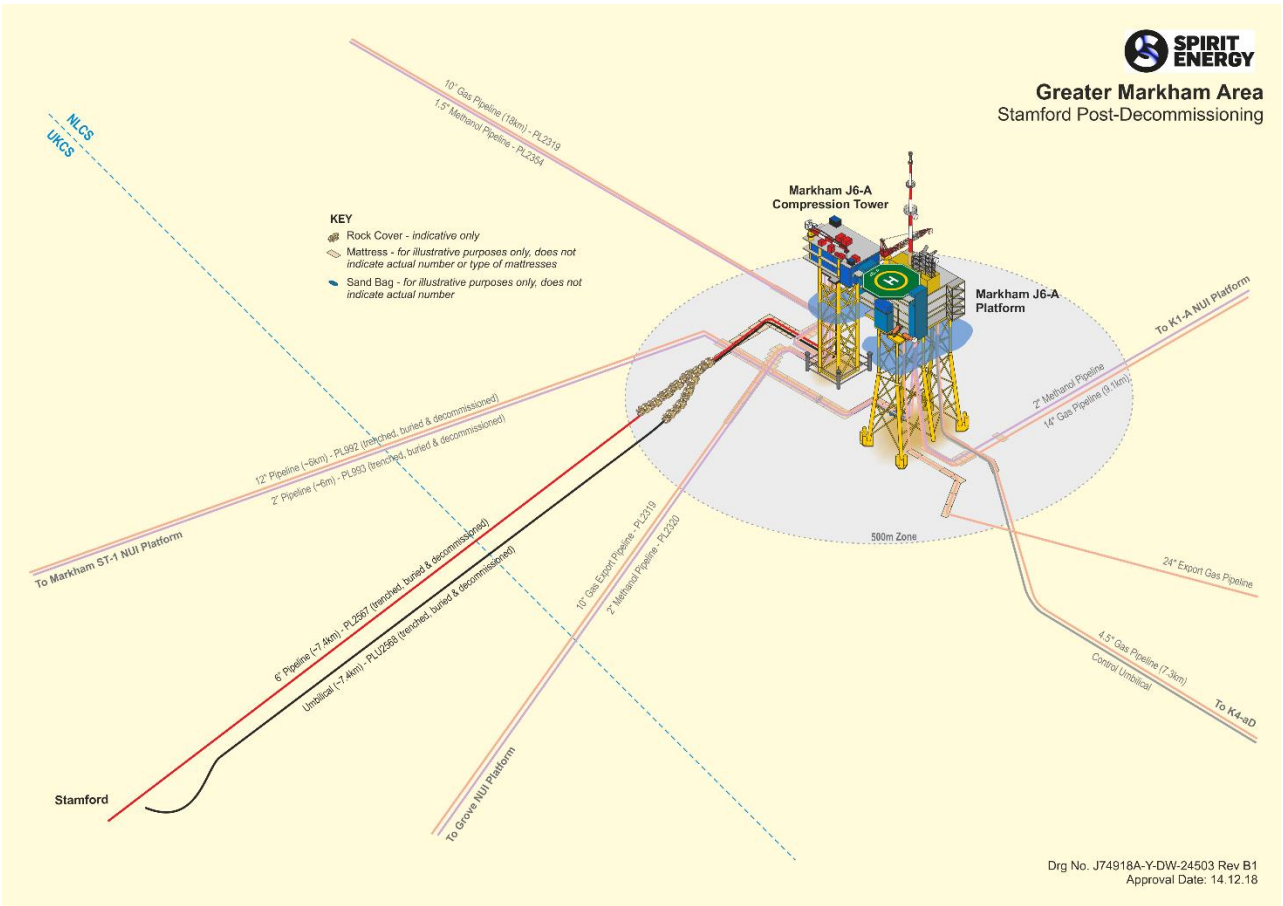
Stamford Decommissioning
Close-Out Report



SPIRIT ENERGY

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A1	15/09/17	Issued for Review and Comment
A2	04/05/18	Re-issued for Review and Comment
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C1	14/12/18	FINAL VERSION

EXECUTIVE SUMMARY

This document contains the close-out report for the two Stamford Decommissioning Programmes (DP) approved by the Secretary of State on the 30th April 2015, one for each set of notices under section 29 of the Petroleum Act 1998:

- The Stamford installation (a wellhead protection structure), and;
- The associated pipeline and umbilical.

The pipeline and umbilical cross the UK-NL Median Line, so the State Supervision of Mines (NL) was also consulted as part of the Statutory Consultation process.

Key elements of the approved DP are summarised below:

- The Stamford well will be abandoned;
- Removal of WHPS: To remove the installation and leave a clean seabed;
- Flexible riser will be re-used if possible: The flexible riser at Markham will be unbolted at the pipeline interface and left with the platform and re-used if possible;
- Pipeline will be flushed clean and most it will be left trenched and buried *in situ* with the short end sections cut and removed to minimise snag hazards arising in future;
- Umbilical will be flushed and will be left buried *in situ* with the short end section in the UK sector to be cut and removed to minimise snag hazards arising in future. The section of umbilical within the J-tube at the Markham CT platform will be fully removed, but within the NLCS a short section of umbilical within the Markham J6A platform 500m zone will remain where it is covered by protection mattresses and removed along with the Markham platform as part of future-decommissioning activities;
- Mattresses and grout bags will be removed as part of the partial pipeline and umbilical removal activities.

Following completion of the Stamford decommissioning operations, SNSGL has reviewed the activities to ensure that the scope has been executed in accordance with the approved Decommissioning Programmes; that risks to other users of the sea have been removed or reduced as far as possible, and regulatory requirements have been met. One minor variation to the DP arose, and this concerned a 148m increase in the length of umbilical recovered from the seabed near the Stamford well.

As a result of monitoring and a review of recorded data, SNSGL believes that all residual risks to other users of the sea have effectively been removed on a long-term basis and that a programme of future field infrastructure surveys would not provide any useful information in this regard. SNSGL believes that the stability of the seabed, pipeline and umbilical in this area is such that it would be unnecessary to conduct further inspection and verification work in future.

Analysis of environmental survey data also suggests that the local environment is in a state typical of the wider southern North Sea region. With no further site specific anthropogenic inputs, it is felt that that natural degradation of contaminants should help restore the area to pre-developed conditions in a relatively short timescale. Accordingly, SNSGL proposes that no additional site and environmental surveys or inspection of remaining features in the Stamford area are necessary.

Approval for the final status of the seabed in the former development area has been acquired from NFFO, in the form of the trawl clearance certificate. SNSGL now seeks formal approval from OPRED to enable full project close-out.

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ACRONYMS AND GLOSSARY OF TERMS

ACRONYM	DESCRIPTION
Ba	Barium
BC	Background Concentrations
BOP	Blow Out Preventer
BRC	Background Reference Criteria
bscf	billion standard cubic feet
Bullheading	The operation of placing a column of heavy fluid into a well bore in order to prevent the flow of reservoir fluids without the need for pressure control equipment at the surface
CA	Comparative Assessment
CEU	Centrica Energy Upstream
CoP	Cessation of Production
CT	Compression Tower
DOB	Depth of burial. The depth between the blue line (DOC) and maroon line (DOL) on the burial profiles
DOC	Depth of Cover: The blue line on the burial profiles shows the profile of cover. The area between the blue line (DOB) and maroon line (DOL) shows the backfill
DOL	Depth of Lowering: Pipeline trench profile; depth of lowering to top of pipe
DP	Decommissioning Programme(s)
DPSV	Dynamic Positioning Supply Vessel
DSV	Dive Support Vessel
FEMUL	Fugro EMU Limited
FIV	Flowline Isolation Valve
GY	Great Yarmouth, UK
HSE	Health and Safety Executive
IBC	Intermediate bulk container
ICC	Isolation Confirmation Certificate
kg	kilogramme
J6A	Markham J6A Platform owned by Markham Partners and operated by SNSGL Production Nederland B.V.
km	kilometre
NB	Nominal Bore
NFFO	National Federation of Fisherman's Organisation
NORM	Naturally Occurring Radioactive Material
OGA	Oil & Gas Authority
OPEP	Oil Pollution Emergency Plan
OPRED	The Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	Oslo-Paris Convention
PAH	Polycyclic Aromatic Hydrocarbon
PL2567	Stamford pipeline
PLU2568	Stamford umbilical pipeline
RSV	ROV Support Vessel
SEI	Significant Environmental Impact
SNSGL	Spirit North Sea Gas Limited
SNS	Southern North Sea
Spirit Energy	In November 2017 Centrica Exploration and Production and Bayerngas formed a Joint Venture called Sprit Energy
SS7	Subsea 7
SUTU	Subsea Umbilical Termination Unit
Te	Metric Tonne (1,000kg)
THC	Total Hydrocarbon Content
TOC	Total Organic Carbon
TOM	Total Organic Matter

ACRONYM	DESCRIPTION
TUTU	Topside Umbilical Termination Unit
UKCS	United Kingdom Continental shelf
UKOOA	United Kingdom Offshore Operators Association
WBM	Water Based Mud
Wellhead	Component at the seabed surface that provides the structural and pressure containing interface for the drilling and production equipment. A wellhead must be present in order to use a Xmas tree.
WHPS	Wellhead Protection Structure
Xmas tree	An assembly of valves, spools, and fittings used for different types of well and used to control the flow of fluids into or out of the well.

1 INTRODUCTION

1.1 Purpose

This document contains the close-out report for the two Stamford Decommissioning Programmes [2] approved by the Secretary of State on the 30th April 2015, one for each set of notices under section 29 of the Petroleum Act 1998:

- The Stamford installation (a wellhead protection structure), and;
- The associated pipeline and umbilical.

The Decommissioning Programmes explain what needs to have been achieved for decommissioning. The Decommissioning Programmes were supported by a Comparative Assessment [3] and an Environmental Impact Assessment [1].

This document reports the outcome of the Stamford Decommissioning activities and marks the formal close out submission to the Offshore Petroleum Regulator for Environment and Decommissioning as described within the OPRED Guidance Notes.

1.2 Field Overview

The Stamford Field is wholly owned by Spirit North Sea Gas Limited and lies in the UK sector (block 49/10c). The field was discovered in 1990 by Total Oil Marine but was developed by Venture Production in 2008. Ownership moved to Spirit Energy (formerly Centrica) in 2009 following the Venture Production acquisition.

