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Abstract No. 7

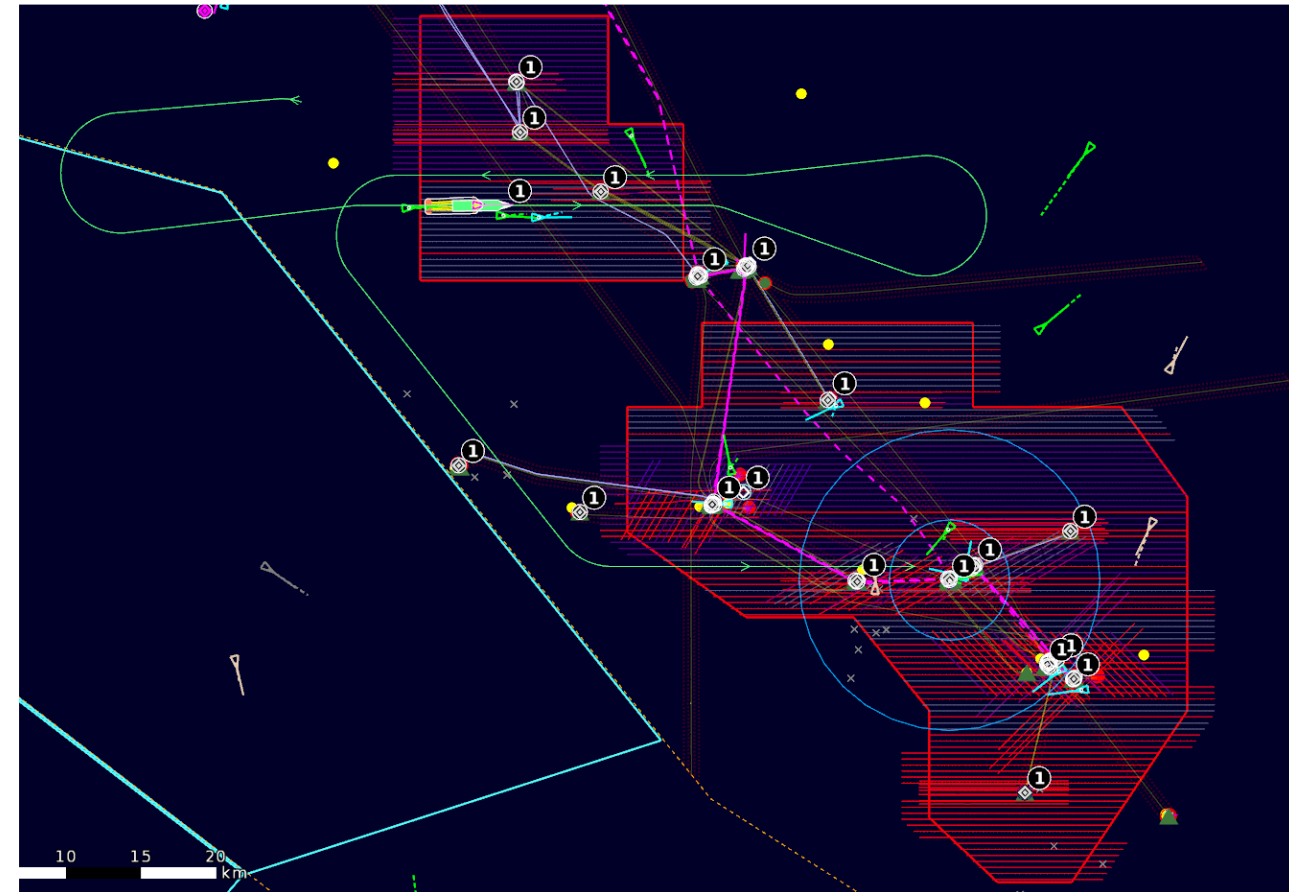
**The importance of macroplanning tools to deliver
efficiencies in ocean bottom surveys**

Rosie Andrews



*Situational awareness is the accuracy of a person's (or a team's) current knowledge and understanding of the task and working conditions, compared to actual conditions at that time (**Endsley, 1995***)*

- Understanding simultaneous operations (**SIMOPS**) is key when working in operating fields
- Tools and personnel dedicated to managing this information significantly improves the success of the project
- Has long been a consideration for towed streamer
- Ocean bottom projects haven't had the same focus



*Endsley, M.R. [1995] Toward a theory of situation awareness in dynamic systems. Human Factors, 37 (1), 32-64.

