SOUND LEVEL VERIFICATION PLAN FOR MARINE CONSTRUCTION AND OPERATION

Port Dolphin Deepwater Port

Submitted By:

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1.0 INTRODUCTION

This document presents the marine sound level verification plan in the form of an acoustic monitoring plan for the construction and operation of the Port Dolphin Energy, LLC (Port Dolphin) liquefied natural gas (LNG) deepwater port. The Deepwater Port License (DWPL) issued to Port Dolphin by the Maritime Administration (MARAD) requires the project to develop and implement an acoustic monitoring plan - DWPL Annex A Condition 13) Prevention, Monitoring, and Mitigation Plan b) Noise Impacts) Noise Monitoring Plan:

> *The Licensee shall monitor noise levels during construction and operation of the Deepwater Port to address uncertainties in the estimated noise levels, document propagation characteristics, and verify the impact zones estimated in the FEIS. The Licensee shall submit a noise monitoring plan to NOAA Fisheries, USCG and MARAD for review prior to the start of pile-driving activities. NOAA Fisheries is available to assist with the study design and data collection protocols that may be necessary.*

The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) is currently reviewing an application that Port Dolphin has submitted for a Letter of Authorization (LOA) under the Marine Mammal Protection Act (MMPA). NOAA Fisheries has informed Port Dolphin that the sound levels verification plan needs to be approved as part of the LOA process. Therefore, this plan is being submitted in compliance with the DWPL Conditions and the NOAA Fisheries request. This plan presents the proposed sound level verification plan for both the marine construction activities and operations of the Port Dolphin project.

2.0 PREDICTED SOUND LEVELS

2.1 Construction and Operations Sound Characteristics

The information contained in this section is derived from Section 6 of the Port Dolphin LOA January 2011 Application, which relied on the noise modelling analysis completed by JASCO Research Limited in 2008 and 2010 (the JASCO reports; see Appendices C-D of Port Dolphin's application). The JASCO reports addressed the sound characteristics of construction and operations of the Port, factoring in local oceanographic and seafloor characteristics, to predict ranges to various regulatory sound level thresholds.

NOAA Fisheries recognize two types of sound: pulsed (impulsive) and non-pulsed (often referred to as continuous). Both types of sound are expected to be generated during the construction and/or operation of the Deepwater Port and appurtenant facilities. Pulsed and non-pulsed sounds are subject to NOAA Fisheries acoustic exposure criteria. The acoustic exposure criteria are based on the rms of the sound levels; defined as the maximum root mean square of the sound pressure level (SPL) measured over the duration of the waveform. The exposure criteria are:

- Level A harassment - 180 dB re 1 μPa (RMS)
- Level B harassment –
    - 120 dB re 1 μPa (RMS) for continuous sources
    - 160 dB re 1 μPa (RMS) for impulsive sources.

2.2 Construction – Related Sound Fields

The predicted construction – related sound fields were developed from the modelled underwater analysis (as presented in the JASCO reports). The predicted construction – related sound fields are summarized as follows:

- Pipelaying: Pipelaying activities are expected to generate continuous, transient, and variable sound levels. Depending on location (offshore, inshore), the120-dB isopleth for pipelaying activities are predicted to extend either 6.0 or 7.5 kilometers from the source, encompassing an area of 113 or 177 square kilometers, respectively.
- Pipeline Burial: Pipeline burial using the plow system is expected to generate continuous, transient, and variable sound levels. Distances to the 120-dB isopleths is predicted to be 6.7 or 8.4 kilometers from the source, ensonifying an area of 141 or 222 square kilometers.
- Pile Driving, Offshore: Installation of anchors via pile driving is expected generate pulsive and intermittent sound levels. This impulsive sound is predicted to produce 160-dB isopleths at 4.5 kilometers (>20 km for 120-dB isopleths) from each STL buoy location, ensonifying an area of approximately 64 square kilometers.
- Buoy Installation: Installation of the buoys at the Port is expected to produce continuous sound for a relatively short period of time. The 120-dB are predicted to be located 3.9

kilometers from each STL buoy location with a corresponding ensonification of approximately 48 square kilometers.

- Horizontal directional drilling (HDD): HDD within Tampa Bay is expected to produce continuous sound levels. The 120-dB isopleth is predicted to extend 0.24 kilometers from the drilling operation, ensonifying an area of approximately 0.2 square kilometers.
- HDD rig installation Vibratory Driving: The goal posts used for the HDD operations may be either gravity based or installed by vibratory driving. If vibratory driven, the installation of the goal posts at each HDD location are expected to produce a continuous sound for a relatively short period of time. The 120-dB isopleths for HDD vibratory driving is predicted to extend 12.6 kilometers from the source, ensonifying an area of 501 square kilometers.