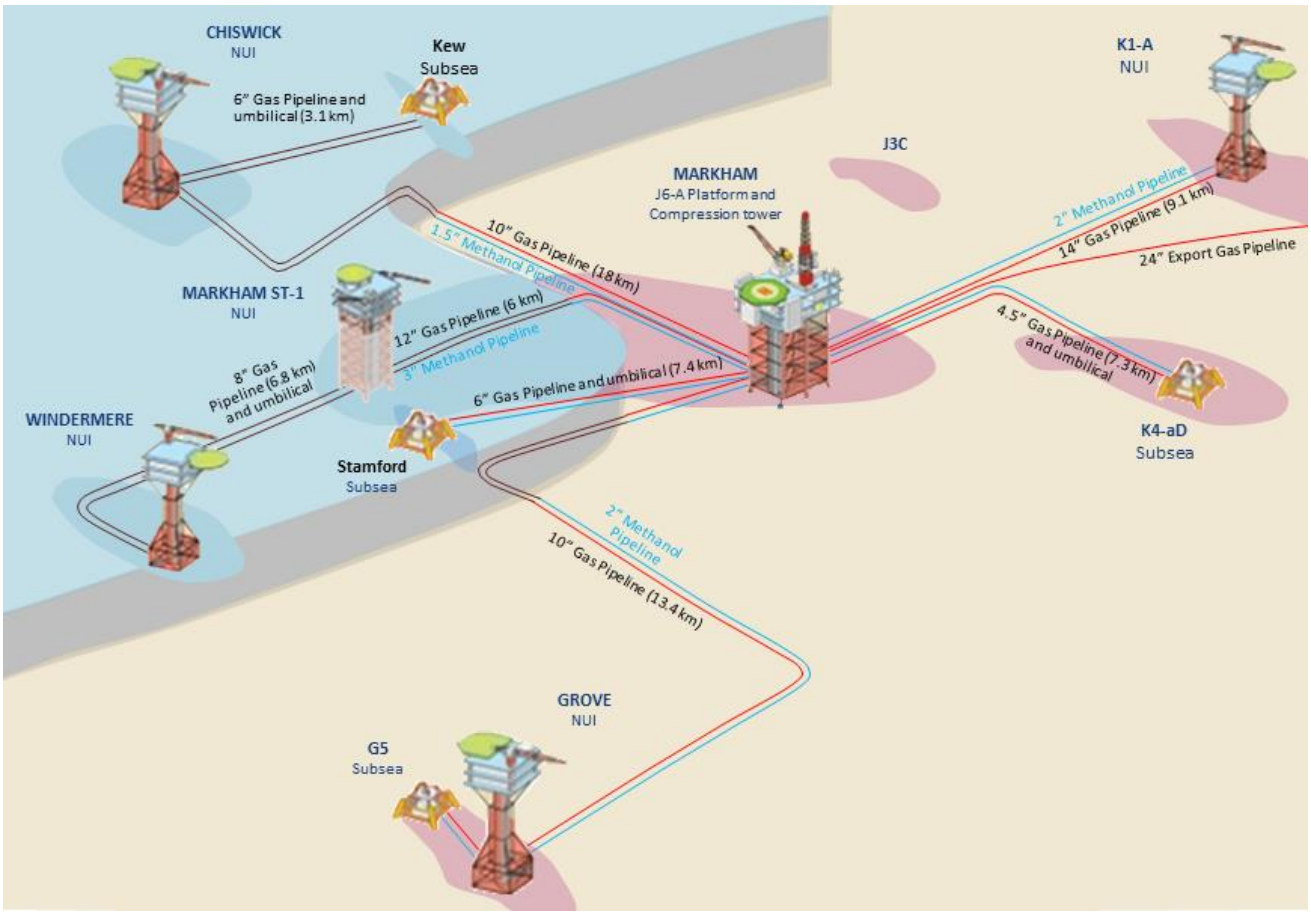

Figure 1.2.1: Stamford Field layout prior to decommissioning

The field was developed by tying back a single Stamford appraisal/development well (49/10b-3) to the Markham J6A platform located in the Dutch sector 7.5km from the Stamford well location. The Stamford pipeline and umbilical crosses the median line into the Dutch sector.

First gas was achieved in December 2008 with the gas transported via a 6" pipeline back to the Markham J6A Compression Tower platform. A 5" control umbilical providing power, chemicals and hydraulics to the wellhead. The pipeline was connected to the J6A CT via a 6" flexible riser routed up through the platform J-tube.

The remaining subsea infrastructure included the Stamford wellhead, wellhead protection structure, Xmas tree and stabilisation features for protection which included concrete mattresses, grout bags and rock deposits.

The well had been unproductive since mid-2012, with Stamford reaching its economic limit as it was no longer producing. Field life extension options were investigated but none were deemed technically and financially feasible and consequently the field was considered ready for abandonment.

2 DECOMMISSIONING PROGRAMMES

With the Stamford well no longer producing and any extension options not being considered viable a Cessation of Production report was submitted to DECC Licensing, Exploration and Development (now part of OGA) and approved on the 10th September 2014. The Stamford Decommissioning Programmes were submitted along with all required supporting data and approved on the 30th April 2015; the OPRED approval reference is MI-OGO5-00024.

Key elements of the approved DP are summarised below and covered in more detail in this report.

- The Stamford well will be abandoned;
- Removal of WHPS: To remove the installation and leave a clean seabed;
- The flexible riser will be re-used if possible: The flexible riser at Markham will be unbolted at the pipeline and left with the platform and re-used if possible;
- The pipeline will be flushed clean and left buried *in situ*: Most of the 6" pipeline will be left *in situ* with the short end sections cut and removed to minimise snag hazards in future;
- The umbilical will be flushed and left buried *in situ*: The umbilical will be left *in situ* with the short end section in the UK sector to be cut and removed to minimise snag hazards in future. The section of umbilical within the J-tube at the Markham CT platform will be fully removed, but within the NLCS a short section of umbilical within the Markham J6A platform 500m zone will remain where it is covered by protection mattresses and removed along with the Markham platform as part of future-decommissioning activities;
- Mattresses and grout bags will be removed as part of the partial pipeline and umbilical removal activities, at the time the sections are-decommissioned.

3 AMENDMENTS AND REVISIONS TO THE DP

No formal amendments were made to the approved DP and no deviations to decommissioning guidance and legislation requirements were made during the project.

4 DECOMMISSIONING ACTIVITIES

The following section describes the completed decommissioning activities, how they were executed and confirms that the completed activities were carried out in accordance with the requirements of the approved DPs. Decommissioning activities carried out on pipelines PL2567 & PLU2568 are provided in more detail within section 5 of this report.

The execution phase was split into three distinct phases: Phase 1 platform and subsea works, Well Abandonment and Phase 2 platform and subsea works. This was deemed to be the best execution strategy from a cost and scheduling perspective, taking advantage of efficiencies that could be gained during phase 2 of execution.

- Phase 1 preparatory works on Markham J6A platform;
- Phase 1 was executed for Stamford as a standalone campaign but phase 2 was completed as part of a wider campaign associated with Rose decommissioning as there were similarities in scope and timing for the final phase of the Stamford and Rose decommissioning campaigns and comprised DSV Phase 1 and well abandonment activities:
    - DSV Phase 1: Preparation at Stamford well location using DSV to facilitate full well abandonment by the jack up drill rig. Activities included isolations and barrier testing disconnection of pipeline PL2567 and umbilical PLU2568 from the Xmas tree and removal of WHPS;
- Well Abandonment – Full abandonment of the Stamford well including removal of Xmas tree and wellhead.
- Phase 2 preparatory works on J6A platform;
    - DSV Phase 2: Flush and clean PL2567 & PLU2568, cutting and recovery of end sections, removal of concrete mattresses, grout/sand bags & remaining subsea facilities to leave clean seabed.

4.1 Phase 1 Preparatory Work on Markham J6A Platform

Prior to arrival of the DSV in the field the following activities were carried out on the J6A platform to allow diver intervention work to commence:

- Depressurised pipeline PL2567 to seabed ambient and provided the required valve isolations topsides;
- Depressurised and fully isolated hydraulic lines within the Stamford umbilical;
- Depressurised and fully isolated chemical injection lines within the Stamford umbilical;
- Fully isolated Stamford umbilical electrical power;
- Provide Isolation Confirmation Certificates for pipeline and umbilical.

4.2 Phase 1 DSV Activities

The offshore work was carried out by Subsea 7 using their Seven Pelican DSV. The vessel mobilised from Hull on the 1st May 2015. The offshore DSV campaign took 11 days to complete. The work scope completed is briefly described below:

- Cleaning and inspection of Xmas tree and associated infrastructure which was heavily covered in marine growth;
- Isolations, barrier testing and Xmas tree spool flushing;

- Disconnection of pipeline from Xmas tree and installation of blind flange on pipeline end in preparation for the next diving campaign;
- Fitting blind flange and leak testing of the Xmas tree;
- Tree tie-in spools disconnected and recovered;
- Umbilical disconnection, jumper/flushing loop reconfiguration and relocation of SUTU;
- Remove WHPS;
- Trial lift of mattress.

These activities were completed by the dive team on the Seven Pelican. The WHPS was removed as planned, using the Seven Pelican prior to arrival of the drilling rig. The pipeline and umbilical were successfully disconnected to allow the drill rig to remove the Xmas tree and wellhead.

4.2.1 Phase 1 Removal of WHPS

The Stamford WHPS was of bolted construction and was disconnected and removed in sections. The two side sections of the main structure were held in place by four nuts and two tie-in bars; all retaining nuts were slackened off initially. The trawl deflection legs were then retracted using lift bags and localised rigging, once retracted the retention bucket was fixed in the closed position with locking pins engaged. A SUTU cradle was then unbolted from the WHPS and lifted to the vessel deck.

The two tie bars were located on the north-west and south-west faces, these had to be removed to allow complete removal of the side sections. These were fully unbolted and recovered with choked slings due to the unknown integrity of the existing lifting points.

Divers then secured rigging to the padeyes[1] on the canopy of the structure ensuring that the debris doors remained secured. The locking pins were then disengaged, and the canopy lifted to deck.

Finally, the four nuts holding the two side panels in place were removed; the side sections were then rigged and recovered to deck.

Figure 4.2.1 shows the side panel locking nuts which were removed, Figure 4.2.2 shows a trawl deflection leg in the ‘up’ position with retention bucket engaged and Figure 4.2.3 shows the tie bars that were removed. Onshore trials were carried out on a similar Xmas tree prior to mobilising and this provided confidence in the method and tools to be used; the tools for the side panel nuts had been fabricated for the purpose.

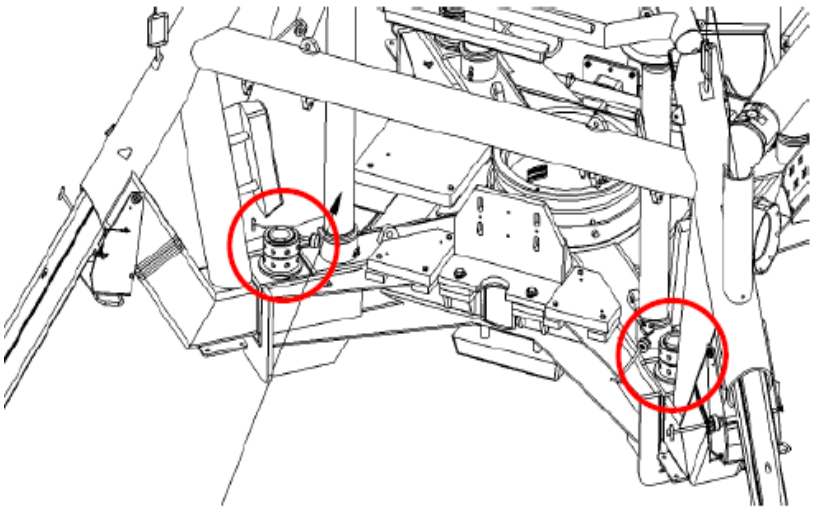

Figure 4.2.1: Side Panel Locking Nuts on WHPS

[1] These were found to be in good condition.