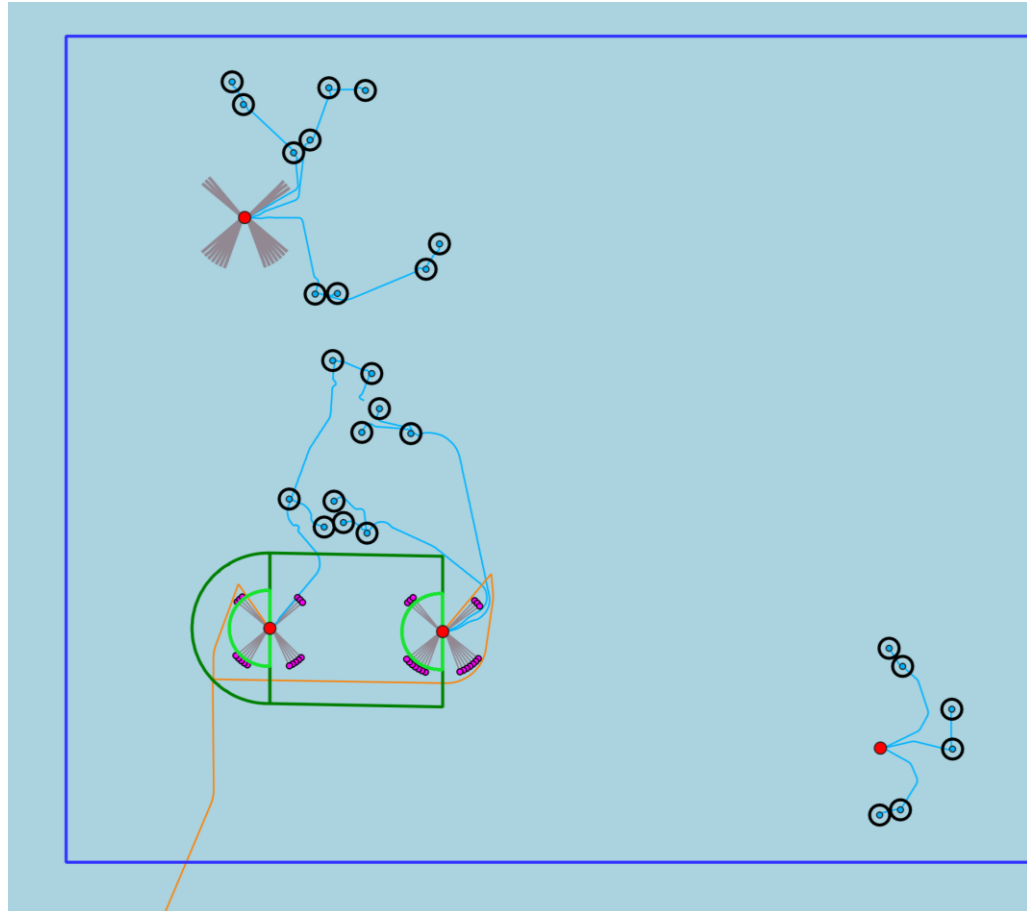
Project Overview

OBN Operation

- 14-month operation
- 3 back-to-back projects
- 4D element
- 1 source vessel
- 1 node vessel
- Planning Co-ordinator onboard

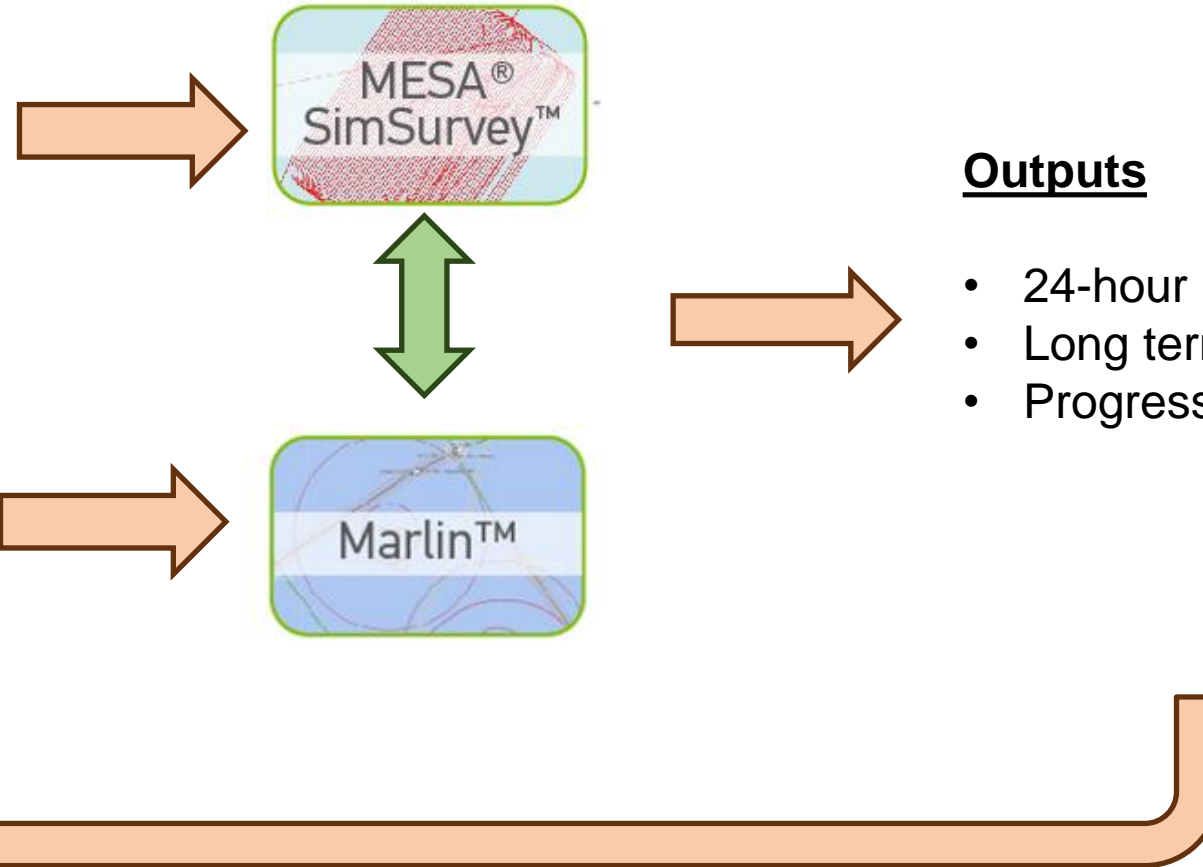
Project Area

- 2 FPSOs
- Installation for 3rd FPSO
- 6 drill ships
- 3 MPVs
- Diving
- Geotechnical survey



