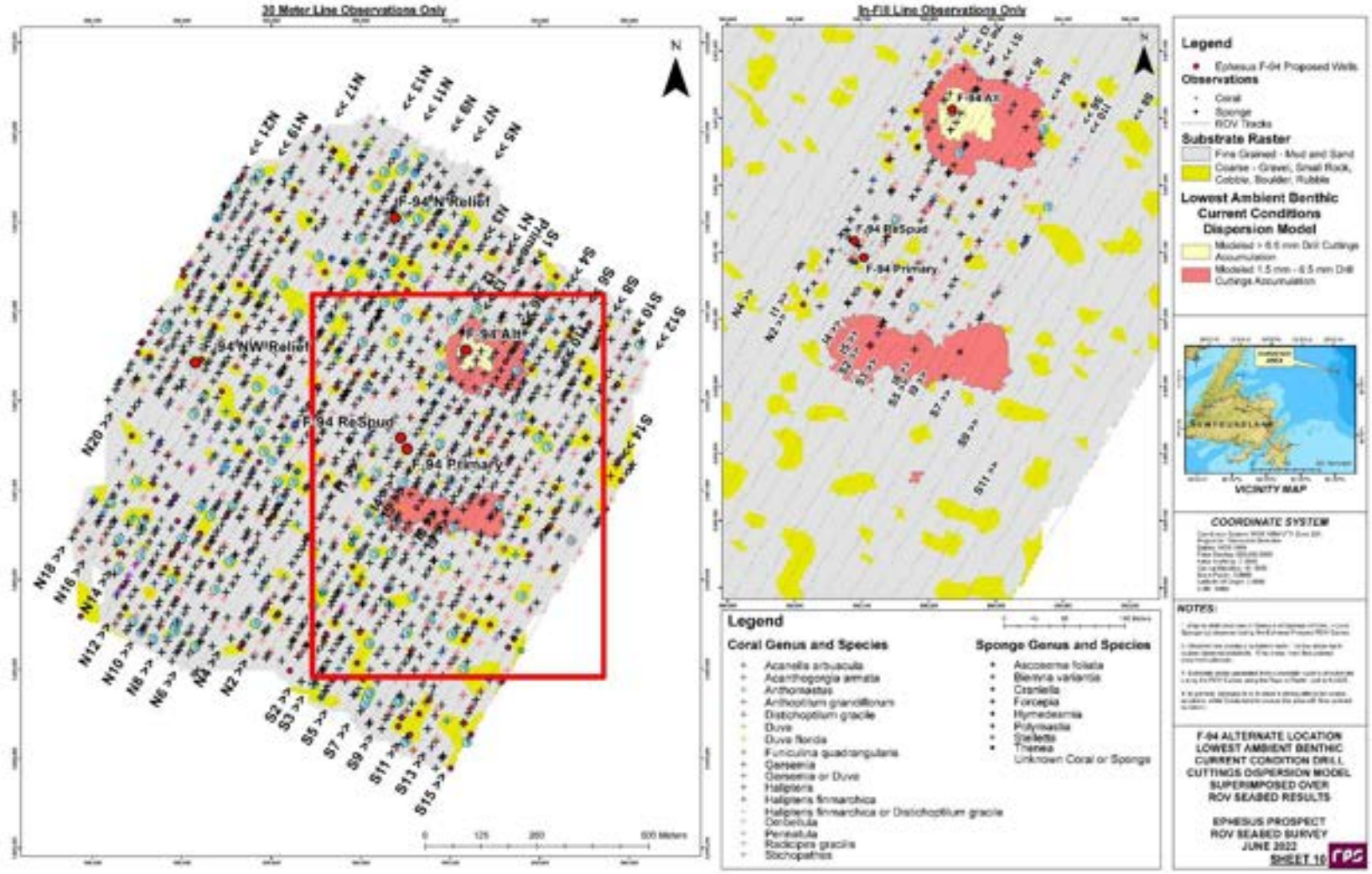
Sheet 7: F-94 Primary Location Highest Ambient Surface Current Condition Drill Cuttings Dispersion Model superimposed over ROV Seabed results



