FINAL

2022 Marine Mammal and Sea Turtle Mitigation Report for EL1156 Cambriol J-31 Vertical Seismic Profile Program

Submitted to:

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IMPORTANT NOTICE

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Document Name	Document No.	Rev. No.	Prepared By	Reviewed By	Date (y-m-d)
2022 Marine Mammal and Sea Turtle Mitigation Report for EL1156 Cambriol J-31 Vertical Seismic Profile Program	ME2272103-1-1	1.0	L. Miles	J. So	22-07-21
2022 Marine Mammal and Sea Turtle Mitigation Report for EL1156 Cambriol J-31 Vertical Seismic Profile Program	ME2272103-1-2	2.0	L. Miles	K. Baldwin	22-08-24
2022 Marine Mammal and Sea Turtle Mitigation Report for EL1156 Cambriol J-31 Vertical Seismic Profile Program	ME2272103-1-3	3.0	L. Miles	M. Jones	22-08-30
2022 Marine Mammal and Sea Turtle Mitigation Report for EL1156 Cambriol J-31 Vertical Seismic Profile Program	ME2272103-1-4	4.0	L. Miles	K. Baldwin	22-11-14

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ABBREVIATIONS

C-NLOPB	Canada - Newfoundland and Labrador Offshore Petroleum Board
db	decibels
DFO	Fisheries and Oceans Canada
EL	Exploration Licence
km	kilometres
m	meters
MMO	Marine mammal observer
MODU	Mobile offshore drilling unit
PAM	Passive acoustic monitor

SOCP	Statement of Canadian Practice with respect to the mitigation of seismic sound in the marine environment
VSP	Vertical seismic profile
DECKSHEET ABBREVIATONS	
v	Visual
p	PAM
n	Not firing
s	Soft start
f	Firing (sound source on full power)
sw (wind direction)	Southwest
c	Choppy with many white caps
sl	Slightly choppy with few white caps
o	Swell (<2 m)
g	Visibility good > 5 km
sf	Strong gale forward
vf	Variable glare forward
non (sun glare)	No glare
non (precipitation)	No precipitation

1.0 INTRODUCTION

Equinor Canada Limited (Equinor) contracted Wood Environment & Infrastructure Solutions Canada Limited (Wood), to conduct marine mammal and sea turtle monitoring and mitigation as part of the 2022 EL1156 Cambriol J-31 Vertical Seismic Profile (VSP) Program (Figure 1.1). The VSP program was conducted on July 11 to July 12, 2022, on the *West Hercules* MODU (Mobile Offshore Drilling Unit). Monitoring for marine mammals and sea turtles was conducted to fulfill requirements outlined in the Flemish Pass Exploration Drilling Project- Environmental Assessment Decision Statement- Condition 3.9 (ECCC 2019), the "Geophysical, Geological, Environmental and Geotechnical Guidelines" (C-NLOPB 2019) and "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment" (SOCP) (DFO 2012). A marine mammal and sea turtle mitigation plan for VSP (referred to herein as the Plan) was developed and accepted for this program in consultation with the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) and Fisheries and Oceans Canada (DFO) (Wood 2022).

The scope of work included monitoring for the presence of marine mammals and sea turtles inside the 500-metre safety zone around the sound source by visual observation and passive acoustic monitoring. Mitigation protocols were implemented by qualified marine mammal observers (MMO) and passive acoustic monitors (PAM). All marine mammal and sea turtle mitigation was conducted aboard the supply vessel, *MV Atlantic Merlin*.

The following summarizes events and sightings during the 2022 Marine Mammal and Sea Turtle Mitigation Program at Cambriol J-31.

