FINAL

EL 1144 Seabed Survey
Coral Determination Report

Submitted to:

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IMPORTANT NOTICE

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Document Name	Document No.	Revision	Prepared By	Reviewed By	Date
EL1144 Seabed Survey Coral Determination Report	TA1983403-1	1.0	LM	JS	12-Aug-2019
EL1144 Seabed Survey Coral Determination Report	TA1983403-2	2.0	KM	JS	20-Aug-2019
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EL1144 Seabed Survey Coral Determination Report	TA1983403-6	6.0	LM	JS	23-Oct-2019

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C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
cm	centimeters
CSRS	Canadian Spatial Reference System
DFO	Fisheries and Oceans Canada
EL	Exploration License
HiPAP	High precision acoustic positioning
m	meters
ROV	Remotely-operated vehicle
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

Wood Canada Environment and Infrastructure, a division of Wood Group PLC (Wood), was contracted by Oceaneering to conduct seabed surveys at two wellsite locations within the CNOOC Petroleum North America ULC (CNOOC) Exploration Licence (EL) 1144 in the Flemish Pass. Prior to the authorization of drilling activities, a seabed survey is needed to assess the presence of coral colonies surrounding the proposed drill center sites. The objective of the survey was to characterize aggregations of deep-sea corals at two drill center sites (Figure 1-1).

To mitigate effecting deep-sea corals within the vicinity of drilling activities, the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) applies a specific guidance prior to authorization of drilling activities. The guidance indicates that drilling activities, shall not occur within 100 m of coral colonies, defined either as:

- *Lophelia pertusa* reef complex; or
- Five or more large corals (larger than 30 centimeters in height or width) within a 100 square metre area.

The following report summarizes the occurrence of deep-sea corals (in accordance with C-NLOPB guidance) within 100-m from the proposed drill center.

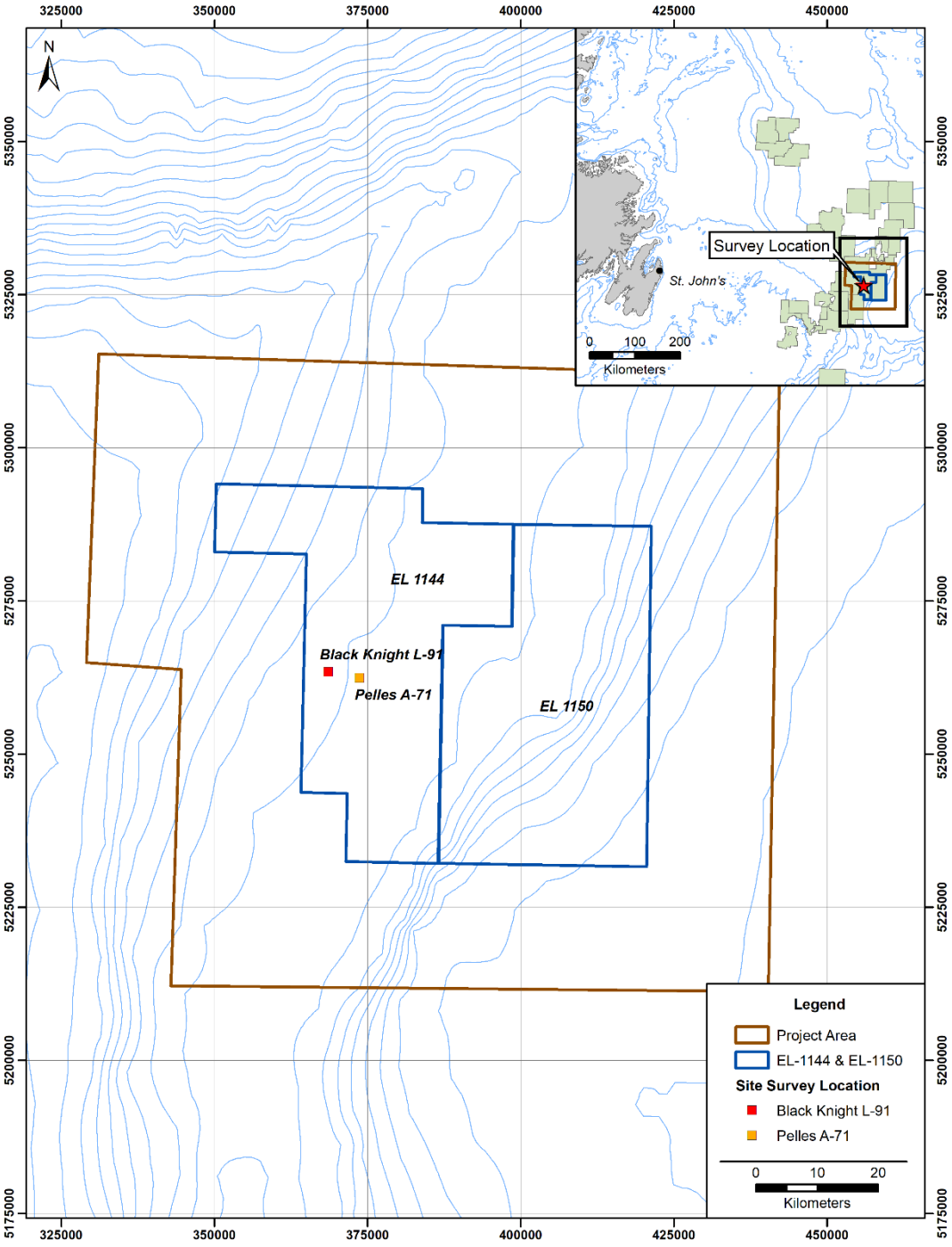


Figure 1-1 Area map of the two proposed sites with ROV video imagery surveys.

2.0 METHODS

Two drill center sites were surveyed within EL1144 in the Flemish Pass from July 15th - July 18th, 2019 aboard the MV *Horizon Star* (Figure 1-1,Table 2.1) with a Magnum 157 remotely-operated vehicle (ROV) (Figure 2-2). The ROV was used to collect video and still imagery along a pre-determined survey design plan. The surveys were designed to investigate within 100-m around the proposed drill centers, 250 m radial pattern through the drill centres (8 lines), and the extent of the predicted drill cuttings footprint.

Oceaneering was responsible for chartering of the vessel, operation of the ROV, and overall positioning quality assurance / quality control (QA/QC) for the project. All parties participated in vessel health and safety under the ultimate responsibility of the captain of the *Horizon Star*. ROV positioning was determined using the vessel's high precision acoustic positioning (HiPAP) system. Transects were plotted from coordinates captured using the HiPAP system aboard the vessel the *Horizon Star*. These coordinates were then plotted using GIS software ArcMap v10.5 (ESRI 2016). Wood provided onboard marine biologists (24/7) that were responsible for providing direction to ROV operators to ensure the collection of appropriate benthic video imagery for assessment of C-NLOPB guidance and characterizing the benthic environment, as well as marine mammal and seabird observation. Daily update reports were sent to Oceaneering and CNOOC detailing project activities and survey progress.

Table 2.1 Centre coordinates for seabed survey sites.

Site	Latitude (N)	Longitude (W)	Northing (m)	Easting (m)
Pelles A-71	47°30' 12.847"	46°40' 38.849"	5262490.00	373675.00
Pelles A-71*[1]	47°30' 11.90"	46°40' 39.14"	5262460.78	373668.24
Black Knight L-91	47°30' 39.841"	46°44' 44.278"	5263436.40	368559.80

[1] revised drill center location for Pelles A-71
Latitude and Longitude are in degree minutes seconds
UTM coordinates in NAD83 (CSRS), Zone 23, EPSG: 26922

2.1 Seabed Survey

The seabed survey was designed, in consultation with Fisheries and Oceans Canada (DFO) and the C-NLOPB, to investigate within 100-m of the proposed drill center, 250-m radial pattern (8 lines) beyond the drill center, and the drill cuttings footprint from an applicable drill cuttings dispersion model (Figure 2-1; Nexen 2018). The proposed drill center survey included eleven transects within a 200 x 200 m boundary for comparison against the C-NLOPB guidance for avoiding coral colonies and is the focus of this report. This includes all corals above 30 cm observed along grid lines G1 through G11 for a total of 11 transects (Figure 2-1). Overall survey results, including coral and sponge densities and reports of fish and invertebrates, will be presented in a separate final report.

A Magnum 157 ROV was used to collect video and still imagery at each site (Figure 2-2). Video was collected less than 1 m above the seabed at speeds of less than 1 km/hr along pre-determined transects of the survey design within the survey area. The ROV was equipped with a Kongsberg oe/4-366 color zoom camera and scaling lasers spaced 25 cm apart. The video was overlaid with date, time, depth, heading, and coordinates (UTM). Coral heights were determined using the scaling lasers and geo-referenced still images were taken of corals above 30 cm within 100-m of the proposed drill center. When corals above C-NLOPB guidance were observed at the Pelles

A-71 location, the proposed drill center was revised and the survey re-centered around the revised drill center (Table 2.1). The survey details for each site is presented in Table 2.2.