Greater details on the sound fields and levels are presented in the LOA application and JASCO reports.

2.3 Operations-Related Sound Fields

The predicted operations – related sound fields were developed from the modelled underwater analysis (as presented in the JASCO reports). Operational activities which are expected to have associated sound fields include the maneuvering and docking operations of the Shuttle and Regasification Vessel (SRV) and the regasification process. The predicted operations – related sound fields are summarized as follows:

- SRV Maneuvering and Docking: Once the SRV is within approximately 5.6 kilometers of the STL buoy, bow and stern thrusters will be utilized. Thruster use will vary, operating for 10 to 30 minutes to allow for the properly positioning of the vessel and allow for connection to the STL buoy. Docking or berthing is expected to occur at alternate STL buoys approximately every 8 days. Noise modeling, assessing the periodic use of the thrusters (i.e., every 8 days) producing an intermittent and moving noise, predicted that the 120 dB isopleth could be expected to occur at 3.6 kilometers from the SRV, ensonifying an area of approximately 41 square kilometers.
- Regasification: The SRV will regasify its LNG cargo while attached to (i.e., berthed at) the STL buoy. Sound levels for regasification are low, with the 120 dB isopleths predicted to be at 0.17 kilometer from the source. The total area ensonified to this level is predicted to be approximately 0.09 square kilometers.

Greater details on the sound fields and levels are presented in the LOA application and JASCO reports.

3.0 CONSTRUCTION SOUND LEVEL VERIFICATION PROGRAM

3.1 Construction Acoustics Program Overview

In accordance with the DWPL Conditions, Port Dolphin will implement a sound level verification program during construction of the deepwater port and appurtenant marine facilities. The objectives of this program are to: 1) verify the acoustic source levels (SLs) associated with the construction vessels and equipment, and 2) verify ranges to relevant threshold levels.

Source level (SL) measurements will provide reference sound levels of the vessels and equipment used during the construction of the deepwater port and associated marine facilities. The modelling results (as presented in the JASCO reports) relied primarily on estimated source levels derived from literature and/or JASCO's acoustic source level database. Accordingly, this plan will measure the actual sound levels that will be introduced into the underwater environment during construction. The background, or ambient, sound levels will also be established by analysis of recordings when no construction activities are present, such as before start up or during inevitable down times.

SL measurements will be made using a combination of bottom deployed autonomous recorders and cabled systems. Source level measurements require that accurate measurements of distance from source to monitoring hydrophones be made. Range measurements are required for scaling the measured levels to a standard reference range (typically 1 meter from the source). Range measurements will be performed using a combination of GPS, radar and laser range finders.

Received sound levels will be measured at pre-determined distances (as specified below) and will be used to determine site-specific propagation characteristics and verify ranges to the relevant sound exposure thresholds. Received sound levels will be measured using bottom deployed autonomous acoustic recorders as outlined in the sections below.

3.2 Construction Activities to be Monitored

The construction sound source level verification program will focus on the construction – related sound fields identified in Section 2.2, above. The construction activities to be monitored are:

- Pipelaying activities.
- Pipeline burial using the plow system and dredging.
- Pile driving at the buoy locations.
- Installation of the buoys.
- HDD within Tampa Bay.
- HDD rig installation -Vibratory Driving (if conducted).

Verification of sound source levels (objective 1) emitted by each of the various construction activities is required. Although, most types of construction activity will be conducted at more

than one location and on more than one occasion during the construction period, it is only necessary to determine their sound source level once because local acoustic propagation characteristics should have little effect on the source level calculation. Some construction activities are of long duration and may vary in source level during the operation. For these longer-duration activities, such as pipelaying and pipeline burial using the plow system, a sound level monitoring program of seven days of continuous recording at a sample rate of 128 kHz will be implemented to capture and consider potential variability when determining the source level associated with these activities.

The choice of seven days is recognized to be a somewhat arbitrary time period. Most variability in source level is expected to be represented within one day (or less), so seven days is a conservative choice to ensure variability is captured. If significant changes in operation were to occur outside of the seven day period, an optional monitoring period could be made available. During the seven day program, logs of the various activities will be collected, permitting a correlation between the activities occurring and the sound levels monitored. Port Dolphin believes this monitoring approach will yield sufficient data to satisfy the DWPL Conditions and the objectives of this plan.