Figure 4.2.2: Trawl Legs Locked in Retention Bucket

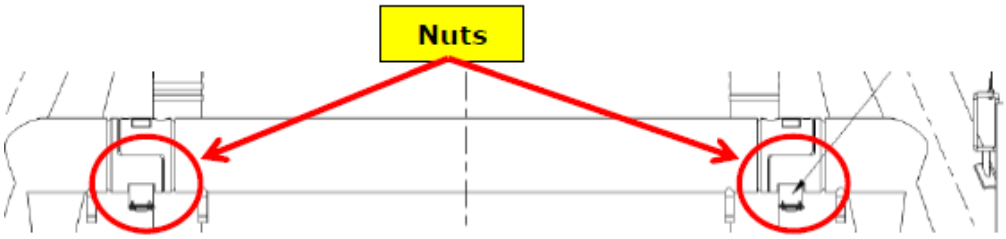

Figure 4.2.3: Tie-bars to be released

4.3 Abandonment of the Subsea Well

The Stamford subsea well 49/10b-3 was abandoned in line with OGUK Guidelines “Guidelines for the Suspension and Abandonment of Wells” [11] and SNSGL Standards. This involved removing the subsea Xmas tree, recovering the upper completion and setting three permanent barriers. These barriers were to isolate the hydrocarbon bearing Leman Sandstone reservoir from the Stassfurt Halite, isolate the Stassfurt Halite from surface and isolate the Chalks from surface.

The jack up drill rig Paragon B391 arrived on location on 3rd June 2015 and ran a landing string to connect to the Xmas tree. The tubing contents were bullheaded with seawater before bullheading a cement plug in the 4½” liner, squeezing into the perforations. This plug served as a barrier between the Leman Sandstone and Stassfurt Halite and was pressure tested to 500psi over injection pressure, with a theoretical top of cement at 2,737m.

The Xmas tree was then recovered before rigging up the BOPs, releasing the completion, displacing the annulus to seawater and recovering the completion.

A 304m combination cement plug was set to provide two permanent barriers to surface from the Stassfurt Halite and was tagged at 2,195m.

The 9-5/8” casing was cut at 1,012m where brine flow was observed from the shallow Chalks. The well was displaced to 10.55ppg WBM and the 9-5/8” subsequently recovered. The well was then displaced back to seawater and a 221m combination cement plug was set in the 13-3/8” casing, tagged at 786m, providing 2 barriers for isolating the Chalks.

The 13-3/8” casing was cut and pulled before cutting the wellhead 3.15m below seabed, performing an as left seabed survey and departing location.

All activities were consented under the appropriate permits and monitored throughout operations by an independent well examiner. The subsea well 49/10b-3 abandonment was completed in a total of 28 days. The abandoned well schematic is included in Appendix A.1.

4.4 Phase 2 Decommissioning Activities

With the Stamford well abandonment complete, the final part of the campaign was concerned with removal of the remaining infrastructure thereby leaving a clear seabed. Three vessels were used to carry out the work, and these were:

- The DSV **Seven Pelican** addressed all diving critical activities which included; flooding PL2567 from former Stamford well location, hook up of Olympic Taurus for receipt of flushing waste, flush and clean PL2567 with the required 120% line-volume, cutting the umbilical and its removal at J6A, disconnection of PL2567 at base of the riser and installation of a blind flange at the base of the riser;
- The DPSV **Olympic Taurus** took receipt of flushing waste via filtration equipment on-board the vessel;
- The ROVSV **Seven Pacific** completed all remaining pipeline and umbilical cuts at required burial depths, recovery of concrete mattresses, grout & sand bags and remaining infrastructure on the seabed.

4.4.1 Phase 2 Preparatory Works on J6A Platform

Prior to and during the offshore campaign for the phase 2 scope of work, the J6A operations team and 3rd party contractors carried out work on the platform to support the subsea decommissioning work. This work included:

- Installation of flushing equipment skid & flushing of PLU2568 chemical cores;
- Supported flooding of PL2567 back to J6A platform from former Stamford well location, venting gas from platform vent system;
- Topsides barriers and isolations put in place prior to nitrogen purge of topsides pipework to allow breaking containment for hook up of pipeline flushing pipework;
- Relocation of existing fuel bunkering hose so that existing cradle could be used for pipeline flushing hose connection to platform;
- Supported flushing of PL2567, flushed from J6A platform to former Stamford well location. This included loading of gel pig train and transfer of flushing hose assembly from DSV to platform tie-in location;
- Removal of PLU2568 through the bottom of the J-tube using the DSV. This operation included the installation of a winch on platform to support lowering of the umbilical through the J-tube;
- Topping up the Stamford riser with treated potable water once the pipeline had been disconnected and a blind flange installed;
- Confirm permanent isolations are in place once pipework re-installed after completion of pipeline flushing and leak test activities;
- ICCs signed & copies issued as required during operations.

4.4.2 Subsea Equipment and Pipeline Stabilisation Features

Prior to the removal of mattresses by the Seven Pacific an ROV survey was first carried out to confirm condition and number of mattresses to be removed at the former Stamford well site as outlined in Figure 4.4.1.

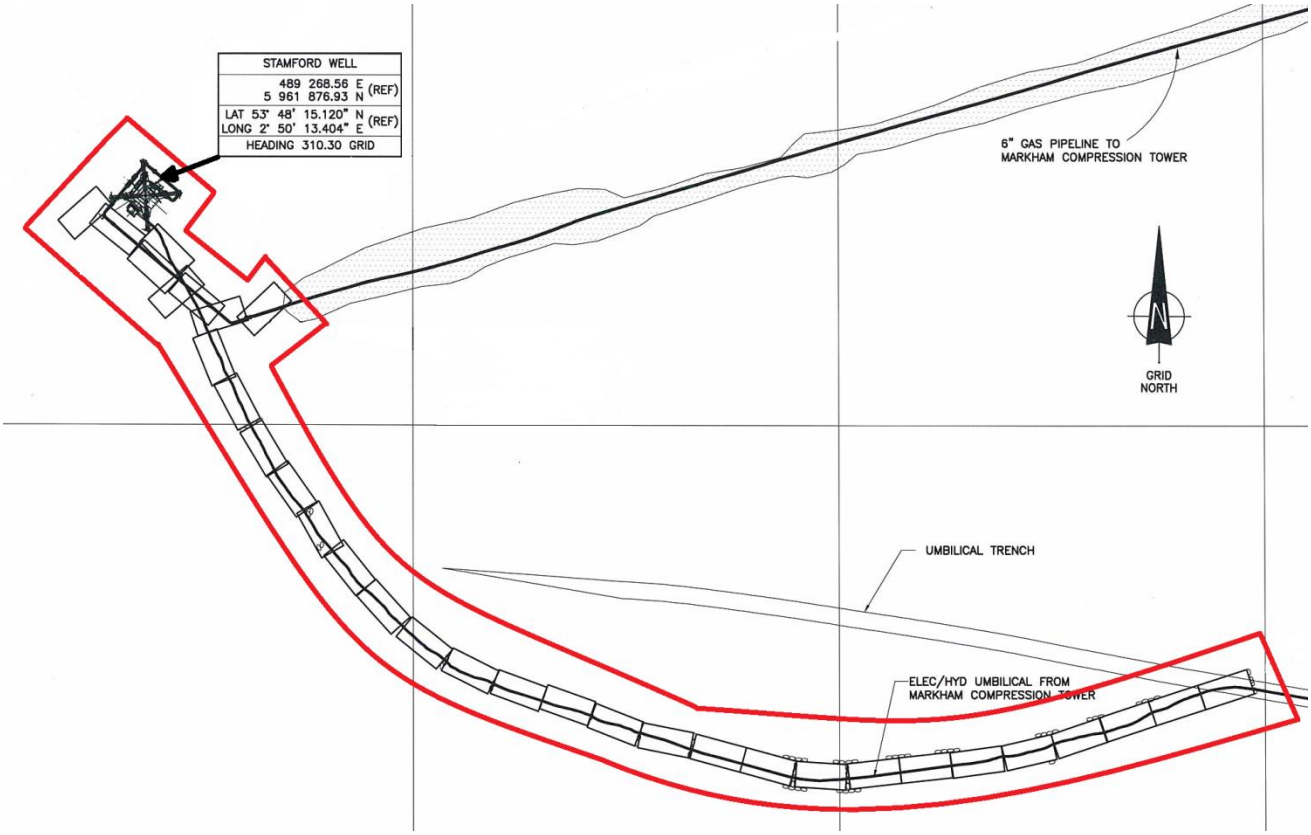

Figure 4.4.1: Mattress locations on Stamford well approaches

Lifting loops were checked for condition prior to each lift. An ROV operable mattress spreader beam was then deployed via the ROVSV crane (Figure 4.4.2). The lifting beam was positioned over the concrete mattress and snap hooks were connected by ROV along one edge. The crane hook was lifted gently all-the-while with the ROV monitoring the activity. The mattresses were brought back to deck and stored in speed loaders for ease of back load.

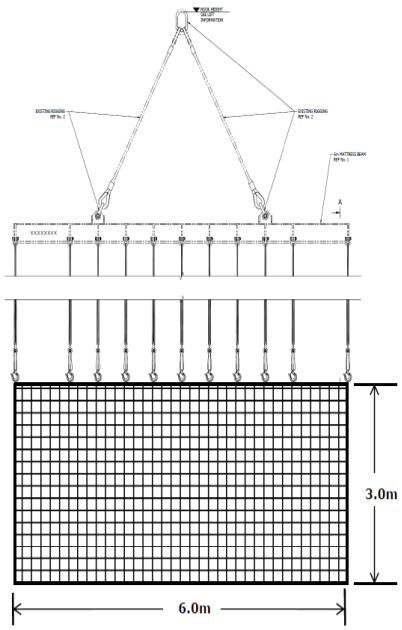

Figure 4.4.2: Mattress Rigging

All concrete mats at Stamford were found to be in good condition and were lifted successfully using this method. There was some minor degradation of mats but this did not impede the method used. A trial lift of a mattress was carried out during the DSV phase 1 campaign to provide confidence of the method to be used and condition of the mats. Mattresses within the Markham J6A 500m zone will remain *in situ* until full decommissioning of the Markham J6A platform and associated infrastructure.

All grout and sandbags were removed from the seabed using an hydraulic grab with half shell bucket attachments. Once lifted, they were decanted into a basket and recovered to the DSV deck. Sand bags had been deposited during phase 1 to protect the FIVs and SUTU and these were removed using the same method. The FIV block (Figure 4.4.3) and SUTU (Figure 4.4.4) were lifted to deck using the platform crane and rigging. An ROV survey was carried out to ensure that no further subsea equipment or stabilisation items remained at the wellhead location.