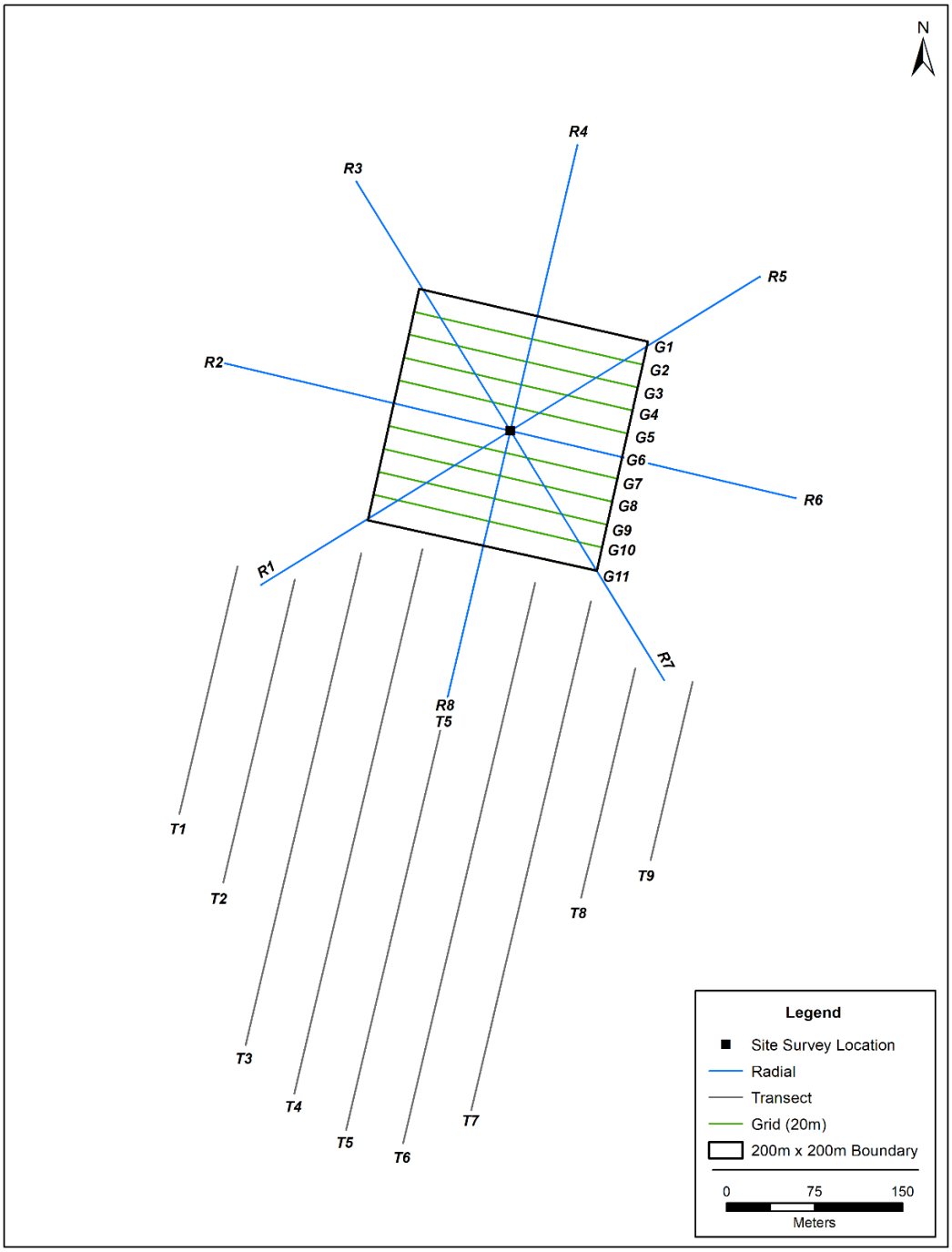


Figure 2-1 Planned seabed survey design for each potential drill center.

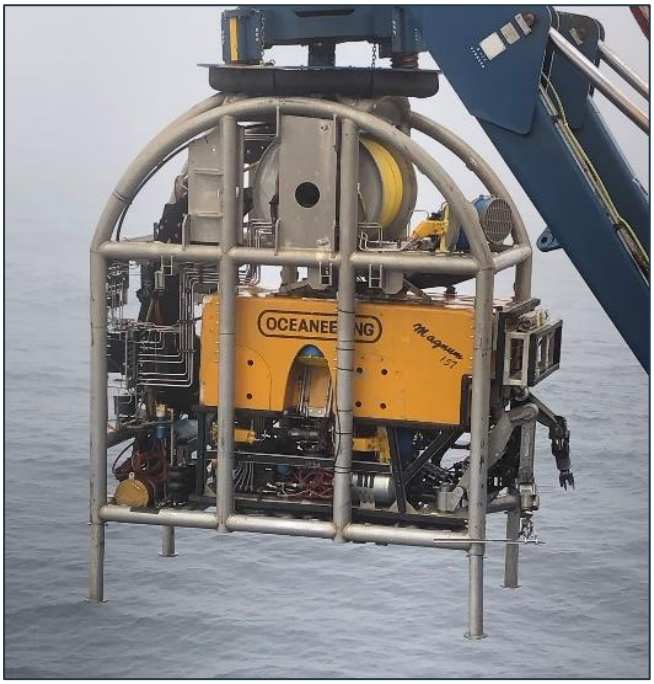


Figure 2-2 Oceaneering Magnum 157 ROV used for the Flemish Pass benthic survey in its cradle

Table 2.2 The number of transects, depths, survey distances, and total video collected (time) collected by ROV at each site within the 200 x 200 m boundary.

Area	No. of Transects	Depth Range (m)	Total Survey Distance (m)	Total Survey Video (hh)	Comments
Pelles A-71	22[1]	1,162	3,360	12.75	Drill center was revised
Black Knight L-91	19	1,154-1,156	2,960	5.25	

Notes: See Appendix A for start and end points for each transect line.
[1] Additional grid lines and radials were centered around the revised drill center

2.2 Analysis

Transects within a 200 m x 200 m boundary around the proposed and revised drill center at each site were assessed based on the current (2019) C-NLOPB regulatory coral guidance. This includes noting the presence or absence of the reef-forming deep-sea coral *Lophelia pertusa* and the presence of five or more corals above 30 cm in height or width within a 10 m by 10 m area. Coral heights exceeding guidance were determined during the survey with scaling lasers (25 cm) and a measuring tool with 10 cm sections. A geo-referenced still image (using the digital overlay) for each coral observed above 30 cm in height/width was recorded. The still imagery was analyzed to confirm heights using the scaling lasers and a measuring tool in the scientific image analysis

software ImageJ, (Rueden et al. 2017; Figure 2-3). Corals above 30 cm in height/width were mapped using ArcMAP 10.5 (ESRI) in NAD83 datum zone 23N.

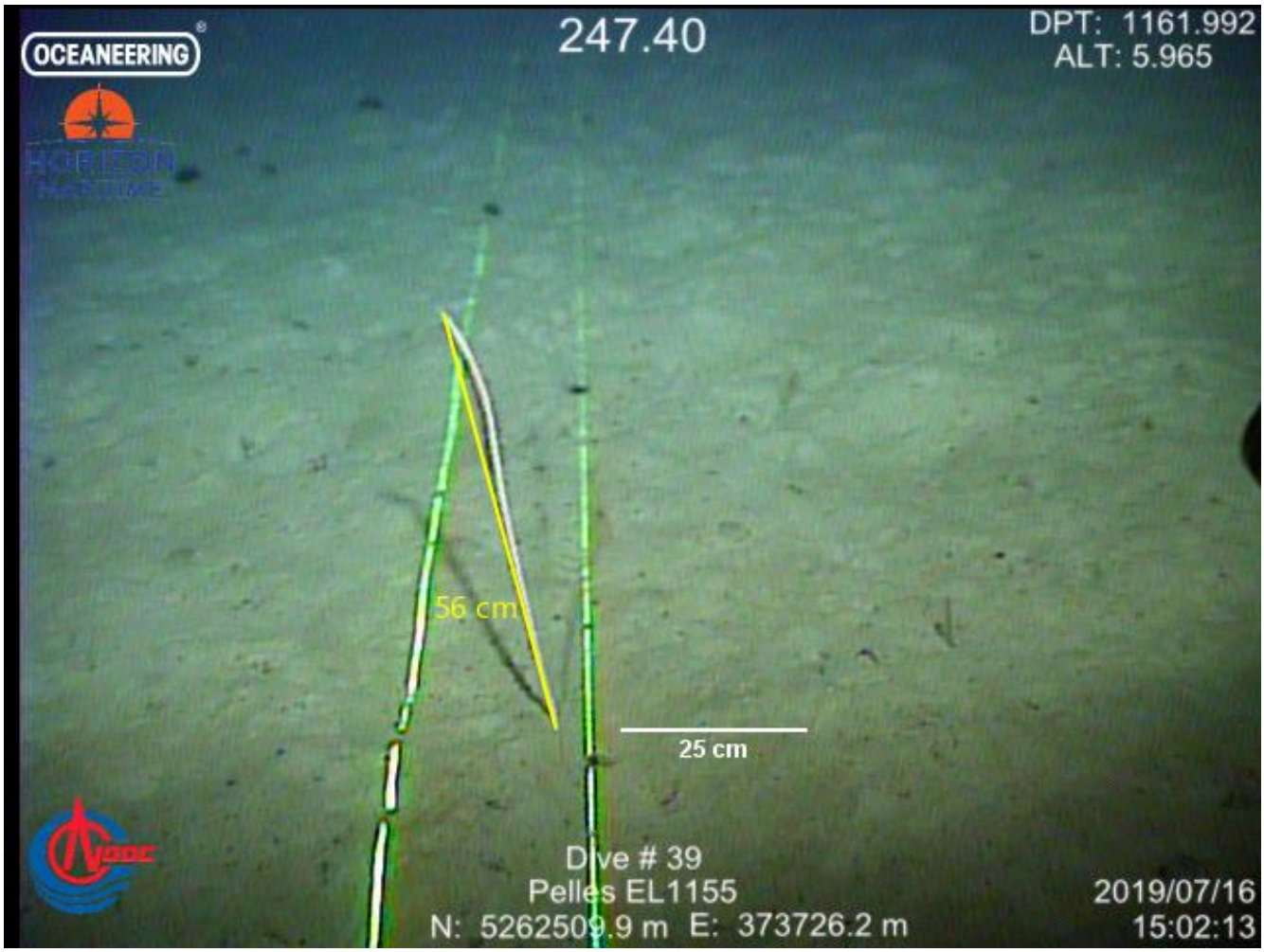
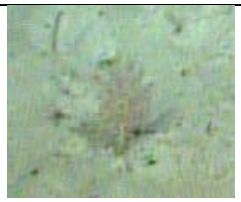
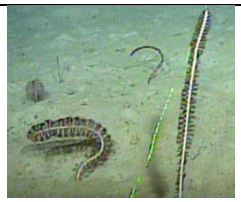


