An aerial photograph of a large industrial facility, likely an oil and gas processing plant, situated on a coastal area. The facility features numerous large storage tanks, complex piping, and processing units. A long pier extends from the land into the water, where a large green and white ship is docked. The surrounding landscape is arid and hilly, with some vegetation. The water is a deep blue color.

AUTONOMOUS TECHNOLOGY – OPPORTUNITIES AND CHALLENGES FOR THE OIL AND GAS INDUSTRY

AUT 2017 – Pan Pacific Hotel, Perth, WA
Mike Bowler – Survey Operations Manager
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Disclaimer and important notice



This presentation contains forward looking statements that are subject to risk factors associated with oil and gas businesses. It is believed that the expectations reflected in these statements are reasonable but they may be affected by a variety of variables and changes in underlying assumptions which could cause actual results or trends to differ materially, including but not limited to: price fluctuations, actual demand, currency fluctuations, drilling and production results, reserve estimates, loss of market, industry competition, environmental risks, physical risks, legislative, fiscal and regulatory developments, economic and financial market conditions in various countries and regions, political risks, project delay or advancement, approvals and cost estimates.

All references to dollars, cents or \$ in this presentation are to US currency, unless otherwise stated.

References to “Woodside” may be references to Woodside Petroleum Ltd. or its applicable subsidiaries.

- Introduction
- Technology
- Opportunities
- Challenges
- AUT focus areas for survey operations
- Conclusions





- 10th SUT/AHS Conference
- Significant advances in technology
- Multiple types for different applications
- AUVs have become a standard tool
- What has changed?
- Where is the technology going?

The Oil & Gas industry is facing an increasingly demanding business environment:

- Cost constraints
- Health and Safety expectations
- Reduced environmental footprint
- Moving in to more remote areas
- Increased security risk
- Increased sub-sea infrastructure





- AUTs are only part of the picture
- Autonomous technology is advancing rapidly
- Rapid introduction across a range of industries
- Broad range of applications

Autonomous systems represent an emerging category that can provide solutions needed to meet the challenges faced by the industry.

Industries are already utilising autonomy in order to execute tasks that can be performed more safely and efficiently

Advances being lead by:

- Military Applications
- Aerospace Industry

But also in common use in areas such as:

- Farming
- Public Transport

New technology allows new solutions:

- AUVs
- Hybrid AUV/ROVs
- Resident AUV operations
- Gliders
- Crawlers
- Autonomous vessels
- Drones

