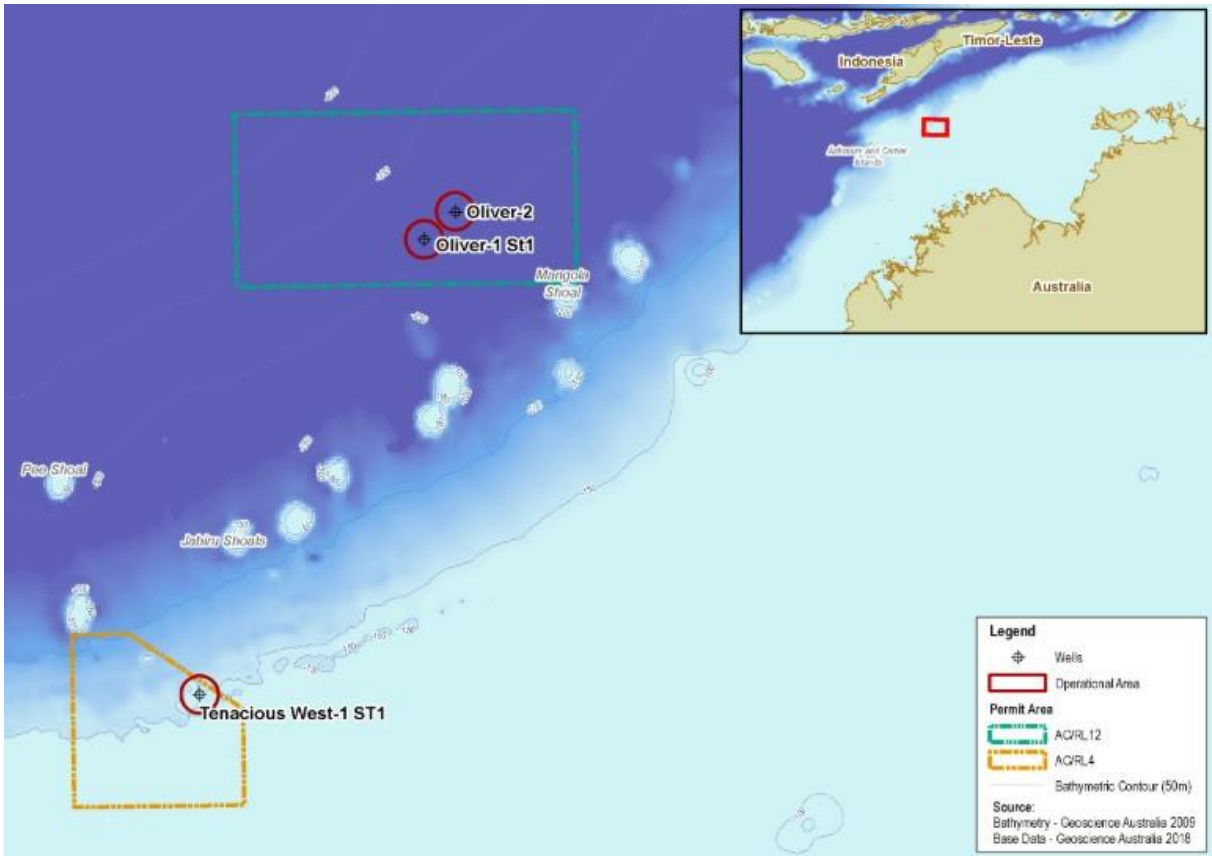
Intervention Engineering

Inspection of Ten West 1 and Oliver 2 wells

PTTEP / Petrofac



Revision	Date	Comments	Author	Approver
4	26/06/2023	James Manson	T. Overmars	
3	23/03/2022		T. Overmars	
2	22/03/2022		T. Overmars	
1	22/03/2022		T. Overmars	
0	18/03/2022		T. Overmars	

Table of Contents

List of Figures

List of Tables

Terms and Abbreviations

Term / Abbreviation	Definition
Approx	Approximately
Demob	Demobilise
DGPS	Differential Global Positioning Satellite
HD	High Definition
IE	Intervention Engineering
Lat	Latitude
Long	Longitude
L&R	Launch and recovery
Mob	Mobilise
NE	North East
NW	North West
PGB	Permanent guide base
SE	South East
SOW	Scope of work
Stbd	Starboard
SW	South West
Ten West 1	Tenacious West-1 ST1 well
TGB	Temporary Guide base
USBL	Ultra Short Base Line

1 Introduction

Intervention Engineering was contracted by Petrofac to inspect the Tenacious West 1 and Oliver 2 wells owned by PTTEP.

The ROV was operated from the Go Spica vessel which was contracted by Petrofac for the operations. The vessel and equipment were mobilised and demobilised from the port of Dampier.

At the request of our clients Intervention Engineering (IE) mobilised a gas sampling tool in case any gas was noted at either of the inspection locations.

