

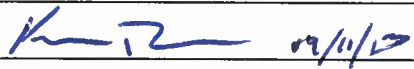
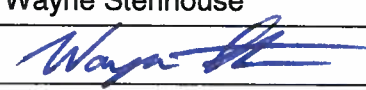


**LINNHE FIELD**

**SUBSEA FACILITIES  
DECOMMISSIONING**

**CLOSE OUT REPORT**

**Document Number: BB/07/M010/20/MP/012**

<b>Approval Authority</b>	
<b>Position</b>	Projects Manager
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<b>Signature</b>	 09/11/13
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**Issue Classification**

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## Abbreviations

CM	Central Meridian
DECC	Department of Energy and Climate Change
DSV	Dive Support Vessel
ED50	European Datum 1950
MV	Motor Vessel
MNS LLC	Mobil North Sea LLC
NORM	Naturally Occurring Radioactive Material
OBM	Oil Based Mud
OSPAR	Oslo and Paris Convention
ROV	Remotely Operated Vehicle
ROVSV	ROV Support Vessel
UTM	Universal Transverse Mercator

# **1 INTRODUCTION**

## **1.1 Background**

The Linnhe Field was a subsea satellite approximately 4 miles north east of the Beryl Bravo platform, in Block 9/13c (refer to Figure 1), and approximately 220 miles from the Scottish mainland. The field was discovered in 1988, with the wildcat well 9/13a-40, and developed as single production well, 9/13c-40z, and single water injection well, 9/13-44z, tied back to Beryl Bravo. The field came onstream in October 1989 and production ceased in December 1991.

In 1992, the wells were decommissioned; plugged, abandoned and wellheads removed, and the pipelines were flushed and left filled with treated seawater. Subsequently, three, of the four pipeline risers have been re-used, and the three pipelines are disconnected at Beryl Bravo.

The remaining parts of the field; the protection structure, four pipelines, hydraulic / chemical umbilical and electrical umbilical were decommissioned in 2009 and 2010 in general accordance with the approved Decommissioning Programmes [Reference 1].

This Report summarises the work done to decommission the Linnhe Field installation and pipelines and highlights any deviations to the Decommissioning Programmes.

## **1.2 Executive Summary**

The removal of the Linnhe Field installation and pipelines was completed in two separate campaigns of work, the first was completed in August 2009 and the second in July 2010; the schedule given in the Decommissioning Programmes [Reference 1] was to complete all work in 2009; refer to section 3.1 below.

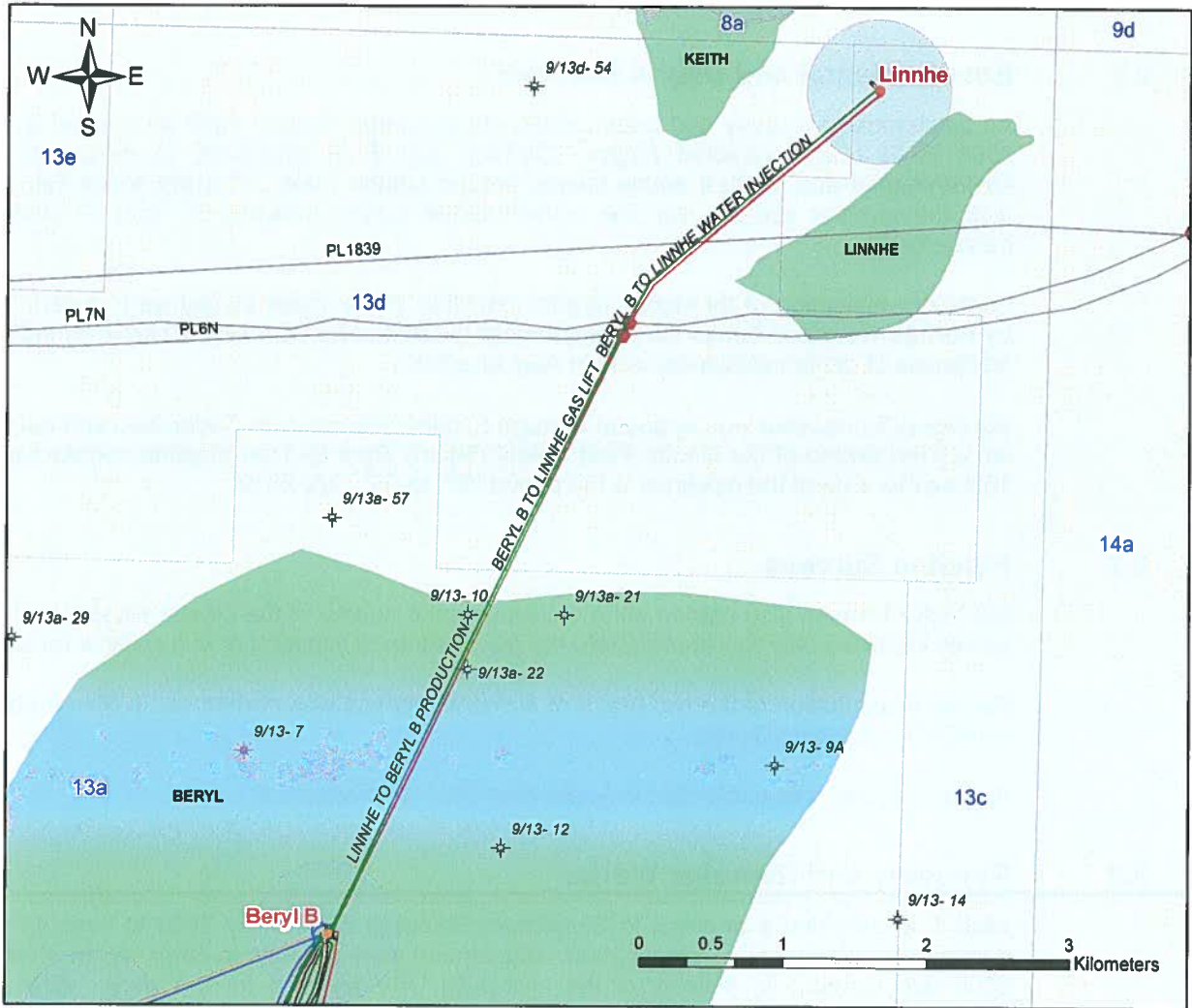
The installation was removed in accordance with the Programme; the entire protection structure, including the piles cut at no less than 0.6m below seabed, was recovered from the seabed for disposal onshore.