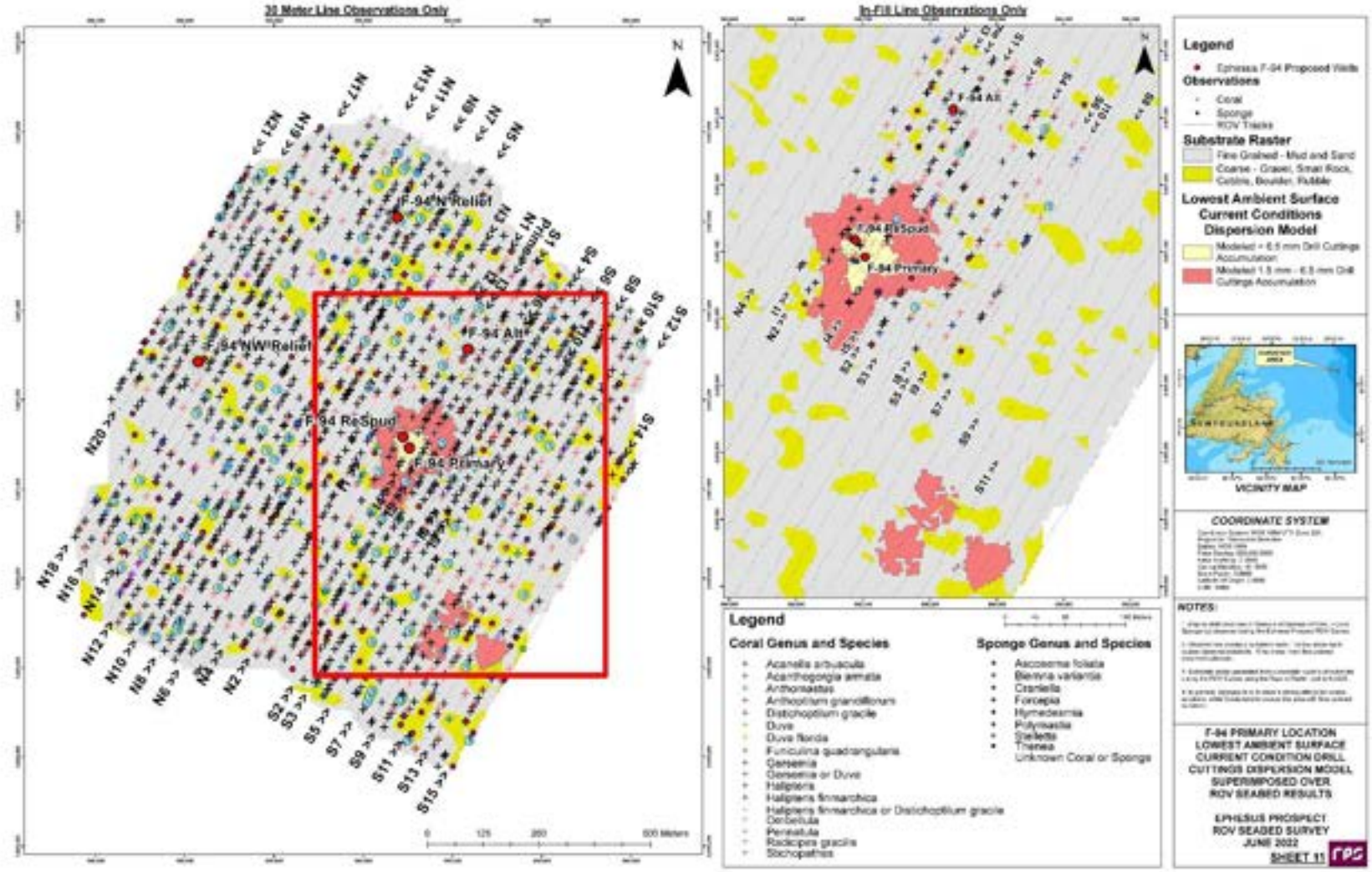
Sheet 8: **F-94 Alternate Location Highest Ambient Surface Current Condition Drill Cuttings Dispersion Model superimposed over ROV Seabed results**