The vessel departed Dampier port on the 10-03-22 and began transiting to the first work location. The vessel reached the Ten West 1 well location at 08:30 on the 13-03-22 and began ROV operations directly after arrival.

Once the Ten West 1 well survey was complete, the vessel then transited to the Oliver 2 well location approximately 16 nautical miles away.

The second well inspection on Oliver 2 well was then conducted by the ROV and completed by 19:45 on the 13-03-22. The vessel began is transit back to Dampier port and arrived back in port on the 17-03-22.

2 Client stated objectives

PTTEP and Petrofac outlined the following objectives in their document '*PTTEP Australia*

Petrofac Project Execution Plan ROV Surveillance of Tenacious West-1 ST-1 and Oliver-2'

Under section 2.2 'Objectives' it is stated:

The objectives of the ROV surveillance scope are as follows:

• Survey the condition and integrity of the wellheads and immediate surroundings.

• In the event of escaping gas bubbles, capture samples for further testing onshore.

• Measure the approximate height of the subsea wellheads and the guideposts above the seabed using the ROV depth gauge.

• Conduct a visual inspection of the wellhead's surroundings (+/- 10 m radius) e.g., cement patio, cuttings mount, etc.

• All of the above is to be recorded using high-definition colour video complete with commentary and anomaly records.

• Conduct the above scope whilst being fully compliant with the PTTEP SSHE policy and fully meeting the PTTEP EP Commitment register.

3 Well locations

These are the locations for the wells given by PTTEP / Petrofac in their document '*PTTEP Australia*

Petrofac Project Execution Plan ROV Surveillance of Tenacious West-1 ST-1 and Oliver-2'

Please note that these locations are given with the location datum GDA94 CM129˚E.

Well name	Ten West 1 ST 1	Oliver 2
Geographical location	Timor Sea	Timor Sea
Location Datum	GDA94 CM129°E	GDA94 CM129°E
Latitude	11° 51' 46.748" S	11° 38' 03.674" S
Longitude	124° 53' 44.131" E	125° 01' 36.470" E
Easting	706 491.5 mE	720 970.84 mE
Northing	8 687 890.2 mN	8 713 089.86 mN

Figure 1 Client supplied location of wellheads

4 Tenacious West 1 well

The Ten West 1 well was the first well to be inspected by the ROV.

The vessel arrived at the location at 08:30 on the 13-03-22 and the ROV began operations directly after arrival.

The well was located at the Navigation chart location.

4.1 Condition and integrity of the wellheads and immediate surroundings.

The Ten West 1 wellhead appeared to be in undamaged condition.

The wellhead had significant hard marine growth and appeared to be a haven for fish and other marine life in the area. (Figure 2)

There was some minor fishing gear entanglement on the wellhead consisting of mostly fishing line. There was no fishing net seen on the wellhead. (Figure 3)

The wellhead had evident corrosion in all main areas, with the TGB appearing the most heavily corroded (Figure 4). There were no anodes seen on the wellhead or guide bases during the survey.

The corrosion cap appeared intact, in place and appeared undamaged. (Figure 5)

There was some scouring occurring under the wellhead, approx. 0.3m to 0.4m under the TGB. This lowest point was measured at 1m below mean seabed. (Figure 6)

There is concrete / grout seen around the wellhead on the seabed. A majority of this is broken up into smaller pieces around the wellhead, with one section still intact making a small bridged section. (Figure 7 and 8)

No cuttings from the hole appeared to be around the wellhead area.

