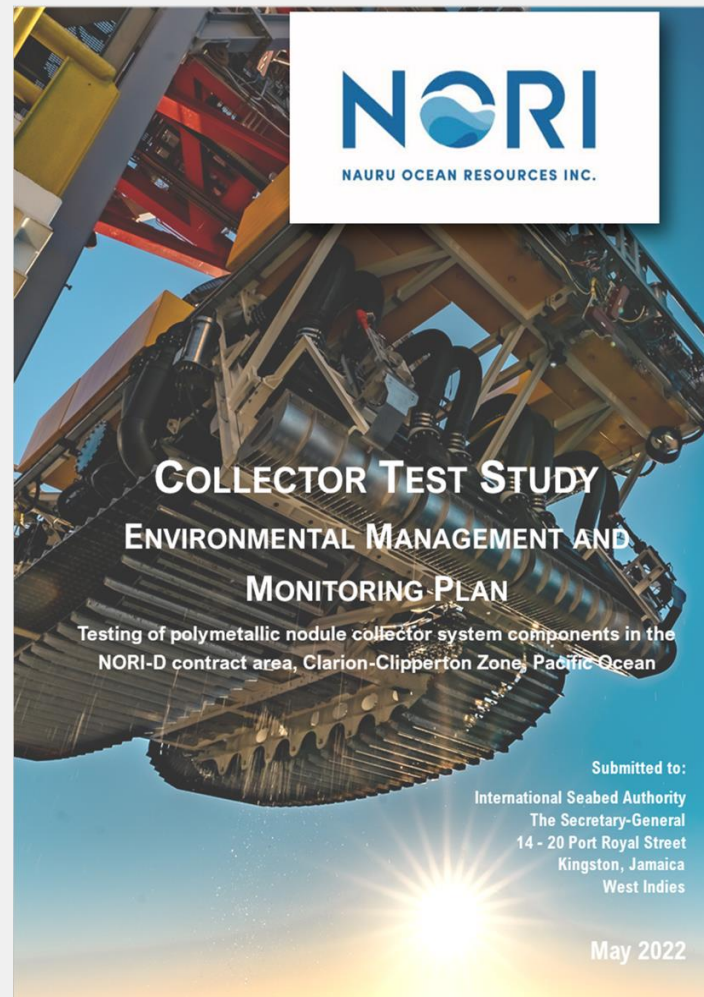
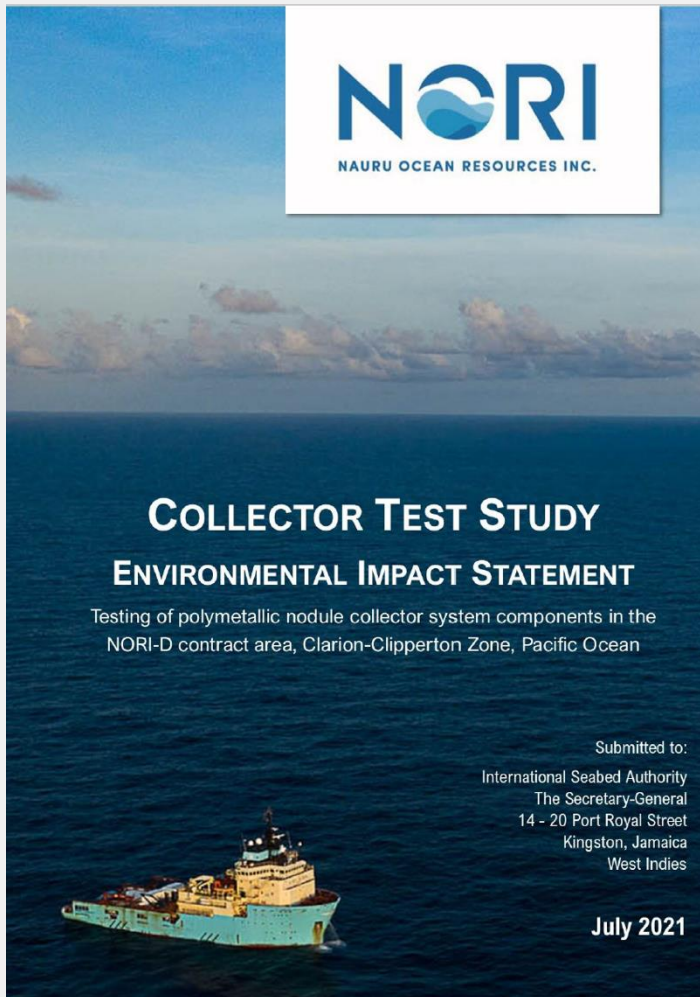




NORI Test Mining

Corey McLachlan
December 2024,
Test Mining Workshop, Germany

Environmental Impact Statement (EIS) was submitted to the ISA in July 2021 and approved in September 2022.



NORI-D Collector Test EIS review process

- EIS submitted to the ISA in July 2021
- Two stakeholder information sessions conducted
- Responses were provided to over 600 stakeholder comments
- Revisions made to the EIS in response to stakeholder comments and initial ISA review
- EMMP submitted in May 2022
- Additional information supplied in response to LTC request in August 2022
- Recommended inclusion of the collector test in the work program provided in September 2022

Test Mine programme included: : system tests, Test Mining and pre, during and post environmental impact monitoring



2022 INTEGRATED SYSTEM TEST PROGRAM

January	Riser acceptance test
February	Thruster re-lift, dockside vessel commissioning, review of nodule offloading & handling test program
Feb 7	LARS load test
Feb 28–Mar 3	Thruster installation
Feb 22 – March 4	Collector wet function tests in outer harbor
March 12–17	Hidden Gem dynamic positioning trials
March 22 – April 1	Collector drive test in the North Sea
April 6–11	Deep-water test in the Atlantic
March 22 – April 6	Riser deployment test
May 22 – June 10	Jumper deployment and connection test
June	Transit to Mexico
June 29	Mobilization

ENVIRONMENTAL IMPACT MONITORING CAMPAIGN

26 July 20 Sept.	Pre-mining baseline environmental survey Test mining environmental & plume monitoring program Post mining environmental monitoring
19 Sept – 10 Nov	
10 Nov – 15 Dec	

