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**Monitoring the temporal and spatial characteristics of the noise
radiated from marine piling**

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Noise is often an unintended by-product of offshore activities, and a significant source of impulsive underwater noise is marine piling, where a pile is driven into the sea-bed using a hydraulic hammer. This paper describes work undertaken to monitor the underwater radiated noise during offshore marine piling. The measurements made include full characterisation of the temporal variation of the resulting sound field, including frequency content of the pulses and the increasing amplitude typically observed during the soft start period. Results are also shown for the spatial variation of the field, including the effect on propagation of significant bathymetry changes (for example, due to the presence of a sand bank). The energy within each acoustic pulse is an appropriate measure of the sound field, having the advantage that it is relatively straightforward to add the contributions from each pulse in order to derive an overall sound exposure level (SEL) in a manner analogous to methods familiar from air acoustics. An example is then given of how the measured data and predictive modelling may be used to calculate an overall exposure for an animal in the vicinity, using various assumptions about the location and mobility of the animal.