Figure 2 Ten West 1 well marine life overview

Figure 3 Ten West 1 fishing line entanglement

Figure 4 Ten West 1 example of corrosion

Figure 5 Ten West 1 corrosion cap

Figure 6 Ten West 1 example scour under guide base

Figure 7 Ten West 1 example grout on seabed

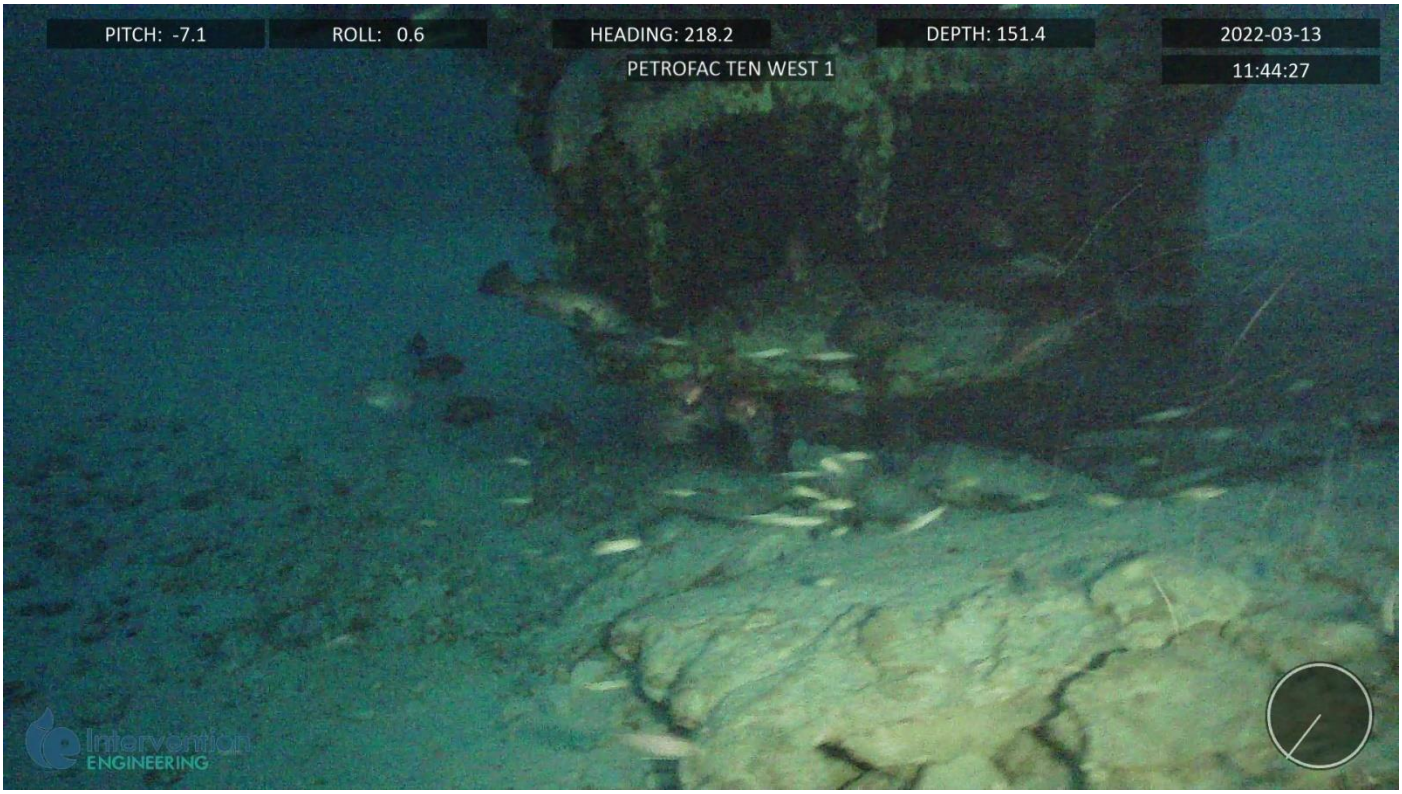


Figure 8 Ten West 1 example broken grout on seabed

4.2 Escaping gas / Bubble survey

The Ten West 1 wellhead was thoroughly inspected from all four sides, from above and at seabed level looking under the wellhead. The overall inspection of the wellhead and surrounding area took 50min.

At no time during the survey were there any indications of gas bubbles, leaks or hydrocarbon releases of any kind seen, nor any telltale evidence of previous leaks evident.

As such the gas sampler tool was not required at this location.

4.3 Heights of Wellhead and guideposts above mean seabed

Mean seabed away from the well was measured with the ROV depth gauge to be 150.9m.

- The top of the corrosion cap on the wellhead was seen to be 148.0m – 2.9m above mean seabed.
- The top of the NW guide post was seen to be 147.2m – 3.7m above mean seabed.
- The top of the SW guide post was seen to be 147.2m – 3.7m above mean seabed.
- The top of the NE guide post was seen to be 147.2m – 3.7m above mean seabed.
- The top of the SE guide post was seen to be 147.2m – 3.7m above mean seabed.
- The lowest scour point around the wellhead was seen to be 151.9m – 1m below mean seabed.

4.4 Visual inspection of the wellheads surroundings (+/- 10 m radius)

The Ten west 1 well head is surrounded by flat featureless seabed. The seabed did have some small sand waves, creating ridges and furrows, but these were small in height, approx. 0.2m from top to bottom.

No significant marine life was observed on the seabed in the areas surrounding the wellhead. The only significant marine life seen by the ROV during the survey was located in the vicinity directly on or around the wellhead.

The Ten West 1 wellhead had created a depression in the seabed around it which is shown in Figure 9.

Nothing of significance was seen on the seabed surrounding the wellhead 20m in all directions during the survey. The seabed was searched using both visual and sonar techniques.

An example of the seabed around the well is in Figure 10.

Figure 9 Ten West 1 well head and surrounding seabed

Figure 10 Ten West 1 example surrounding seabed

5 Oliver 2 well

The Oliver 2 well was the second well to be inspected by the ROV.

The vessel arrived at the location at 14:20 on the 13-03-22 and the ROV began operations directly after arrival.

The well was located at the Client Supplied Position, Figure 1.