3.3 Location and Number of Sound Monitoring Stations

Clamshell Dredging and Excavation

Port Dolphin is planning to monitor the dredging operation at either the exit or entry pit dredges of the western Gulfstream HDD. Sound level monitoring stations will consist of bottom deployed autonomous recorders (AMARs) at ranges of 500, 1,000 and 1500 meters from the activity. In addition, a cabled recording system (ADAM) will be deployed from the dredging barge in order to capture close range data suitable for determining a source level estimate.

Horizontal Directional Drilling (HDD)

The proposed HDD locations are drilling from land to water at the Port Manatee shore approach and from water-to-water at two crossings of the Gulfstream pipeline.

Port Dolphin is planning to monitor the HDD operations at the entry pit of the western Gulfstream HDD. The actual drilling equipment and barges are expected to be located near the HDD entry pit. The HDD activities may take more than one week so Port Dolphin will limit the noise level monitoring to seven days of drilling.

Sound level monitoring stations will consist of bottom-deployed autonomous recorders (AMARs) at ranges of 100, 250 and 500 meters from the drilling platform and in a line parallel to the direction of drilling. The drill head is expected to produce the most sound. The exact ranges may change depending on the location of the drill head or factors related to safety and access. In

addition a cabled recording system (ADAM) will be deployed from the floating spud barge in order to capture close range data (~10-25 m) suitable for determining a source level estimate.

Horizontal Directional Drilling Rig Installation – Vibratory Driving

The goal-post rigs used for the HDD operations may be either gravity based or installed by vibratory driving. If vibratory driven, the installation of the goal posts at each HDD location are expected to produce a continuous sound for a relatively short period of time.

Port Dolphin is planning to monitor the HDD rig installation. Sound level monitoring stations will consist of bottom deployed autonomous recorders (AMARs) at ranges of 500, 1,500 and 12,500 meters from the activity. In addition a cabled recording system (ADAM) will be deployed from the barge in order to capture close range data. Data recorded at these distances will be used to validate the acoustic propagation model and back-propagated to estimate the acoustic source level.

The distances and directions of any of these sound monitoring locations from the construction activity may be changed if, in the opinion of either Port Dolphin or the marine construction contractors, activities at the planned monitoring locations could pose health and safety risks or impede vessels or construction. If the locations must be changed, the monitoring will occur at the safest location that is closest to the proposed location that will not interfere with vessels or construction.

Pipeline Laying, Plowing and Backfilling the Pipeline Trench

For the pipeline laying, plowing and backfilling the pipeline trench, based upon the FDEP water quality monitoring requirements, Port Dolphin plans to conduct the sound level verification for each activity in the Sarasota Bay Estuarine System. The pipeline laying, the trench plowing, and the trench backfilling with the plow will take more than one week so Port Dolphin will limit the noise level monitoring to seven days of continuous data collection for each of these construction activities. During these activities, the construction spread will be moving relative to the acoustic monitoring stations. This will provide a more detailed record of data on received sounds levels as a function of range and direction from the construction spread.

Sound level monitoring stations will consist of bottom deployed autonomous recorders (AMARs) at ranges of 500, 1,000 and 7,500 meters perpendicular to the construction spread's direction of travel (Figure 1). In addition a cabled recording system (ADAM) will be deployed from the construction spread in order to capture close range data suitable for determining a source level estimate. Monitoring will occur at an inshore and an offshore location.

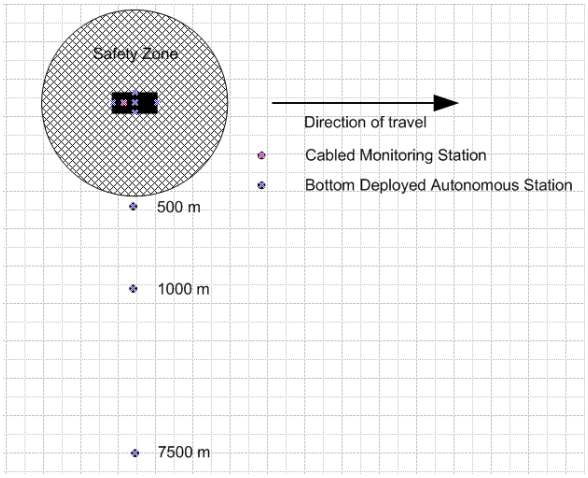


Figure 1: Acoustic Monitoring Stations: Pipeline Laying, Plowing and Backfilling the Pipeline Trench Locations

Pile Driving and STL Buoy Installation

During pile driving (impact hammering) and STL buoy installation, sound level monitoring will consist of three bottom deployed autonomous recorders (AMARs) at ranges of 500, 1,000 and 5,000 meters from the activity. In addition a cabled recording system (ADAM) will be deployed from the barge in order to capture near source measurements.