Figure 2-3 Example from Pelles A-71 of measuring heights using ImageJ. Lasers are 25 cm apart.

Corals were categorized into widely used functional groups that have been established and defined across several coral identification guides (e.g. Kenchington et al. 2015). Coral identification to species often requires recovered specimens as distinguishing features may require examination under magnification by a qualified taxonomist. No corals specimens were collected during the seabed investigation. Coral functional groups are based on shape and species characteristics of which four were observed during the survey (Table 2.3). Soft corals (Alcyonacean and Nephtheids) have a soft hydrostatic support system and lack of a hard-supporting structure. Black coral (Antipatharians) generally have a black hard skeleton visible beneath the polyps. Stony coral (Scleractinia) can form either reefs/mounds or exist as individual cup corals. This functional group includes target species *L. pertusa*. Branching coral (Alcyonacea, also known as gorgonians) form fan or bush like structures with

hard skeletons. Sea pens (Pennatulaceans) can appear feather-like or as long whips. Faunal identification was dependent on the quality of the imagery and prominence of identifying characteristics.

Table 2.3 Coral Functional Groups

Class	Functional Group	Representative Photo	Example Taxa
Alcyonacea	Soft Coral		*Anthomastus* sp, Nephtheidae
Antipatharia	Black-Coral		*Stauropathes* sp., *Stichopathes* sp.
Scleractinia[1]	Stony Coral		*Lophelia pertusa*, *Desmophyllum* sp. *Flabellum* sp.
Alcyonacea	Branching Coral		*Acanella* sp *Paragorgia* sp.
Pennatulacea	Sea Pen		*Anthoptilum* sp *Pennatula* sp

Note: Functional groups from Kenchington et al. 2015
[1] Image Source Miles 2018

3.0 RESULTS

A combined total of 18 hours of ROV video covering 6,320 m of seafloor were analyzed within the 200 m x 200 m boundary at both sites (Pelles A-71 and Black Knight L-91). The depth at Pelles A-71 was 1,162 m and between 1,154 to 1,156 m at Black Knight L-91 (Table 2.2). Visibility varied due to 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. Video quality was acceptable for categorizing corals into functional groups, assessing abundance, and conducting measurements as per regulatory guidance Two additional grid lines and 3 radials were added to the survey at Pelles A-71 to account for a revised drill center.

3.1 Assessment to C-NLOPB Coral Guidance

Pelles A-71

A total of four different coral functional groups were observed at Pelles A-71. Sea pens were the most common coral functional group observed with soft corals and branching corals commonly observed as well. There were also two observations of black coral. The reef-forming coral *Lophelia pertusa* was not observed at this site. A total of 72 corals above 30 cm were within 100-m of the revised drill center at Pelles A-71. There were 89 corals above 30 cm observed within the 200 m x 200 m survey area. There were two confirmed coral colonies as defined by C-NLOPB observed at Pelles A-71.

A group of five corals above 30 cm was located on grid line G-2 (Figure 3-1, red box). As a result, the Pelles A-71 drill center was revised and the entire survey was moved 30 m at heading 193° from the pre-survey proposed drill centre (Figure 3-2) to ensure the coral group was greater than 100 m from the drill centre. These corals were observed in a tight grouping at the same location. A second aggregation of five sea pens above 30 cm was located on grid line G-13 in the southern portion of the survey (Figure 3-1, red box). The sea pens were less tightly clustered but were within sight of each other from the ROV field-of-view (Figure 3-3). This coral group was located more than 100 m from the revised drill center.

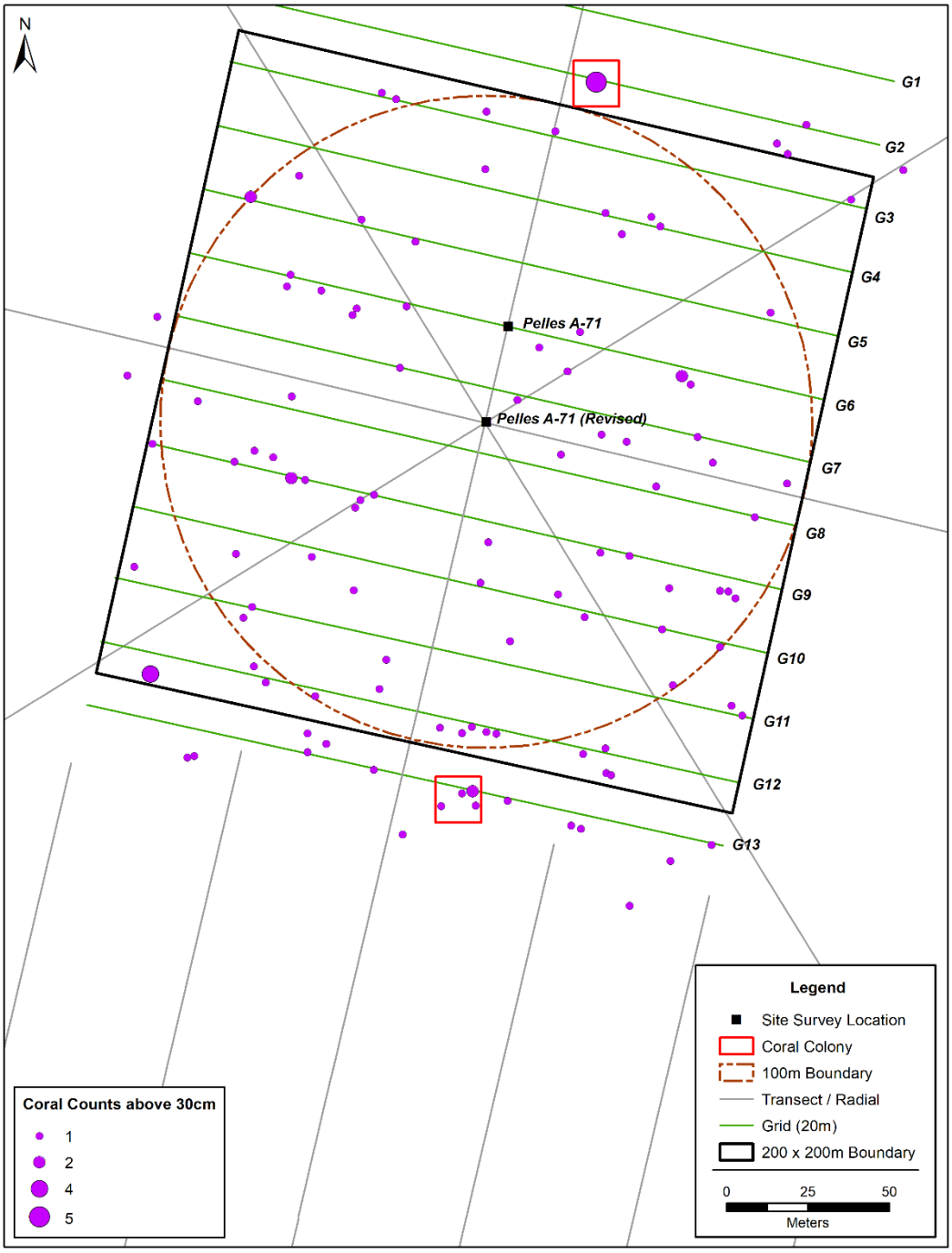


Figure 3-1 Location of corals above 30 cm observed within 200 m x 200 m boundary of proposed drill center and 100-m boundary of the revised drill center at Pelles A-71. Red boxes identify guidance coral colonies.