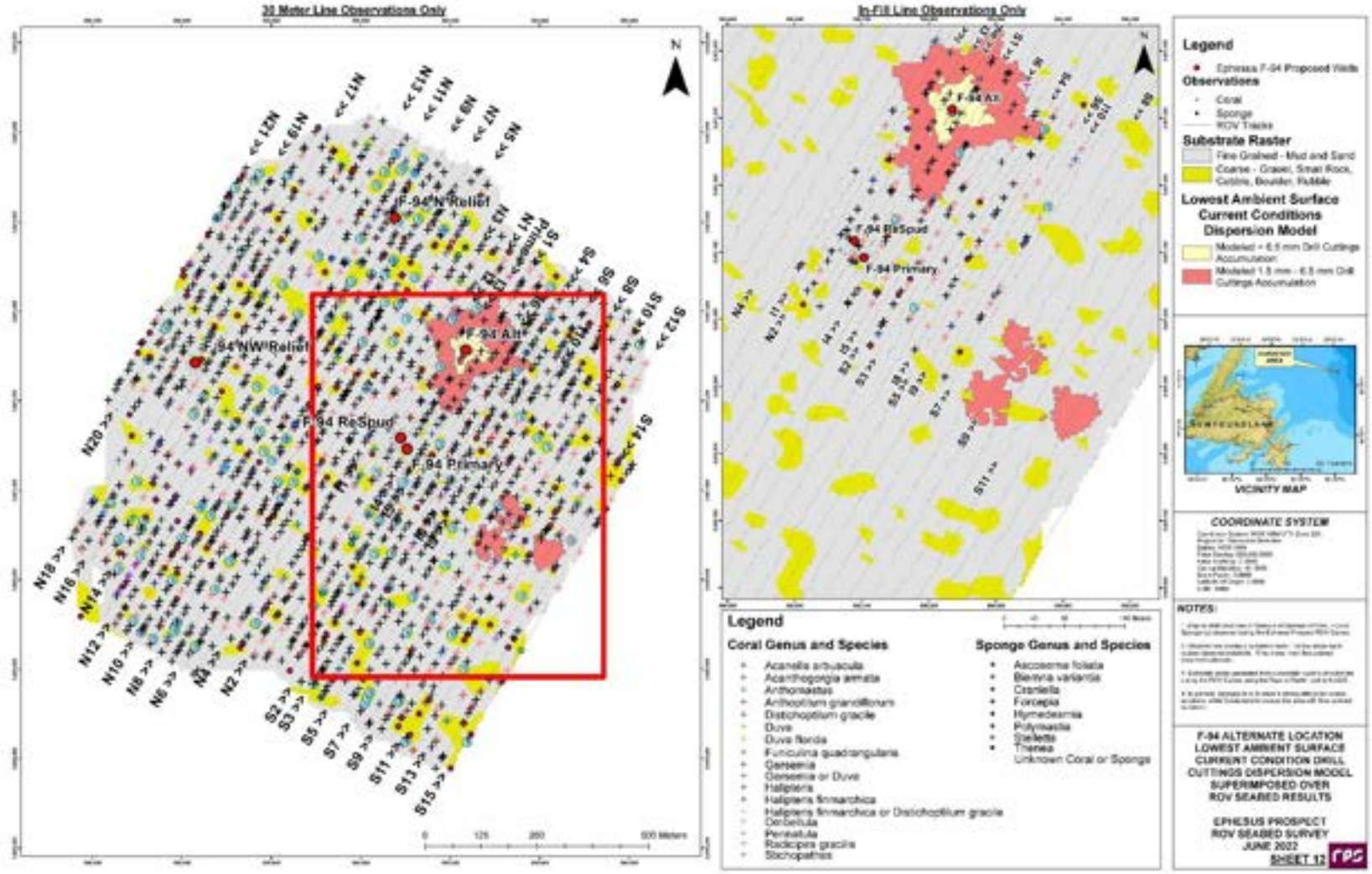
Sheet 9: **F-94 Primary Location Lowest Ambient Benthic Current Condition Drill Cuttings Dispersion Model superimposed over ROV Seabed results**