The distances and directions of any of these sound monitoring locations from the construction activity may be changed if, in the opinion of either Port Dolphin or the marine construction contractors, activities at the planned monitoring locations could pose health and safety risks or impede vessels or construction. If the locations must be changed, the monitoring will occur at the safest location that is closest to the proposed location that will not interfere with vessels or construction.

3.4 Underwater Sound Monitoring During Construction

Sound level measurements will be made using a combination of autonomous bottom-deployed recorders and cabled systems. Both systems will obtain measurements at 1.5 m (5 ft) above the sea floor. The recording stations will be located as described in Section 3.3 (above). The depth of the hydrophone will be determined by measuring the lead while taking into account the effect of current or by collocating pressure-sensitive depth gauges. The accuracy of the hydrophone depth measurement will be <1 m. Sound source level calculations require that the distance from source to monitoring hydrophones be accurately known (range measurements). Range measurements will be performed using global positioning systems (GPS), radar, or laser range finders.

For construction activities lasting less than seven days, sound level monitoring will be conducted continuously at 128 kHz for the entire duration of the activity. However, as discussed in Sections 3.2 and 3.3 (above), certain construction activities will be conducted for extended periods of

time. For these long-duration activities, the sound level measurements will be limited to seven days of continuous monitoring during the construction period.

The recording system will have a frequency response of ±3 dB from 10 Hz to 64,000 Hz over the anticipated measurement range of 100 dB to 220 dB (linear peak re: 1 µPa). Hydrophones with differing sensitivities may be required at different locations depending upon the acoustic environment and source to be measured.

Analysis of the recorded data will determine the amplitude, time history, and frequency of sounds associated with construction activity. Acoustic data to be reported include:

- rms of 90% impulse energy (dB re 1 µPa/s, rms) for impulsive sounds.
- SPL (dB re 1 µPa, rms) for non-impulsive (continuous) sounds
- The maximum averaging time and representative range of SPLs.
- Representative range of frequency spectra; 1/3rd octave band center frequency SPLs dB re1 µPa measured over the frequency range of 10 Hz to 64,000 Hz.
- Peak SPL (dB re 1 µPa; the largest absolute value of the instantaneous sound pressure over the minimum frequency range of 10 Hz to 64,000 Hz). The maximum and representative range of peak SPLs will be recorded for each activity.

The recorded data will be used to verify acoustic modeling parameters and sound level radii predicted by the modelling. A report summarizing the sound levels during construction will be provided to the NOAA Fisheries and MARAD within 60 working days after construction data collection concludes.

4.0 OPERATIONS SOUND LEVEL VERIFICATION PROGRAM

4.1 Operations Acoustics Program Overview

In accordance with the DWPL Conditions, Port Dolphin will implement a sound level verification program during the operation of the deepwater port and appurtenant marine facilities. This program will consist of underwater sound monitoring. There will be two primary objectives of this program. The first objective will be to measure the sound levels associated with the operations vessels and equipment. The second objective will be to verify the sound levels that were utilized as modeling input and the distance of the sound level isopleths predicted through the noise modeling.

With regards to the first objective, source level (SL) measurements will provide reference noise source levels of the vessels and equipment used during the operation of the deepwater port. The modeling results (as presented in the JASCO reports) relied primarily on source level data from literature and/or JASCO's own library of sound data and based upon JASCO's experience on sound modeling. Accordingly, this plan will measure the actual noise levels that will be introduced into the underwater environment during operation. The sound levels will be recorded at pre-determined distances (as specified below) to document the sound levels and attenuation for the different operational activities.

The second objective will focus on assessing the accuracy of the acoustic propagation model that was used to predict the sound fields that would be generated by the operation of the port. The attenuation of the noise over the pre-selected distances will be used to estimate the distance of the isopleths for the NOAA Fisheries mandated noise criteria. These distance calculated in the field will be compared to the impact distances predicted from the modeling and presented in the JASCO report.

The sound level verification program will be implemented during the commissioning phase of the SRV at the buoy location. The program is planned to be implemented during the first arrival, docking, unloading, undocking and departure of each SRV. A report summarizing the results of the noise level verification program will be provided to the NOAA Fisheries and MARAD within 60 working days after noise level verification monitoring has been completed for each SRV utilized at the port.