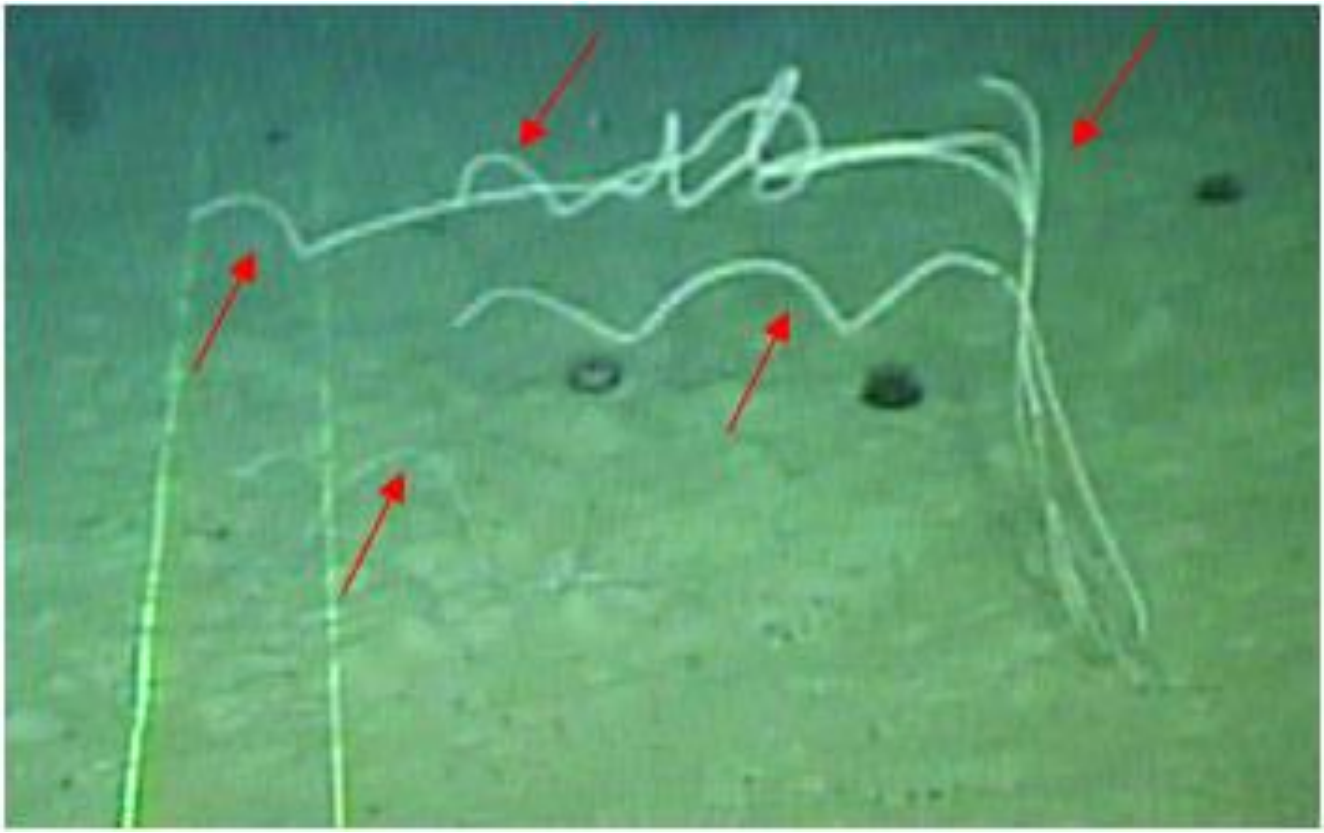


Figure 3-2 Coral colonies above guidance thresholds observed at Pelles A-71 grid line G-2. Green lasers are spaced 25 cm apart. Individual corals are identified by 5 red arrows.

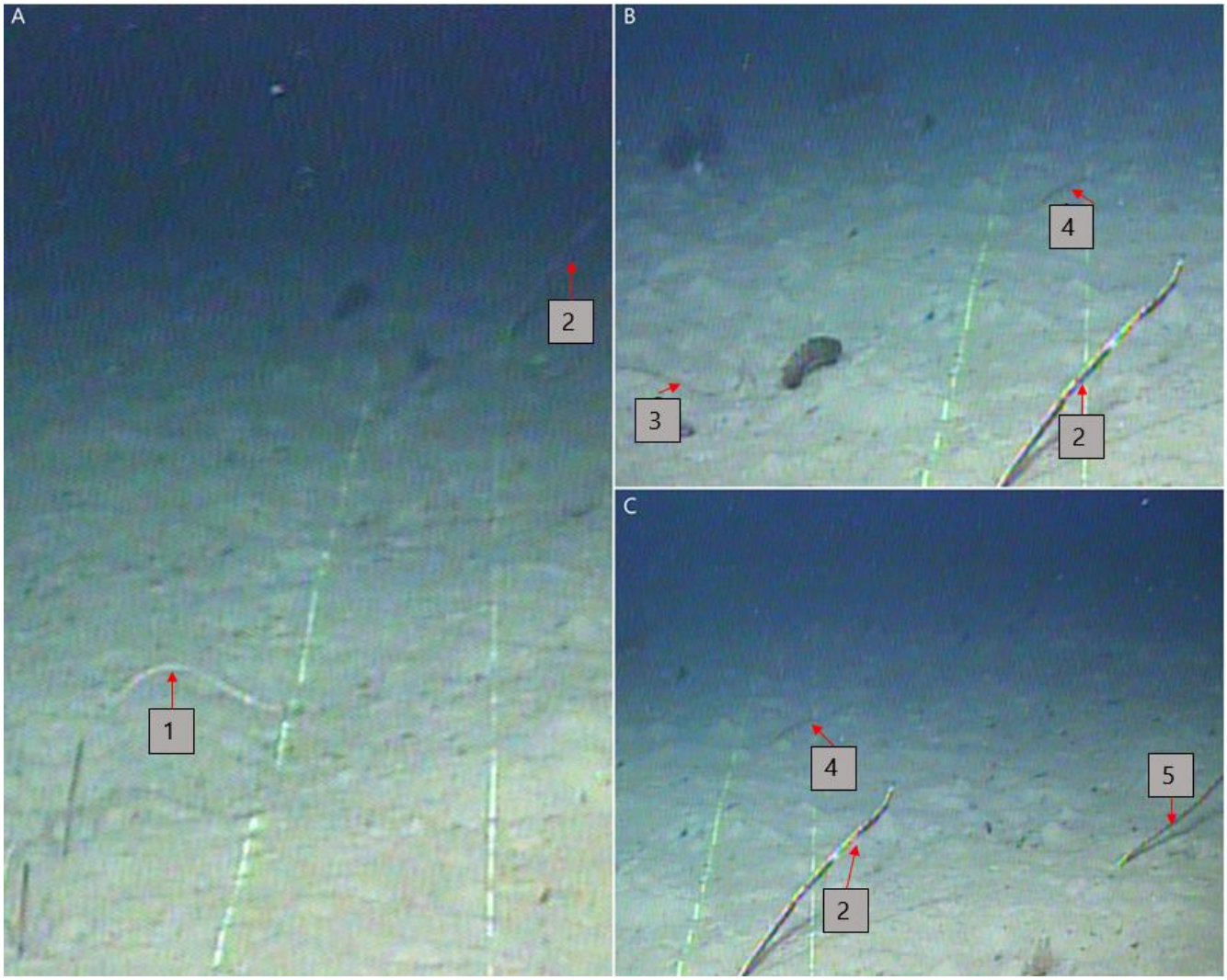


Figure 3-3 Five coral colonies above 30 cm within 10 m of each other at Pelles A-71 on grid line G13.Green lasers are spaced 25 cm apart. Individual corals are numbered 1 through 5.

Black Knight L-91

There were 19 corals above 30 cm within 100-m from the drill center at Black Knight L-91 (Figure 3-4). Twenty-five corals above 30 cm were observed within the 200 m x 200 m survey area. Common coral functional groups observed were sea pens, soft corals, and branching corals. The reef-forming coral *Lophelia pertusa* was not observed at this site. There were no groupings of corals observed that exceeded guidance thresholds. A coil of metal wire was also observed within the 200 m x 200 m boundary (Figure 3-5).