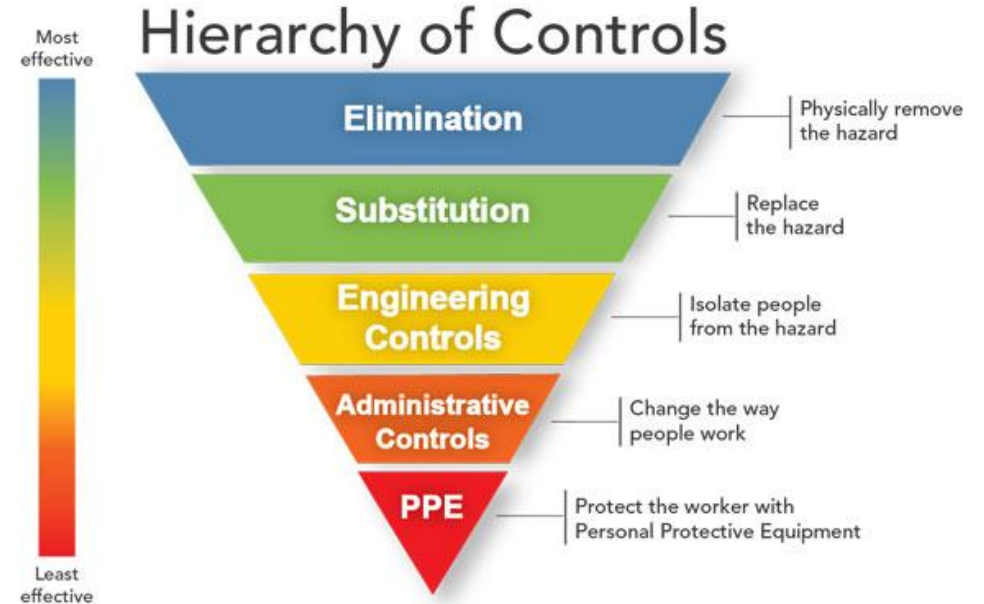


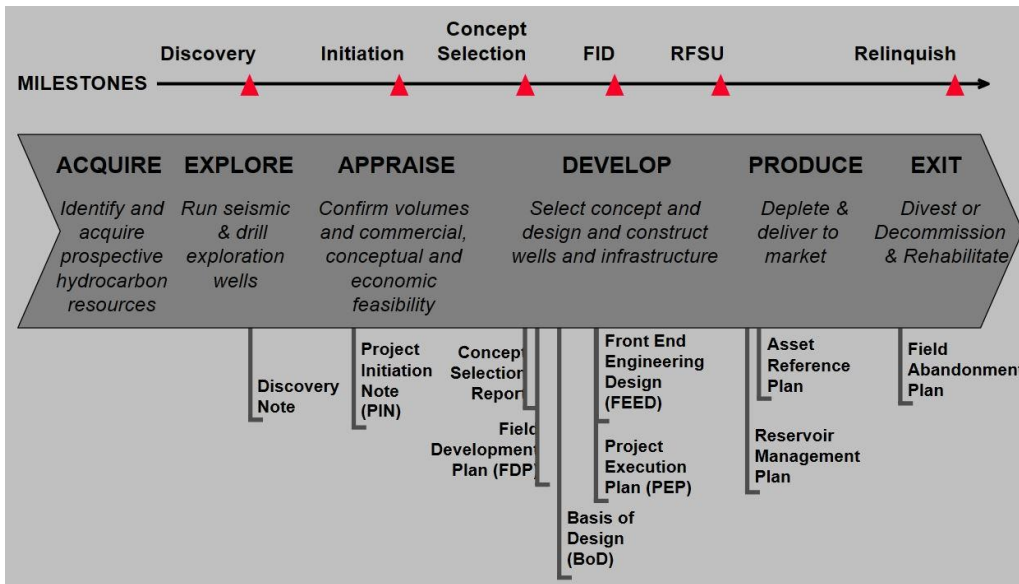


Enablers include:

- Battery technology
- Improved navigation
- Ability to manage large data volumes
- Data storage and harvesting
- Improved communications
- Cloud compute

- Reduced HS&S exposure
- Reduced environmental footprint
- Better information
- Real time data
- At lower cost





Implement in all phases:

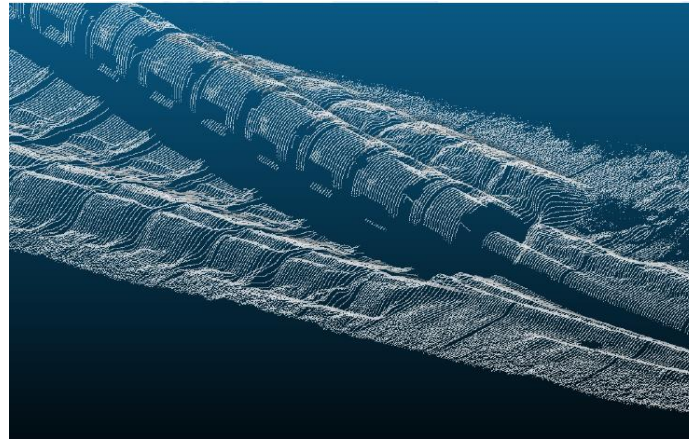
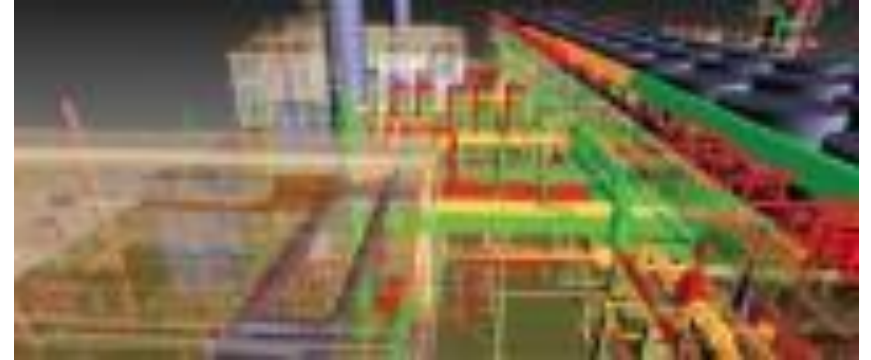
- Exploration
- Development
- Operations
- Decommissioning

And across all parts of the business

Technology moving fast:

- Multiple solutions
- Changing requirements
- Need right equipment
- Significant investment
- Need for future proofing