TEST MINING IN NORI-D

19 Sept – 10 Nov	Integrated collector test ~4.5k wet tonnes collected, over 3k wet tonnes brought to surface
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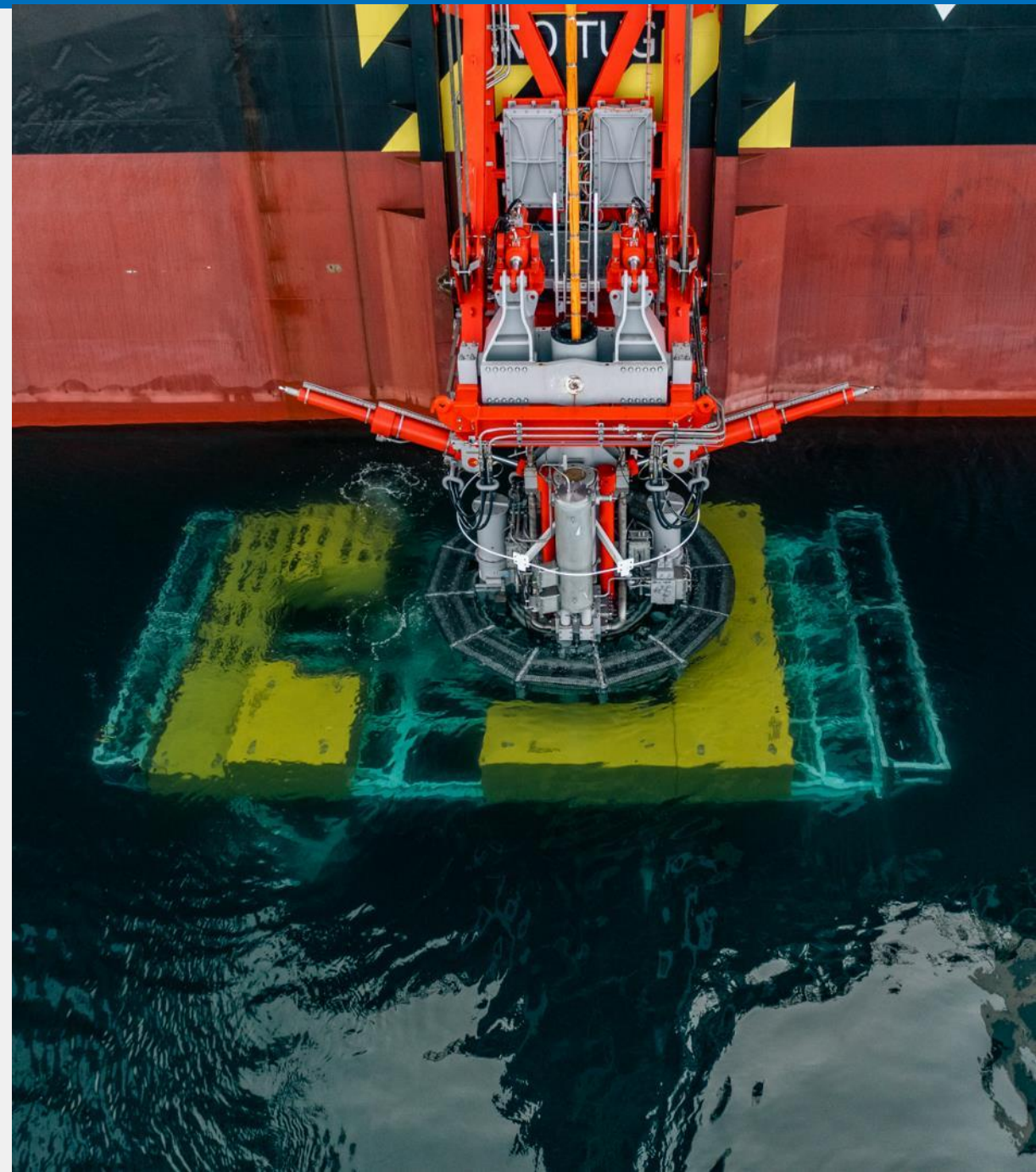
Key test mining project objectives.

Key objectives of full system test mining project:

- 1** Test the integrated nodule collection system to inform the design and operation of a commercial nodule collection system
- 2** Develop sound procedures to assess environmental risks associated with collecting polymetallic nodules
- 3** Study the impacts collecting polymetallic nodules has on the environment to inform monitoring and mitigation measures for commercial operations

NORI's test mining programme and objectives were informed by:

- ISBA/25/LTC/6/Rev.3 and
- Aligned with Draft Regulations ISBA/29/C/CRP.1



Offshore collector system: General arrangement.

Platform for equipment handling
and nodule processing
(surface vessel)