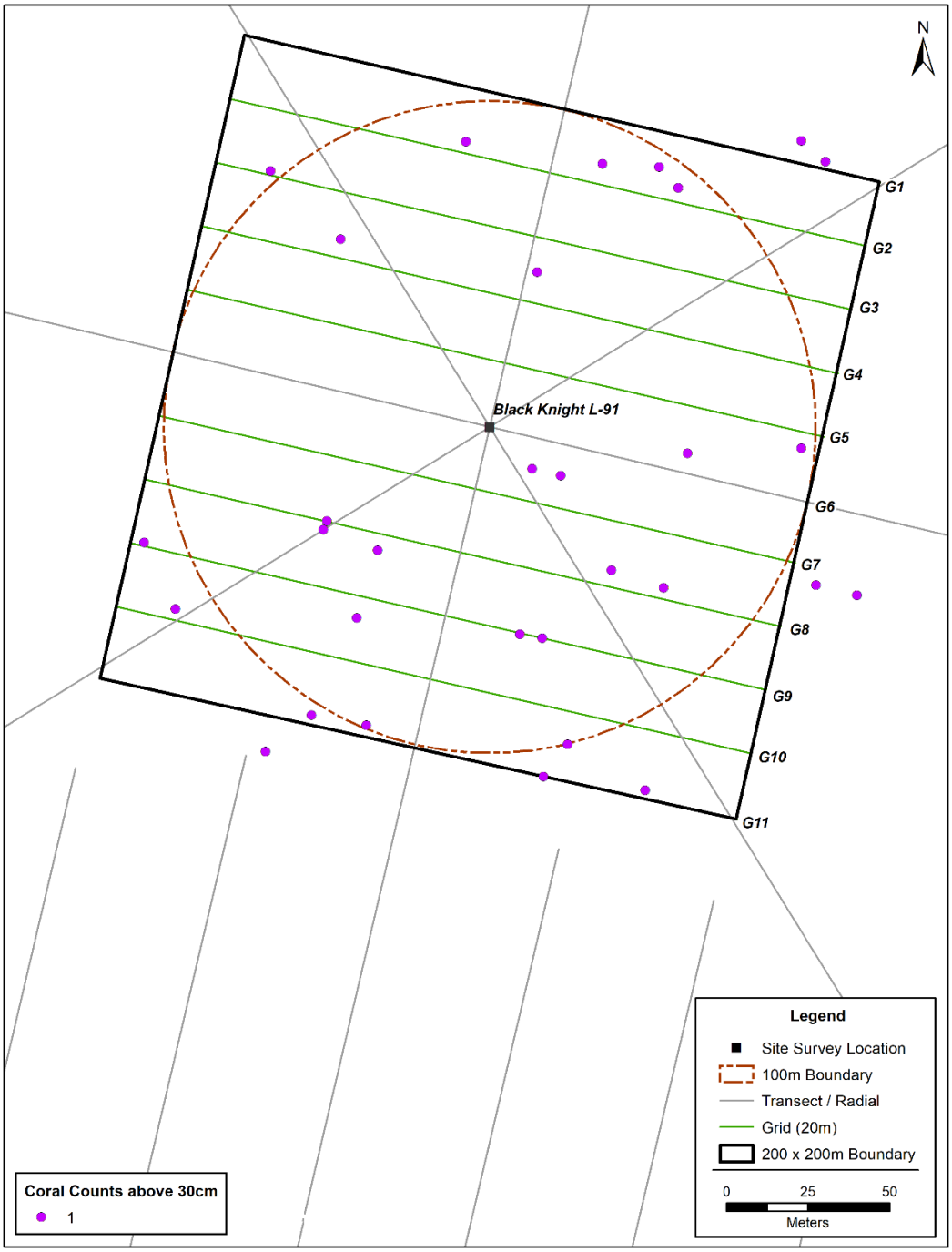


Figure 3-4 Locations of corals above 30 cm observed within the 200 m x 200 m boundary the proposed drill center at Black Knight L-91.

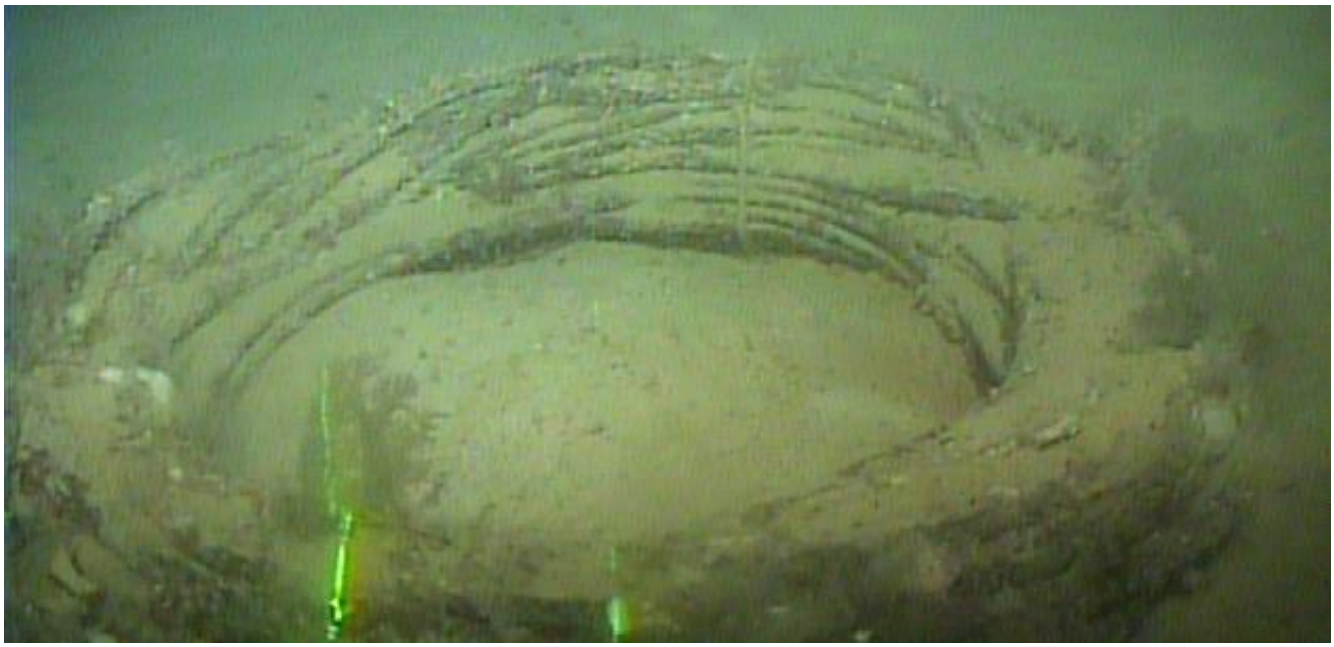


Figure 3-5 Coil of metal wire observed along Grid Line 8 at Black Knight L-91. Green lasers are spaced 25 cm apart.

4.0 SUMMARY AND CONCLUSION

Seabed video surveys were conducted with an ROV at two sites within EL1144 and were assessed against C-NLOPB guidance on coral colonies. The guidance states that no drilling activities should occur within 100-m of a coral colony, defined as *Lophelia pertusa* coral or a grouping of five or more corals above 30 cm in height/width in a 10 m x 10 m area.

At Pelles A-71, the reef-forming coral *Lophelia pertusa* was not observed within the 200 x 200 m area surveyed by ROV. Two coral colonies were observed during the survey (on Transects G2 and G13) which resulted in the selection of a revised drill site location. These corals were observed relatively close to each other or together within the field of view at densities of five within a 10 x 10 m area. These colonies are greater than 100m from the revised drill center location.

At Black Knight L-91, there were no coral colonies above threshold guidance observed as defined by C-NLOPB guidance and *Lophelia pertusa* was not observed.

5.0 CLOSURE

This report of the biological environment observed at EL 1144 has been prepared for the exclusive use of Oceaneering and CNOOC. The project was conducted using standard practices by qualified Wood staff and in accordance with verbal and written requests from the client.

Yours sincerely,

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6.0 References

Kenchington, E., L. Beazley, F. J. Murillo, G. Tompkins MacDonald, and E. Baker. 2015. Coral, sponge, and other vulnerable marine ecosystem indicator identification guide, NAFO area. NAFO Scientific Council Studies Number 47:1–74.

Miles, L. L. 2018. Cold-water coral distributions and surficial geology on the Flemish Cap, Northwest Atlantic. Memorial University of Newfoundland, St John's, NL.

Nexen (Nexen Energy ULC). 2018. Nexen Energy ULC Flemish Pass Exploration Drilling Project (2018-2028). Environmental Impact Statement. Pursuant to the Requirements of the Canadian Environmental Assessment Act, 2012. St John's, NL.

Rueden, C. T., J. Schindelin, M. C. Hiner, and et al. 2017. ImageJ2: ImageJ for the next generation of scientific image data.

APPENDIX A TRANSECT START AND END POINTS

Table A.1 Start and end coordinates for the ROV survey (NAD 83 (CSRS), Zone 23). "*" Indicates transects centered on revised drill center.

Site No	Site Name	Date	Start Time (NDL)	End Time (NDL)	Northing Start	Easting Start	Northing End	Easting End	Transect
1	Pelles A-71	20190715	21:45	11:58	5262514.3	373586.3	5262463.8	373796.6	G6
1	Pelles A-71	20190716	00:30	01:02	5262442	373761.7	5262488.2	373568.2	G7
1	Pelles A-71	20190716	01:04	01:29	5262475.9	373553.2	5262432.1	373757.8	G8
1	Pelles A-71	20190716	01:47	02:19	5262403.1	373767.6	5262455.6	373565.2	G9
1	Pelles A-71	20190716	02:35	03:01	5262529.3	373582.1	5262492.4	373785.4	G5
1	Pelles A-71	20190716	03:12	03:42	5262507	373769.4	5262548.8	373589.4	G4
1	Pelles A-71	20190716	03:54	04:17	5262577.5	373589	5262528.6	373796	G3
1	Pelles A-71	20190716	04:26	04:40	5262544.8	373800.5	5262587	373702.8	G2
1	Pelles A-71	20190716	06:00	06:50	5262391.6	373756.8	5262426.5	373560	G10
1	Pelles A-71	20190716	07:03	07:45	5262419.4	373544.9	5262361.3	373752.7	G11
1	Pelles A-71	20190716	07:59	08:36	5262345.9	373739.3	5262395.8	373547.3	G12
1	Pelles A-71	20190716	08:46	09:30	5262379.2	373545.5	5262329	373742.2	G13
1	Pelles A-71	20190716	10:25	10:50	5262281.6	373795.5	5262481.8	373675.3	R7
1	Pelles A-71	20190716	10:50	11:13	5262481.8	373675.3	5262693.3	373546.8	R3
1	Pelles A-71	20190716	13:44	14:06	5262544.2	373436	5262504.4	373667.6	R2
1	Pelles A-71	20190716	14:06	14:34	5262504.4	373667.6	5262433.2	373919.5	R6
1	Pelles A-71	20190716	14:51	15:12	5262618.5	373881.1	5262482.8	373674.5	R5
1	Pelles A-71	20190716	15:12	15:29	5262482.8	373674.5	5262360	373459.8	R1
1	Pelles A-71	20190716	16:28	16:45	5262719.9	373729.7	5262499.8	373674.2	R4
1	Pelles A-71	20190716	16:45	17:11	5262499.8	373674.2	5262256.8	373616.8	R8
1	Pelles A-71	20190716	17:11	17:38	5262256.8	373616.8	5261878.7	373530.9	T5
1	Pelles A-71	20190716	18:50	19:13	5262342.2	373436.9	5262136.3	373392.5	T1
1	Pelles A-71	20190716	19:32	20:00	5262087.3	373423.5	5262322.6	373492.8	T2
1	Pelles A-71	20190716	20:05	20:27	5262377.2	373546.8	5261970	373466	T3
1	Pelles A-71	20190716	20:43	21:32	5261906.6	373473.5	5262357.6	373589.5	T4
1	Pelles A-71	20190716	21:57	22:30	5262328.6	373688.6	5261861.4	373584.6	T6
1	Pelles A-71	20190716	22:39	23:12	5261887.9	373652.5	5262320	373735.5	T7
1	Pelles A-71	20190716	23:30	23:44	5262260.8	373780.4	5262079.8	373734.6	T8
1	Pelles A-71	20190716	23:55	00:08	5262083.4	373780.4	5262237.4	373817.7	T9
1*	Pelles A-71	20190718	02:34	03:45	5262509.3	373466.9	5262460.77	373668.25	R2*
1*	Pelles A-71	20190718	02:34	03:45	5262460.77	373668.25	5262404.1	373905.8	R6*
1*	Pelles A-71	20190718	04:14	04:38	5262591.1	373885.6	5262494.8	373717.3	R5*
1*	Pelles A-71	20190718	04:38	05:19	5262494.8	373717.3	5262329.5	373460.4	R1*