The commissioning of a new SRV (i.e., larger cargo containment capacity) at the port may involve the unloading of more than one shipment of LNG through the port. The sound level verification program is planned to be implemented only once for each new SRV type during the approach, unloading, and departure during the first commissioning shipment. The monitoring program will consist of a combination of autonomous and cabled acoustic recorders as outlined in the sections, below.

4.2 Operational Activities to be Monitored

The operations sound level verification program will focus on the operation – related sound fields identified in Section 2.3, above. Operational activities include:

- SRV Maneuvering and Docking: Once the SRV completes its approach to Port Dolphin and is within approximately 5.6 kilometers of the Port, bow and stern thrusters will be utilized. Thruster use will vary, operating for 10 to 30 minutes to allow for the proper positioning of the vessel and allow for connection to the STL buoy. Docking or berthing is expected to occur at alternate STL buoys approximately every 8 days.

The proposed noise level verification monitoring to be performed for these two operational activities is outlined below.

4.3 Location and Number of Sound Monitoring Stations

SRV Maneuvering

For SRV maneuvering (approaches, docking, unloading, undocking and departure) operations, Port Dolphin proposes to establish four sound level measuring stations. As part of the DWPL issued by the MARAD, a safety zone, an area to be avoided (ATBA), and a no anchoring zone have been established around the deepwater port. The boundary of the safety zone has been set at a distance of 850 meters (2,790 feet) from both the northern and southern submerged turret loading buoy (STL buoy). The boundaries of both the ATBA and no anchoring zone have been set at 1,500 meters (4,925 feet) from both the northern and southern STL buoy.

For the SRV maneuvering to docking/undocking at and departure from the two STL buoys, the sound level verification measurements will be taken at the boundary of the ATBA. Three bottom deployed autonomous recording stations will therefore be set at a distance of 1,500 meters (4,925 feet) from the STL buoys (Figure 2). This will ensure that sufficient data is collected regardless of the SRV's specific approach to the STL buoy. In addition a fourth autonomous system will be deployed on a platform directly below the STL buoy.

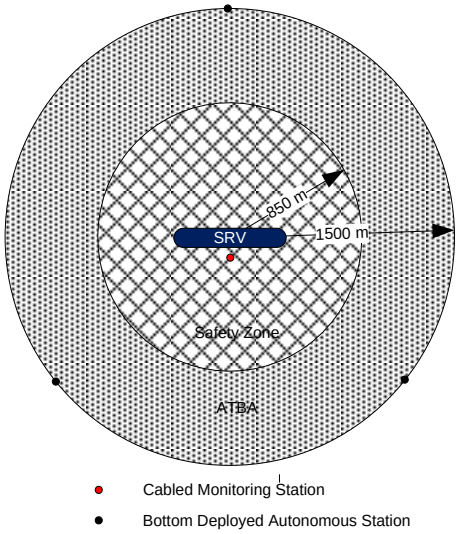


Figure 2: Acoustic Monitoring Stations: SRV Maneuvering

4.4 Underwater Sound Monitoring During Operations

As discussed in Section 4.2 above, during the life of the deepwater port, there will be numerous SRV approaches, docking, unloading, undocking and departure from both of the STL buoys. The sound level verification program will be conducted during the commissioning of each new SRV to service the deepwater port. The commissioning of each vessel may involve the transfer of more than one LNG cargo at an STL buoy. Port Dolphin plans to perform the sound level verification program for the first cargo transfer during commissioning of a new SRV at the port.

As with the construction monitoring, sound level measurements for operations will be made using a combination of cabled and autonomous bottom deployed recorders. Both systems will obtain measurements at approximately 1.5 m (5 ft) above the sea floor. The recording stations will be located as described in Section 4.3 (above). The depth of the hydrophone will be determined using collocated pressure-sensitive depth gauges.

The accuracy of the hydrophone depth measurement will be <1 m. Because sound source level calculations require the range to the source, range measurements will be performed using global positioning systems (GPS), radar, or laser range finders. The recording system will have a frequency response of ±3 dB from 10 Hz to 64,000 Hz over the anticipated measurement range of 100 dB to 220 dB (linear peak re: 1 µPa), and hydrophones with differing sensitivities may be required at different locations depending upon the location and source to be measured.