Unfortunately due to a glitch with the ROV depth gauge during the descent the gauge needed to be zeroed at mean seabed level, so all seabed depths are relative.

Mean seabed away from the well was measured with the vessel echo sounder at 301m

5.1 Condition and integrity of the wellheads and immediate surroundings.

The Oliver 2 wellhead was found to be in undamaged condition.

The wellhead has significant hard marine growth on all areas and was a haven for fish and other marine life in the area. (Figure 11)

There was no fishing gear entanglement seen on the wellhead.

The wellhead had evident corrosion in all main unpainted areas (Figure 12). There were no anodes seen on the wellhead or guide base.

The corrosion cap was intact, in place and appeared undamaged. (Figure 13)

There is no significant scour seen under the guide base as the PGB appears to be level with the seabed in most areas. Areas that are not in contact with the seabed are only approx. 0.1m above seabed. (Figure 14)

Each of the 4 guide posts have a remnant of guide wire hanging out of each post. The small section of guide wire has fallen out of the slit in the guide post and is in contact with the seabed. (Figure 15)

No cuttings from the hole appear to be around the wellhead area.

Figure 11 Oliver 2 marine life overview

Figure 12 Oliver 2 Example of corrosion on wellhead

Figure 13 Oliver 2 Corrosion cap

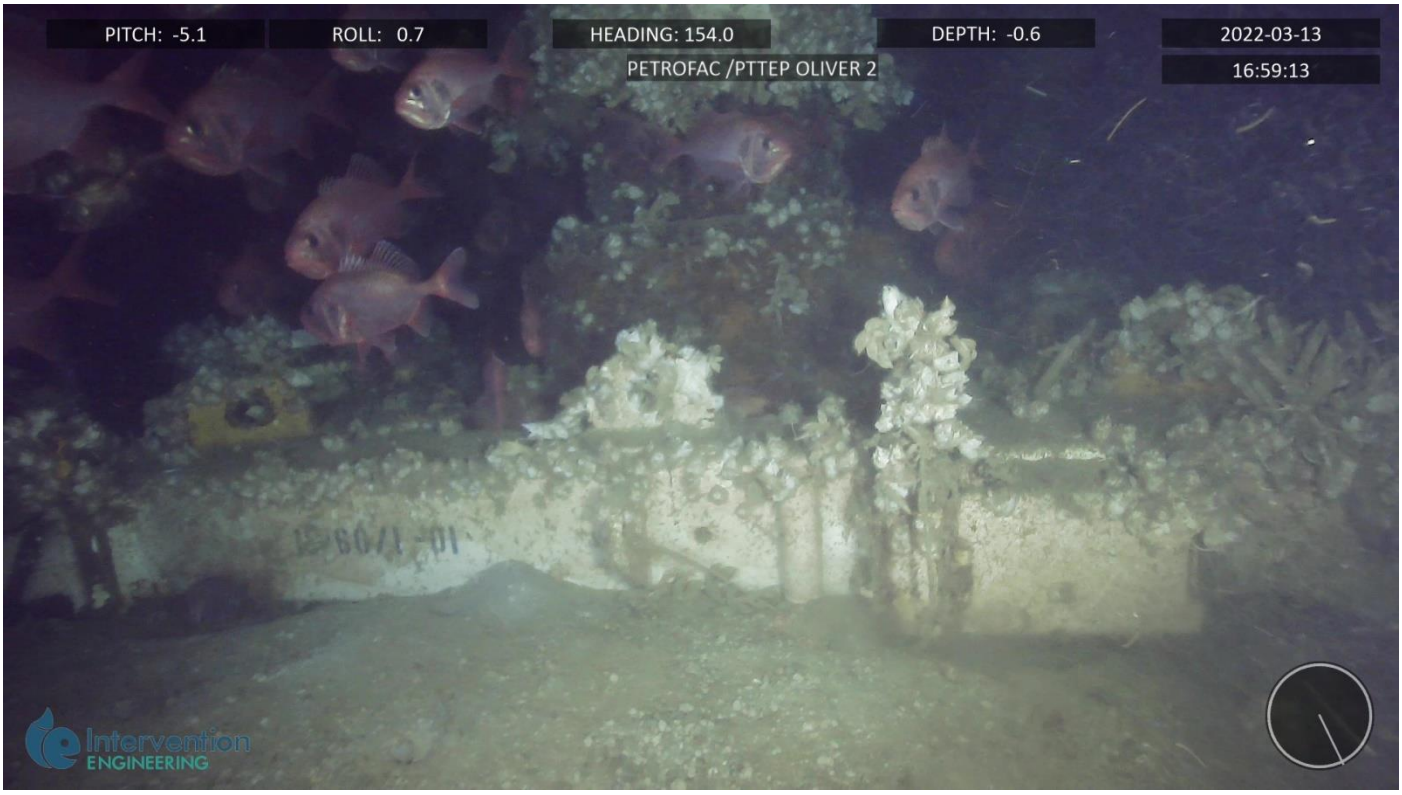


Figure 14 Oliver 2 PGB at seabed level

Figure 15 Oliver 2 Guide wire remnant in contact with seabed

5.2 Escaping gas / Bubble survey

The Oliver 2 wellhead was thoroughly inspected from all four sides and from above the wellhead. The overall inspection of the wellhead and surrounding area took 35min.