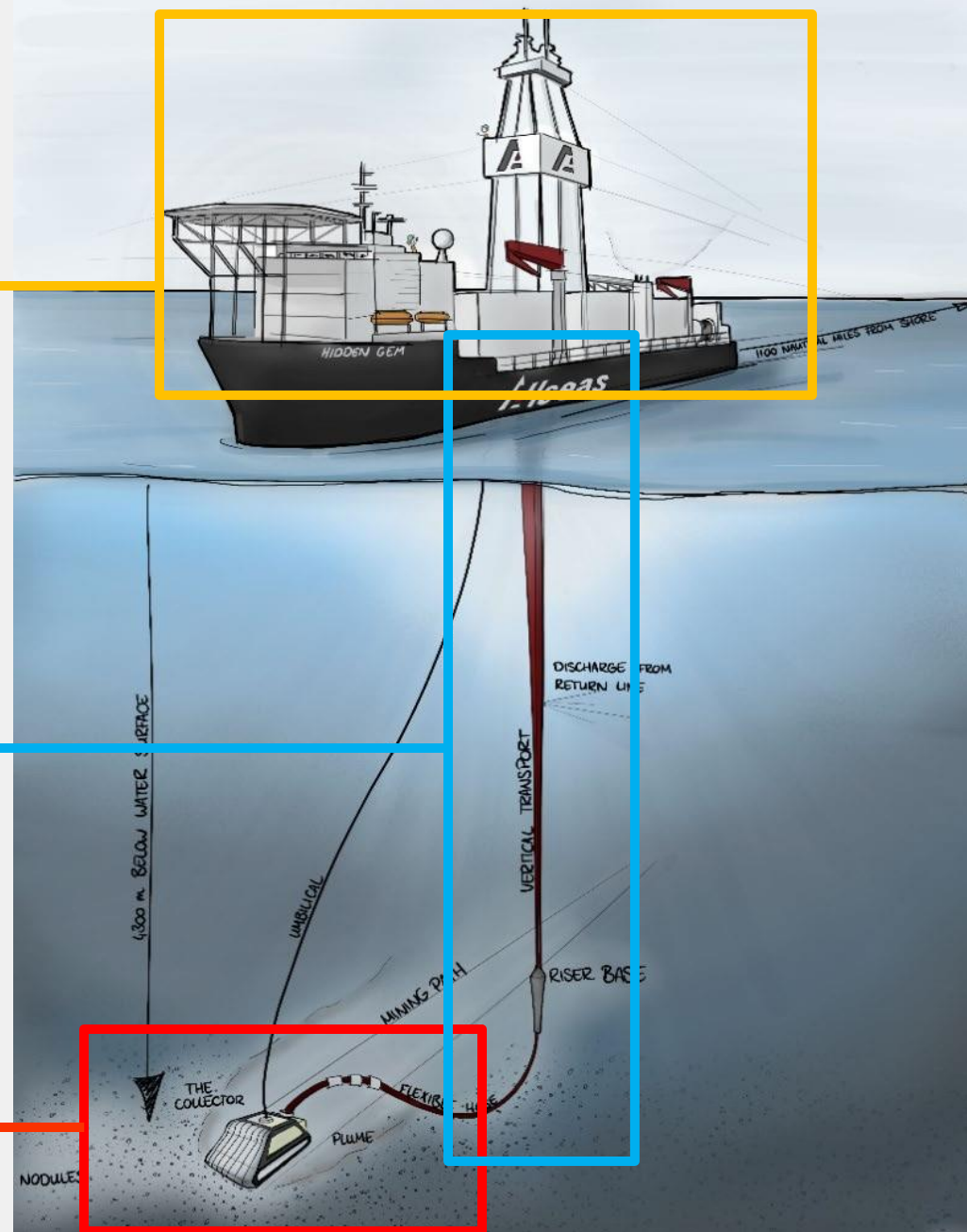
3

Vertical transport system
(riser pipe)

2

Seabed collector vehicle

1



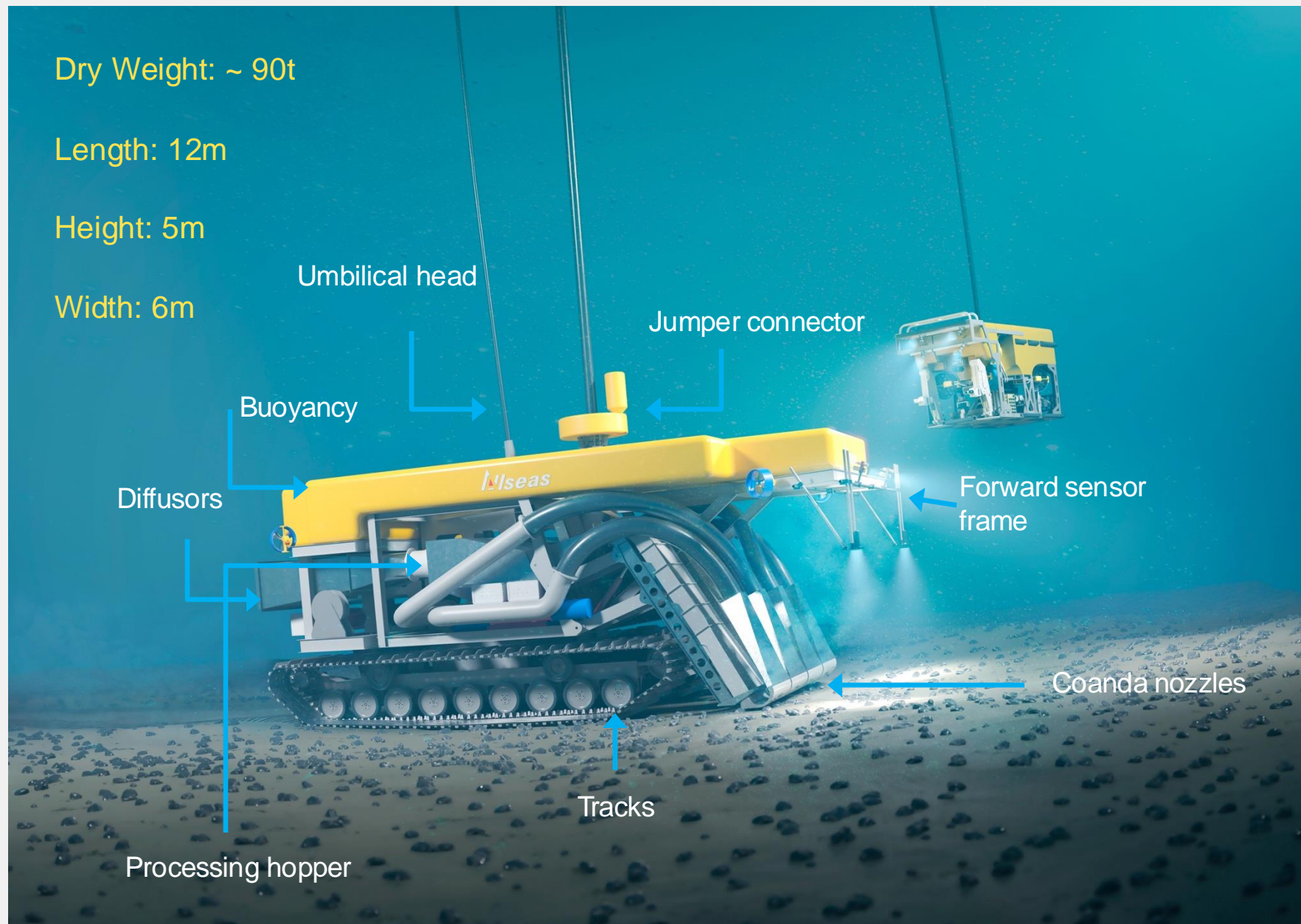
Surface support vessel: Hidden Gem.



Hidden Gem: Launch & Recovery System (LARS).



Collector design.