Analysis of the recorded data will determine the amplitude, time history, and frequency of sounds associated with construction activity. Acoustic data to be reported include:

- rms of 90% impulse energy (dB re 1 µPa/s, rms) for impulsive sounds.
- SPL (dB re 1 µPa, rms) for non-impulsive (continuous) sounds
- The maximum averaging time and representative range of SPLs.
- Representative range of frequency spectra; 1/3rd octave band center frequency SPLs dB re1 µPa measured over the frequency range of 10 Hz to 20,000 Hz.
- Peak SPL (dB re 1 µPa; the largest absolute value of the instantaneous sound pressure over the minimum frequency range of 10 Hz to 20,000 Hz). The maximum and representative range of peak SPLs will be recorded for each activity.

The recorded data will be used to verify the inputs to the noise modeling (source levels) and the predicted radii to the various sound level thresholds.

5.0 QUALITY CONTROL AND REPORTING

The acoustic measurement program for both construction and operations underwater noise measurements will include regular calibration and calibration checks in the field. At a minimum, field verification will be performed at the beginning and end of each field use or at least on a daily basis for each monitoring event. Calibration or calibration checks will be conducted in the field by checking the system response to a known acoustic quantity. At a minimum, calibration tones will be recorded prior to and at the end of each measurement day.

Since underwater blast transducers cannot be field-calibrated, factory or vendor calibration certification will be required. All hydrophones, microphones, integrating measurements systems, and calibrators will be certified before use.

Calibration of tape recordings will include the recording of calibration tones at the beginning and end of each tape recording or at least on a daily basis. Calibration will be accomplished through subsequent analysis of these recordings. The frequency response of each recording system will be tested and records will be maintained.

Port Dolphin will provide NMFS with a final report for both the construction and operation monitoring. The final reports will include:

- The monitoring protocol;
- Documentation of calibration activities;
- A summary of the data recorded during monitoring; and
- Analysis of the recorded data and conclusions.

The construction final report will be provided at the completion of all marine construction activities. The operation report will be provided at the completion of the commissioning period for each new SRV servicing the port. Port Dolphin plans to submit the noise level verification report to NOAA Fisheries and MARAD within 60 working days of the completion of each monitoring event.

ANNEX A: EQUIPMENT SPECIFICATIONS

Autonomous Multichannel Acoustic Recorder—Generation 3

AMAR G3

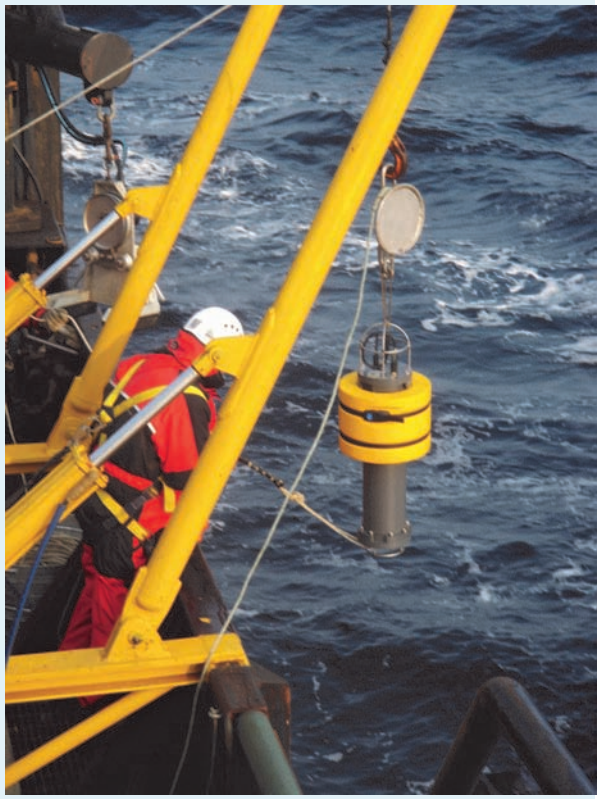
General purpose, multichannel, data acquisition, recording & streaming system designed specifically for underwater applications

JASCO APPLIED SCIENCES

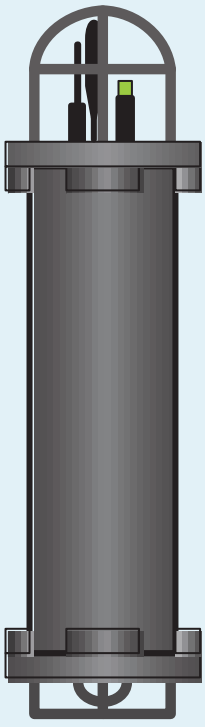
Sound Science and Technical Excellence

Applications

- Autonomous acoustic or oceanographic data acquisition
- Long duration acoustic measurement or monitoring missions
- Wide-area, persistent acoustic monitoring/characterization
- Sound/Noise measurement
- Environmental science
- Environmental Impact Assessments
- Underwater Acoustic Measurements
- Radiated self-noise measurement
- Sonar performance measurement
- Acoustic Intelligence (ACINT) missions
- Mobile acoustic ranging



AMAR G3 Key Features



√ Multiple real-time acoustic and non-acoustic data input channels

√ Supports most hydrophones and oceanographic instruments.

