

CLIENT:

**NAMIBIAN MARINE
PHOSPHATE (PTY) LTD**

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CONTRACTOR:



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PROJECT NAME:

SANDPIPER PHOSPHATE PROJECT

DOCUMENT TITLE:

TSHD SOUND MEASUREMENTS

Document no.: PS.NAM-PA-20.001-FJ-1

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1. Introduction

Sounds emitted by a trailing suction hopper dredger (TSHD) are similar to those of merchant ships. The dominant source is the main engine (500 Hz) and the propellor (300 Hz). Higher frequencies due to draghead/soil interaction, hydraulic transport, hopper loading, etc. have a higher frequency and are faster attenuated.

2. Underwater sounds

Under water sound limits are imposed to prevent possible damage to hearing organs of marine mammals and fishes, occurring above 150 dB re 1 μ Pa. Sounds from 100 dB re 1 μ Pa trigger an avoidance response.

Imposed limits are scarce for dredging projects. In La Rochelle a maximum broadband limit of 160 dB re 1 μ Pa at 750m from the vessel is imposed.

Limits are more common for piling activities (e.g. at offshore wind farms), were the sound is intermittent. In the North Sea, a similar limit of 158-160 dB re 1 μ Pa at 750 m is imposed.

The source level for a TSHD in operation is 180-190 dB re 1 μ Pa at 1m. Figure 1 summarizes the measurements done around dredgers of the JDN fleet. This confirms what can be found in literature, that the 150 dB contour range is less than 100m around the vessel.

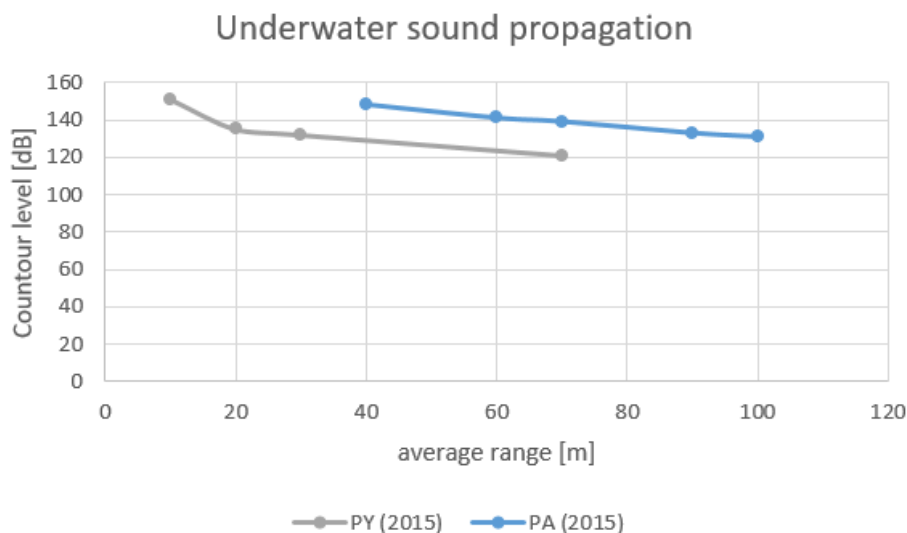


Figure 1: measured underwater sound for BHD Posnik Yakovlev (PY) and TSHD Pedro Alvares Cabral (PA)

The propagation of the underwater sound over a larger range is modelled for TSHD Gerardus Mercator and shown in Figure 2

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Underwater sound propagation (modelled) Neptune project

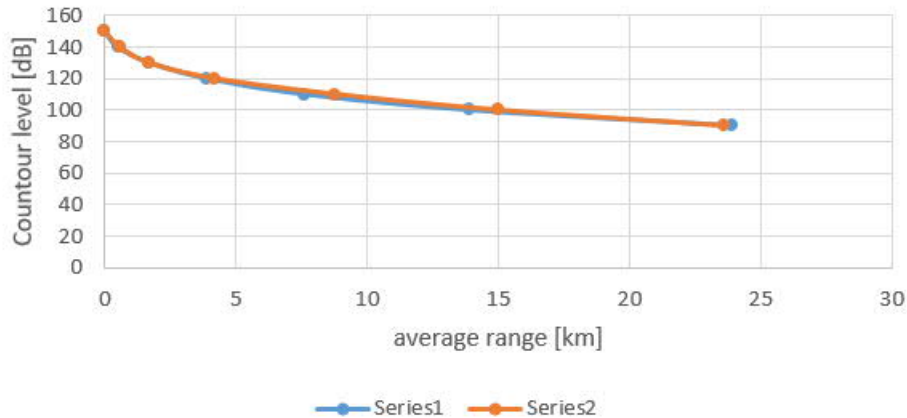


Figure 2: modelled underwater sound for TSHD Gerardus Mercator (GM)

3. Above water sounds

Limits are imposed when working close to residential or touristic areas. In Monaco (2018), limits between 65 and 75 dB were imposed at the sensitive location, depending on the time of day.

No measures were required for the dredgers, but for the rock installation vessels, sound absorbing panels were installed on deck.

The source level for a TSHD in operation is 80-90 dB re 1µPa at 1m. Figure 3 summarizes measurements done around dredgers of the JDN fleet.

Above water sound propagation measured

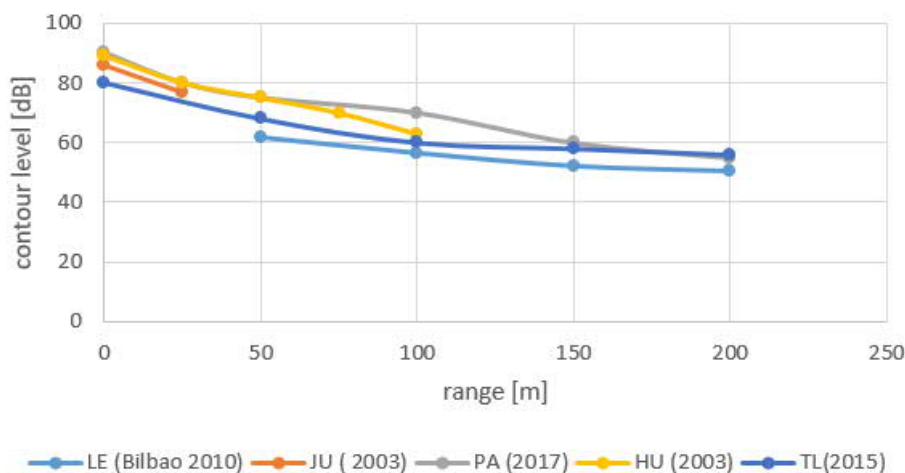


Figure 3: measured above water sounds for TSHD Leiv Eiriksson (LE), Juan Sebastian De Elcano (JU), Pedro Alvares Cabral (PA), Alexander Von Humboldt (HU) and Taccola (TL)