Site No	Site Name	Date	Start Time (NDL)	End Time (NDL)	Northing Start	Easting Start	Northing End	Easting End	Transect
1*	Pelles A-71	20190718	06:04	06:23	5262683.8	373531.9	5262484.8	373656.4	R3*
1*	Pelles A-71	20190718	06:23	06:49	5262484.8	373656.4	5262258.1	373797.2	R7*
2	Black Knight L-91	20190717	03:27	03:48	5263461.4	368482.5	5263425.1	368656.3	G6
2	Black Knight L-91	20190717	03:51	04:10	5263432	368662.5	5263469	368470.7	G5
2	Black Knight L-91	20190717	04:15	04:35	5263502.8	368482.2	5263433.7	368724.1	G4
2	Black Knight L-91	20190717	04:44	05:02	5263475.5	368672.7	5263513.4	368475.3	G3
2	Black Knight L-91	20190717	05:05	05:21	5263533.5	368477.4	5263499.1	368665.7	G2
2	Black Knight L-91	20190717	06:20	06:38	5263507.2	368685.2	5263554.6	368485.3	G1
2	Black Knight L-91	20190717	07:05	07:27	5263439.8	368474.5	5263361.7	368689.4	G7
2	Black Knight L-91	20190717	10:42	11:14	5263393.5	368604.5	5263414.5	368461.9	G8
2	Black Knight L-91	20190717	11:25	11:41	5263398.6	368455.8	5263358.4	368625.6	G9
2	Black Knight L-91	20190717	11:54	12:12	5263333.8	368608.1	5263373.2	368432.9	G10
2	Black Knight L-91	20190717	12:13	12:30	5263363.2	368443.2	5263317.3	368626.8	G11
2	Black Knight L-91	20190717	12:55	13:18	5263224.9	368687.4	5263435.9	368554.3	R7
2	Black Knight L-91	20190717	13:18	13:37	5263435.9	368554.3	5263636.3	368425.3	R3
2	Black Knight L-91	20190717	14:25	14:43	5263479.9	368336.9	5263441.6	368548.9	R2
2	Black Knight L-91	20190717	14:43	14:56	5263441.6	368548.9	5263373.8	368791.3	R6
2	Black Knight L-91	20190717	15:31	15:50	5263573.6	368758	5263435.8	368562.9	R5
2	Black Knight L-91	20190717	15:50	16:12	5263435.8	368562.9	5263295.8	368357.2	R1
2	Black Knight L-91	20190717	17:05	17:25	5263672.5	368614.6	5263432	368566.3	R4
2	Black Knight L-91	20190717	17:25	17:40	5263432	368566.3	5263204.3	368510.5	R8

Site No	Site Name	Date	Start Time (NDL)	End Time (NDL)	Northing Start	Easting Start	Northing End	Easting End	Transect
2	Black Knight L-91	20190717	17:40	18:03	5263204.3	368510.5	5262832.3	368422.2	T5
2	Black Knight L-91	20190717	18:33	18:48	5263105.5	368272.8	5263328.8	368339.4	T1
2	Black Knight L-91	20190717	18:57	19:19	5263324.1	368380.9	5263053.7	368326.1	T2
2	Black Knight L-91	20190717	19:50	20:17	5262932.7	368326	5263372.4	368443.3	T3
2	Black Knight L-91	20190717	20:23	20:58	5263348.7	368493.4	5262881.5	368364.9	T4
2	Black Knight L-91	20190717	21:23	21:53	5262814.3	368468.3	5263308.2	368588	T6
2	Black Knight L-91	20190717	22:00	22:35	5263300.1	368638	5262879.3	368537.7	T7
2	Black Knight L-91	20190717	23:03	23:14	5263044.7	368630.6	5263242.2	368672.8	T8
2	Black Knight L-91	20190717	23:20	23:38	5263227.9	368722.2	5263080.2	368677.3	T9

APPENDIX B COORDINATES OF CORALS ABOVE 30 CM

Table B.1 Coordinates for Corals measured above 30 cm (NAD 83 (CSRS), Zone 23) at Pelles A-71 and Black Knight L-91 including: site number, site name, date, waypoint, measured height, and coral functional groups. "*" Indicates transects centered on revised drill center. Functional Groups: Sea Pen (SP), Branching Coral (BC), Black Coral (BW),

Site No	Site Name	Date	Transect	Waypoint	Northing	Easting	Height/Width cm	Functional Group
1	Pelles A-71	20190716	G2	G2-1	5262537.9	373796.2	47	SP
1	Pelles A-71	20190716	G2	G2-2	5262551.8	373766.4	79	SP
1	Pelles A-71	20190716	G2	G2-3	5262542.9	373760.7	59	SP
1	Pelles A-71	20190716	G2	G2-4	5262546.1	373757.4	122	BC
1	Pelles A-71	20190716	G2	G2-5	5262564.9	373702	53	BC
1	Pelles A-71	20190716	G2	G2-6	5262564.9	373702	119	BC
1	Pelles A-71	20190716	G2	G2-7	5262564.9	373702	73	BC
1	Pelles A-71	20190716	G2	G2-8	5262564.9	373702	130	BC
1	Pelles A-71	20190716	G2	G2-9	5262564.9	373702	161	BC
1	Pelles A-71	20190716	G3	G3-1	5262561.6	373636.2	71	SP
1	Pelles A-71	20190716	G3	G3-2	5262559.7	373640.6	66	SP
1	Pelles A-71	20190716	G3	G3-3	5262555.9	373668.3	44	SP
1	Pelles A-71	20190716	G3	G3-4	5262549.8	373689.4	49	SP
1	Pelles A-71	20190716	G3	G3-5	5262528.9	373780.2	47	SP
1	Pelles A-71	20190716	G4	G4-1	5262520.7	373721.6	33	SP
1	Pelles A-71	20190716	G4	G4-2	5262523.6	373718.9	38	SP
1	Pelles A-71	20190716	G4	G4-3	5262518.3	373709.8	73	SP
1	Pelles A-71	20190716	G4	G4-4	5262524.8	373704.8	59	SP
1	Pelles A-71	20190716	G4	G4-5	5262538.2	373667.9	40	SP
1	Pelles A-71	20190716	G4	G4-6	5262536.2	373610.9	30	SP
1	Pelles A-71	20190716	G5	G5-1	5262529.7	373596.1	32	SP
1	Pelles A-71	20190716	G5	G5-2	5262529.7	373596.1	51	SP
1	Pelles A-71	20190716	G5	G5-3	5262522.8	373630	42	SP
1	Pelles A-71	20190716	G5	G5-4	5262516	373646.5	52	SP
1	Pelles A-71	20190716	G5	G5-5	5262494.2	373755.5	54	SP
1	Pelles A-71	20190715	G6	G6-1	5262505.8	373608.2	40	SP
1	Pelles A-71	20190715	G6	G6-2	5262502.3	373607.1	52	SP
1	Pelles A-71	20190715	G6	G6-3	5262501	373617.6	49	SP
1	Pelles A-71	20190715	G6	G6-4	5262493.5	373627.2	51	SP
1	Pelles A-71	20190715	G6	G6-5	5262495.5	373628.5	62	SP
1	Pelles A-71	20190715	G6	G6-6	5262496.1	373643.8	38	SP
1	Pelles A-71	20190715	G6	G6-7	5262483.5	373684.5	53	BC
1	Pelles A-71	20190715	G6	G6-8	5262488.3	373697	53	SP
1	Pelles A-71	20190715	G6	G6-9	5262476.2	373693.2	58	SP
1	Pelles A-71	20190715	G6	G6-10	5262474.7	373728.3	58	SP
1	Pelles A-71	20190715	G6	G6-11	5262474.7	373728.3	55	SP

