

Statement of Work

Sub-Bottom Profiler – Design and Build for 200 mm AUV Integration

[Reference Design Data Sheet](#)

[Open Source SBP Paper](#)

Issued by: Ulysses

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1. Purpose

This Statement of Work (SOW) defines the scope, requirements, targets, and deliverables for the design, fabrication, and delivery of a sub-bottom profiler (SBP) payload for integration into the Ulysses autonomous underwater vehicle (AUV). The unit must fit within the vehicle's 200 mm diameter profile and integrate with the vehicle's power, networking, and acoustic timing infrastructure.

2. Scope of Work

The team shall design, fabricate, test, and deliver a complete sub-bottom profiler system. The following are in scope:

- Hydrophone and transducer design and fabrication
- Transmit-and-receive chain hardware (power amplifier, pre-amplifier, filtering, ADC/DAC)
- Networking hardware for integration with the vehicle
- Mechanical design for vehicle integration, including pressure housing(s) and mounting
- Digital signal processing (DSP) software
- Data-representation software and/or export in an industry-standard format

3. Requirements and Targets

"Requirement" denotes the minimum acceptable performance. "Target" denotes the desired performance the team should design towards where practical.

Parameter	Requirement	Target
Penetration depth (muds and clay)	10 m – 15 m	30 m or greater
Vertical resolution	6 cm – 10 cm	Less than 6 cm
Depth rating	300 m	Greater than 1500 m

4. Integration Requirements

- **Form factor:** The complete system shall fit within a 200 mm diameter envelope.
- **Buoyancy:** The system shall be neutrally buoyant.
- **Data output:** Ethernet on an 8-pin JST connector.
- **Power input:** 32 V – 55 V system voltage. A 2-pin JST ZE connector is preferred. If additional power is required, up to 3x 2-pin JSTS ZE's may be used instead.
- **Acoustic timing / trigger:** The system shall provide a hardware trigger pin to coordinate transmit timing with other acoustic devices on the vehicle, so that those devices are not blinded during SBP transmission. Trigger control shall also be available over Ethernet.

5. Design Notes and Recommendations

- **Receive chain:** A 24-bit ADC is worth considering for the receive chain to improve data resolution.
- **Transmit frequency:** The emitting transducer frequency will be driven largely by the required penetration depth. A CHIRP waveform sweeping across a frequency range should be considered to improve penetration whilst retaining high vertical resolution.
- **Reference design:** An off-the-shelf reference point is the EdgeTech DW-424, which uses a CHIRP sweep from 4 kHz to 24 kHz, achieves approximately 40 m penetration in clay, a vertical resolution in clay of 4 cm – 8 cm, and a beam width of 15° – 25°.

6. Data Formats

Two industry-standard formats are recommended for consideration:

- **EdgeTech Envelope**
- **SEG-Y.** If SEG-Y is chosen, the following shall apply:
 - EBCDIC, binary, and trace headers shall be populated.
 - Shotpoints shall be populated in the trace headers.
 - Microseconds shall be populated in the trace headers to allow for AUV altitude correction.

7. Deliverables

- Preliminary design review (PDR) package: system architecture, transducer/hydrophone concept, transmit/receive chain design, mechanical concept, and DSP approach
- Critical design review (CDR) package: detailed drawings, schematics, buoyancy and pressure analysis, interface control document (ICD) covering connectors, pinouts, power, Ethernet protocol, and trigger behaviour
- Fabricated hardware: transducer/hydrophone assembly, electronics, and mechanical integration hardware
- DSP and data-representation software, including source code and build instructions
- Test reports: pressure test, acoustic characterisation (source level, beam width, bandwidth), penetration and resolution verification, and vehicle integration test

- User and integration documentation

8. Acceptance Criteria

- All requirements in Sections 3 and 4 are met and demonstrated by test.
- Performance against targets in Section 3 is reported.
- Data output validates correctly in the chosen format (Section 6), with all specified headers populated.
- Trigger function operates correctly via both hardware pin and Ethernet.

9. Schedule and Milestones

[To be agreed – suggested milestones: kick-off, PDR, CDR, hardware fabrication complete, factory acceptance test, vehicle integration test, final delivery.]