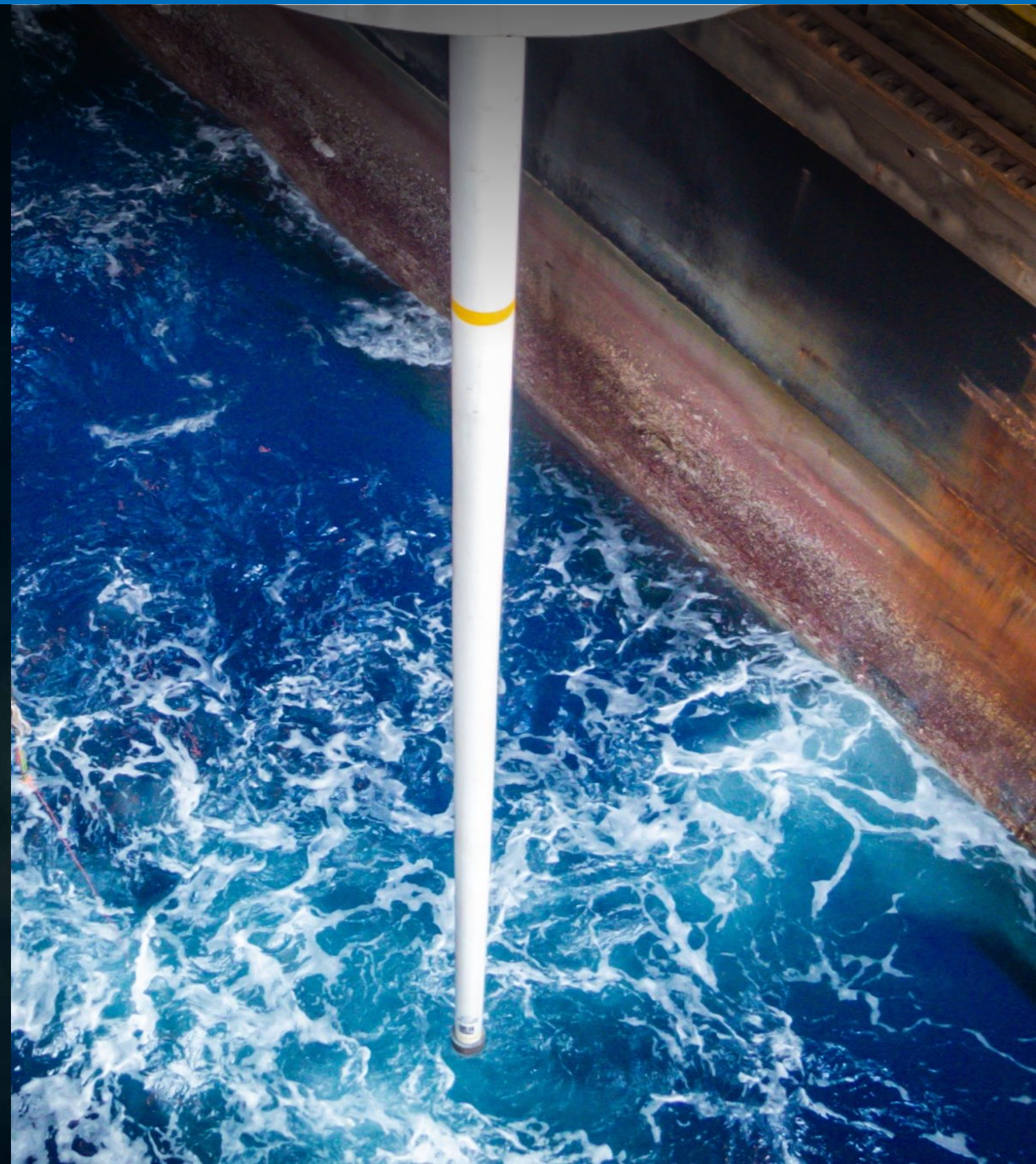
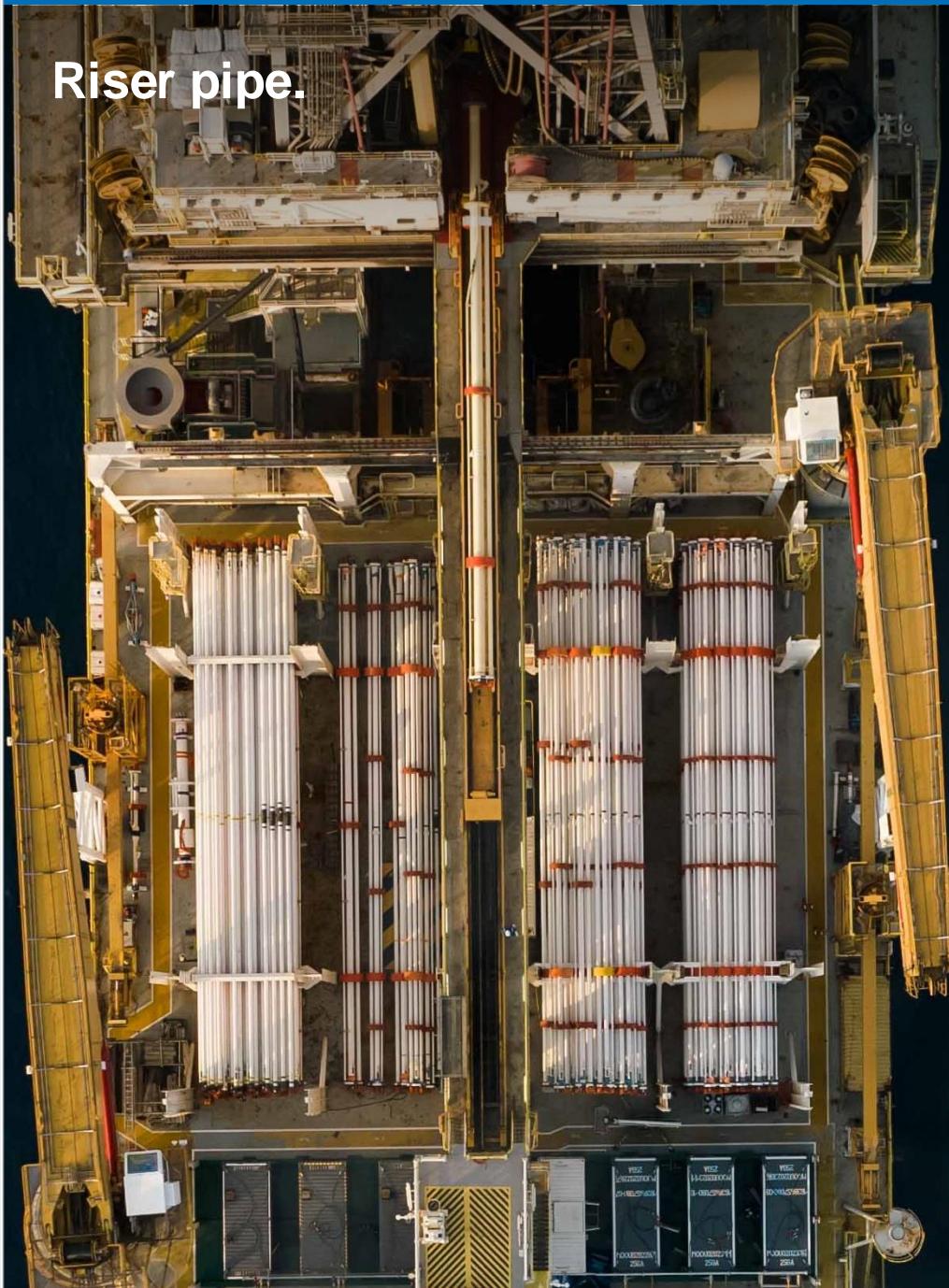
Prototype Collector Vehicle (PCV) on LARS.