At no time during the survey were there any indications of gas bubbles, leaks or hydrocarbon releases of any kind seen, nor any tell tail evidence of previous leaks evident.

As such the gas sampler tool was not required at this location.

5.3 Heights of Wellhead and guideposts above mean seabed

Mean seabed away from the well was measured with the vessel echo sounder at 301m. Unfortunately, due to a glitch with the ROV depth gauge, the gauge needed to be zeroed at mean seabed. The gauge is still accurate in its measurement, but as it was now zeroed on the seabed, all measurements will be in reference to the mean seabed depth instead of the surface. To adjust depths referenced to sea surface instead of the seabed the 301m measurement shall be used.

- The top of the corrosion cap on the wellhead was seen to be 2.0m above mean seabed, 299m water depth.
- The top of the NW guide post was seen to be 3.1m above mean seabed, 297.9m water depth.
- The top of the SW guide post was seen to be 3.1m above mean seabed, 297.9m water depth.
- The top of the NE guide post was seen to be 3.1m above mean seabed, 297.9m water depth.
- The top of the SE guide post was seen to be 3.2m above mean seabed, 297.8m water depth.
- The bottom of the PGB was seen to be at seabed level, so there is no scour.

5.4 Visual inspection of the wellheads surroundings (+/- 10 m radius)

The Oliver 2 well head is surrounded by flat featureless seabed. The seabed does have some small sand waves, creating ridges and furrows, but these are small in height, approx. 0.2m from top to bottom.

No significant marine life was observed on the seabed in the areas surrounding the wellhead. The only significant marine life seen by the ROV during the survey was located in the vicinity directly on or around the wellhead.

The Oliver 2 PGB is at seabed level, which is shown in Figure 16. There is a small rise in the seabed around the wellhead, which then goes back to mean seabed. This difference is very small. It is estimated at less than 0.2m (Figure 17)

Nothing of significance was seen on the seabed surrounding the wellhead 20m in all directions. The seabed was searched using both visual and sonar techniques.

An example of the seabed around the well is in Figure 18.