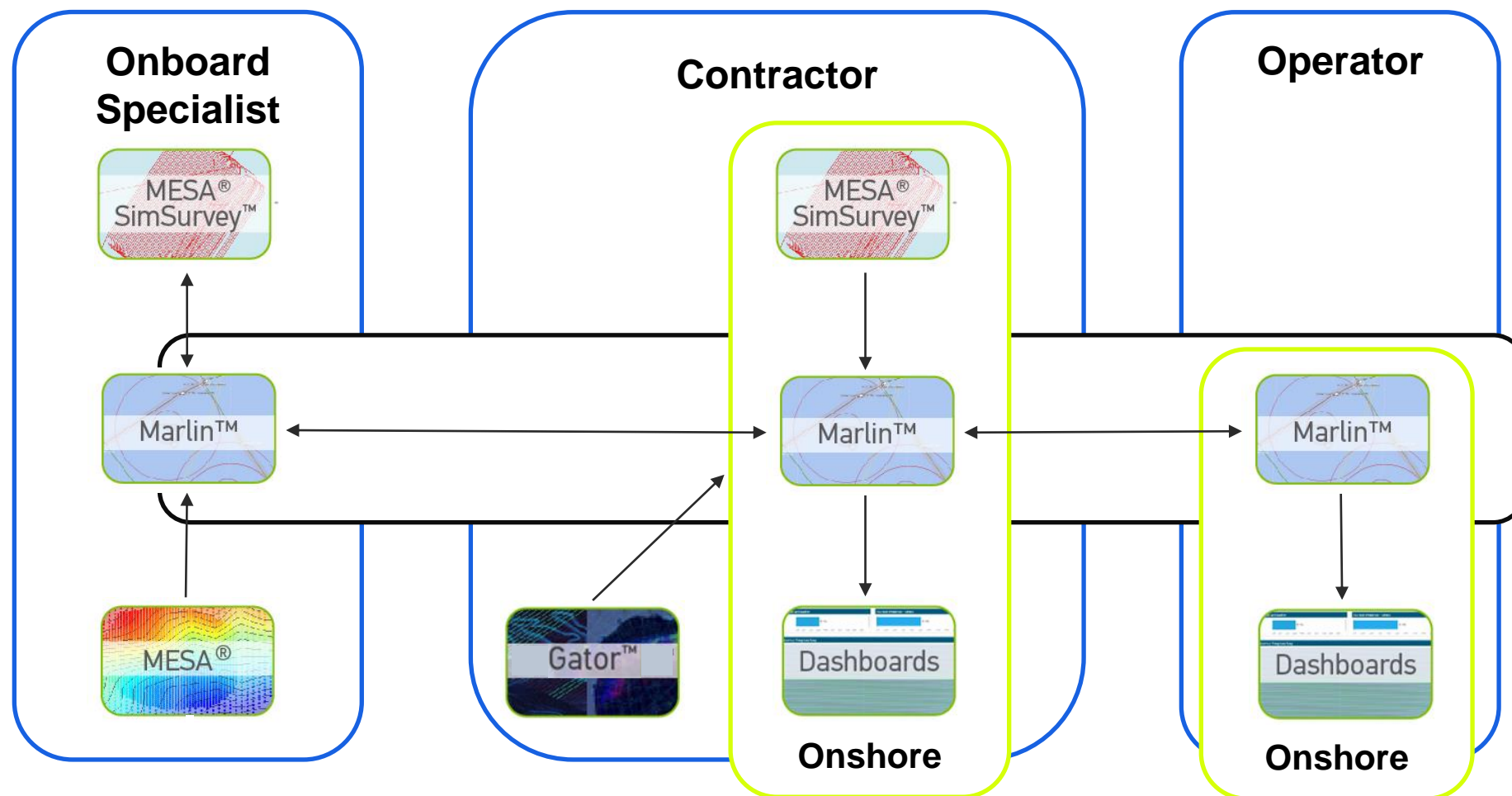
Inputs

- Fleet setup
- Node inventory
- Vessel speeds
- Field tasks
- Exclusion zones
- Current vessel status



Outputs

- 24-hour plan
- Long term strategy
- Progress vs plan



FPSO Offtake Operations

- Blocks source and node lines
- 36 hours duration
- Occurs every 4 days

500m zone

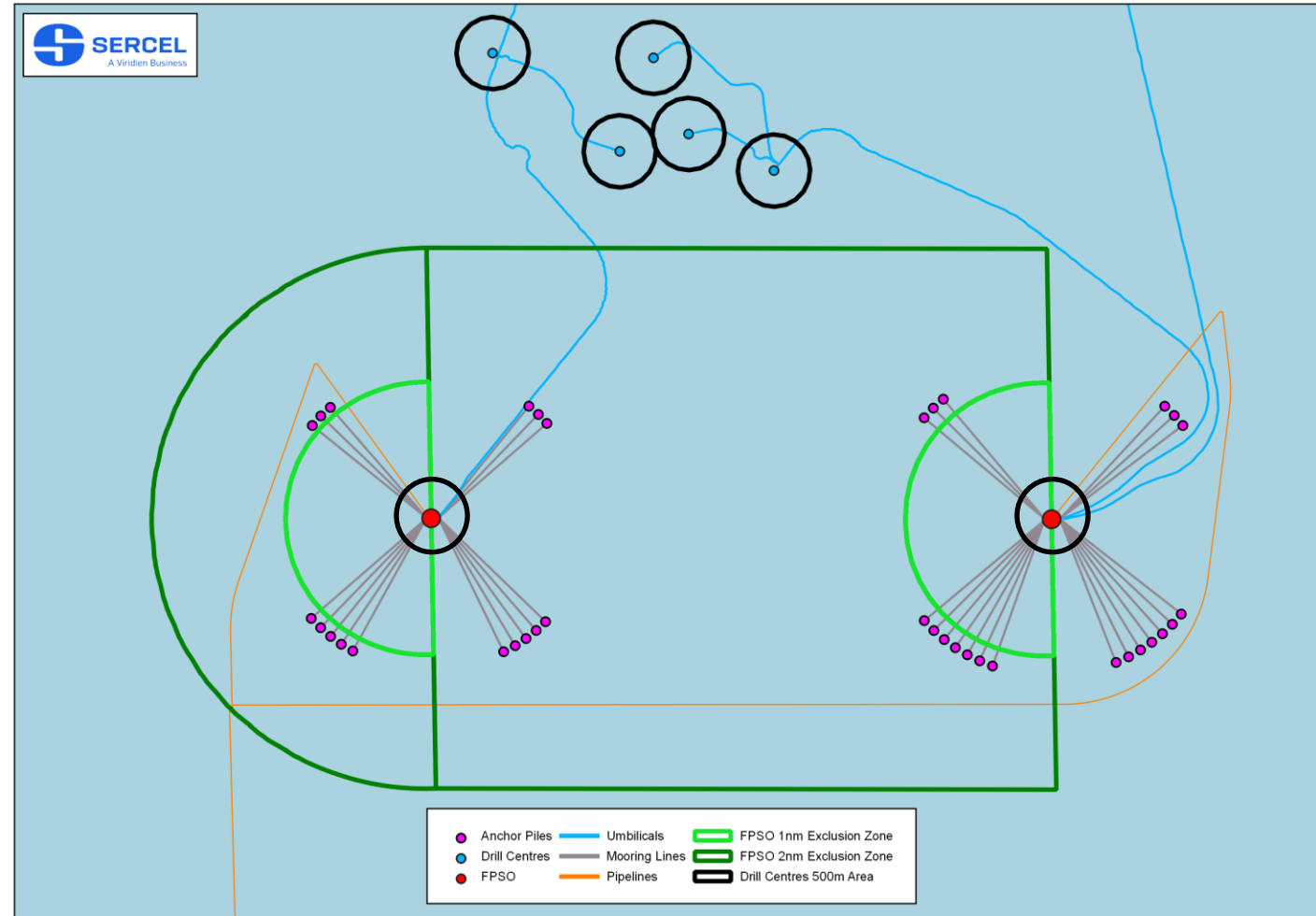
- Close pass zone for source vessel and ROVs
- Requires permit to work