PCV umbilical.



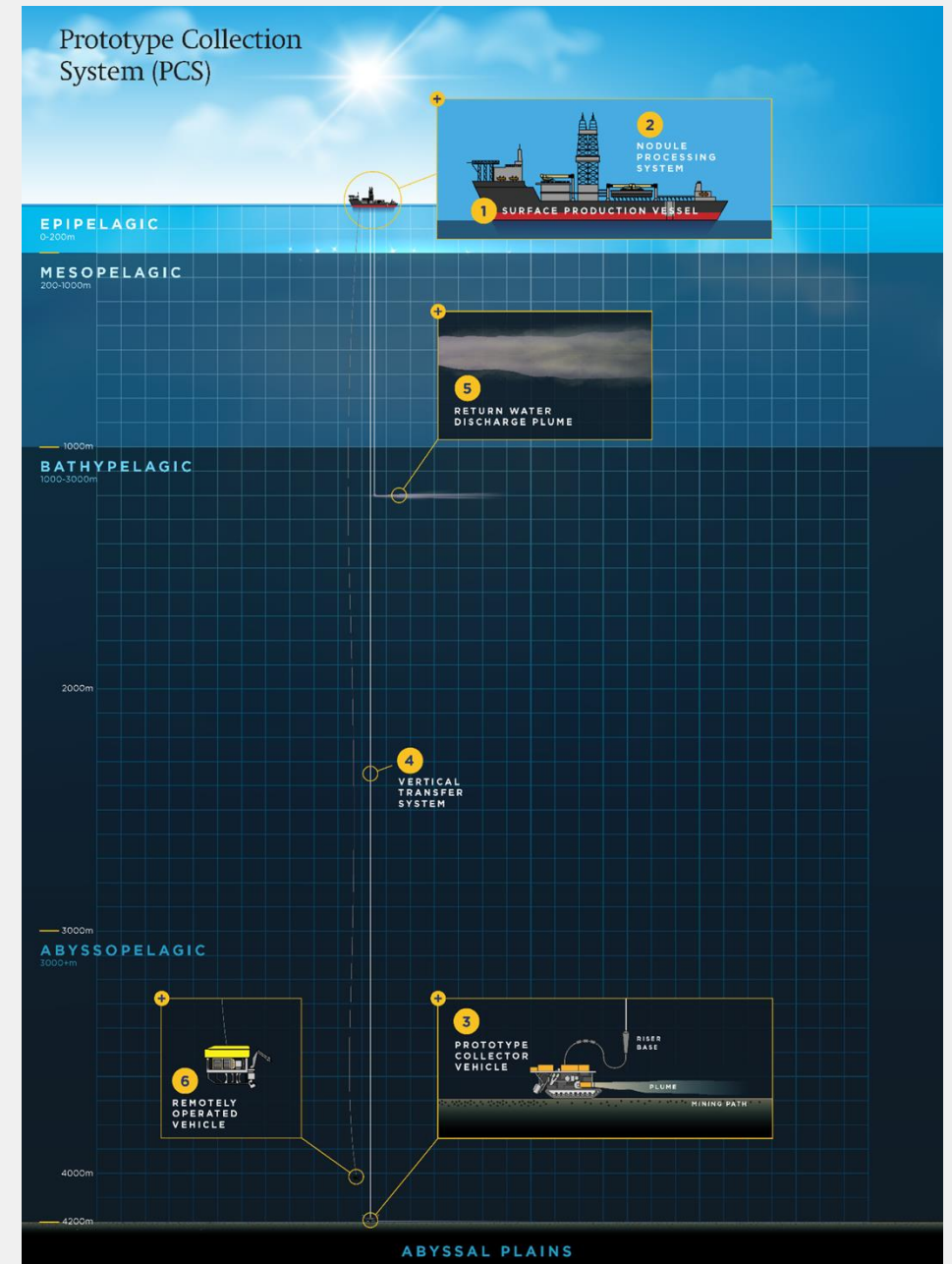
Riser pipe.



Test mining ramp up

The nodule collection system underwent a series of system tests, culminating in continuous operations:

- 1) Field inspection and preparation (FIP)
- 2) Collector vehicle deployment, recovery & test runs (HTR)
- 3) Riser installation and commissioning (RIC)
- 4) System integration test (SIT)
- 5) System test runs (STR)
- 6) Production runs (PR)
- 7) Emergency shutdown test (EST)
- 8) Decommissioning and site closure (DSC)



Collaborated with leading research institutions for our NORI-D Collector Test.



Collector Test Environmental Monitoring Studies.