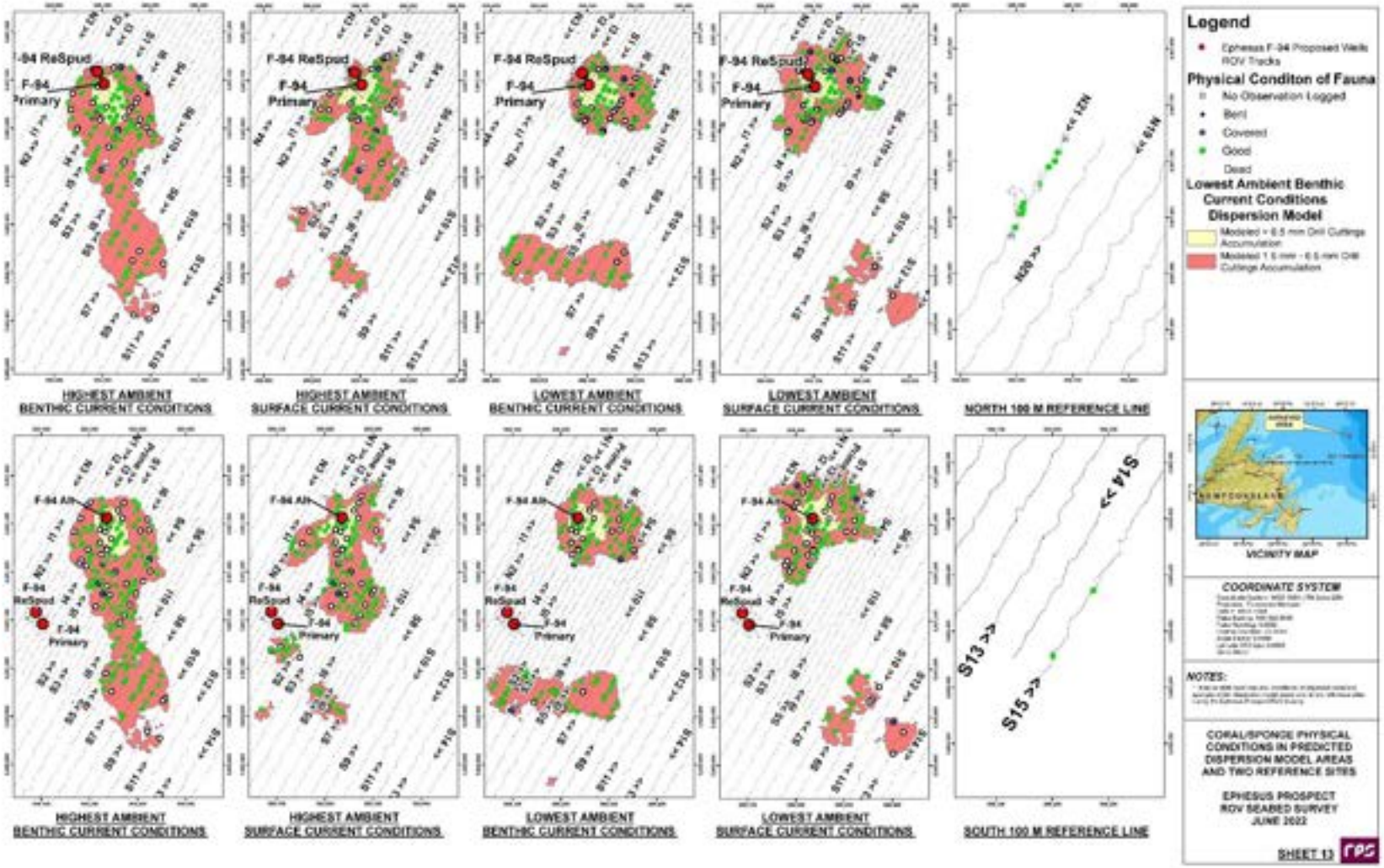
Sheet 10: F-94 Alternate Location Lowest Ambient Benthic Current Condition Drill Cuttings Dispersion Model superimposed over ROV Seabed results