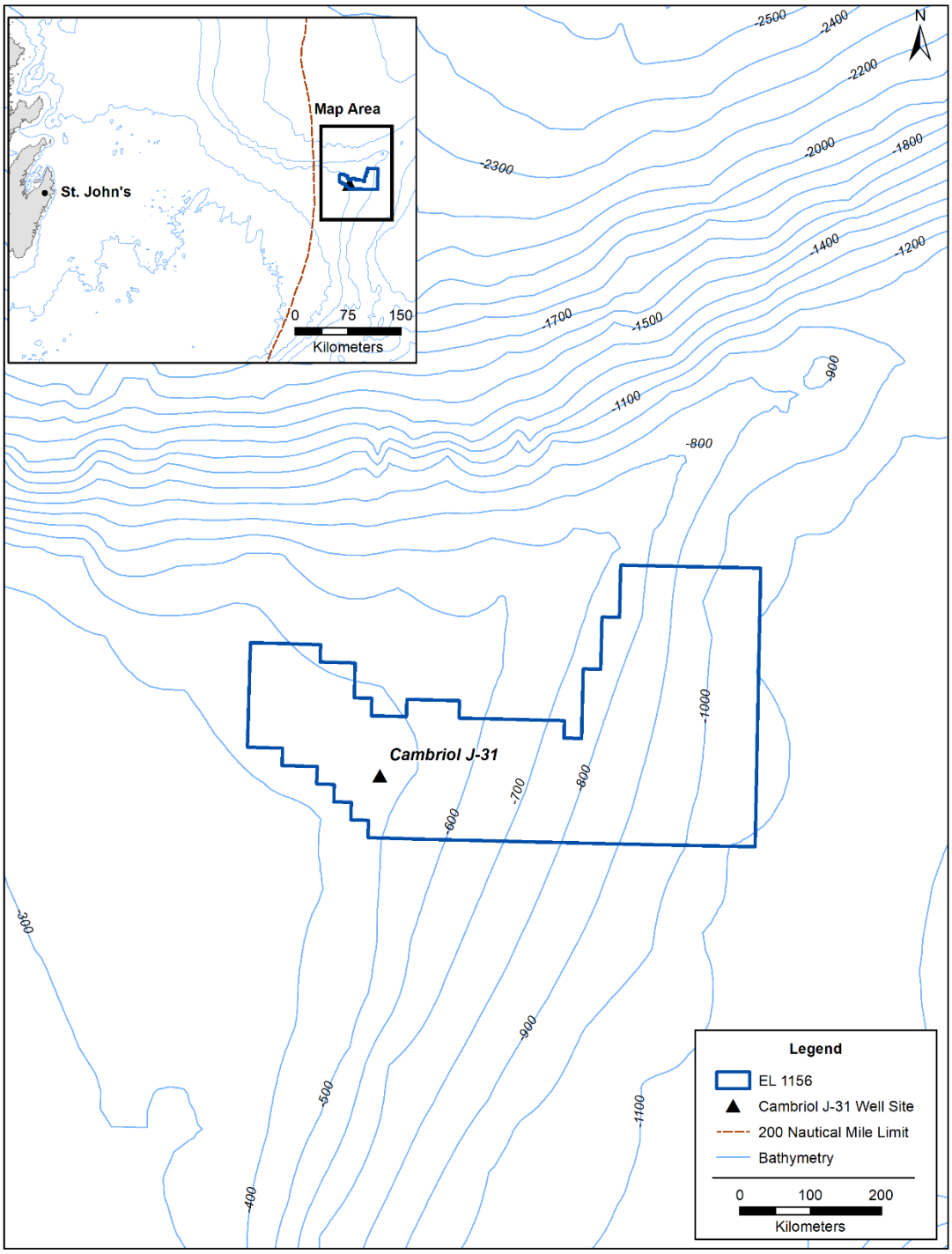

Figure 1.1 Map of the project location and Cambriol well site in EL 1156

2.0 PERSONNEL

2.1 Delivery

The following personnel participated in the delivery of the 2022 Marine Mammal and Sea Turtle Mitigation Program during VSP operations at the Cambriol well site:

Wood

- Lara Miles – Biologist-Team Lead (Passive Acoustic Monitor)

Edgewise Environmental

- Teresa Best – Marine Mammal Observer
- Susan Hann- Marine Mammal Observer

JASCO Applied Sciences

- Jason Hines – Passive Acoustic Monitor

Schlumberger Oilfield Services (onboard the West Hercules)