Figure 16 Oliver 2 PGB at seabed level

Figure 17 Oliver 2 Seabed around well

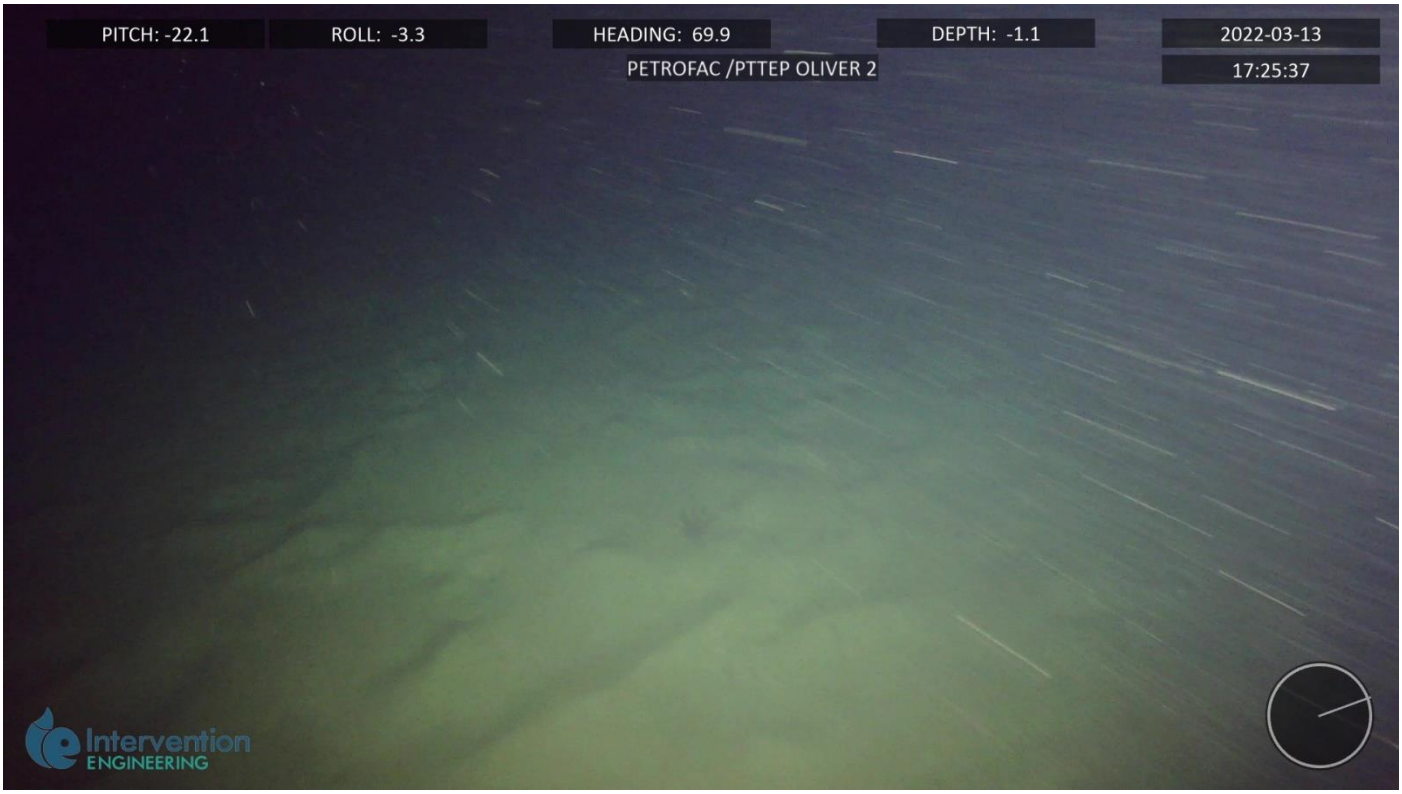


Figure 18 Oliver 2 wellhead example of surrounding seabed

6 Conclusions

All client objectives have been met with no injury to personnel or harm to the environment.

The wellheads were located and surveyed in a timely manner.

The wellheads appeared to be in good overall condition with no obvious disturbance.

The project has been conducted effectively even with strong time constraints.

All of the project crew worked well as a team and had good communication throughout. This has led to an effective and efficient survey of the wellheads.

Table 1 Anomaly register

Anomaly	Location	Description	Picture
Fishing line	Ten West 1	Light fishing line	Ten west 1 - Pic00021
Guide wire NE	Oliver 2	Cut Guide wire	Oliver 2 - Pic00019
Guide wire SW	Oliver 2	Cut Guide wire	Oliver 2 - Pic00020
Guide wire NW	Oliver 2	Cut Guide wire	Oliver 2 - Pic00021
Guide wire SE	Oliver 2	Cut Guide wire	Oliver 2 - Pic00022