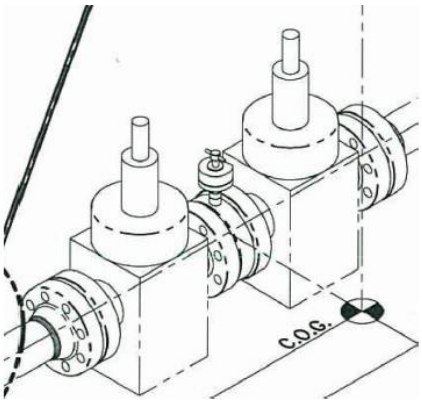

Figure 4.4.3: FIV Block Removal

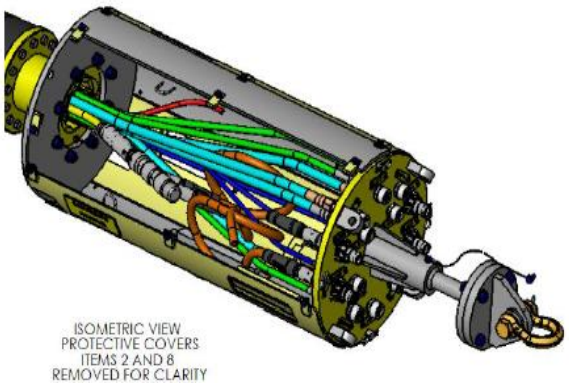

Figure 4.4.4: SUTU Removal

5 PIPELINE DECOMMISSIONING

5.1 PL2567 Decommissioning Activities

5.1.1 Flushing, Isolation & Severance

During the phase 1 campaign two out of three tie-in spools were removed after they were locally flushed to remove any hydrocarbons remaining. With the necessary barriers and isolations in place, divers disconnected the spools to be recovered to deck. Blind flanges were fitted to the Xmas tree and pipeline ends and leak tests carried out. The pipeline was now disconnected from the well. The spool pieces were found to contain low levels of NORM contamination. Once on deck the pipespools were bagged and tagged and quarantined ready for back load and processing onshore.

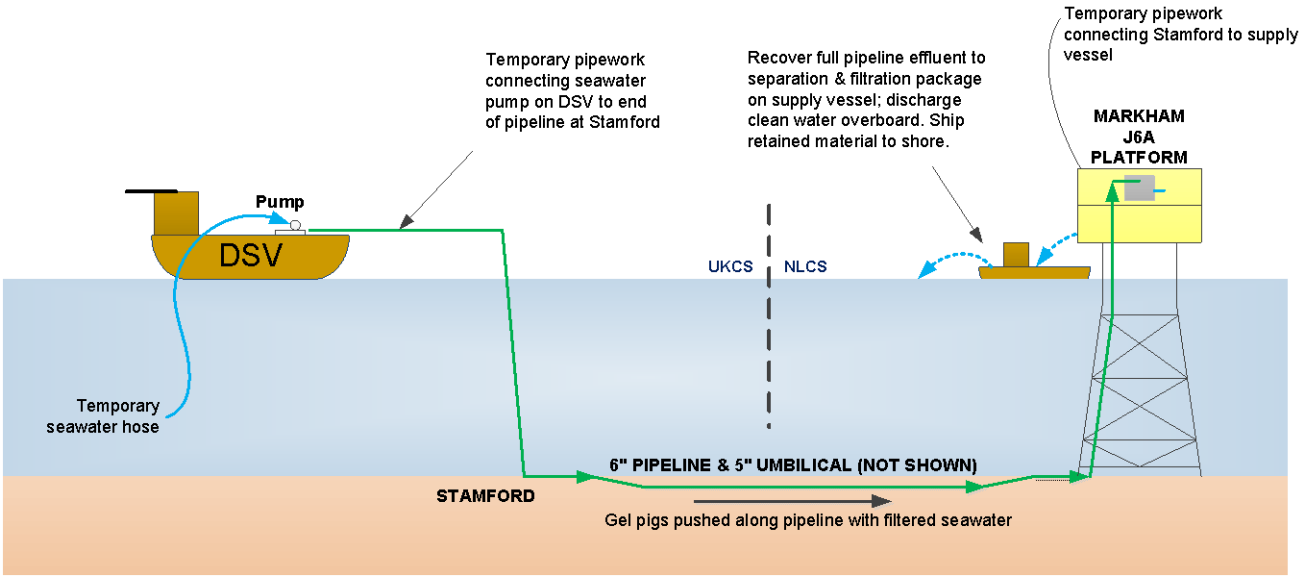

Figure 5.1.1: Stamford Pipeline Flushing Schematic

During Phase 2 pipeline flushing operations were completed between the Seven Pelican and Olympic Taurus (Figure 5.1.1). The Olympic Taurus was located at the former Stamford well location. The DSV located at the Stamford well location removed the blind flange, and installed a flooding flange that was to be used to allow the pipeline to free flood with seawater back to J6A, displacing gas which was to be vented at J6A. The divers also attached a crossover flange assembly to the flushing hose routed to the Olympic Taurus. The DSV then moved to the J6A platform to connect the flushing hose between the DSV and platform. A gel pig train was loaded into the pipeline at the platform and DSV started pumping operations using raw seawater.

The pipeline was flushed clean with using 120% line-volume with the pipeline contents being received by a filtration spread on the Olympic Taurus. Once pipeline flushing was completed a diver disconnected and retrieved the flushing hose from the platform and sailed to the former well location to disconnect the Olympic Taurus hose subsea, thereby completing the pipeline flushing work scope.

A diver disconnected the pipeline at the base of the riser at J6A and a blind flange was installed as an environmental barrier. The riser was then filled with treated potable water using the temporary pipework that had been installed for the pipeline flush to preserve it for future use. Once the diver intervention works at both locations had been completed, the DSV was demobilised.

The final pipeline decommissioning activities were completed by the Seven Pacific. The remaining exposed pipeline was cut starting at the FIV location at the end of the pipeline using a shear cutter and the vessel crane. The ROV was used to guide the crane rigging to the required cut locations 10m apart using a buoy and sonar reflectors. At the deposited rock transition point the 6” pipeline was exposed using a dredger, and the cut was made at the required 0.6m depth of burial.

The hydraulic grab was then used and pipeline sections removed from the seabed and recovered to deck.

5.1.2 PL2567 Burial Status

The pipeline burial status in 2014 [2] showed excellent depth of burial and cover along the majority of the length.

Following completion of decommissioning activities, the pipeline was surveyed again in 2016 (Appendix B.1). The results showed as similar trend, with a good and consistent depth of cover along the pipeline. At the Stamford end the pipeline remains covered with rock.

5.2 PLU2568 Decommissioning Activities

5.2.1 Flushing, Isolation & Severance

During the phase 1 campaign with the umbilical fully isolated at the J6A platform the dummy stab plate was removed from the park position on the Xmas tree, the production stab plate was then disconnected and placed in a safe laydown area off the seabed. The dummy stab plate was then installed onto the production stab plate for protection in preparation for the upcoming drill rig activities. The electrical connectors were removed along with hydraulic and chemical connectors. Once all jumpers were disconnected they were removed from the Xmas tree and recovered to surface in a basket. Flushing loops were installed on the chemical injection lines at the SUTU to allow round trip flush from platform at later date. The SUTU was moved to a safe laydown area clear of the Xmas tree and protected with sand bags.

The next phase of umbilical decommissioning was flushing of the chemical injection cores from the platform displacing the chemicals within the cores with raw sea water with returned waste being decanted into IBCs located on the platform. This was completed prior to the Phase 2 offshore campaign commencing.

Phase 2 activities were then carried out with the umbilical disconnected from the topside umbilical termination unit (TUTU) and cut at the J-tube hang off location with access via overboard scaffold which had been installed prior to DSV arrival. The exposed cut section of umbilical at the J-tube hang off was then rigged as required and connected to a winch which had been installed on the platform to enable the controlled lowering of the umbilical. The hang off collar was removed topsides and the full weight of the umbilical was taken by the winch. The umbilical was then cut subsea using hydraulic shears and the section of umbilical within the J-tube was pulled through the bottom of the J-tube using a crane on the DSV. The umbilical was also supported from the top by winch wire. To seal the J-tube a brush pig was then pulled into its bell-mouth.

The umbilical section in the NL sector was removed from the J-tube and stored on the seabed for recovery by ROV later in the campaign.

The umbilical was removed from the seabed at the former Stamford well location using the same method as used for the pipeline. The umbilical was cut into 10m sections using hydraulic shears and was removed from within the rock dump at a depth of 0.6m. Due to uncertainties with seabed profile and depth of burial it was decided to recover more of the umbilical than originally estimated. The length of material recovered was 148m longer than originally proposed in the Pipeline Works Authorisation variation [4][5]. This was to ensure that the umbilical remaining *in situ* would remain sufficiently buried, thereby avoiding the need for potential remedial work in future.

To complete the work the hydraulic grab was used to remove all cut sections of pipeline and umbilical to the DSV deck.

5.2.2 PLU2568 Burial Status

In 2014 [2] the umbilical showed excellent depth of burial and cover along its length.

Following completion of decommissioning activities, the umbilical was surveyed again in 2016 (Appendix B.2). The results showed as similar trend, with a good and consistent depth of cover along the pipeline. At the Stamford end the umbilical remains covered with rock.

Appendix B.2 presents the umbilical profile in 2016 showing a similar trend, good and consistent depth of cover along most of the umbilical. As identified in historical surveys there is a short length just outside the Stamford 500m zone where there is a reduced depth of cover, but the seabed remains stable, so we don't believe that the area with reduced depth of cover should be of concern.

6 ENVIRONMENTAL IMPACT AND PERFORMANCE

6.1 Permits and Licenses

The decommissioning work was undertaken under the existing OPEP for the facilities (OPEP Reference number 2089). The scope of the OPEP includes well abandonment and decommissioning.

The Environmental Impact Assessment was submitted to OPRED as a supporting document to the decommissioning programme for the Stamford field. The decommissioning programmes and supporting documents were submitted to OPRED for public consultation on the 28th January 2015. Following consultation the final version was submitted 07th April 2015.

The works undertaken were aligned with the proposals submitted in the decommissioning programmes and the supporting documents, including the Environmental Impact Assessment.

The permits and licences obtained for the decommissioning of the Stamford facilities are shown in Table 6.1 including their current status. The Stamford facilities were subsea so no 'Consent to Locate' was required for the decommissioning vessels.

Table 6.1: Stamford Environmental Permits and Licenses

Permit	Reference Number	Status
Marine Licence	PLA/208 ML/82/2	Return submitted
Chemical Permit	PLA/208 CP/636/2	Return submitted
Oil Discharge Permit	PLA/208 OTP/280 and OTP/408	Returns submitted
Environmental Permit Radioactive Substances	EPR/RB3595DS	Relinquished

The Pipeline Works Authorisation for The Stamford Field Development (10/W/08) was varied (226/V/16 dated 15 August 2016, [5]) to show the final decommissioned status of PL2567 and PLU2568.