- Frank Hinchey-Wireline Professional Field Engineer

2.2 Support

The following personnel were involved in shore support, mobilization, and demobilization of the 2022 Marine Mammal and Sea Turtle Mitigation Program:

Equinor Canada Limited

- Melissa Jones
- Neil Osmond

Wood

- Kevin Baldwin – Project Manager
- Justin So – Project Manager
- Andrea Lundrigan – HSE Manager
- Andrew Peddle – Logistics Support
- Ashton Verge – Logistics Support

3.0 OPERATION OVERVIEW

3.1 Mobilization/Demobilization

The *MV Atlantic Merlin* mobilized on June 30th, 2022, in St. John's, NL and departed for the *West Hercules* the same day. Mobilization included the onboarding of the mitigation team and all necessary equipment being delivered to the vessel. The vessel arrived at St. John's harbour on July 15th, 2022, and demobilization commenced after docking.

3.2 Health and Safety

A Hazard Assessment and Health and Safety Plan were developed and followed for the 2022 Marine Mammal and Sea Turtle Mitigation Program. This document identified potential hazards associated with project activities, mitigation measures, and any residual risk. The Health and Safety Plan was reviewed by all personnel from Wood, Edgewise, and JASCO. Deck safety meetings for the deployment/retrieval of PAM equipment were also conducted by Wood, JASCO, and the crew of the *MV Atlantic Merlin*, where any arising safety issues were discussed. Furthermore, vessel operations were conducted by the vessel officers.

3.3 Communications-Daily Reports

The *MV Atlantic Merlin* maintained scheduled communications with on-shore personnel and *West Hercules* personnel via e-mail. Mitigation team daily updates were sent to key personnel. Updates included information on daily activities, planned activities, any issues that arose, any detections, and a projected timeline for the VSP program. Daily updates were sent to the following personnel:

Equinor Canada Limited

- Neil Osmond-Logistics Coordinator
- Melissa Jones- Environmental Advisor

Wood

- Kevin Baldwin – Project Manager
- Justin So – Project Manager

4.0 METHODS

The 2022 VSP Program consisted of both visual and acoustic monitoring for marine mammals and sea turtles during VSP operations. The mitigation team was comprised of MMOs, and PAM technicians from Wood, Edgewise, and JASCO (Appendix B). The mitigation team operated from the bridge of the *MV Atlantic Merlin*.

The ship's crew was responsible for vessel operations and assisting with the deployment/retrieval of the monitoring equipment. The captain had authority in matters of safety and the duty officer ensured the vessel travelled such that the PAMs and MMOs could monitor the 500-m safety-zone. Wood personnel were responsible for the overall implementation of the Plan under the direction of biologist, Lara Miles. Ms. Miles also functioned as the field team lead and provided Equinor with daily updates on the progress of the 2022 Marine Mammal and Sea Turtle Mitigation Program. JASCO personnel directed the ship's crew on the installation, deployment, and retrieval of the towed hydrophones.

As outlined in the Plan (Wood 2022), species for which shut-down procedures would be implemented included all SARA Schedule 1 marine mammal and sea turtle species, as well, as all beaked whales. To allow for a 360-degree view of the safety zone and to ensure proper deployment of the PAM equipment (e.g., towed hydrophones); during VSP/monitoring activities, the vessel travelled at less than 3 knots along a parallel 2 km track approximately 750-m from the MODU. A direct line of communication between the VSP wireline operators on the MODU and MMO/PAMs using the ship's VHF was established before VSP operations. VSP wireline operators communicated all VSP sound source activities to the mitigation team (e.g., request for pre-watch, start of soft start, end of VSP).

Further details of monitoring and mitigation protocols are detailed in the MMST Mitigation Plan for VSP programs (Wood 2022).

4.1 Schedule

VSP operations took place on July 11, 2022 and lasted approximately 12 hours, concluding on July 12th, 2022(Table A.1). During VSP operations during daylight hours, weather conditions were clear with full visibility. In addition to VSP operations, the *MV Atlantic Merlin* acted as a dedicated stand-by support vessel.

Following is a summarization of activities onboard the vessel as it pertains to the mitigation program.