Sheet 11: F-94 Primary Location Lowest Ambient Surface Current Condition Drill Cuttings Dispersion Model superimposed over ROV Seabed results



Sheet 12: F-94 Alternate Location Lowest Ambient Surface Current Condition Drill Cuttings Dispersion Model superimposed over ROV Seabed results



Sheet 13: Coral & Sponge Physical Conditions in Predicted Dispersion Model Areas and Two Reference Sites

Appendix B
Data Observations

Appendix C
GIS Files

Appendix D Addendum

Preamble

This post regulatory review addendum was prepared by bp on October 18, 2022, to address a regulatory (DFO) request to update Section 2.1 Methods of this report.

The relevant DFO comments are found in the C-NLOPB Comment Tracking Sheet (CTS) which was based on an October 14, 2022, review of this report. Items numbered 8 and 10 below were extracted from the CTS.

Item 10: More detailed should be provided in the methods section. How were data captured in real time? Did RPS biologist review data after the survey as well? Please add an explanation of what BP did with the 32 observations (with abundances > 5) to methods section of report. Also add some detail about the wagon wheel surveys around primary well and alternate well. (Section 2.1 Methods Page 5).

Item 8: Is the distance between the lasers always 50 cm? Once obtained, please add details to methods section of report.

Update October 19, 2022

2 Methods (paragraphs below added)

The ROV was equipped with a laser projector which cast on the seafloor dual parallel laser lines at 48 cm apart. This was intended to provide a reference by which approximate measurements of distances to enable areas to be determined.

During the ROV survey one or both laser devices faulted. Four lasers were supplied for the survey, two operational and two spares. As the equipment faulted, they were replaced when the ROV resurfaced. An inquiry has been submitted to the vendor to determine the cause.

2.1 bp Seabed Survey Plan (paragraphs below added)

ROV surveys were also completed in the immediate vicinity of each of the five well sites, these have been referred to as the wagon wheel surveys. The wagon wheel surveys consisted of eight transects of 15 meters length originating from the well site coordinates and extending in a direction aligned with the cardinal and ordinate points of a compass. It can also be described as four 30m transects centered on each of the well sites.

When a coral or sponge was thought to be seen by the biologist, it was considered an observation and thus recorded. Observations are defined as the *number of recorded instances*; a total of 2336 observations were recorded. Abundance is the *total number of individuals recorded in each instance*. However, sea pens were the exception as they were the dominant coral present and occurred quite frequently. Sea pens occurred so constantly it was impossible to record them all as observations. All other corals were recorded as observations as they appeared in the field of view.

If an observation contained both a coral and sponge two or more observations were recorded. All still images presented are extracts from the high-resolution video camera.

It should be noted that still images of corals and sponges may not reflect the same number of individuals recorded for abundance. This is due to the fact that the ROV did not stop for each observation, and data had to be recorded by the biologist at the same time the observation took place. Additionally, the ROV operator was tasked with obtaining a still image when prompted by the biologist and a time lag could have occurred. There were also situations when the ROV approached something of interest and a fix on the position was recorded, but the ideal still image for that observation may have occurred seconds later. Due to these factors, there are situations in which the timestamp does not correspond with the observation data sheet. When reviewing a still image and locating it in the video, reviewers should also review video leading up to and after the timestamp to obtain a more accurate perspective of the observation.