6.2 Environmental Surveys

6.2.1 Background

The results of the post-decommissioning environmental sampling survey are described here. This includes any immediate consequences of the decommissioning activity that have been noticed. Three environmental surveys have been completed around the Stamford area (Table 6.2).

Table 6.2: Environmental Surveys in Stamford Area

Date	Title	Reference	Comment
June – July 2007	Stamford pre installation or environmental baseline survey	Gardline Report No: J/3/25/2595. [8]	Contains surveys for more than one area.
April 2014	Stamford pre-decommissioning environmental survey and habitat assessment	Fugro Ref.7269-7271, 7273 and 7274	Two volumes: Volume 1 Habitat assessment [6] Volume 2 Pre-decommissioning environmental survey [7]
Sept – October 2016	Stamford post-decommissioning environmental survey	Gardline Report Ref 10861 [9]	

Where feasible the post-decommissioning survey adopted techniques and methods used in the earlier surveys to allow the results to be comparable. Similarly, the sample locations were targeted to the same locations, where the presence of subsea infrastructure would allow. Sampling was targeted to the areas where-decommissioning activity took place.

6.2.2 Changes in Environmental Characteristics

TOM and TOC content in the sediment showed little variation across stations and were consistent with values in the earlier surveys.

THC concentrations in the post-decommissioning survey were above those recorded in both earlier surveys. They were also above the UKOOA (2001) 95th percentile for stations further than 5km from existing infrastructure in the southern North Sea, while concentrations in the earlier surveys were below this threshold.

Total n-alkane concentrations in the current survey were generally above those recorded in both earlier surveys and above the UKOOA (2001) 95th percentile at the two deeper stations. In both earlier surveys total n-alkane concentrations were below the UKOOA (2001) 95th percentile, except for one station in the 2007 survey.

THC concentrations at all stations and n-alkane concentrations at least at the two deeper stations were above background conditions for the wider area. However, while these THC concentrations are sufficient to potentially impact specific sensitive species they were below the SEI threshold, and therefore are not expected to have an adverse effect upon the overall macrofaunal community.

Although the hydrocarbon results show a temporal increase the hydrocarbons in the post-decommissioning survey they were found to be highly weathered, with no evidence of fresh point source petrogenic contamination. The possibility of chronic low-level petrogenic contamination from general anthropogenic activities, such as shipping fuel discharges or remobilisation of previously contaminated sediments associated with decommissioning in the area around the former Stamford well location could be considered as reasons for the temporal increase in hydrocarbon concentrations since 2014.

Total PAH concentrations in the current survey were greater than those recorded in the pre-decommissioning survey and broadly within the range recorded in the pre-installation (baseline) survey. Patterns indicated that concentrations of US Environmental Protection Agency PAHs were not representative of a ‘pristine’ environment, as described by OSPAR (2005), but consistent with the extent of oil and gas activities, more recently associated with decommissioning in the area.

Except for one sample to the north northwest of the well location all Ba concentrations were corresponding to a similar range of values to the earlier surveys. There is no obvious explanation for this temporal increase in barium concentration.

Concentrations of arsenic, cadmium, chromium, iron, nickel and vanadium, once normalised to 5% aluminium, were above their respective BCs or BRC at several or all stations except chromium which was below its BC at all stations investigated in earlier surveys but above it in the post-decommissioning survey. Conversely, mercury and zinc were below their respective BRC at all stations in the post-decommissioning survey, but above in the earlier surveys. Temporal increases in some metal concentrations maybe derived from relatively recent decommissioning activities in the general area such as remobilisation of sediments or from maritime fuel discharges.

Although S. *spinulosa* was sampled in high densities at the three shallower, coarse sediment stations, no reef-like structures or aggregations were observed. The seabed type across the Stamford survey area at most represented low resemblance to stony reef in very localised instances (<25m^2) which is like the conclusion reached in the previous Fugro habitat assessment. One juvenile individual of Arctica islandica (ocean quahog) was recorded. No other species or habitats of conservation significance were observed across the Stamford surveyed area.

The benthic community at the shallower, coarser sediment stations had a higher faunal density and species richness. Faunal diversity was similar at the two deeper, finer sediment stations. Overall, the community composition differed considerably between both sediment types, with little overlap between the taxa present in each of the two sediment types. This was also true in the earlier surveys. There was, however, a change in the community composition with time with the macrobenthic community sampled in 2014 being at an intermediate stage between the ones

sampled in 2007 and 2016. Compared with the previous surveys, polychaete abundance and dominance - with the exception of S. *spinulosa*, had declined. This included the hydrocarbon tolerant polychaete *Diplocirrus glaucus*, which had been one of the dominant taxa in the Fugro (2014b) survey. This possibly indicates a recovery of the faunal community since decommissioning.

In summary, the post-decommissioning survey results showed the area to be broadly similar to those identified in earlier surveys; levels of contamination that are not expected to have an adverse effect upon the overall macrofaunal community; in fact, the macrobenthic community is possibly showing signs of recovery.

No future environmental monitoring plan was proposed in the decommissioning programmes, although the decision for such monitoring was deferred until the results of the post-decommissioning environmental survey were known. Given the results of the post-decommissioning survey being broadly similar to the earlier surveys and showed signs of recovery we cannot envisage a scenario where any future remedial action would be required. Therefore, on balance, given the relatively small extent of the development and of decommissioning activities, and the comparable results of the three environmental surveys we propose not to undertake any future environmental surveys.

6.3 Waste Management Performance

6.3.1 Commitments

Waste was to be dealt with in accordance with the Waste Framework Directive. The reuse of an installation or pipelines (or parts thereof) is first in the order of preferred decommissioning options. Options for the reuse of installations or pipelines (or parts thereof) are currently under investigation. Waste generated during decommissioning will be segregated by type and periodically transported to shore in an auditable manner through licensed waste contractors. Steel and other recyclable metal are estimated to account for the greatest proportion of the materials inventory.

The estimated mass of material to be returned to shore and our aspirations for the disposal of waste were described in the decommissioning programmes (Table 6.3 and Table 6.4) below. The pipeline crosses the UK-NL median line so the data were proportioned per country.

Table 6.3: Inventory Disposition (Te)

Inventory (excludes rock)	Region	Total Inventory	To shore	To be decommissioned *in situ*	Left *in-situ* for potential re-use or deferred decommissioning
Installations	UK	54	54	0	0
	Netherlands	0	0	0	0
Pipelines	UK	673	222	451	0
	Netherlands	424	3	194	227

Table 6.4: Re-use, Recycle & Disposal Aspirations for Material Recovered to Shore

Inventory	Region	Re-use	Recycle	Disposal
Installations	UK (54 Te)	Approx. 40%	Approx. 60%	<5%
	Netherlands	n/a	n/a	n/a
Pipelines	UK (222 Te)	<5%	Approx. 95%	<5%
	Netherlands	<5%	Approx. 95%	<5%

6.3.2 Performance

Table 6.3 presents the material returned to shore and the final disposal routes. The decommissioning was undertaken in alignment with the decommissioning programme. All the material listed in Table 6.4 was recycled, and no material was returned to landfill.

Table 6.5: Material returned to shore

Item	Description	Location Landed[2], Date	Comment
WHPS (33.70Te)	26.55Te	P 11/05/2015 GY 01/07/2015	7.15 Te less than quoted
Xmas tree (17.20Te)	20Te	GY 16/07/2015	2.8Te more than quoted
Wellhead (3.10Te)	3.8Te	GY 01/07/15	0.2Te less than quoted
Spool at wellhead (UK)	1.38Te	P 11/05/15	No comment
Spools, pipeline sections (UK)	332m	P 12/06/16	No comment
Umbilical sections (UK)	1Te	GY 25/06/16	No comment
Umbilical sections (NL)	2.28Te	Den Helder (NL)	No comment
Mattresses (UK)	32 Total	GY 19/05/16 to 02/06/16	No comment
Grout Bags (UK)	100 Total	GY 18/05/16 to 02/06/16	No comment

Some minor debris was also recovered. The pipeline, pipeline spools, concrete mattresses and grout bags at J6A platform (NL) were left *in situ* to be decommissioned along with J6A platform.

[2] P – Peterhead; GY – Great Yarmouth

7 HEALTH, SAFETY & ENVIRONMENT

7.1 Key Performance Data

The HSE Key Performance data for the project is listed in Table 7.1. A number of Key Performance Indicators were tracked on the project.

Table 7.1: Stamford HSE Performance Summary

Metric	Total
HIPO Events	0
Lost Time Injuries/Restricted Work Case	0
Medical Treatment Cases	0
Health Related Treatment Case	0
First Aid Cases	0
Near Misses	0
Environmental Events	2
Material Loss	1
Observation Cards	134

Although overall the HSE performance during the project was strong, one minor incident occurred:

- One near-miss incident involving a dropped object: This was dealt with by stopping all work, establishing a safe course of action to continue the work and examining the lessons that could be learned.

The vessel crews were fully inducted into the SNSGL Safety expectations during preparations for mobilising the vessel mobilisations and we believe that led to a safe execution project execution.

As is standard procedure when incidents occur, we have examined the root cause of the events and incorporated any lessons learned into our procedures and processes so that we can avoid the re-occurrence of similar incidents in future.

Overall we believe that the HSE performance during the Stamford decommissioning project was acceptable.

7.2 Safety Case

The Stamford well was connected to the Markham J6A platform. As this platform is located on the NLCS it does not operate using a UK Safety Case.

8 SCHEDULE COMMITMENTS

8.1 Original Schedule

Figure 8.1.1 presents the outline schedule commitment for Stamford well abandonment and decommissioning activities.