Table 4.1 Timeline of activities related to the mitigation program onboard *MV Atlantic Merlin*

Date	Description
30 /06/ 2022	Mobilization and departure from St. John's, NL
1 /07/ 2022	In transit to and arrival at the *West Hercules*
01 /07 to 14 /07/ 2022	*MV Atlantic Merlin* on stand-by (except for during VSP)
5 /07/ 2022	PAM equipment was set up and wet tested
11 /07/ 2022	Start of VSP and marine mammal and sea turtle monitoring
12 /07/ 2022	End of VSP and marine mammal and sea turtle monitoring
15 /07/ 2022	*MV Atlantic Merlin* arrives in St. John's Harbour; Demobilization

4.2 PAM Hydrophone Wet-Test

The setup of the hydrophone equipment and wet test was conducted on July 5, 2022. PAM operators were located on the bridge of the vessel and the hydrophones were deployed approximately 490 m from the stern.

For optimal acoustic monitoring, the vessel travelled at approximately 2.5 knots 750 m from the starboard side of the MODU along a 2 km long parallel track (centred on the MODU) (Figure 5.1).

The PAM equipment wet test included:

1) Wood, JASCO, and vessel crew toolbox safety meeting;
2) Crew familiarization with the PAM equipment and handling techniques;
3) Practice vessel movements with towed array deployed;
4) Gather background soundscape during normal MODU operations, and
5) Optimization of the equipment setup including deployment, towing, and retrieval.

The wet test lasted for 5 hours. No marine mammals were detected in the area during the test.

5.0 MONITORING AND MITIGATION PROGRAM RESULTS

The 500-m safety zone was monitored for the entire duration of VSP activities, approximately 12 hours during VSP operations (Table A.2). Monitoring of the safety zone began 30-minutes before soft start. There were no detections (acoustically or visually) of marine mammals or sea turtles at any time during the VSP program and no detections of species for which shut-down procedures would be implemented. There fore biological delays or shutdowns were not required during the program.

During the post-retrieval acoustic monitoring analysis, sperm whale clicks were identified (Kowarski 2022). These clicks were distant and easily masked by vessels in the area. The detected clicks were mostly at levels below 115 dB with none greater than 120 dB. To be within the 500 m safety zone the received sound would need to be at 136 dB. A full analysis is available in JASCO's Post-Retrieval Acoustic Monitoring Report, provided under separate cover.