At the site of the installation, the pipelines were cut and removed outside of the trenches with plugs installed in the pipe ends. However, the adjacent seabed material did not consolidate to cover the plugged pipeline ends and loose gravel was used to cover the ends; refer to section 3.2 below. Additionally, sections of the pipelines in the eastern trench, of approximately 25m length, were removed at an area where the pipelines were spanning and the trench was shallow; <0.6m depth to top of pipe. At the latter site the pipeline ends were plugged and, due to the failure of the seabed material to consolidate, gravel was used to cover the pipe ends; refer to section 3.2 below. At the site of the protection structure, all protection / stabilisation materials and the pipeline valves and their protection structures were removed.

A seabed sampling and analysis survey was completed in 2008 and this found that the level and persistence of the hydrocarbon, and other contaminants, was less than found in the survey carried out in 1997 and was below the OSPAR 2006/5 threshold level [Reference 2]; refer to section 4 below.

Two separate seabed debris surveys were completed, in 2008 [Reference 2] and 2009, the former using sidescan sonar and the latter more detailed investigation using ROV. Of the twenty eight features identified in the 2008 survey, at eleven sites no debris was found. In the later survey, debris was removed at seven sites, four were found to be boulders and six, small, corroded metallic items remain in place; refer to section 3.3 below. Two additional items were found and removed during the work to remove the protection structure and pipe at Linnhe site.

After completion of the removal works in July 2010 the MV Moray Endeavour carried out a trawl sweep over the Linnhe Safety (500m) Zone and the extents of the remaining pipeline, up to 100m either side of the trenches. Two items of debris were found and removed during the sweep. The trawl sweep snagged on a large, ~3m diameter, boulder, losing the net. This has been added to the Seafish Kingfisher Fortnightly Bulletin.



**Figure 1** Beryl Bravo – Linnhe Field Pipeline Route (Source: Subsea 7)

## **2 OPERATIONS**

### **2.1 Environmental and Debris Surveys**

An environmental survey had been carried out at Linnhe Field in 1997 [reference 3]. In 2008 MNS LLC contracted Fugro ROVTech and ERT (Scotland) to carry out an environmental and seabed debris survey around Linnhe Field. The MV Victor Hensen took the seabed samples for the environmental survey between 6<sup>th</sup> and 9<sup>th</sup> August [reference 2].

Further investigation of the debris targets identified in the sonar survey were undertaken by ROVSV Normand Tonjer on 6<sup>th</sup> September 2009, and by DSV Bibby Topaz during the first phase of decommissioning work in August 2009.