√ Easily configured to satisfy unique data recording requirements.

√ Recording missions up to one year in duration

√ Large volume of data storage

√ Intelligent power management

√ Extremely low-noise floor

√ Harsh ocean environments up to 2500m in depth.

√ Real-time streaming when integrated with a real-time telemetry system.

√ Improved usability and data upload performance.

Specifications

Inputs:

24-bit Analog-to-Digital Channels:

Number of 24 bit Analog Channels: 8
Two banks of four channels - each bank capable of independent sample rates
Sample Rates: 16, 32, 64, 48, 96 & 128 kHz (ksps)
Dynamic Range: 17 effective bits (104 dB)
Spectral noise floor at 128 ksps is better than -150 dB re FS
Software binary gain settings for each channel: 1 (0dB), 2 (6dB), 4 (12dB), 8(18dB), 16(24dB), 32(30dB), 64(36dB), 128(42dB)
Each channel independently AC or DC Coupled
Voltage: 0 to 5V single ended, +/- 2.5V (peak-to-peak)

High Speed 16-bit Analog-to-Digital Channel:

Sample Rates: 125, 250, 375, 687.5 & 916.667 kHz (ksps)
Dynamic Range: 14.5 effective bits
Each channel independently AC or DC Coupled
Voltage: 4.5V (peak-to-peak)

Low Speed Analog-to-Digital Channels:

Number of Low Speed Channels: 8
Sample Rate: 1 S/s
Dynamic Range: 10.5 bits
Voltage: +10V to -10V

Digital Inputs/Outputs:

Ten Digital Input/Output (DIO) lines (3 V)
Two 10/100 Ethernet
One USB 2.0 OTG
Two RS-232 serial channels
One RS-485 serial channel

Outputs:

Two 20 bit audio outputs (48 kHz bandwidth)
Intended to support optional headphone or acoustic projector
Software gain settings for audio outputs

Power:

DC power from battery pack (7 to 16 Vdc) or PoE
Three Standard Battery Packs Available (Short, Medium and Long Duration)
Extended duration possible through intelligent duty-cycling
Power consumption while recording 8 ch @ 16 kS/s: Approx 600 mW
Max Power in sleep mode: Approx 50 mW

Memory & Recording:

Solid-state memory
Min Memory: 256 GBytes
Max Memory: 1792 GBytes
Recording Duration: Up to One Year
- dependent on input channel configuration
- dependent duty cycle settings
- dependent on attached battery-pack(s)

Data input sampling configurations and duty cycling is programmable.
Acoustic Data downloaded as WAV formatted files
Non Acoustic Data downloaded as CSV files

Environmental:

Max Depth (Shallow AMAR): 250m
Max Depth (Deep AMAR): 2500m
Operating Temps: -5C to +50C
Storage Temps: -30C to 70C
Shock: 1 meter drop on to concrete and
3 meter drop into water
Vibration: transportation by air, truck or vessel

Physical:

Two Standard Depths: Shallow (250m) or Deep (2500m) (PVC and Aluminum Pressure Housings)
Three Standard Battery Durations: Short, Medium or Long

Approx Dimensions: (Medium Duration)
- Diameter: 165 mm (6.5”)
- Max Length (Long Duration): 1321 mm (52”)
- Min Length (Short Duration): 406 mm (16”)