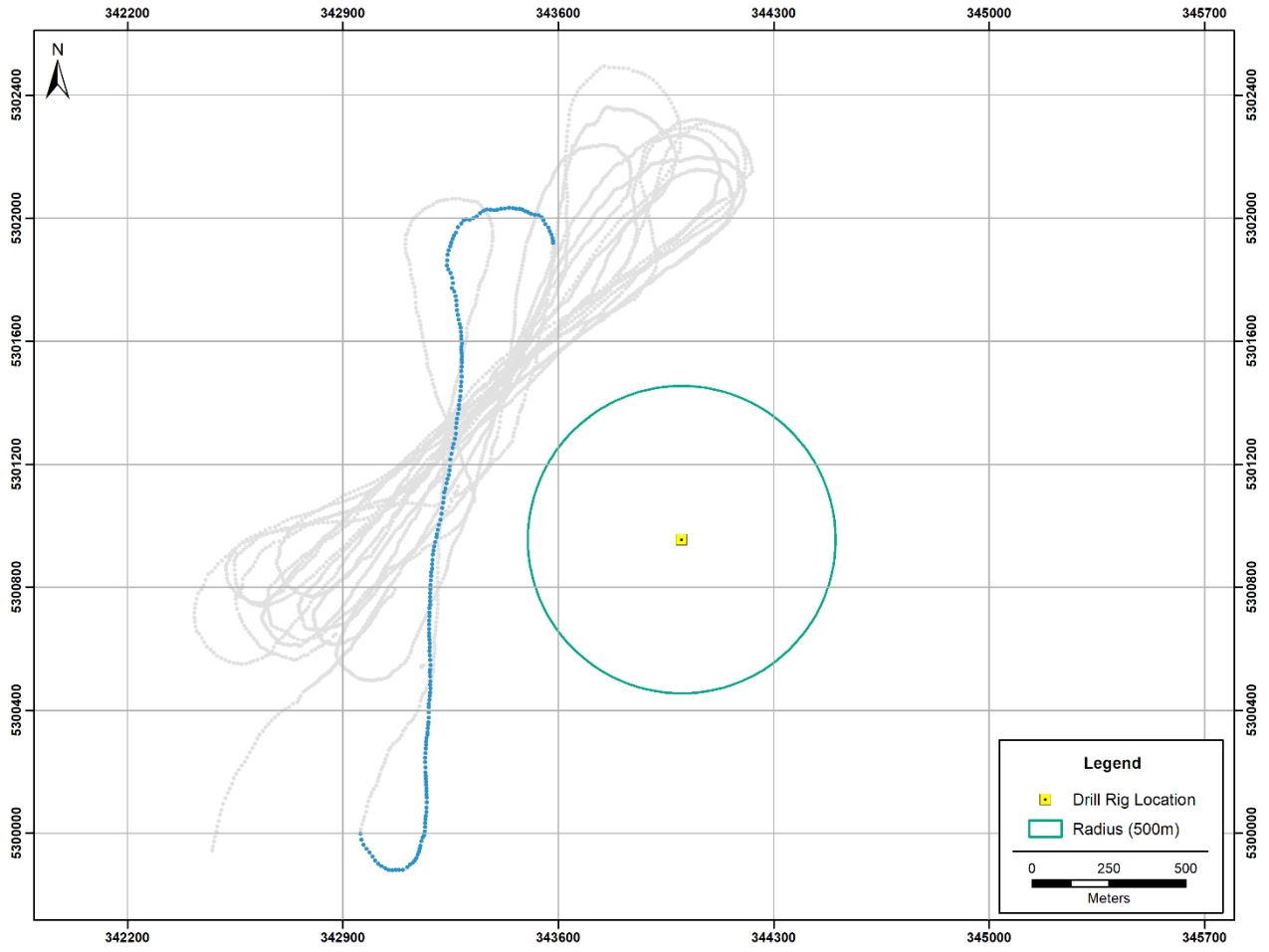

Figure 5.1 Vessel track (blue and grey dots) during VSP operations from July 11th to July 12th with rig location and 500-m safety zone. A portion of the track has been highlighted with blue dots for visual purposes.

6.0 SUMMARY

The VSP program lasted for approximately 12 hours, during which time there were no marine mammal or sea turtle detections within the 500-m safety zone (combined visual and acoustic observations) thus, no biological delays or shutdowns to operations were required during the program. Following the completion of the program Condition 3.9 of the Decision Statement for the Flemish Pass Exploration Drilling Project for VSP activities at Cambriol J-31 was met.

7.0 CLOSURE

This report on the 2022 Marine Mammal and Sea Turtle Mitigation Program for Cambriol J-31 has been prepared for exclusive use by Equinor Canada Limited. The project was conducted using standard practices by qualified Wood staff and in accordance with verbal and written requests from the client.

Yours sincerely,

Wood Environment & Infrastructure Solutions,
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8.0 REFERENCES

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APPENDIX A: OBSERVATION DECK SHEETS

Table A 1 VSP Operations

Regulatory reference number	Ship/ platform name	Date	Reason for firing	Time soft start/ ramp-up began (UTC)	Time of full power (UTC)	Time of start of line (UTC)	Time of end of line (UTC)	Time of reduced output (UTC) (if relevant)	Time airguns/ source stopped (UTC)	Time pre-shooting search began (UTC)	Time search ended (UTC)	Time PAM began (UTC)	Time PAM ended (UTC)	Depth range	Was it day or night in the period prior to firing?	Was any mitigating action required?	Comments
EL1156	Atlantic Merlin	2022-07-11	l	15:08	15:15	15:15				14:36	15:06	15:08	0:00	>200	d	No	firing continued into the next day without delays or any stoppages
EL1156	Atlantic Merlin	2022-07-12	l				2:26		2:26				2:26	>200	n	No	
Abbreviations: l = survey line, d = daytime, n = nighttime																	