1NM exclusion

- For source and ROVs vessel during offtakes

2NM exclusion

- Always applies to node vessel
- For source vessel and ROVs during tanker connecting



Efficiency Savings in Obstructed Area

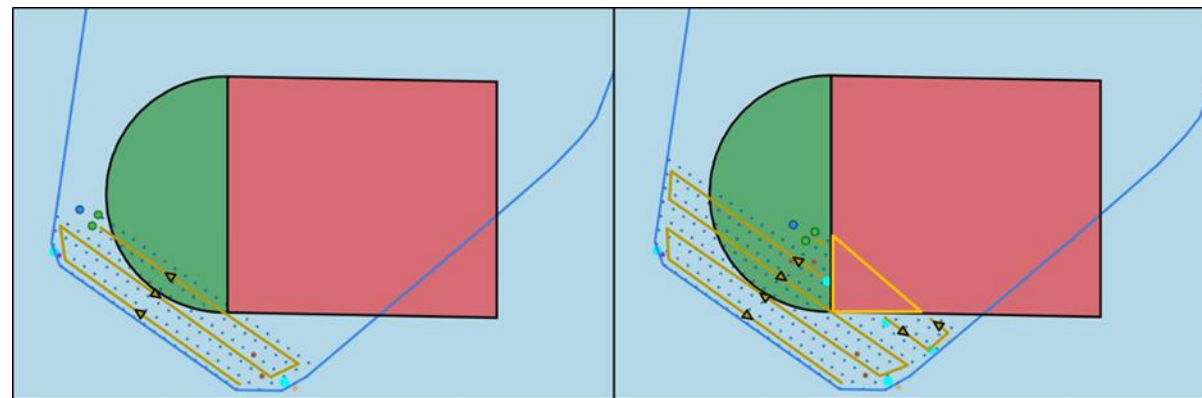
Scenario 1

- Prioritised full node line deployment for initial source production
- FPSO offtakes would block full node lines as acquisition progressed
- Continuous acquisition for first week
- Would incur **36 hours** of source downtime within a number of days

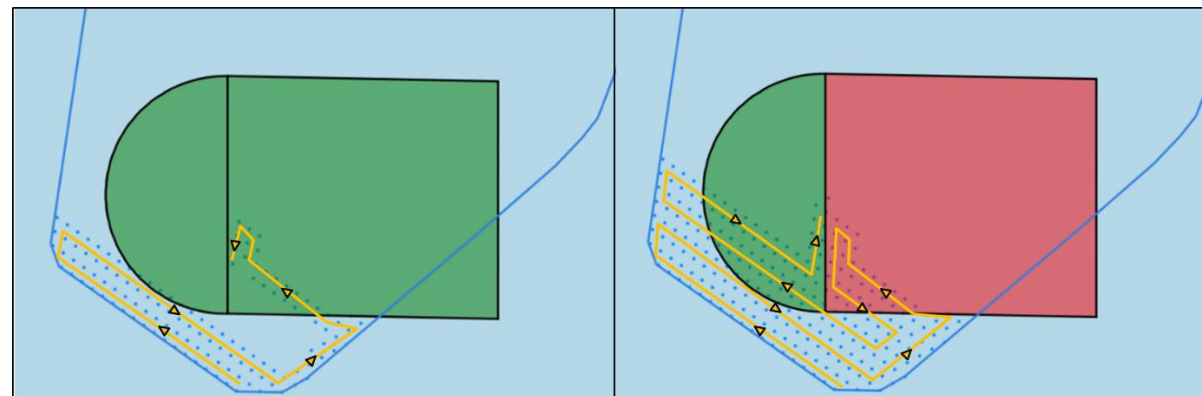
Scenario 2

- Prioritised node deployment in the exclusion
- Incurred **15 hours** of source downtime in first few days
- Incurring down time early on to adjust strategy **saved 21 hours**