Impact Zone 1 - Surface

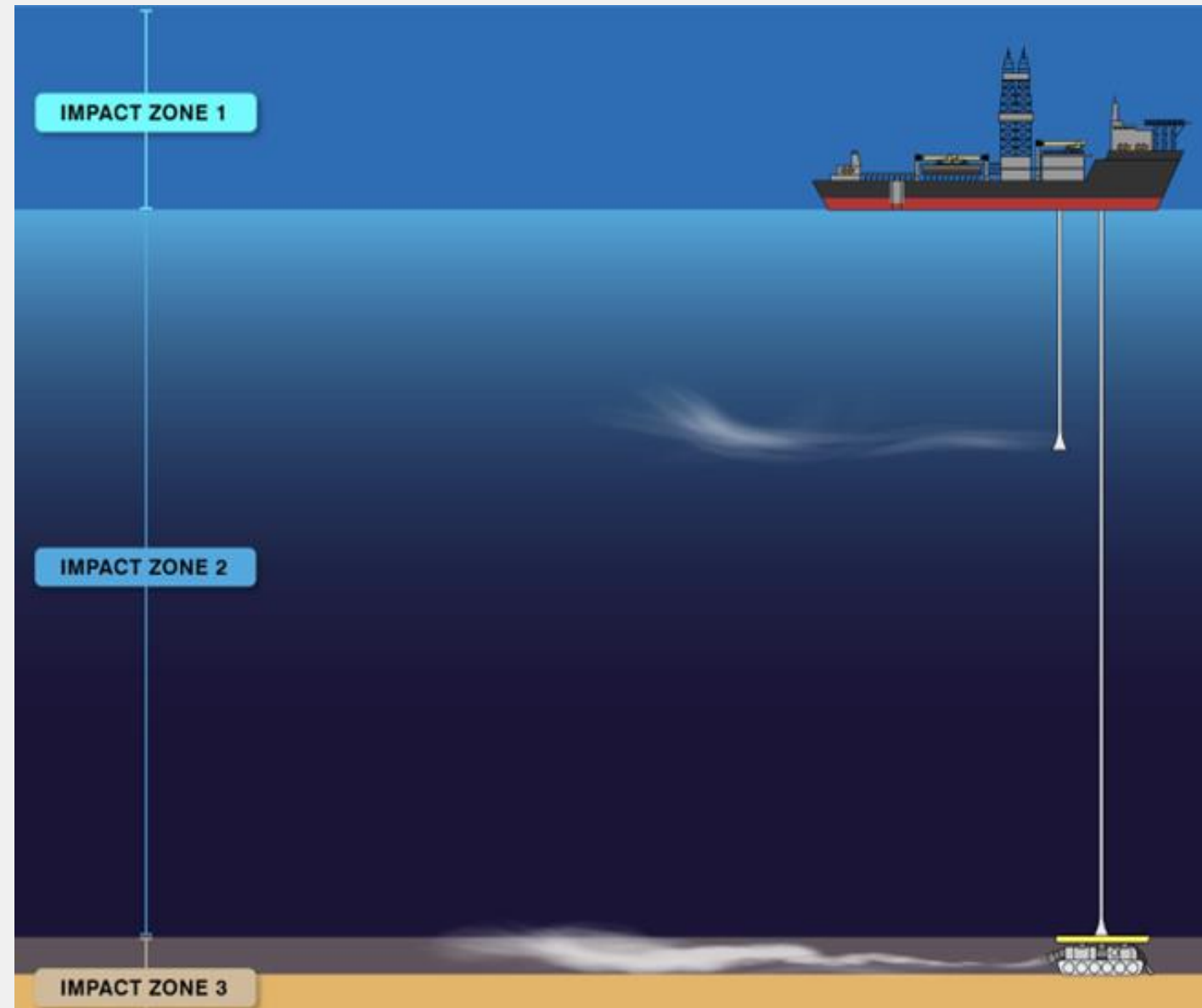
- Vessel emissions
 - Noise
-

Impact Zone 2 - Pelagic

- Mid-water plume dispersal and characterization
 - Trace metals / Ecotoxicology
 - Acoustic modeling
 - Phytoplankton community characterization
 - Food web linkages (stable isotope analysis)
-

Impact Zone 3 - Benthic

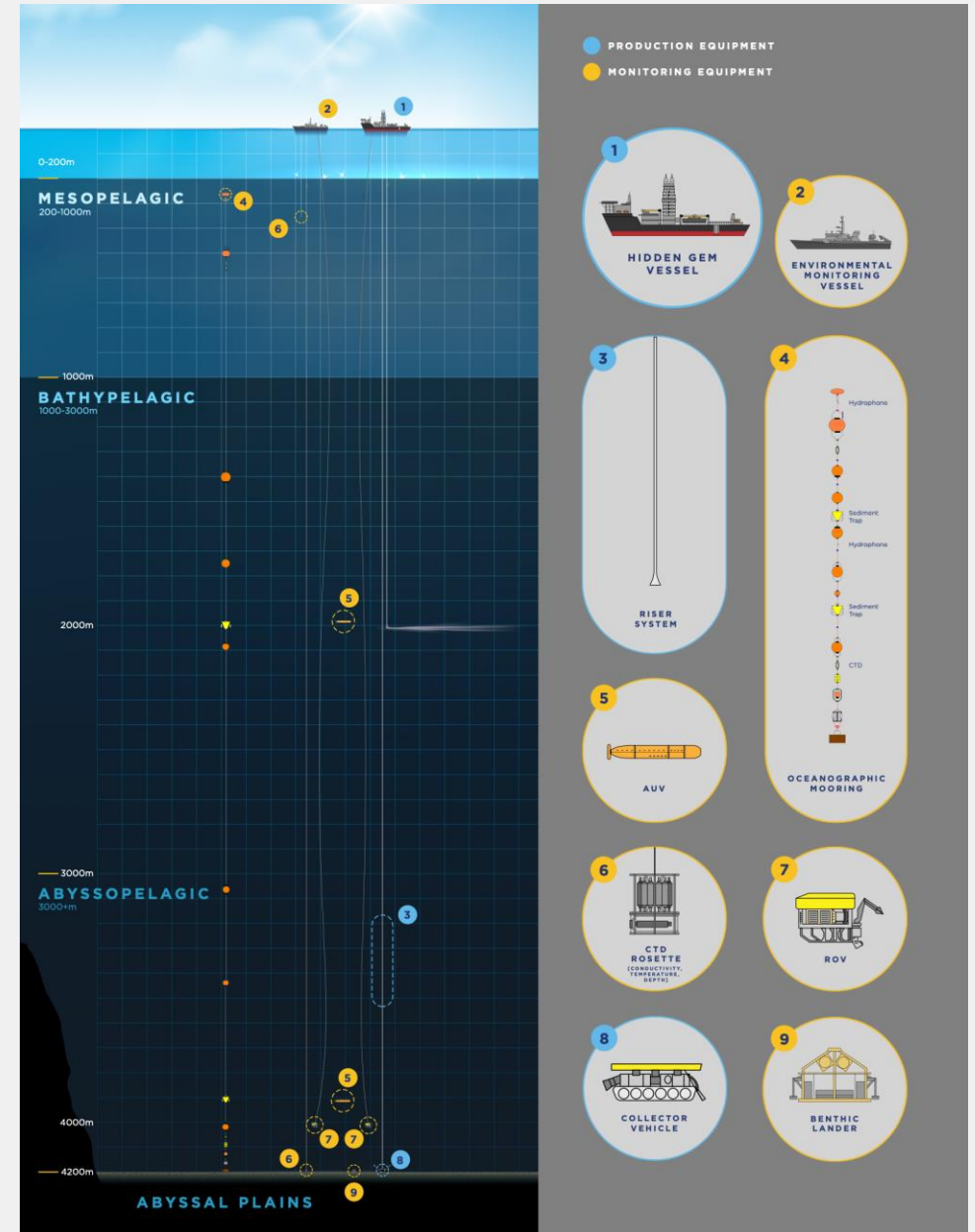
- Physical and chemical disturbance of sediment
- Seafloor mapping (pre and post-disturbance)
- Fauna (mega, macro, meio, forams, micro)
- Sediment ecotoxicology
- Ecosystem function (benthic landers)
- Acoustics / Light