Needs a clear business case



Other non-technical challenges include:

- Regulation
- Acceptance
- Environment approvals
- Proof testing
- Ad-hoc implementation

Requires alignment across the business



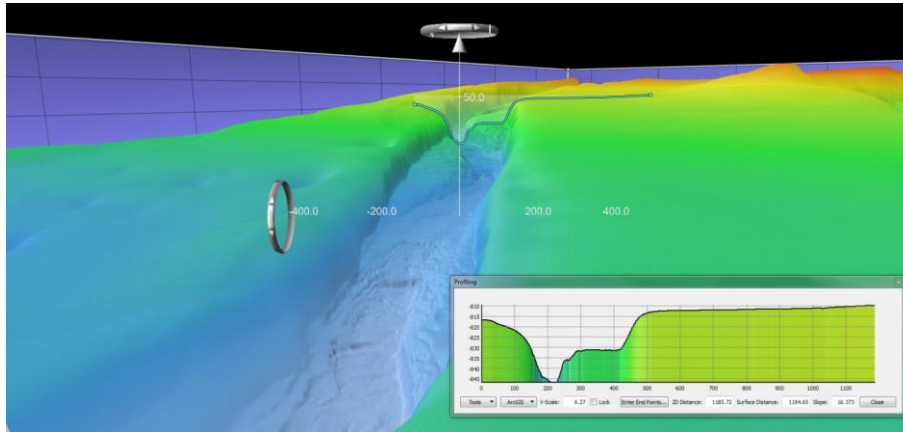
AUT Focus Areas for Survey Operations (as of today!)



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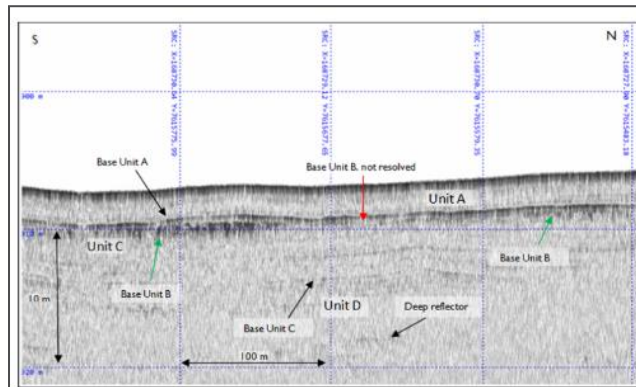


- AUVs / inspection
- Survey vessels
- Seismic operations
- Production support
- Data harvesting
- Environmental monitoring
- Decommissioning support



Areas of Interest:

- Extra sensors
- Hybrid AUV/ROVs
- Hovering AUVs
- Resident AUV operations
- Gliders



Autonomous survey vessels:

- Semi autonomous (remote control)
- Fully autonomous
- Payloads





Using Autonomous Technology to supplement existing surveys:

- Wavegliders / AUTs with seismic hydrophones
- Provide long offset data
- Provide rich azimuth data
- Infill data (infrastructure, shallow water)