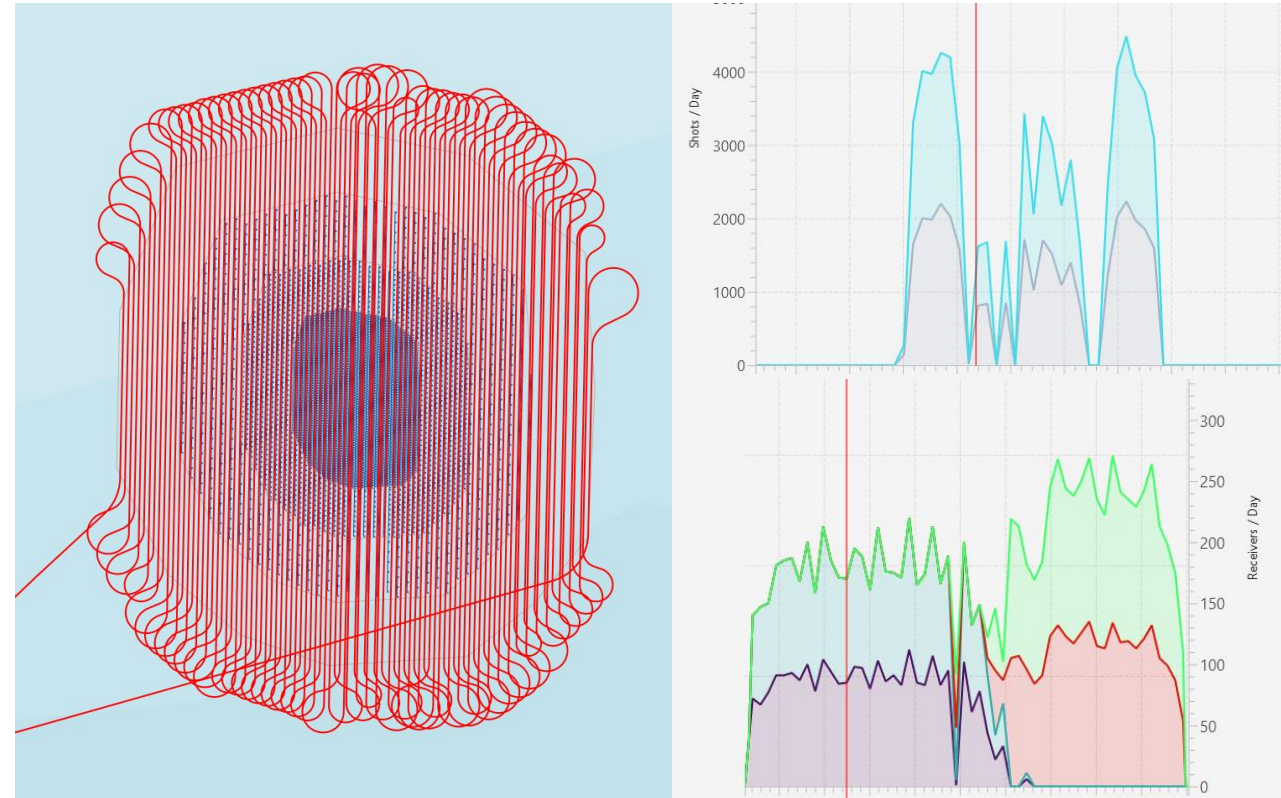
Modelled Scenario 1



Modelled Scenario 2

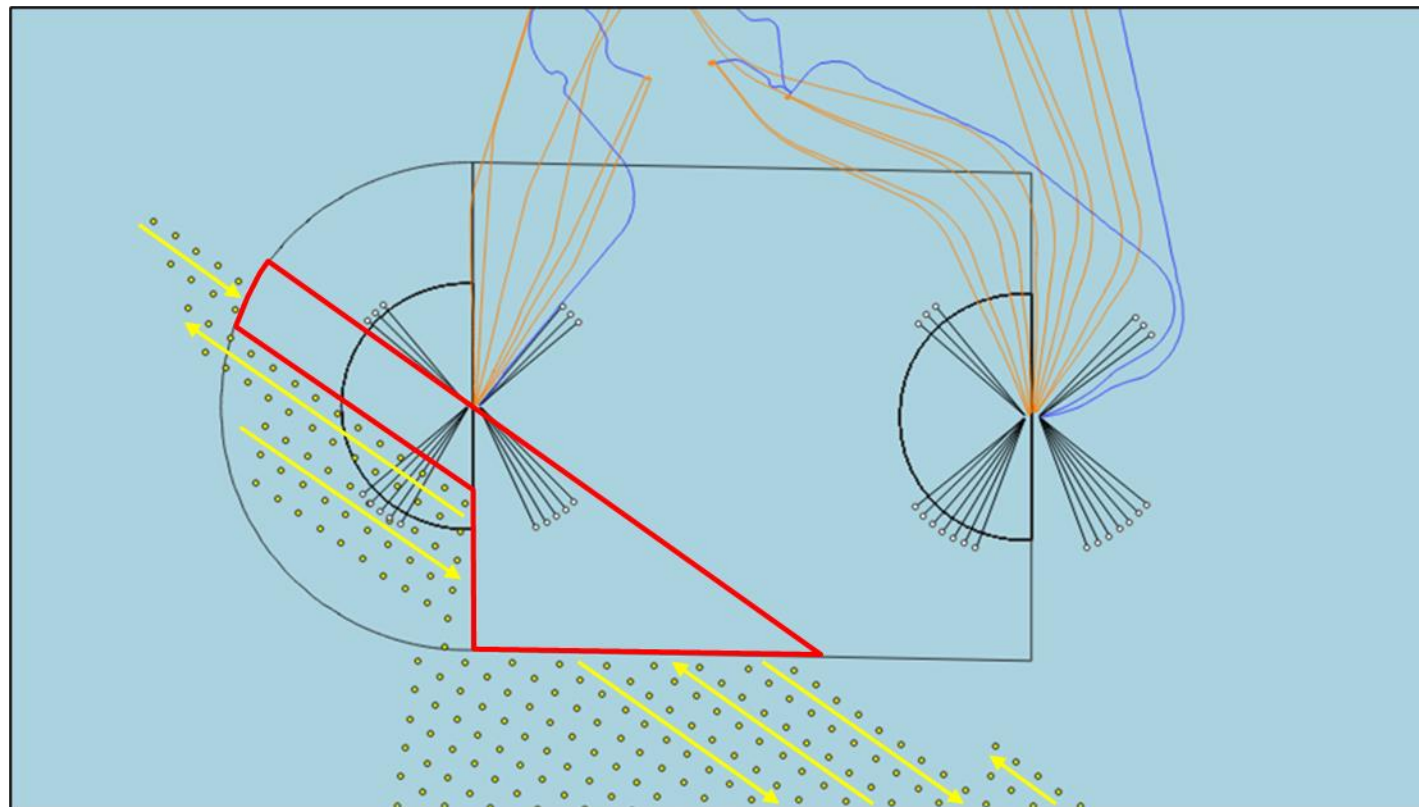


- Analysis on the actuals identified areas for improving efficiency
- Updated long term strategy to ensure source vessel remained in production for duration of project
- 18 node line buffer added to strategy