Site No	Site Name	Date	Transect	Waypoint	Northing	Easting	Height/Width cm	Functional Group
1	Pelles A-71	20190715	G6	G6-12	5262472.2	373731	50	SP
1	Pelles A-71	20190716	G7	G7-1	5262441.8	373760.5	44	SP
1	Pelles A-71	20190716	G7	G7-2	5262448.2	373737.7	63	SP
1	Pelles A-71	20190716	G7	G7-3	5262456.1	373733.1	57	BC
1	Pelles A-71	20190716	G7	G7-4	5262454.6	373711.3	61	SP
1	Pelles A-71	20190716	G7	G7-5	5262456.8	373703.6	186	BC
1	Pelles A-71	20190716	G7	G7-6	5262467.4	373677.8	38	SP
1	Pelles A-71	20190716	G7	G7-7	5262477.3	373641.8	55	BC
1	Pelles A-71	20190716	G7	G7-8	5262492.9	373567.3	42	SP
1	Pelles A-71	20190716	G8	G8-1	5262474.9	373558.2	37	BC
1	Pelles A-71	20190716	G8	G8-2	5262467.1	373579.8	43	SP
1	Pelles A-71	20190716	G8	G8-3	5262468.5	373608.6	57	BC
1	Pelles A-71	20190716	G8	G8-4	5262440.9	373720.3	52	SP
1	Pelles A-71	20190716	G8	G8-5	5262431.5	373750.6	46	SP
1	Pelles A-71	20190716	G9	G9-1	5262408.7	373742.5	66	SP
1	Pelles A-71	20190716	G9	G9-2	5262408.9	373739.9	109	BC
1	Pelles A-71	20190716	G9	G9-3	5262406.6	373744.7	200	BC
1	Pelles A-71	20190716	G9	G9-4	5262419.6	373712.2	34	SP
1	Pelles A-71	20190716	G9	G9-5	5262420.6	373703.2	46	SP
1	Pelles A-71	20190716	G9	G9-6	5262423.8	373668.9	57	SP
1	Pelles A-71	20190716	G9	G9-7	5262438.3	373633.8	54	SP
1	Pelles A-71	20190716	G9	G9-8	5262436.7	373629.6	47	SP
1	Pelles A-71	20190716	G9	G9-9	5262434.4	373628.1	61	SP
1	Pelles A-71	20190716	G9	G9-10	5262443.5	373608.5	45	SP
1	Pelles A-71	20190716	G9	G9-11	5262444.4	373613.2	45	BW
1	Pelles A-71	20190716	G9	G9-12	5262443.9	373608.9	46	SP
1	Pelles A-71	20190716	G9	G9-13	5262448.5	373591	35	SP
1	Pelles A-71	20190716	G9	G9-14	5262450.7	373691.2	59	SP
1	Pelles A-71	20190716	G9	G9-15	5262449.9	373602.9	>30	SP
1	Pelles A-71	20190716	G9	G9-16	5262449.9	373602.9	>30	SP
1	Pelles A-71	20190716	G9	G9-17	5262454	373565.9	39	SP
1	Pelles A-71	20190716	G10	G10-1	5262420.2	373591.5	57	SP
1	Pelles A-71	20190716	G10	G10-2	5262419.3	373614.7	46	SP
1	Pelles A-71	20190716	G10	G10-3	5262409.1	373627.6	48	SP
1	Pelles A-71	20190716	G10	G10-4	5262411.4	373666.5	55	SP
1	Pelles A-71	20190716	G10	G10-5	5262407.8	373690.3	48	SP
1	Pelles A-71	20190716	G10	G10-6	5262400.8	373698.4	53	SP
1	Pelles A-71	20190716	G10	G10-7	5262409.7	373724.4	69	SP
1	Pelles A-71	20190716	G10	G10-8	5262397.1	373722.2	55	SP
1	Pelles A-71	20190716	G10	G10-9	5262391.7	373739.9	39	SP

Site No	Site Name	Date	Transect	Waypoint	Northing	Easting	Height/Width cm	Functional Group
1	Pelles A-71	20190716	G11	G11-1	5262416.3	373560.3	32	SP
1	Pelles A-71	20190716	G11	G11-2	5262400.7	373593.8	56	SP
1	Pelles A-71	20190716	G11	G11-3	5262404	373596.4	41	SP
1	Pelles A-71	20190716	G11	G11-4	5262387.8	373637.6	35	SP
1	Pelles A-71	20190716	G11	G11-5	5262393.4	373675.5	91	SP
1	Pelles A-71	20190716	G11	G11-6	5262380	373725.5	45	SP
1	Pelles A-71	20190716	G11	G11-7	5262373.7	373743.5	33	SP
1	Pelles A-71	20190716	G11	G11-8	5262370.7	373746.8	56	SP
1	Pelles A-71	20190716	G12	G12-1	5262383.4	373565.2	93	BC
1	Pelles A-71	20190716	G12	G12-2	5262383.4	373565.2	126	BC
1	Pelles A-71	20190716	G12	G12-3	5262383.4	373565.2	126	BC
1	Pelles A-71	20190716	G12	G12-4	5262383.4	373565.2	58	BC
1	Pelles A-71	20190716	G12	G12-5	5262385.8	373597	41	SP
1	Pelles A-71	20190716	G12	G12-6	5262380.8	373600.6	53	SP
1	Pelles A-71	20190716	G12	G12-7	5262376.6	373615.8	47	SP
1	Pelles A-71	20190716	G12	G12-8	5262378.8	373635.5	64	SP
1	Pelles A-71	20190716	G12	G12-9	5262366.9	373654	61	SP
1	Pelles A-71	20190716	G12	G12-10	5262365.3	373660.8	34	SP
1	Pelles A-71	20190716	G12	G12-11	5262365.1	373671.3	59	SP
1	Pelles A-71	20190716	G12	G12-12	5262365.6	373668.3	56	SP
1	Pelles A-71	20190716	G12	G12-13	5262353	373705.1	62	SP
1	Pelles A-71	20190716	G12	G12-14	5262360.6	373704.8	79	SP
1	Pelles A-71	20190716	G12	G12-15	5262358.9	373697.9	49	SP
1	Pelles A-71	20190716	G12	G12-16	5262352.4	373706.5	40	SP
1	Pelles A-71	20190716	G13	G13-1	5262357.8	373576.6	49	SP
1	Pelles A-71	20190716	G13	G13-2	5262358.2	373578.7	37	SP
1	Pelles A-71	20190716	G13	G13-3	5262359.4	373613.4	41	SP
1	Pelles A-71	20190716	G13	G13-4	5262365.2	373613.4	31	SC
1	Pelles A-71	20190716	G13	G13-5	5262362	373619.2	78	SP
1	Pelles A-71	20190716	G13	G13-6	5262354	373633.7	42	SP
1	Pelles A-71	20190716	G13	G13-7	5262334.2	373642.6	37	SP
1	Pelles A-71	20190716	G13	G13-8	5262342.9	373654.4	39	SP
1	Pelles A-71	20190716	G13	G13-9	5262346.8	373660.8	49	SP
1	Pelles A-71	20190716	G13	G13-10	5262343	373665	36	SP
1	Pelles A-71	20190716	G13	G13-11	5262367.2	373663.8	38	SP
1	Pelles A-71	20190716	G13	G13-12	5262347.4	373664.1	38	SP
1	Pelles A-71	20190716	G13	G13-13	5262344.5	373674.8	44	SP
1	Pelles A-71	20190716	G13	G13-14	5262336.9	373694.3	63	SP
1	Pelles A-71	20190716	G13	G13-15	5262335.9	373697.3	33	SP
1	Pelles A-71	20190716	G13	G13-16	5262312.3	373712.2	51	SP