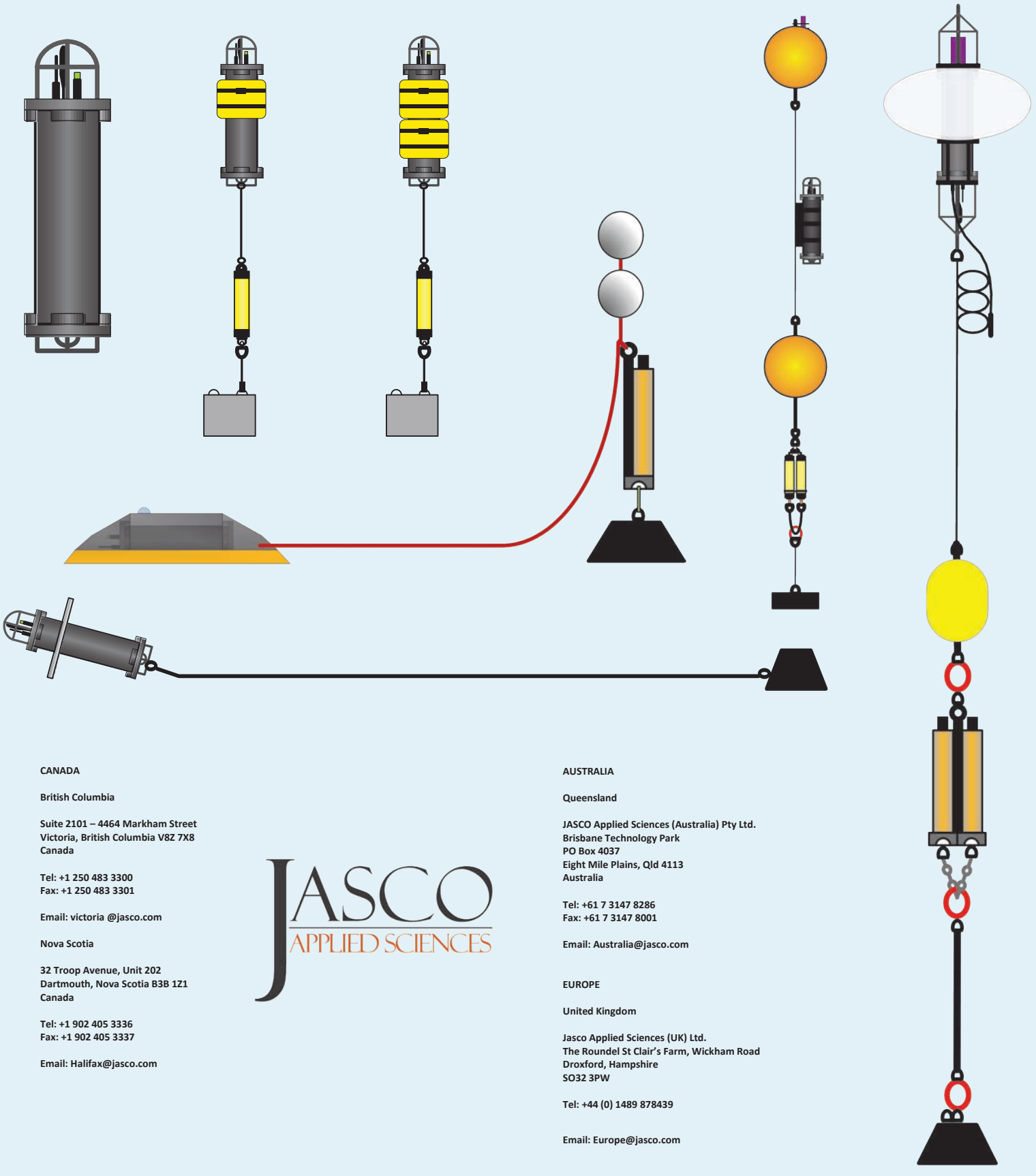
Approx Mass: (Medium Duration—Shallow)
- Mass in Air (Long Duration): 40 kg (88 lbs)
- Mass in Air (Short Duration): 15 kg (33 lbs)

Hydrophone:

The AMAR can be used with hydrophones of varying sensitivities and frequency ranges upon request. A GeoSpectrum M8E hydrophone is typically provided with the AMAR.

Model M8E by GeoSpectrum Technologies Inc.
Omnidirectional:

Nominal sensitivity (1 kHz) : -160 dBV re 1 µPa
Frequency response: 1 Hz to 150 kHz



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Sound Science & Technical Excellence

ADAMS

ADAMS: Acoustic Data Acquisition and Monitoring System.
Manufacturer: JASCO Research Ltd. doing business as JASCO Applied Sciences.
Country of Origin: Canada.
Hydrophone Country of Origin: Canada.

JASCO's Acoustic Data Acquisition and Monitoring System (ADAMS) is a system used to monitor and/or record acoustic information in real time. A hydrophone is connected to a dry-end interface module, which in turn connects to a computer (typically a laptop) through a powered Ethernet cable.

JASCO's custom software runs on the laptop and allows the user to view the acoustic signal as it is received. JASCO's viewing application, SpectroPlotter, displays both signal amplitude and spectrum, and supports audio playback from any point in the monitoring history. The incoming acoustic signal can also be recorded as a series of WAV files for later analysis or viewing.