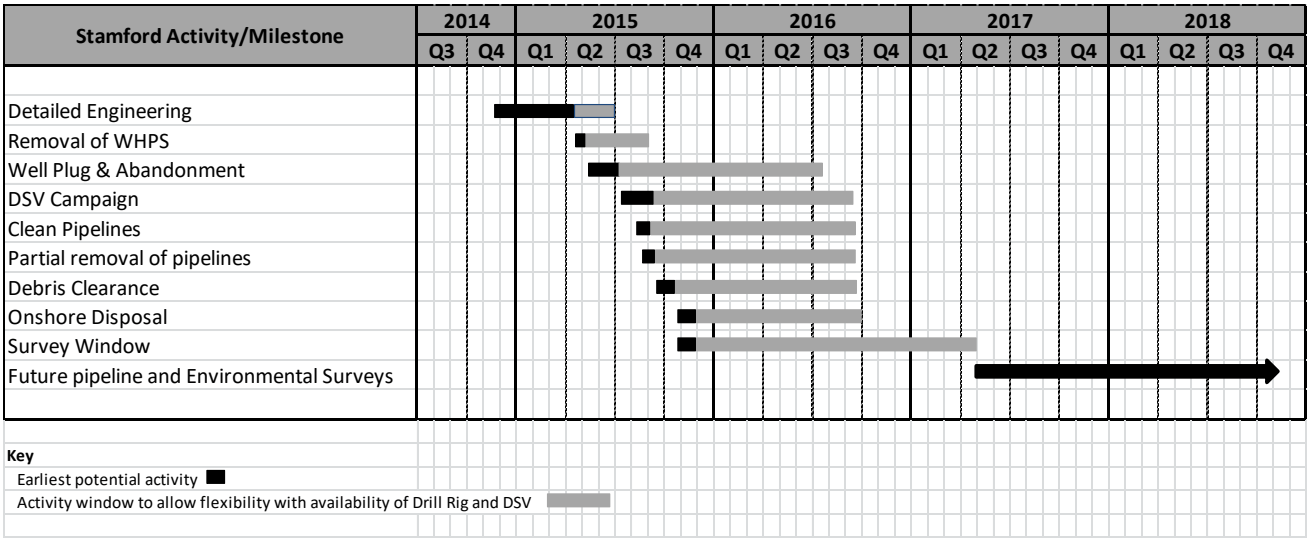

Figure 8.1.1: Original Schedule in Decommissioning Programmes

8.2 As-Built Schedule

Figure 8.2.1 presents the as-built schedule for Stamford well abandonment and decommissioning activities.

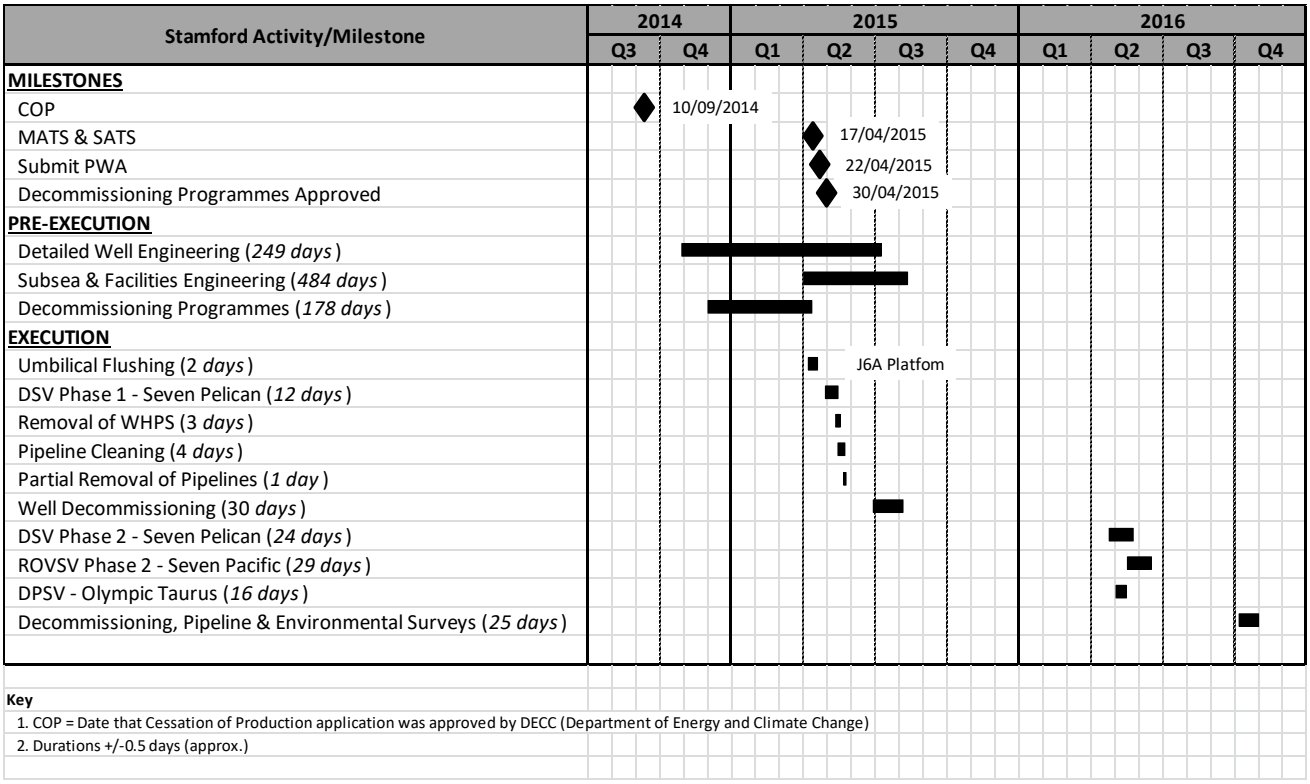

Figure 8.2.1: Stamford As-Built Schedule

9 COMPLETION OF ACTIVITIES

A photographic record was maintained for some of the decommission activities as evidenced below.

9.1 Recovery of Xmas tree

The Xmas tree was recovered using the drill rig during well abandonment operations (Figure 9.1.1) and then transferred to a supply vessel.

Figure 9.1.1: Recovery of the Xmas Tree

9.2 Removal of WHPS & canopy

The WHPS and top canopy were recovered using the DSV (Figure 9.2.1). The following pictures show the WHPS and top canopy lying on the deck of the Seven Pelican DSV.

Figure 9.2.1: WHPS & Canopy

9.3 Recovery of Concrete Mattresses

The concrete mattresses were recovered to the Seven Pelican DSV and secured on deck (Figure 9.3.1).

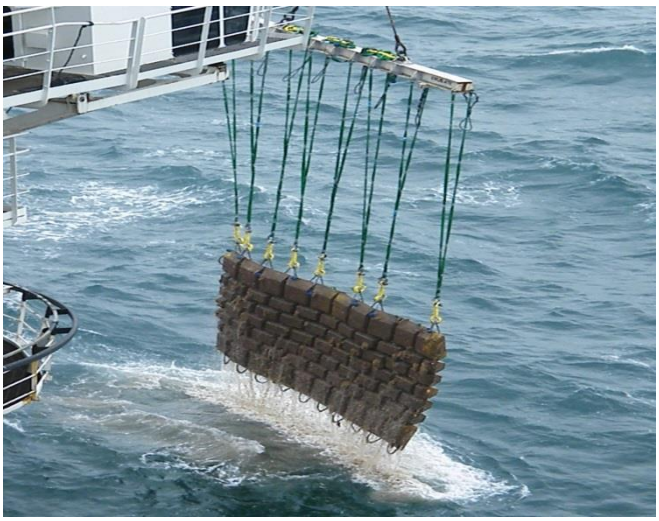

Figure 9.3.1: Mattresses Recovered and Secured on-deck

9.4 Recovery of Pipe Spools

The pipespools were recovered to the deck of the Seven Pelican DSV. It was established that they were contaminated with NORM and they were dealt with in accordance with standard procedures and protocols (Figure 9.4.1).

Figure 9.4.1: Pipe spools stored inside container

9.5 Recovery of Umbilical Sections

The umbilical pipeline was cut using a shear cutter (Figure 9.5.1) before being recovered to the deck of the Seven Pelican DSV (Figure 9.5.2).

Figure 9.5.1: Hydraulic Shear Cutter

Figure 9.5.2: Umbilical sections stored in basket

9.6 Final disposal

All items were recycled including the concrete mattresses which were finally crushed and recycled (Figure 9.6.1).

Figure 9.6.1: Concrete mattresses finally crushed and recycled

10 COST SUMMARY

A comparison of gross estimated and outturn costs for the completion of the Stamford decommissioning is provided in Table 10.1. As we do not propose to carry out legacy surveys for the Stamford pipelines in the UK, we have not included an estimate for future survey costs.

This is based in the abandonment of one subsea well, the decommissioning of the pipeline and umbilical pipeline as per the approved Stamford Field Decommissioning Programmes [2]. The costs cover project management, execution of works, onshore treatment of materials and field surveys.

Table 10.1: Stamford Cost Summary

Scope	Estimated Cost £m	Outturn Cost £m
Pipeline, umbilical decommissioning and subsea installation removal	13.6	6.6
Well Abandonment	9.5	10.2
Future pipeline and environmental survey requirements	1.0	0.0
TOTAL:	**24.1**	**16.8**

Well abandonment costs were higher than originally estimated due to contingencies identified during detailed design not being included in the original estimate.

Pipeline, umbilical and subsea installation costs were lower than estimated due to market rates for vessels at time of execution, the use of ROV supply vessel for recovery of seabed infrastructure rather than DSV as originally planned, and the cost efficiencies gained by combining phase 2 execution into one campaign for both Rose & Stamford Decommissioning projects.

11 LESSONS LEARNED

In preparing for and carrying out the decommissioning activities offshore, there are a number of elements that we felt were good practice and others that with the benefit of hindsight we felt were not so good. The lessons we have learned from these aspects of the project will be carried forward to future projects:

- This work was carried out as part of a wider campaign with Rose well abandonment and decommissioning works and this led to cost efficiencies and savings;
- Onshore cutting trials: We felt there were benefits in carrying out onshore trials to validate different cuttings techniques that could be used for the WHPS;
- Xmas tree cleaning: Be cognisant that the quantity and density of marine growth might not be as expected, requiring extra time for cleaning operations;
- Xmas tree valve testing: We found it useful to prepare contingency plans to allow us to deal with passing valves;
- Pipeline pressure: We have found it useful to leave the pipeline at seabed ambient pressure prior to conducting underwater operations as this made it easier to implement contingency plans in the event that pipeline valves were found to be passing;
- Concrete mattresses: We found it beneficial to carry out trial lifts of the concrete mattresses in the field to facilitate an understanding of the condition of the mattresses and to ensure that it would be possible to recover the mattresses safely;
- Pipeline and umbilical cutting: We found it effective to use hydraulic shears for cutting the pipeline, pipespools and umbilical rather than using diamond wire cutters;
- Grout bag recovery: We found it effective to use a hydraulic grab for removing grout bags.

12 SEABED CLEARANCE CERTIFICATE

On completion of the planned decommissioning activities as detailed within the approved decommissioning programme(s) the National Federation of Fishermen's Organisation (NFFO) were approached to carry out a seabed clearance over trawl survey. This was carried out by the Whitby based trawler - The Advance, an NFFO member.

The Advance completed a series of bi-directional sweeps of the Stamford well 500m safety zone plus the associated pipeline and umbilical to the Markham J6A platform. During the trawl survey standard southern North Sea trawl equipment was used to determine if there were any major obstructions with chains attached to the trawl to ensure continuous contact with the seabed. No debris or obstructions were encountered.

Based on this survey, a 'Clean Seabed Certificate' was issued to SNSGL 13 December 2016.

13 CONCLUSIONS

Following completion of the Stamford decommissioning operations, SNSGL has reviewed all activities to ensure that the scope has been fully executed in accordance with the approved DP, that risks to other users of the sea have been removed or reduced as far as possible and all regulatory requirements have been met. Where any variations to the DP have arisen, they have been documented in this report.