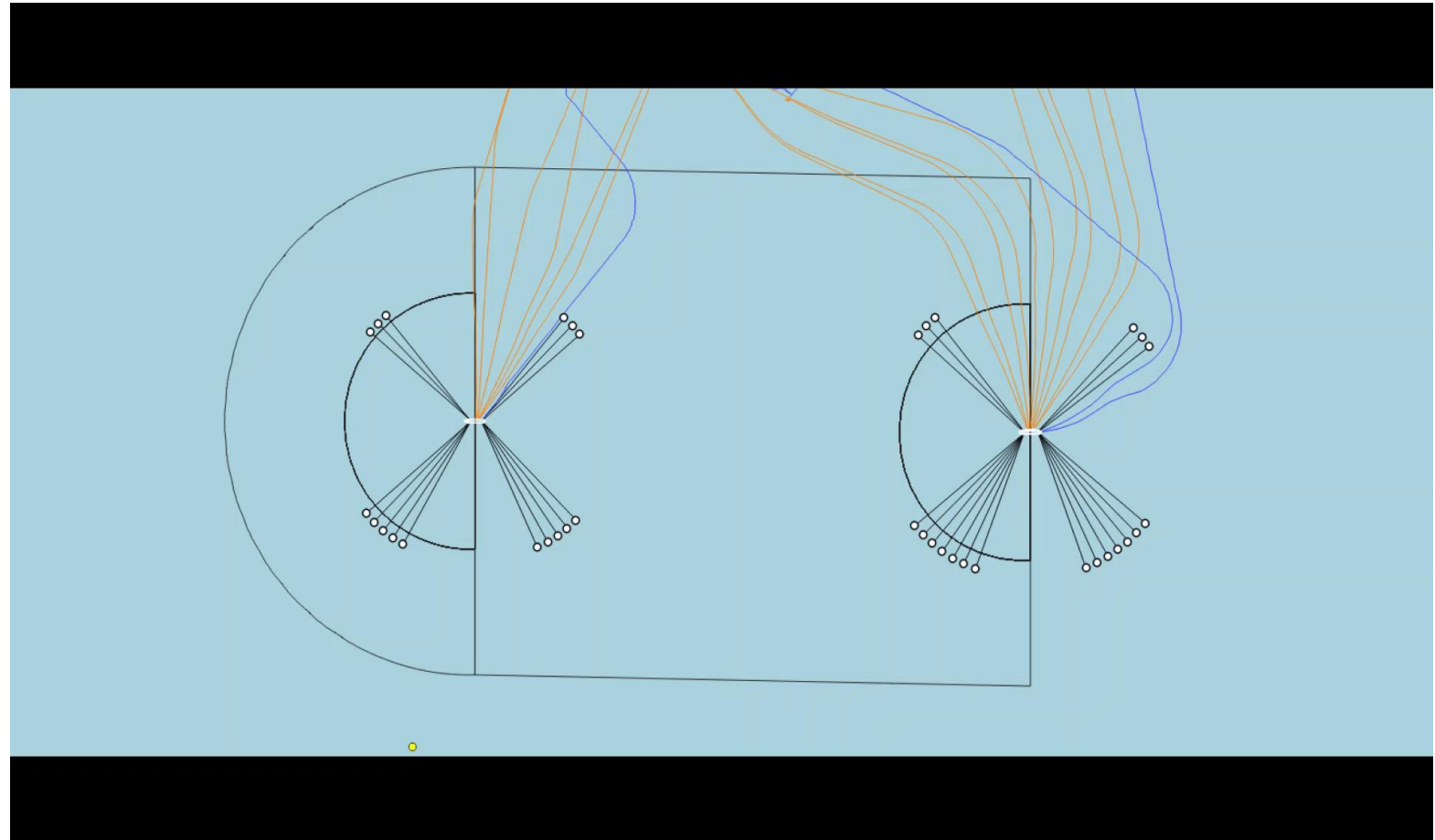
Standard Linear Approach

- Lines acquired in full
- Result in source vessel standby time
- Time to acquire obstructed area:
14 days and 22 hours