MV Moray Endeavour was engaged through Scottish Fishermen's Federation and carried out a trawl sweep of the Linnhe Field Safety (500m) Zone and the pipeline corridor up to 100m either side of the pipelines in the period 22<sup>nd</sup> to 25<sup>th</sup> July 2010.

### **2.2 Pipeline Surveys**

MV Victor Hensen also carried out a sidescan sonar survey of the Linnhe pipelines. This survey identified only two areas where the pipelines were exposed or in a shallow trench.

Further investigation of the two areas of exposed pipeline was carried out in March 2010, by ROVSV Normand Tonjer.

A further survey was completed in September 2011. [Reference 4]

### **2.3 Recovery and Removal Works**

MNS LLC awarded a contract to Bluestream Services BV in May 2008 to execute the decommissioning work in August 2008. Bluestream were not able to carry out the work in 2008 due to delay in delivery of the new-build DSV planned for the work. After re-scheduling the work to be carried out in May 2009, Bluestream had further difficulties and went into liquidation in March 2009.

Tenders were issued to complete Linnhe Decommissioning work in 2009 and MNS LLC awarded the contract to Bibby Offshore Ltd in May 2009 with the offshore work planned for August 2009. The Bibby Topaz started work on 25<sup>th</sup> July 2009 with Linnhe Decommissioning part of a larger campaign of work in the Beryl Field. The Bibby Topaz completed work in-field on 23<sup>rd</sup> August 2009 but the work was not completed, due to a combination of equipment problems and the other commitments of the Bibby Topaz.

MNS LLC engaged a guard vessel to remain stationed at Linnhe Field location after the departure of DSV Bibby Topaz to ensure the materials remaining on the seabed did not present a hazard to others until the completion of the decommissioning work.

The remaining work at Linnhe was re-tendered and award made to Bibby Offshore Limited in April 2010 to complete the work prior to end June 2010 using DSV Bibby Sapphire. Due to delays with previous planned work, the Bibby Sapphire commenced work on 4<sup>th</sup> July 2010 and completed the removal of the Linnhe Field facilities on 21<sup>st</sup> July 2010.

As part of the Linnhe Decommissioning work scope four piles designated North, South, East and West were identified for cutting by divers. Given locations were taken from the provided AutoCAD Drawing.

After all cutting operations were completed a survey of the four cut piles was conducted using an ROV equipped with a profiler system. The ROV also took data before and after each pile in order to establish a mean seabed level.

The depths of all the cut piles were confirmed as greater than 600 mm below seabed. As found locations of the piles and pile depths were confirmed as: North pile (419896.38mE, 6614993.63mN, 803 mm below seabed), West pile (419889.99mE, 6614987.97mN, 648 mm below seabed), South pile (419906.38mE, 6614970.59mN, 784 mm below seabed) and East pile (419912.70mE, 6614977.59mN, 824 mm below seabed).

## 2.4 Disposal of the Linnhe Facilities / Materials

The MNS LLC waste disposal contractor, TWMA Ltd, was responsible for disposal of the various materials removed from Linnhe Field and took receipt of the materials on discharge at the quayside.

Description	Mass of Material (Te)			Treatment
	2009	2010	Subtotal	
Scrap Metal including grillage <sup>1</sup>	149.30	119.23	268.53	Recycled; 60 North Recycling, Lerwick, Shetland, and John Lawrie Group, Aberdeen.
Sand <sup>2</sup>	18.96	5.00	23.96	Re-used; South Nesting Marina, Shetland.
Hoses / Umbilicals / Slings	18.76	8.30	27.06	Landfilled; Sita, Stoneywood Landfill, Peterhead.
Electrical Cables <sup>3</sup>	-	2.10	2.10	Re-used; 60 North Recycling, Lerwick, Shetland
Slings <sup>4</sup>	-	0.57	0.57	Recycled; 60 North Recycling, Lerwick, Shetland.
Mattresses	38.06	-	38.06	Re-used; South Nesting Marina, Shetland.
Mattresses	31.08	-	31.08	Recycled; AM Smith, Aberdeen.
<b>TOTAL</b>	<b>256.16</b>	<b>135.20</b>	<b>391.36</b>	

### NOTES

1. The grillage, approximately 17.5 Te, was put onto the Bibby Topaz and Bibby Sapphire to provide protection to the vessel deck and for seafastening of the recovered materials and was disposed of with the recovered Linnhe materials.
2. Pipes were raised for cutting and when lowered afterwards sand was used to hold the severed and plugged ends down and bury it. Gravel bags were additionally used to weight the ends down and sand bags used to fill the top (sand bags were slit, bags are biodegradable in nature)
3. The electrical cables recovered in 2009 were disposed with the umbilicals.
4. The slings were used for lifting the various materials from seabed and handling onshore.