As a result of monitoring and review of recorded data, SNSGL believes that all residual risks to other users of the sea have effectively been removed on a long-term basis and that a programme of future field infrastructure surveys would not provide any useful information in this regard. SNSGL believes that the stability of the seabed, pipeline and umbilical in this area is such that it would be unnecessary to conduct further inspection and verification work in future.

Analysis of environmental survey data also suggests that the local environment is returning to a state typical of the wider southern North Sea region. With no further site specific anthropogenic inputs, it is felt that that natural degradation of contaminants should help restore the area to pre-developed conditions on a relatively short timescale. Accordingly, SNSGL proposes that no additional site and environmental surveys or inspection of remaining features in the Stamford area are necessary.

Approval for the final status of the seabed in the former development area has been acquired from NFFO, in the form of the trawl clearance certificate (Appendix D). SNSGL now seeks formal approval from OPRED to enable full project close-out.

14 REFERENCES

[1] CEU (2015) Stamford Environmental Impact Assessment, CEU-HSEQ-GMA0042-REP-0002

[2] CEU (2015) Stamford Decommissioning Programmes, CEU-PRJ-GMA0042-REP-0009

[3] CEU (2015) Stamford Comparative Assessment, CEU-PRJ-GMA0042-REP-0010

[4] DECC (Mar 2015) Pipeline Works Authorisation 59/V/16, Approved by DECC 11 Mar 2016

[5] DECC (Aug 2015) Pipeline Works Authorisation 226/V/16, Approved by DECC 15 Aug 2016

[6] FEMUL (2014a) Report for SNSGL. Stamford Well and Stamford to J6A 6" Gas Pipeline and 5" Umbilical Pre-decommissioning Survey. UKCS Blocks 49/10c, 49/10b and NLCS Block J6. Report No: J/3/25/2595. Volume 1 of 2: Habitat Assessment Report. Great Yarmouth, UK: Fugro EMU Limited

[7] FEMUL (2014b) Report for SNSGL. Stamford Well and Stamford to J6A 6" Gas Pipeline and 5" Umbilical. UKCS Blocks 49/10c, 49/10b and NLCS Block J6. Report No: J/3/25/2595. Volume 2 of 2: Pre-Decommissioning Environmental Survey. Great Yarmouth, UK: Fugro EMU Limited

[8] GEL (2008) Report for RPS Energy on behalf of Venture Production PLC. Multifield Survey Campaign 2007. UKCS 47/8, 47/9 and 49/10. Environmental Baseline Report. Gardline Project Ref.7269-7271, 7273 and 7274. Great Yarmouth, UK: Gardline Environmental Limited

[9] GEL (2017) Stamford Post-Decommissioning Survey, Report 10861

[10] HSE (1996) Offshore Installations and Wells (Design and Construction etc.) Regulations

[11] OGUK (2015) Guidelines for the Suspension and Abandonment of Wells, Issue 5, July 2015

[12] OPRED (2011) Decommissioning Guidance Notes, Version 6

[13] OSPAR (1998) OSPAR convention for the protection of the marine environment of the North-East Atlantic: Ministerial meeting of the OSPAR commission - SINTRA: 22 – 23 July 1998.

Appendix A STAMFORD ABANDONED WELL SCHEMATIC

Appendix A.1 Abandoned Well Schematic

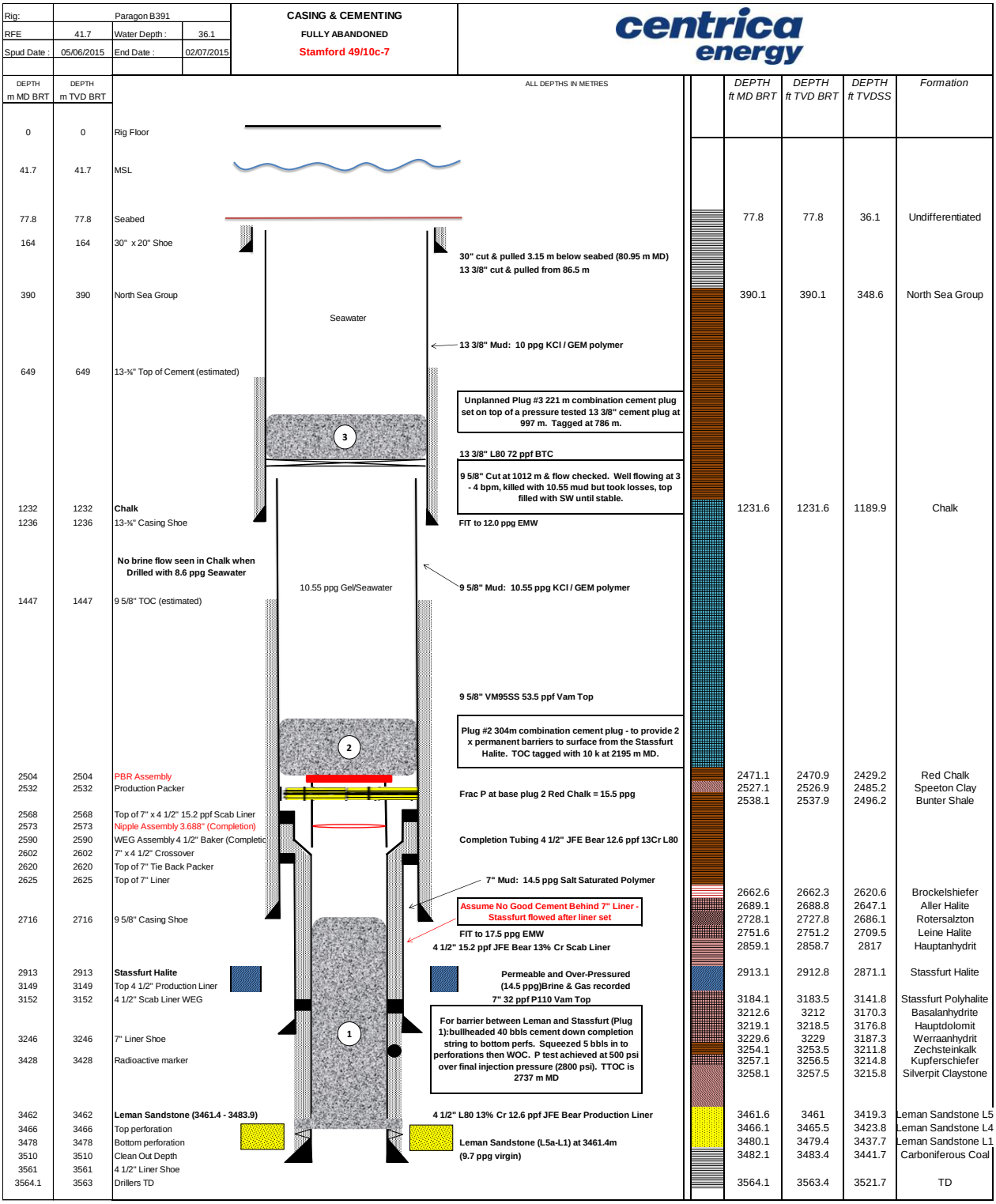

Figure A.1.1: Abandoned Well Schematic

Appendix B AS-BUILT BURIAL STATUS

Appendix B.1 PL2567 Pipeline Burial Profile (2016)

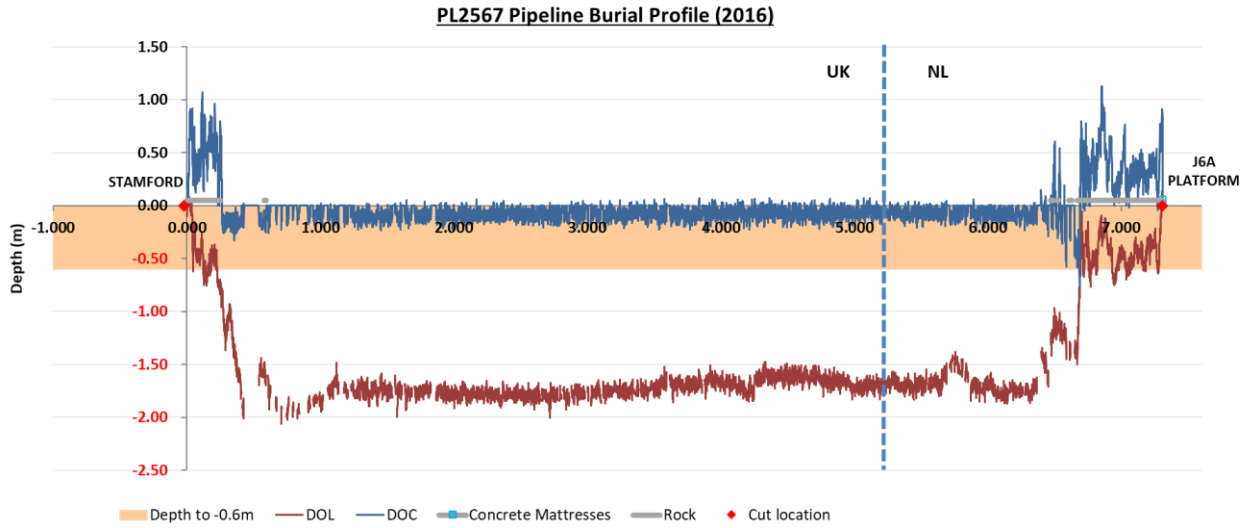

Figure B.1.1: PL2567 Burial Profile (2016)

Appendix B.2 PLU2568 Umbilical Burial Profile (2016)

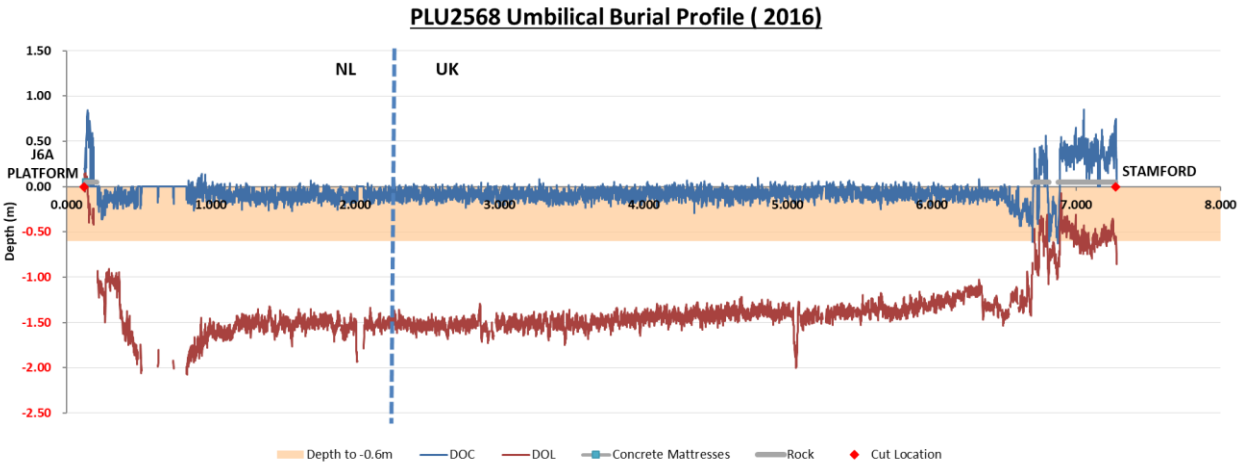

Figure B.2.1: PLU2568 Burial Profile (2016)[3]

[3] Gaps in a burial profile graph can arise in cases where the pipe-tracker is unable to track the umbilical or pipeline reliably. Typically, a pipe-tracker will move along just above the seabed, and its ability to track can be hampered if the pipeline or umbilical is too deep or if there's not enough material (steel) within the umbilical to allow a signal to be reflected-back to the tracker. Typically this can mean that there is at least 800mm depth of cover (DOC). Given the general profile of the umbilical we believe that it remains buried and stable in those areas where no tracking data were recorded.