Table A 2 MMO and PAM Effort

Regulatory reference number	Ship/ platform name	Date	Visual watch or PAM?	Observer's / operator's name(s)	Time of start of section of watch (**UTC**)	Time of end of section of watch (**UTC**)	Source activity	Start position - degrees latitude	Start position - minutes latitude	Start position - north/ south	Start position - degrees longitude	Start position - minutes longitude	Start position - east/ west	Depth of water at start postion (metres)	End position - degrees latitude	End position - minutes latitude	End position - north/ south	End position - degrees longitude	End position - minutes longitude	End position - east/ west	Depth of water at end position (metres)	Speed of vessel (knots)	Wind direction	Wind force (Beaufort)	Sea state	Swell	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation
EL1156	Atl. Merlin	2022-07-11	v	Teresa Best/Susan Hann	14:40	14:49	n	47	50.45	North	47	5.74	West	460.0	47	50.49	North	47	6.24	West	460.0	0.0	sw	5	c	o	g	sf	non
EL1156	Atl. Merlin	2022-07-11	v	T. Best	14:49	15:40	n							460.0							465.0	1.5	sw	5	c	o	g	sf	non
EL1156	Atl. Merlin	2022-07-11	v	T. Best	15:40	16:40	f							465.0							465.0	1.3	sw	4	sl	o	g	vf	non
EL1156	Atl. Merlin	2022-07-11	v	S. Hann	16:40	17:40	f							465.0							465.0	2.3	sw	4	sl	o	g	vf	non
EL1156	Atl. Merlin	2022-07-11	v	S. Hann	17:40	18:40	f							465.0							465.0	1.5	sw	4	sl	o	g	vf	non
EL1156	Atl. Merlin	2022-07-11	v	T. Best	18:40	19:40	f							465.0							465.0	2.5	sw	4	sl	o	g	vf	non
EL1156	Atl. Merlin	2022-07-11	v	T. Best	19:40	20:40	f							465.0							465.0	2.3	sw	5	sl	o	g	vf	non
EL1156	Atl. Merlin	2022-07-11	v	S. Hann	20:40	21:40	f							465.0							465.0	2.9	sw	4	sl	o	g	vf	non
EL1156	Atl. Merlin	2022-07-11	v	S. Hann	21:40	22:40	f							465.0							465.0	1.3	sw	3	sl	o	g	vf	non
EL1156	Atl. Merlin	2022-07-11	v	T. Best	22:40	23:40	f							465.0							465.0	1.7	sw	4	sl	o	g	non	non
EL1156	Atl. Merlin	2022-07-11	v	T. Best	23:40	23:41	f							465.0							465.0	1.0	sw	4	sl	o	g	non	non
EL1156	Atl. Merlin	2022-07-11	v	Lara Miles	14:36	15:06	n	47	50.45	North	47	5.75	West	460.0	47	50.49	North	47	6.24	West	460.0	<2.0			sl	o	g	non	non
EL1156	Atl. Merlin	2022-07-11	p	Jason Hines[1]	15:03	15:08	s															-							
EL1156	Atl. Merlin	2022-07-11	p	L.Miles	15:08	15:15	s															<2.0							
EL1156	Atl. Merlin	2022-07-11	p	L.Miles	15:15	15:49	f															<2.0							
EL1156	Atl. Merlin	2022-07-11	p	L.Miles	15:49	18:00	f															<2.0							
EL1156	Atl. Merlin	2022-07-11	p	Jason Hines	18:00	21:00	f															<2.0							
EL1156	Atl. Merlin	2022-07-11	p	L.Miles	21:00	0:00	f															<2.0							
EL1156	Atl. Merlin	2022-07-12	p	J. Hines	0:00	2:26	f															<2.0							

[1]: lead PAM was preforming final checks on the system. Abbreviations: v = visual, p = pam, n = not firing, s = soft start, f = firing, sw = southwest, c = choppy with many white caps, sl = slightly choppy with few white caps, o = swell low (<2 m), g = visibility good >5 km, sf = strong glare forward, vf = variable glare forward, non = none