Site No	Site Name	Date	Transect	Waypoint	Northing	Easting	Height/Width cm	Functional Group
1	Pelles A-71	20190716	G13	G13-17	5262326	373724.7	66	SP
1	Pelles A-71	20190716	G13	G13-18	5262331	373737.4	46	SP
1	Pelles A-71	20190716	R7	R7-1	5262381.1	373735.5	41	SP
1	Pelles A-71	20190716	R7	R7-2	5262394.2	373729.6	53	SP
1	Pelles A-71	20190716	R7	R7-3	5262419.4	373712.8	29.81	BW
1	Pelles A-71	20190716	R7	R7-4	5262450.6	373700.3	145	BC
1	Pelles A-71	20190716	R7	R7-5	5262469.6	373704.6	47	SP
1	Pelles A-71	20190716	R7	R7-6	5262460.5	373692.9	34	SP
1	Pelles A-71	20190716	R7	R7-7	5262483.9	373671.4	31	SP
1	Pelles A-71	20190716	R3	R3-1	5262515.6	373654.1	42	SP
1	Pelles A-71	20190716	R3	R3-2	5262525.9	373646.4	47.5	SP
1	Pelles A-71	20190716	R3	R3-3	5262558.2	373631.7	43	SP
1	Pelles A-71	20190716	R2	R2-1	5262497.6	373604.6	59	SP
1	Pelles A-71	20190716	R2	R2-2	5262504.3	373625.7	45	SP
1	Pelles A-71	20190716	R2	R2-3	5262488.8	373626.3	60	SP
1	Pelles A-71	20190716	R2	R2-4	5262499.7	373644.4	40	SP
1	Pelles A-71	20190716	R6	R6-1	5262482.1	373692.5	52	SP
1	Pelles A-71	20190716	R6	R6-2	5262491.8	373701.2	30	SP
1	Pelles A-71	20190716	R6	R6-3	5262497.7	373696.6	49	SP
1	Pelles A-71	20190716	R6	R6-4	5262486.4	373713.4	46	SP
1	Pelles A-71	20190716	R6	R6-5	5262480.2	373714.2	67	SP
1	Pelles A-71	20190716	R6	R6-6	5262471.8	373736.9	54	SP
1	Pelles A-71	20190716	R6	R6-7	5262477.6	373741.7	49	SP
1	Pelles A-71	20190716	R6	R6-8	5262473.7	373754.8	52	SP
1	Pelles A-71	20190716	R6	R6-9	5262473.7	373754.8	32	SP
1	Pelles A-71	20190716	R5	R5-1	5262509.9	373726.2	58	SP
1	Pelles A-71	20190716	R5	R5-2	5262510.2	373715.3	52	SP
1	Pelles A-71	20190716	R5	R5-3	5262499.7	373700	50	SP
1	Pelles A-71	20190716	R1	R1-1	5262452.9	373635.7	52	SP
1	Pelles A-71	20190716	R1	R1-2	5262436	373592.8	44	SP
1	Pelles A-71	20190716	R4	R4-1	5262526.7	373686.4	37	SP
1	Pelles A-71	20190716	R4	R4-2	5262508.9	373680.4	44	SP
1	Pelles A-71	20190716	R4	R4-3	5262502.7	373678.1	54	SP
1	Pelles A-71	20190716	R8	R8-1	5262483.1	373675.8	36	SP
1	Pelles A-71	20190716	R8	R8-2	5262483.6	373673	59	SP
1	Pelles A-71	20190716	R8	R8-3	5262468	373678.2	42	SP
1	Pelles A-71	20190716	R8	R8-4	5262458.3	373665.9	43	SP
1	Pelles A-71	20190716	R8	R8-5	5262452.6	373669.1	67	SP
1	Pelles A-71	20190716	R8	R8-6	5262419.3	373661.3	51	SP
1	Pelles A-71	20190718	R2*	R2*-1	5262477	373623.9	53	SP

Site No	Site Name	Date	Transect	Waypoint	Northing	Easting	Height/Width cm	Functional Group
1	Pelles A-71	20190718	R2*R6*	R2*-2	5262469.7	373640.5	64	SP
1	Pelles A-71	20190718	R2*R6*	R2*-3	5262465.9	373661.8	49	SP
1	Pelles A-71	20190718	R2*R6*	R6*-1	5262452.6	373712.1	66	SP
1	Pelles A-71	20190718	R2*R6*	R6*-2	5262450.3	373718.8	50	SP
1	Pelles A-71	20190718	R2*R6*	R6*-3	5262443.2	373734.9	62	SP
1	Pelles A-71	20190718	R6*	R6*-4	5262441.9	373761.7	52	SP
1	Pelles A-71	20190718	R5*	R5*-1	5262521	373761.8	43	SP
1	Pelles A-71	20190718	R5*	R5*-2	5262520.8	373759.1	59	SP
1	Pelles A-71	20190718	R5*	R5*-3	5262520.5	373770	57	SP
1	Pelles A-71	20190718	R5*	R5*-4	5262501.9	373745	42	SP
1	Pelles A-71	20190718	R5*R1*	R5*-5	5262495.1	373720.8	41	SP
1	Pelles A-71	20190718	R5*R1*	R5*-6	5262497	373680.6	61	SP
1	Pelles A-71	20190718	R5*R1*	R1*-1	5262460.5	373670.3	75	SP
1	Pelles A-71	20190718	R5*R1*	R1*-2	5262425.1	373609.5	60	SP
1	Pelles A-71	20190718	R5*R1*	R1*-3	5262415.7	373604	59	SP
1	Pelles A-71	20190718	R1*	R1*-4	5262411.2	373602.1	39	SP
1	Pelles A-71	20190718	R1*	R1*-5	5262387.1	373568.4	98	BC
1	Pelles A-71	20190718	R1*	R1*-6	5262387.1	373568.4	80	BC
1	Pelles A-71	20190718	R1*	R1*-7	5262387.1	373568.4	69	BC
1	Pelles A-71	20190718	R1*	R1*-8	5262387.1	373568.4	34	BC
1	Pelles A-71	20190718	R3*	R3*-1	5262532.5	373629.9	40	SP
1	Pelles A-71	20190718	R3*	R3*-2	5262487.7	373646	57	SP
1	Pelles A-71	20190718	R7*	R7*-1	5262428	373691	64	SP
1	Pelles A-71	20190718	R7*	R7*-3	5262423.4	373689.6	47	SP
1	Pelles A-71	20190718	R7*	R7*-4	5262417.2	373706	50	SP
1	Pelles A-71	20190718	R7*	R7*-5	5262401.7	373699.7	59	SP
1	Pelles A-71	20190718	R7*	R7*-6	5262395.6	373706.7	39	SP
1	Pelles A-71	20190718	R7*	R7*-7	5262380.2	373724.2	47	SP
2	Black Knight L-91	20190717	G1	G1-1	5263516.1	368611.8	56	SP
2	Black Knight L-91	20190717	G1	G1-2	5263517.7	368662.8	61	SP
2	Black Knight L-91	20190717	G1	G1-3	5263524.1	368655.4	58	SP
2	Black Knight L-91	20190717	G2	G2-1	5263523.9	368552.5	68	SP
2	Black Knight L-91	20190717	G2	G2-2	5263517.1	368594.4	47	SP
2	Black Knight L-91	20190717	G2	G2-3	5263509.7	368617.6	90	BC

Site No	Site Name	Date	Transect	Waypoint	Northing	Easting	Height/Width cm	Functional Group
2	Black Knight L-91	20190717	G3	G3-1	5263483.9	368574.4	168	BC
2	Black Knight L-91	20190717	G3	G3-2	5263514.9	368492.6	39	SP
2	Black Knight L-91	20190717	G4	G4-1	5263494	368514.1	71	BC
2	Black Knight L-91	20190717	G5	G5-1	5263429.9	368655.4	58	SP
2	Black Knight L-91	20190717	G6	G6-1	5263421.5	368581.6	55	SP
2	Black Knight L-91	20190717	G6	G6-2	5263428.3	368620.5	58	SP
2	Black Knight L-91	20190717	G7	G7-1	5263423.6	368572.8	65	SP
2	Black Knight L-91	20190717	G7	G7-2	5263387.1	368613.1	52	SP
2	Black Knight L-91	20190717	G7	G7-3	5263387.9	368659.9	62	SP
2	Black Knight L-91	20190717	G7	G7-4	5263384.8	368672.4	32	SC
2	Black Knight L-91	20190717	G7	G7-5	5263384.8	368672.4	44	SP
2	Black Knight L-91	20190717	G8	G8-1	5263404.9	368508.8	47	SP
2	Black Knight L-91	20190717	G8	G8-2	5263407.6	368509.9	76	SP
2	Black Knight L-91	20190717	G8	G8-3	5263398.6	368525.5	92	BC
2	Black Knight L-91	20190717	G8	G8-4	5263372.8	368569.1	49	SP
2	Black Knight L-91	20190717	G8	G8-5	5263371.6	368575.9	44	SP
2	Black Knight L-91	20190717	G8	G8-6	5263392.5	368597.1	72	SP
2	Black Knight L-91	20190717	G9	G9-1	5263401	368453.9	64	SP
2	Black Knight L-91	20190717	G9	G9-2	5263377.8	368519.1	62	SP
2	Black Knight L-91	20190717	G10	G10-1	5263380.6	368463.5	45	SP
2	Black Knight L-91	20190717	G10	G10-2	5263339.1	368583.7	39	SP
2	Black Knight L-91	20190717	G11	G11-1	5263336.9	368491.1	99	BC

Site No	Site Name	Date	Transect	Waypoint	Northing	Easting	Height/Width cm	Functional Group
2	Black Knight L-91	20190717	G11	G11-2	5263348	368505.2	51	SP
2	Black Knight L-91	20190717	G11	G11-3	5263344.9	368522	56	SP
2	Black Knight L-91	20190717	G11	G11-4	5263329.2	368576.3	53	SP
2	Black Knight L-91	20190717	G11	G11-5	5263325	368607.5	47	SP
2	Black Knight L-91	20190717	R7	R7-1	5263368.2	368604.5	33	SP
2	Black Knight L-91	20190717	R7	R7-2	5263384.9	368590.9	50	SP
2	Black Knight L-91	20190717	R3	R3-1	5263447.2	368546.2	107	BC
2	Black Knight L-91	20190717	R2	R2-1	5263456.2	368528.2	48	SP
2	Black Knight L-91	20190717	R1	R1-1	5263403.4	368515.9	70	SP
2	Black Knight L-91	20190717	R4	R4-1	5263511	368578.3	60	SP
2	Black Knight L-91	20190717	R4	R4-2	5263505.3	368577.9	56	SP
2	Black Knight L-91	20190717	R4	R4-3	5263507.4	368579.9	51	SP

Function Groups: Sea pen (SP), Soft Coral (SC), Black-wire Coral (BW), Branching Coral (BC).