Appendix C AS-LEFT LAYOUT DRAWINGS – AS-BUILT

Appendix C.1 Pipeline & umbilical ends at Stamford (UK)

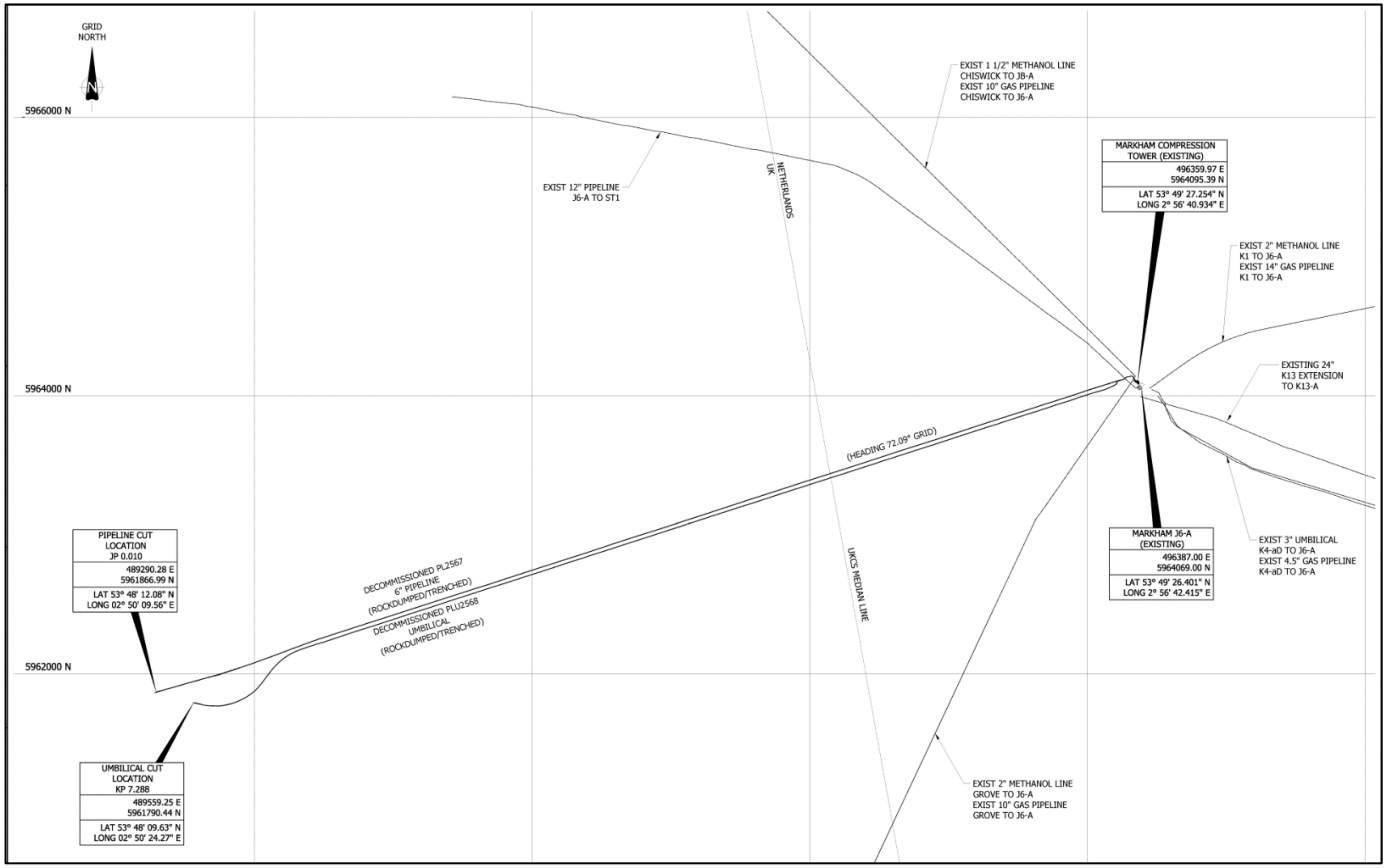

Figure C.1.1: Stamford Umbilical End Locations

Appendix C.2 Pipeline and umbilical ends at Markham J6A Platform (NL)

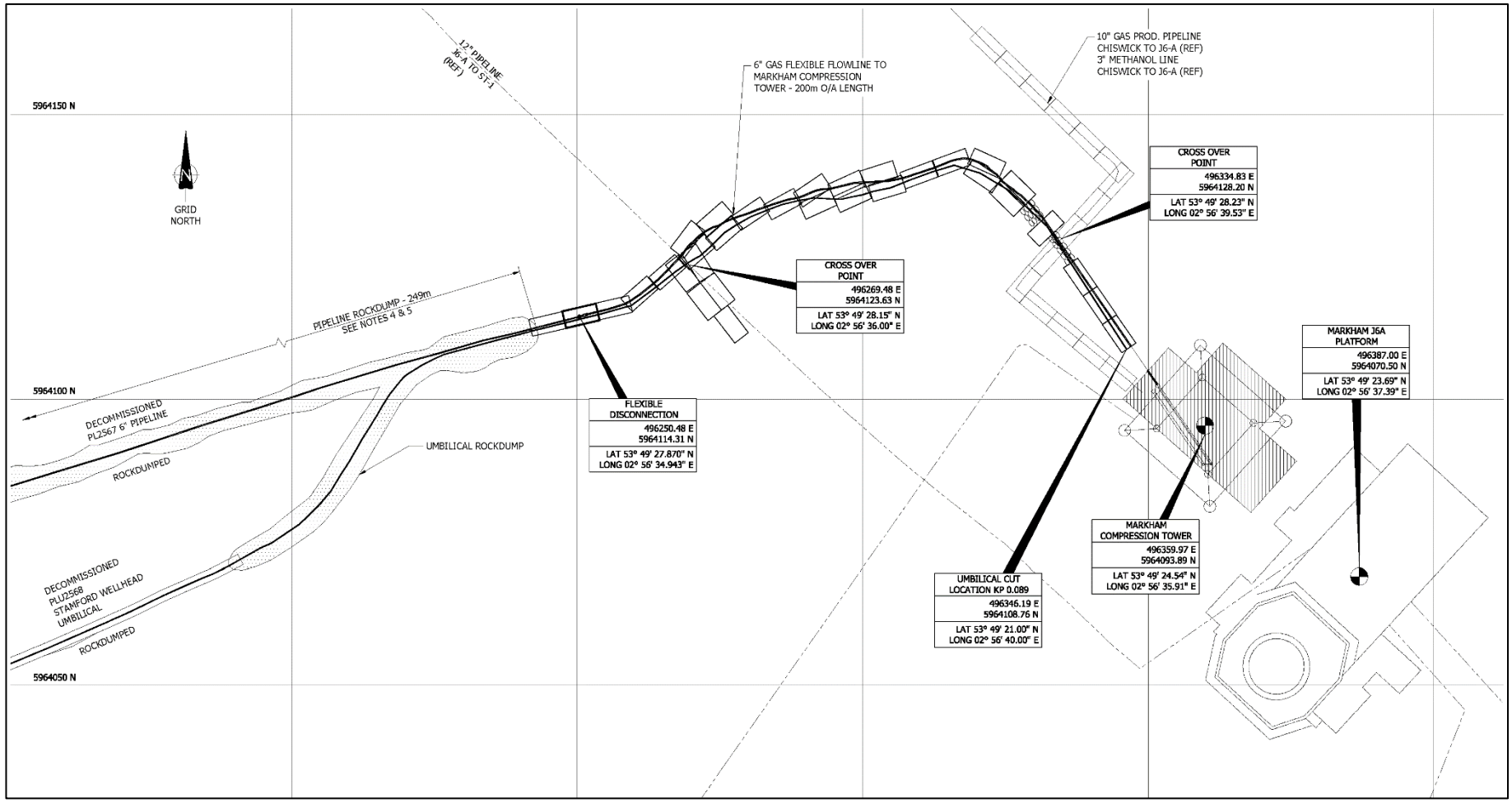

Figure C.2.1: Markham J6A Compression Tower 'As-Left' Status

Appendix D TRAWL CLEARANCE CERTIFICATE

National Federation of Fishermen's Organisations.

30 Monkgate
York
YO31 7PF

Tel: 01904 635 432
Fax: 01904 635 431
e-mail: apiggott@nffo.org.uk
Web: www.nffoservices.com

13th December 2016

To whom it may concern

Stamford Field De Commissioning

CLEAN SEABED CERTIFICATE

The Whitby based Trawler **Advance** operating under NFFO membership conducted the following activities at the Decommissioned **Stamford Subsea Well** 500mtr Zone plus associated pipe line and umbilical to **Markham Platform.**

1. A series of intense bi-directional sweeps over the known 5oo metre Zones and associated Pipe Line and umbilical areas have been conducted with the objective of safe future over trawlerbility within the said zones.

A significant number of passes has been made across each area. (Individual plotter data has been supplied)
Standard Southern North Sea trawl equipment with a series of chains suspended across the mouth of the trawl was used to conduct the sweeps.
Chains were attached to the trawl to ensure continuous contact with the seabed to determine whether there were any major obstructions which might present a major snagging hazard for future fishing activities. The trawl net was also seen as a means of gathering any items of debris located in the area. **No debris or obstructions were encountered.**

Following completion of the sweep programme the skipper of Advance has reported to NFFO the following:

a) No major snag was experienced during any of the sweeps.
b) On no occasion did the winch pressure showed any increase.
c) The skipper of the Advance is happy that as a result of the sweeps and the absence of any debris or snagging points on any of the above named decommissioned sites suggest that the areas will not pose any significant problem for future fishing operations.

Based upon feedback provided by the skipper, the Federation accepts that the decommissioned **(Stamford Field)** sites the abandoned wells, mattress areas, 500m safety zone and the associated pipe lines and umbilical were found to be clear of debris or major obstruction and posed no significant problem for future fishing operations.

The Federation would like to thank Centrica for their efforts in ensuring that all significant items of equipment and debris have been recovered.

Signed

Alan Piggott

A Piggott
General Manager