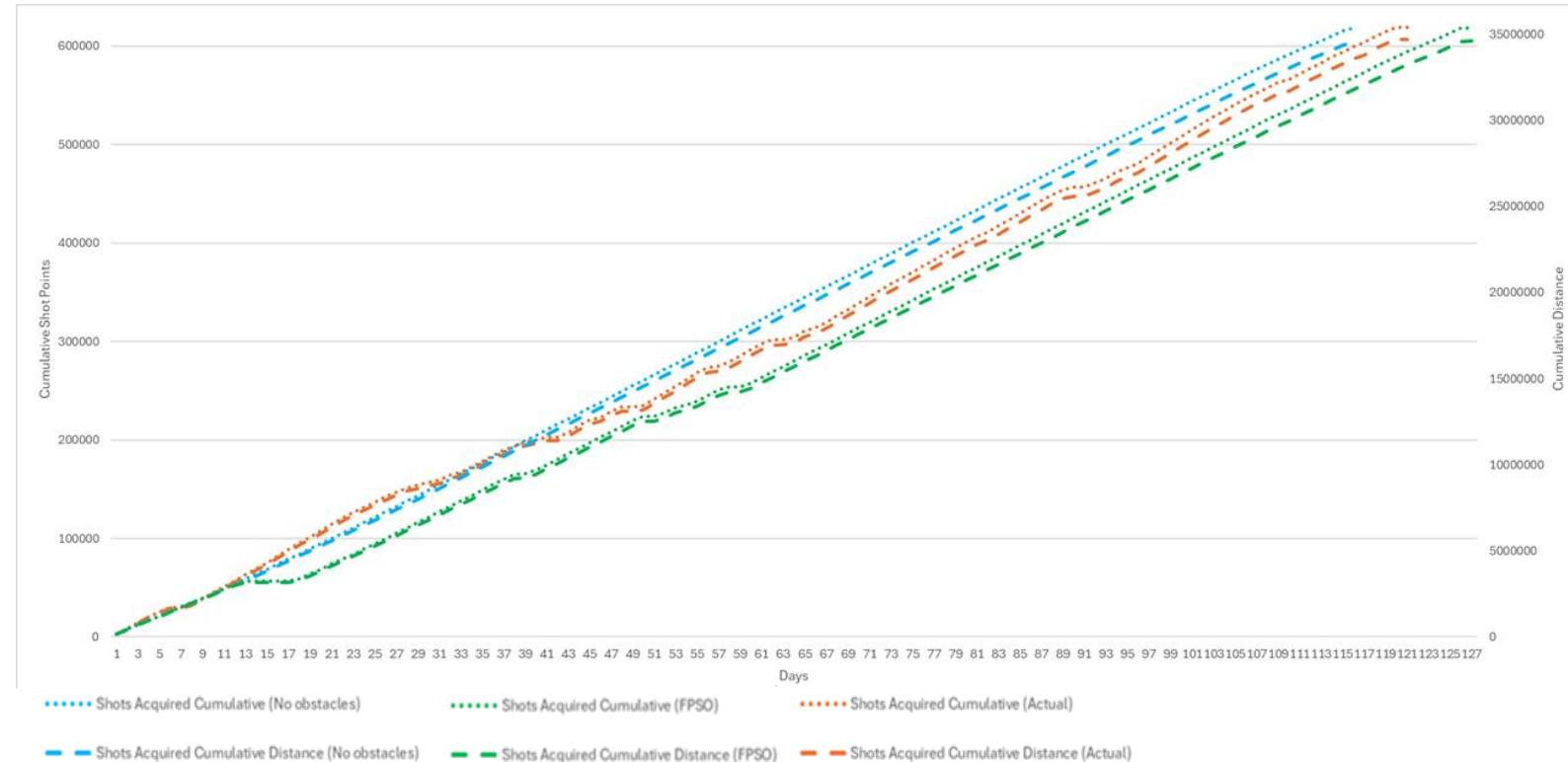
Optimised Approach

- Lines split into small patches
- Acquired out of sequence
- Time to acquire obstructed area:
13 days and 17 hours
- **Saving over 24 hours**



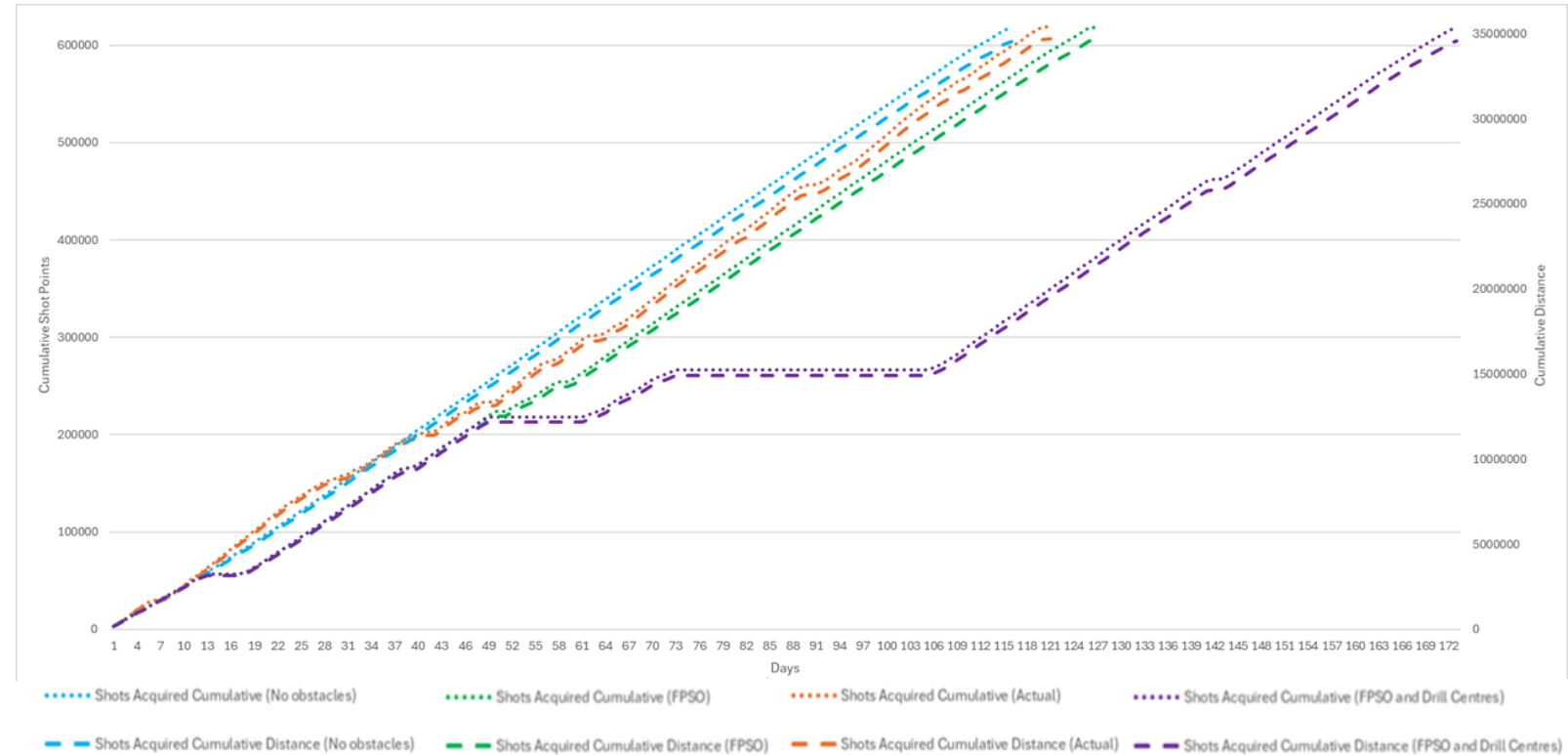
Survey Wide Impact of FPSO Operations

- **Baseline Plan (no SIMOPS)**
116 days
- **Plan with FPSO oftakes**
126 days
- **Actual optimised acquisition**
120 days
- Saving of **6 days**
- Considers FPSO operations only
- (Contractor Plan estimated **148 days**)