## **3 DEVIATIONS FROM THE PROGRAMME**

### **3.1 Schedule**

The Decommissioning Programme [Reference 1] included two alternatives for completing the decommissioning work; offshore work in August/September 2008 or offshore work in May 2009.

Bibby Offshore Limited started the decommissioning work, using DSV Bibby Topaz, on 25<sup>th</sup> July 2009 and this vessel continued to work on Linnhe Decommissioning intermittently, together with other diving work in Beryl Field, until 23<sup>rd</sup> August 2009. However, the work was not completed by the Bibby Topaz.

MNS LLC, in consultation with DECC, deemed that the completion of the work should be postponed until the summer months of 2010 due to the increase in risk if the work was to be completed in winter months with higher occurrence of inclement weather. DECC issued a Determination, in February 2010, approving the revision to the Decommissioning Programme and changing the date of completion of the work to 30 June 2010.

The completion of the Linnhe Decommissioning work was re-tendered and award made, in April 2010, to Bibby Offshore Limited for completion prior to 30 June 2010. The work did not actually start until 4<sup>th</sup> July 2010, due to Bibby's other commitments and vessel breakdown, and was completed on 21<sup>st</sup> July 2010.

### **3.2 Pipelines**

The seabed survey carried out in August 2008 [Reference 2] identified two sections of the pipelines in the eastern trench where the pipelines were exposed and potentially either in a shallow trench or outside of the trench. A more detailed survey of these areas was carried out in May 2010 and confirmed that at one area, approximately KP6.530 (near the edge of the Linnhe 500m safety zone), the pipes were in freespan for approximately 20m length and the depth of the top of pipe was <0.6m below the surrounding seabed. The detailed survey of the second area, at approximately KP3.870 (near the midpoint of the pipelines), found that although the pipes were visible in the trench they were at least partially buried and the depth of top of pipe was around 0.6m.

No subsequent work was carried out at the second area, KP3.870.

At KP6.530, the two 6" pipelines, PL660 and PL661, the hydraulic/chemical umbilical, PL663 to PL668, and the electrical umbilical were cut at either end of the spanning section, and the cut section recovered. The cut ends of the pipelines were plugged. It was not possible to cover the cut pipeline and umbilical ends as planned with local seabed spoil as the seabed did not consolidate when it was excavated from outside the trench and the spoil deposited to cover the ends. Loose gravel, of approximately 20mm diameter, was used to cover the pipeline ends; approximately 2m<sup>3</sup> was used at the southern cut ends and approximately 1m<sup>3</sup> at the northern cut ends.

The pipelines near to the Linnhe Field protection structure were cut and plugged, and the sections outside of the trenches removed, as described in the Decommissioning Programme. However, as the seabed at Linnhe Field was similar to that found at KP6.530, it was not possible to cover the pipeline ends using spoil excavated from nearby seabed and the pipeline ends were covered with loose gravel. Approximately 4m<sup>3</sup> of gravel was used to cover the pipelines, PL659 and PL660, in the western trench and approximately 3m<sup>3</sup> in the eastern trench.