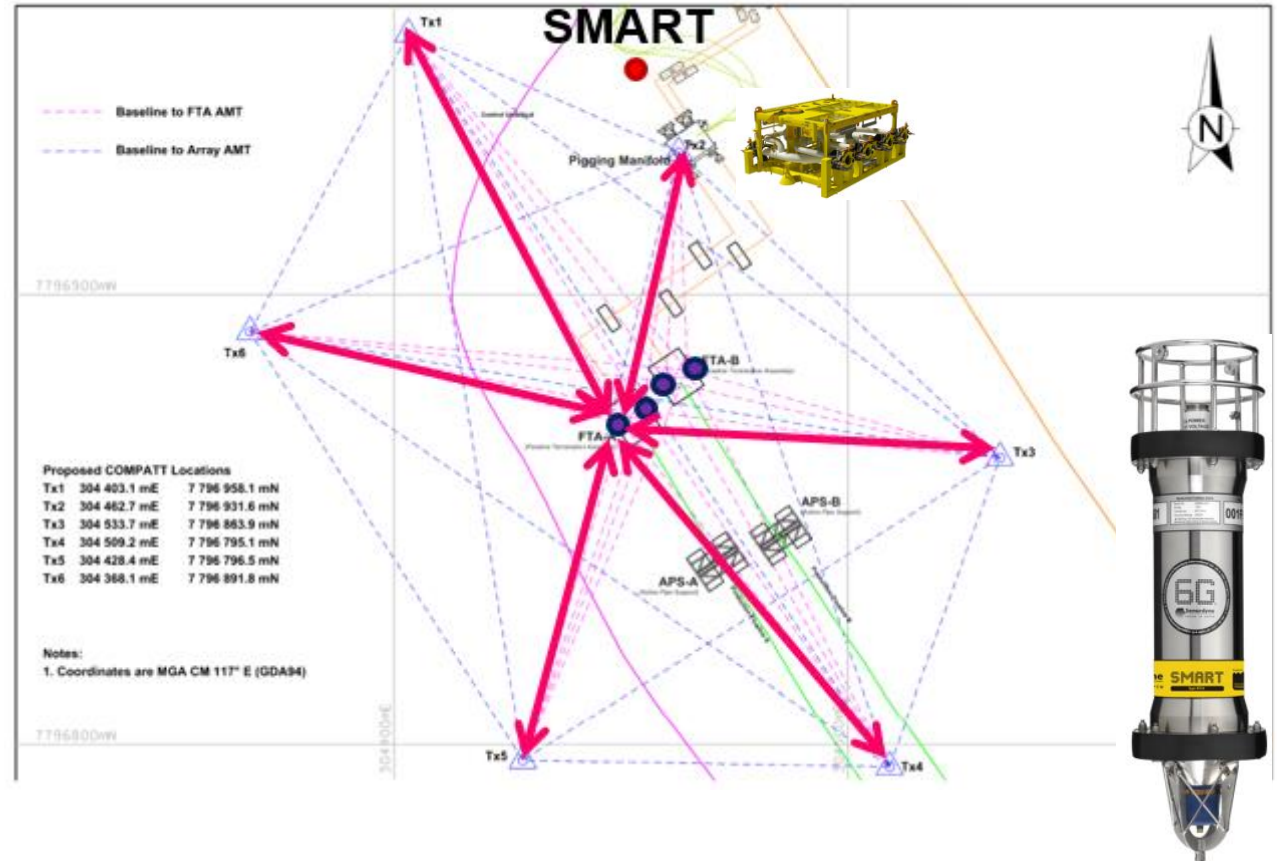
Used to complement established commercial methods

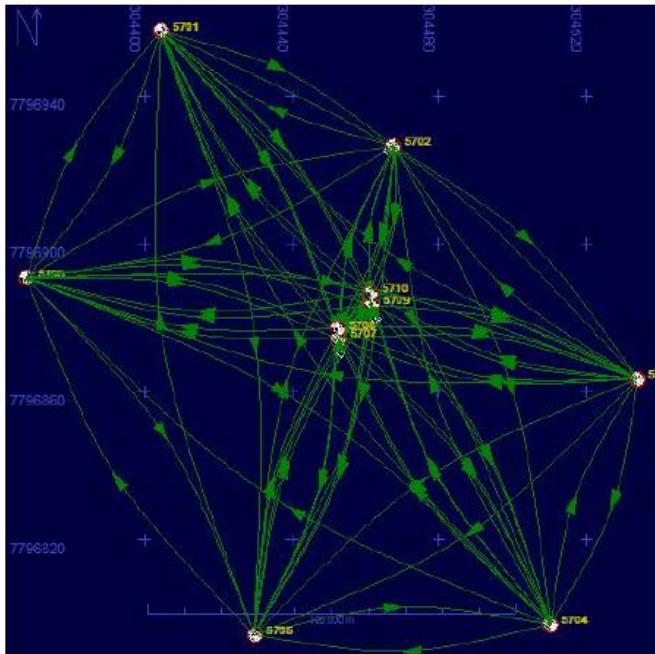
Seabed nodes:

- Flexibility
- Long offsets
- Rich azimuth
- Shear wave recording
- Automate to reduced deployment costs (Relative to ROV / rope deployment)



- Correlating pipeline walking with thermodynamic changes.
- Near real time monitoring
- Production optimisation
- Input to future design





Recovery of data from seabed instruments through:

- Use of resident AUVs
- Wavegliders
- Real time data transmission
- Monitoring of multiple seabed units
- Potentially large aerial coverage from single unit

- Environmental monitoring in support of subsea de-commissioning works
- Real time data transmission
- Well-head monitoring





- Technology moving fast
- Multiple options and competing drivers
- Integrated solutions

Needs to meet at least one of the following:

- Reduced costs
- Reduced HS & S risk
- Reduced environmental footprint
- Improved data quality
- Near real time data delivery



ANY QUESTIONS?



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