Survey Wide Impact of Additional Operations

- **Baseline Plan (no SIMOPS)**
116 days
- **Plan with FPSO offtakes**
126 days
- **Actual optimised acquisition**
120 days
- **Plan with additional operations**
170 days



- Assuming average fuel consumption of 600m³ / month, a 6 day saving equates to **129m³ per vessel**
- Converting this to emissions give the equivalent of **660,000 Kg CO₂ equivalent saved**

Hypothesis from standard Viridien configuration (High end seismic vessel) & Sercel section average age on the field

https://ctprodstorageaccountp.blob.core.windows.net/prod-drupal-files/documents/resource/public/Conversion_factor_introduutory_guide.pdf
<https://www.icbe.com/carbondatabase/volumeconverter.asp>
<https://amarineblog.com/2017/08/22/general-about-marine-fuels/>



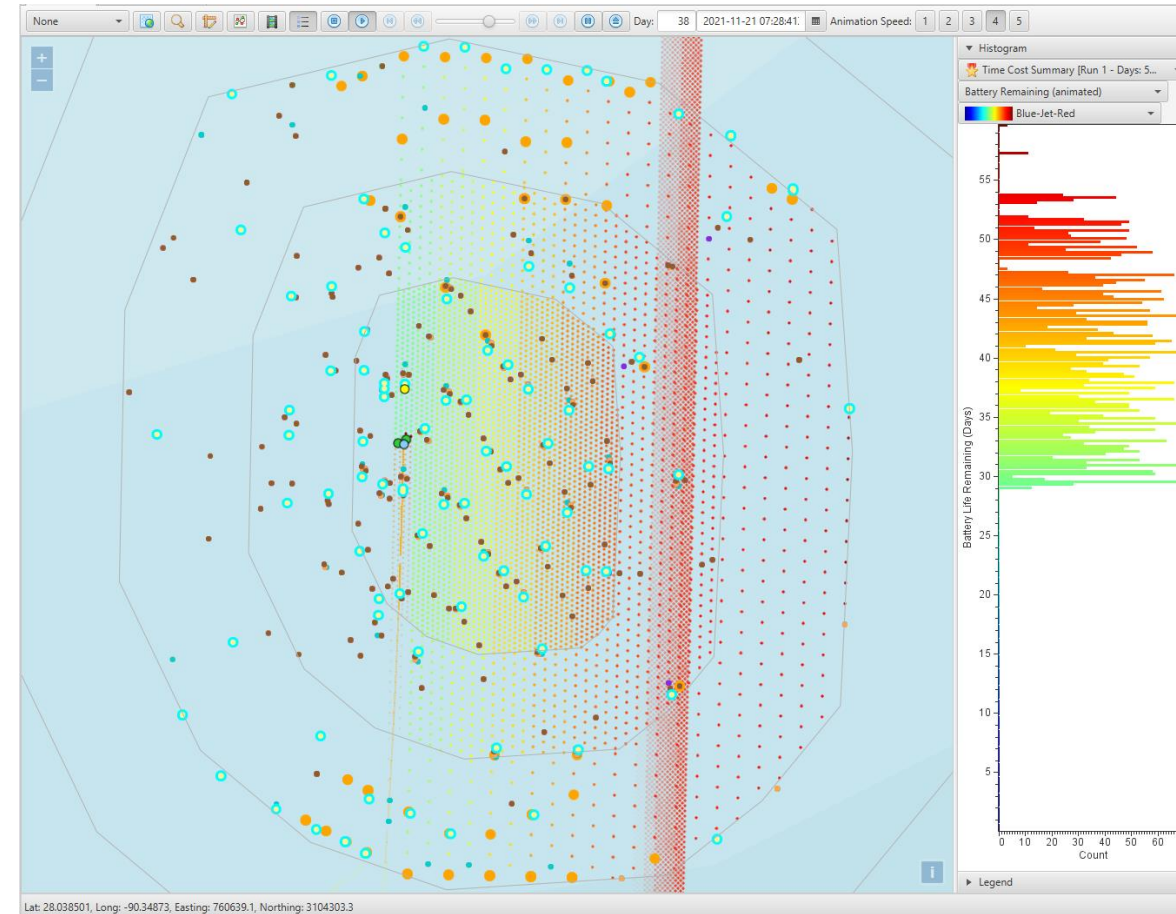
Image: <https://marine-digital.com/>

- One aspect of remote reporting
- Progress metrics fed back into simulation tools
- Tracking progress vs plan
- Identify production drift & cost impact



Battery Life Tracking

- Node battery life of ~100 days
- Some tolerance for failure if enough adjacent nodes
- Software used to monitor and anticipate risk of this situation
- Understand buffer if batteries running out



- Understanding SIMOPS are key for situational awareness to ensure effective planning
- Appropriate monitoring systems and planning tools are key to delivering successful surveys in producing fields
- These facilitate the application of small changes, the cumulative effect of these can have a significant impact on overall acquisition efficiency
- During this OBN project, dedicated software and personnel **saved 5%** acquisition time on a multi-vessel, 14-month project
- Sharing this information to key project stakeholders facilitates decision making

Thank you!
Any Questions?

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