All observation data was collected in real time and recorded on a excel data sheet. The field of view was visually analyzed to determine the number of species present, percent of substrate, abundance, etc. Subsequent to the field program, the data set was organized and analyzed for mapping shown in Appendix A, Sheets 1 – 13. The data sheet was imported into ArcGIS and converted into shapefile format allowing the observation locations to be viewed spatially on maps. To present species, abundance, functional groups, etc., versus substrate, a substrate raster reflecting coarse grained substrate versus fine grained substrate was generated in ArcGIS. ArcGIS then enabled the coral versus sponge distribution (Sheet 2), or the genus and species (Sheet 3), or functional groups (Sheet 4) to be assigned different icons and then displayed above the substrate raster to provide context and spatial analysis. Sheets 5-12 reflect genus and species superimposed over the four cuttings dispersion model scenarios areas to enable identification of observation locations which could potentially be subject to an increase in suspended solids and/or deposition and accumulation of cuttings. Sheet 13 shows physical conditions observations of locations that lie within dispersion model areas.

bp conducted an internal analysis of the data to assess the presence of habitat forming corals and sponges. The approach to the analysis is described as follows:

- Appendix B observation data was first sorted for abundance, highest to lowest.
- Observations with relatively higher numbers of individuals were visually scanned for location (direction and distance) relative to the primary well site.
- Due to the very large data set, which included observations over a very large area outside of the predicted deposition zones, there was a need to prioritize and focus on a subset of the data.
- Observations occurring within the PNET zones for each of the four current scenarios modelled were then extracted as four separated files. The scenarios modeled were high and low surface currents and high and low currents at the seafloor.
- Observations occurring in the PNET zones were further differentiated based on those within the >6.5 PNET versus the 1.5-6.5 PNET.
- For each of the four separate files for the four scenarios, those observations having individuals > 5 became the focus. There was no specific habitat science-based rationale for using 5 as the screening criteria, professional judgement formed the basis of that approach. Based on a random scan of photos and videos as well as the feedback from RPS that sea pens were present throughout the area, widely spaced with no particular area substantially differing from another, a screening criterion of 5 individuals was judged to be at low risk of overlooking observations containing habitat forming corals. To reduce this risk further 100% of the images recorded for the entire survey area were reviewed.
- All observations within both PNET zones for all four scenarios were then listed separately, duplicates removed, leaving 32 observations.
- The images of all 32 were visually examined closely. The videos for each of the 32 were run and the video leading up to and after the recorded timestamp reviewed. All 32 images were then compiled in a PowerPoint file for ease of reference and discussion.
-

Update March 27, 2023

3.1.4 (paragraph below is added)

To improve the sea pen data quality, an analysis of the ROV video of the entire survey was conducted by WSP E&IS Canada Ltd. on behalf of bp. The video analysis results are described in the report titled *bp Ephesus Pre-Drilling Benthic Fauna (Coral and Sponge) Seabed Survey Video Re-Analysis for Sea Pen Abundance and Density Report* CN002-EV-REP-600-00017. The following are the key observations noted in the report:

- Pennatula spp. comprised much of the total sea pen abundance (99.7% of total observations). Other sea pen species observed included Anthoptilum spp. and whip-like sea pens Distichoptilum gracile and Balticina spp.
- The highest densities (>0.48 ind./m2) occurred to the southwest of the primary well site near and within the Southern DFO Area of Interest.
- Sea pen condition within the survey area was 99.8% “Good” with 0.17% considered “Damaged” or “Dead”.

Also evident in the data presented is that the northerly DFO Area of Interest contains slightly higher densities when compared to the infill area surrounding the primary and alternative well sites.

It can be concluded from the report that, based on sea pen densities, the relocation of the well site will not result in a net environmental benefit and the impacts are minimized by drilling at the primary well site.

3.1.5 and 3.2.3 (paragraph below is added)

Four observations of black corals were incorrectly identified during the June 2002 seabed survey. In a subsequent review of the video, DFO identified one back coral located approximately 229m SSW of the well site which is well outside of the predicted area to be subject to deposition of drill solids. DFO also identified a second potential black coral located approximately 82m to the east of the well site which is perpendicular to the predominate direction of the current. During the planned sediment sampling survey in April 2023 both corals will be located and close up images taken.