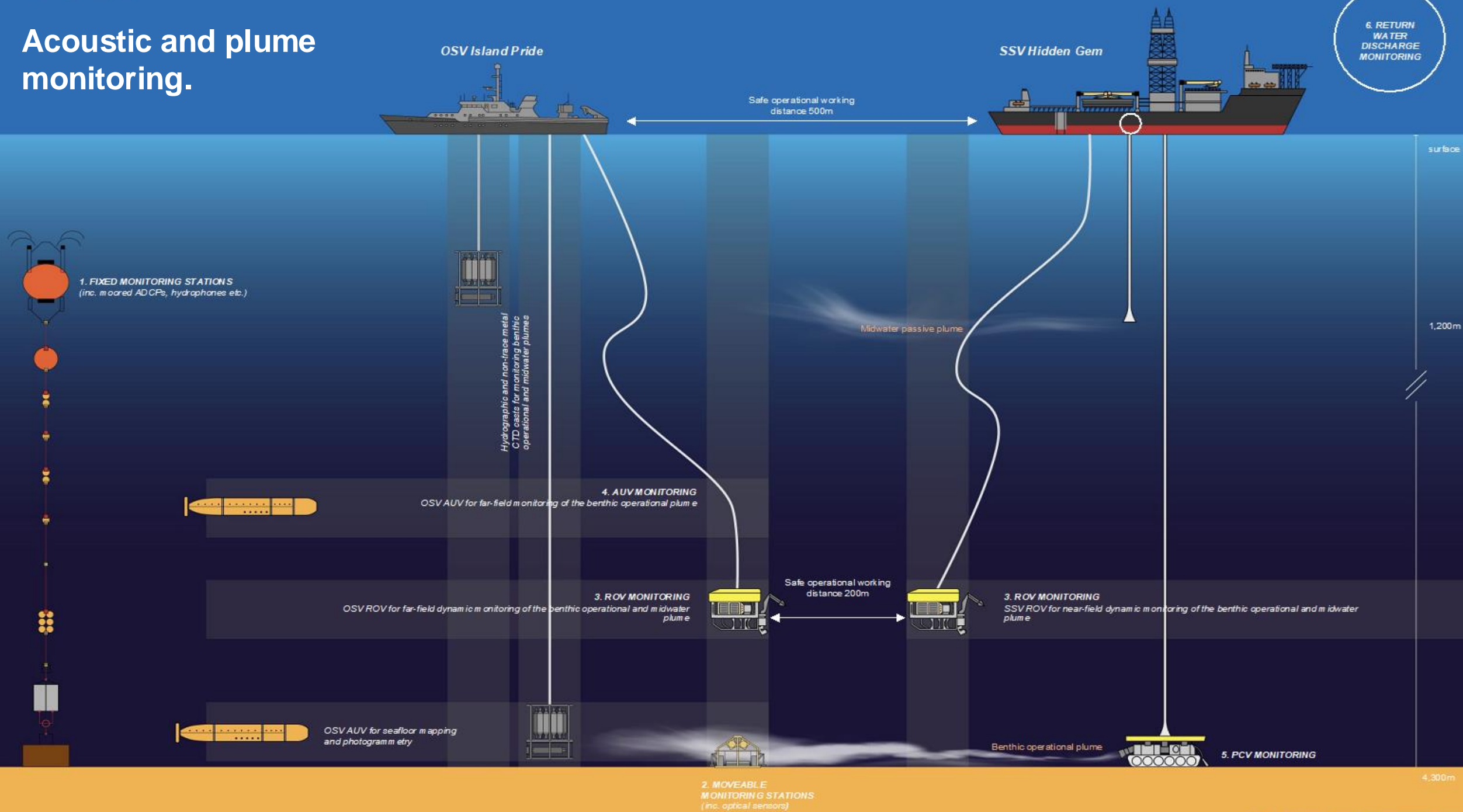
Environmental monitoring programme

Environmental monitoring occurred in three phases:

- 1) Pre-test mining: 26 July – 20 Sept.
 - Objective: obtaining baseline scientific data from the seafloor in the test field and at control sites prior to impact and disturbance
- 2) During test mining (plume, noise & light): 19 Sept. - 10 Nov.
 - Objective: monitoring environmental impacts of test mining. Near field monitoring was conducted from the Hidden Gem and far field (>200m) was conducted on the Island Pride
- 3) Post test mining: 10 Nov. - 15 Dec.
 - Objective: validate and record the scale and scope of the impact area through surveys and sampling



Acoustic and plume monitoring.



6. RETURN WATER DISCHARGE MONITORING



Unplanned events and lessons learned

Test mining allows the testing of systems to identify and resolve design flaws and inefficiencies

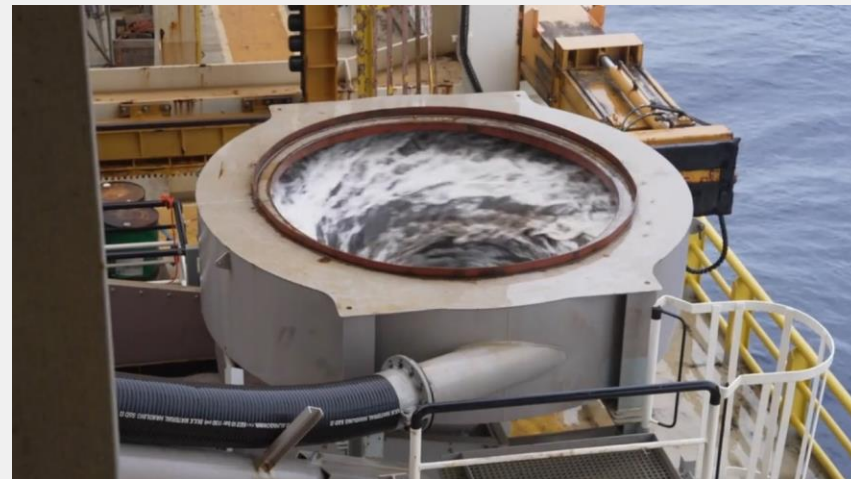
- An approved test mining EIS, EMMP and programme of work ensures the test is well planned and the risk of Serious Harm to the environment or harm to human life is acceptable
- Test mining reduces future environmental and operational risks, increases safety and enhances efficiency

Unplanned events are likely to occur during test mining

- Inherent in the process of test mining is that unplanned and unexpected events can occur – NORI experienced some
- ISA investigation into cyclone overflow

Lessons learned

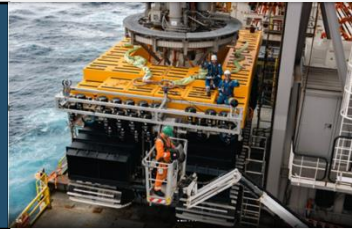
- Unplanned events result in reviews and investigations to identify root causes and implementation of procedures and plans so they don't occur again
- Test mining allows areas to be identified that can be improved to reduce the systems environmental impact and increase efficiency as the system is scaled
- Testing and refinement of the NORI system is underway



Test mining campaign complete.