Appendix A. Anomaly photos

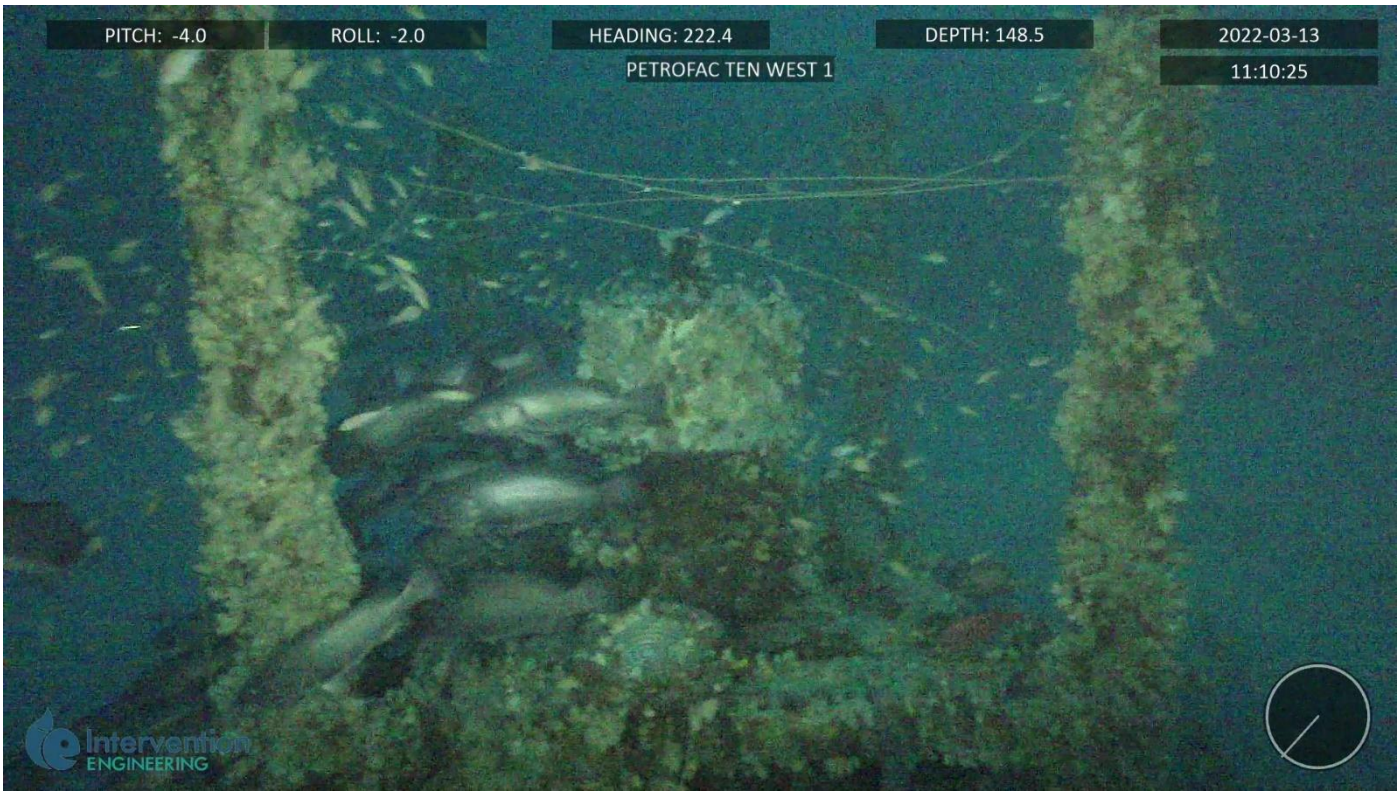


Figure 19 *Ten West 1 - Pic00021*

Figure 20 *Oliver 2 - Pic00019*

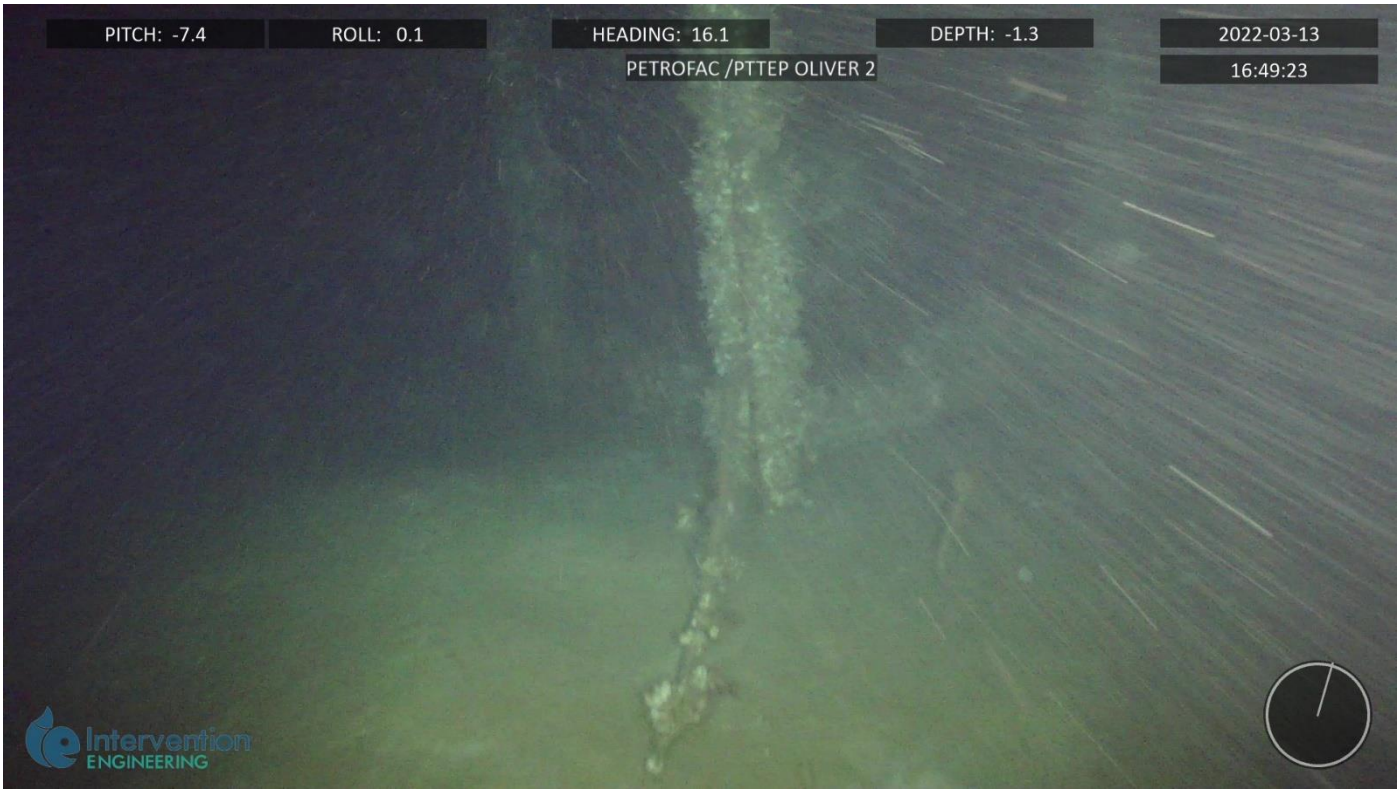


Figure 21 *Oliver 2 - Pic00020*

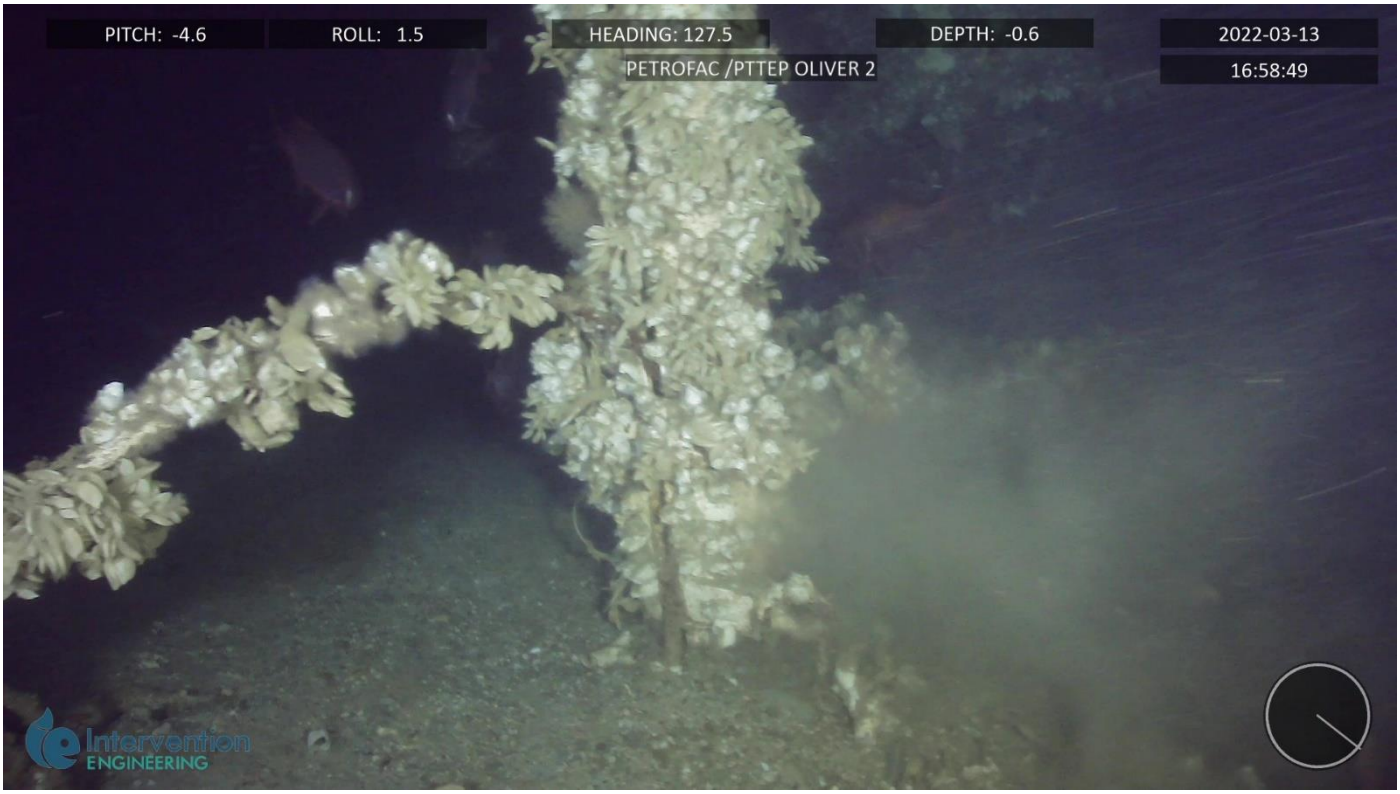


Figure 22 *Oliver 2 - Pic00021*

Figure 23 *Oliver 2 - Pic00022*

Appendix B. Supporting documents for the project

- Dive log 2 – Summary of the dive on Ten West 1 wellhead
- Dive log 3 – Summary of the dive on Oliver 2 wellhead
- Dive 02. Ten west 1 Part 2 13-03-22 video file – Video of the inspection on Ten West 1 wellhead
- Dive 03. Oliver 2 part 2 13-03-22 video file – Video of the inspection on Oliver 2 wellhead
- Dive 02. Ten west 1 sonar. 13-03-22 – Video of the sonar during the inspection of Ten west 1 wellhead
- Dive 03. Oliver 2 sonar. 13-03-22– Video of the sonar during the inspection of Oliver wellhead
- Daily progress reports issued to client from 08-03-22 to the 17-03-22. Summary of daily activities.

All documents and videos can be found on the portable hard drive handed to Petrofac client representative.

Additional copies will be held by IE for auditing and backup purposes.