Objective #1:

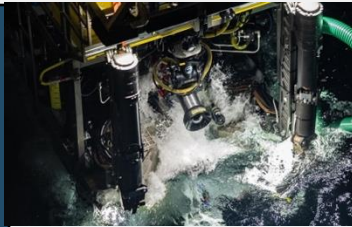
Test the integrated nodule collection system to inform the design and operation of a commercial nodule collection system



- ✓ 4,500 wet tonnes collected & ~3,000 lifted
- ✓ System test & continuous operations
- ✓ Learnings will inform the design of a full scale system

Objective #2:

Develop sound procedures to assess environmental risks associated with collecting polymetallic nodules



- ✓ EMMP implemented
- ✓ Learnings will inform NORI PoW and full scale EMMP

Objective #3:

Study the impacts collecting polymetallic nodules has on the environment to inform monitoring and mitigation measures for commercial operations



- ✓ Pre- and during surveys complete
- ✓ Post-test surveys complete
- ✓ Results are informing NORI's EIS for commercial operations

Next steps

Post monitoring

- 12 months following test mining NORI conducted another post-test monitoring campaign

Analysis of data

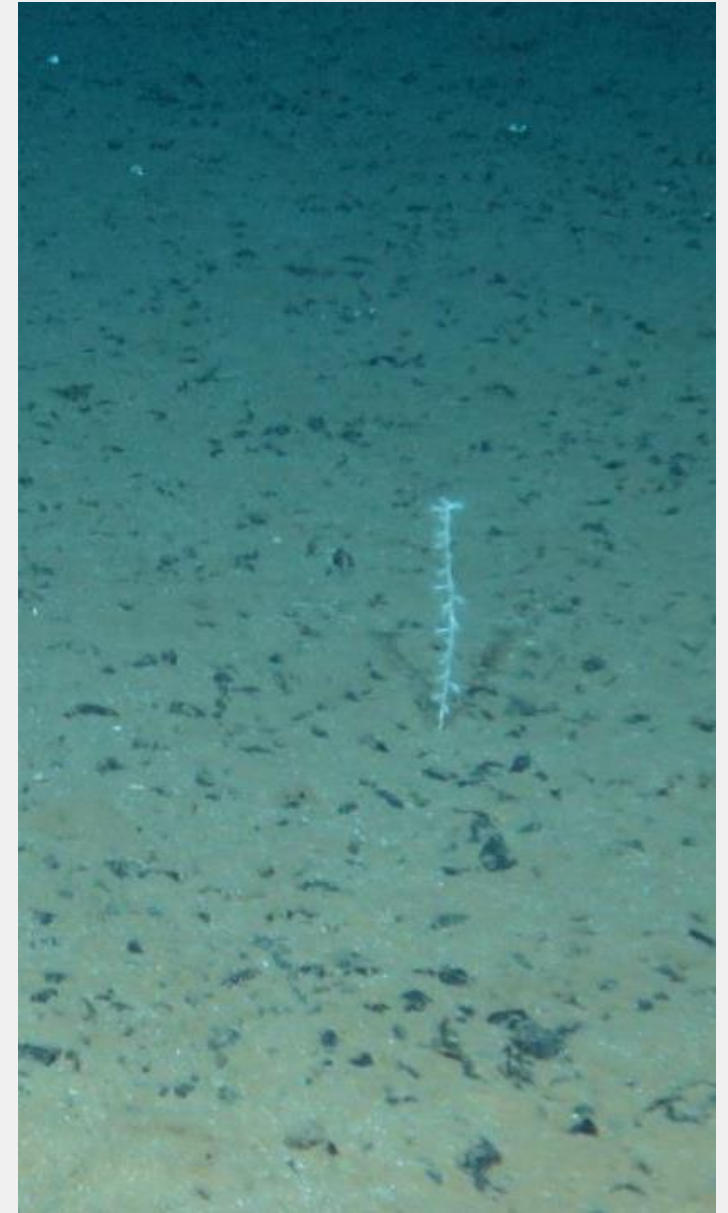
- Over 100 technical reports have been written related to the nodule collection system environmental performance
- NORI PoW is being informed by results of test mining

Test mining report

- Finalization and submission of NORI's test mining report

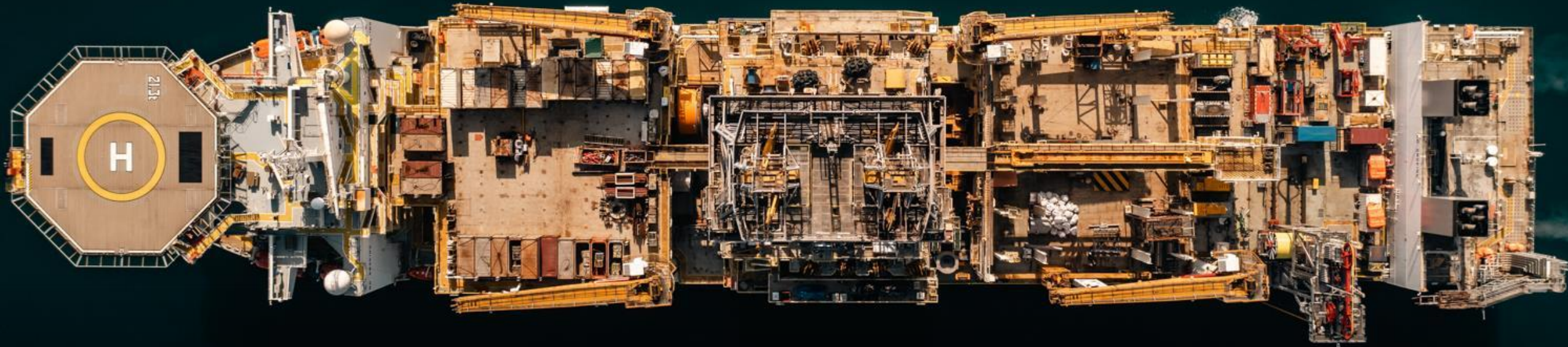
Applying lessons learned

- Areas were identified that could be improved to reduce the systems environmental impact and increase efficiency as the system is scaled
- Testing and refinement of the system is underway



NORI

NAURU OCEAN RESOURCES INC.



Ma Tubwa Kor!