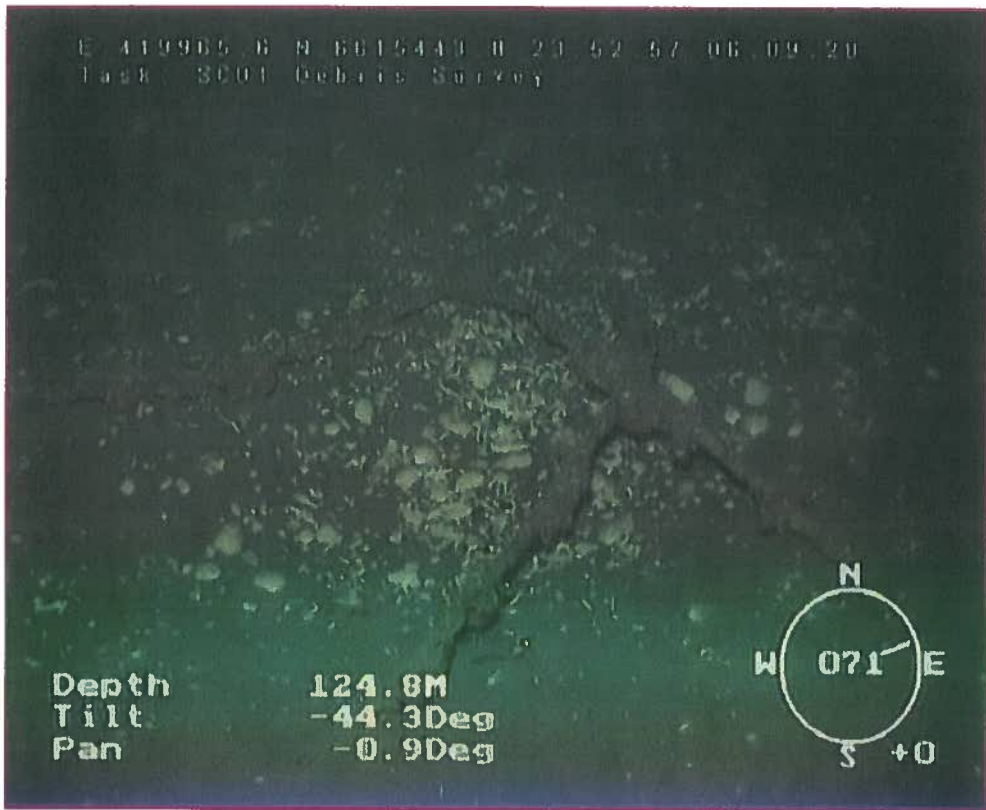
### 3.3 Seabed Debris

The seabed survey carried out in August 2008 [Reference 2] identified twenty-eight potential items of debris and all of these were further investigated during later work.

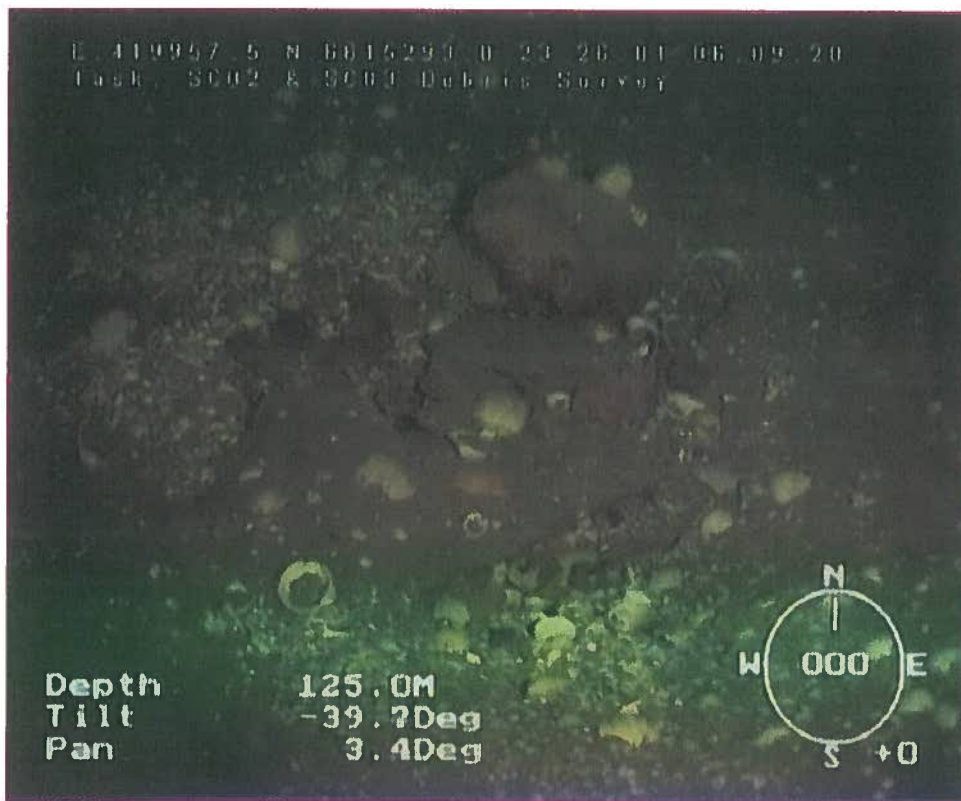
At eleven sites nothing was found. At four sites boulders were found and these remain *in situ*. Six items were confirmed as protection/stabilisation mattresses at Linnhe Field which were all removed by the Bibby Topaz. The Bibby Sapphire removed one item, and also removed three additional items, all located close to the Linnhe Protection Structure, that had not been identified in the original survey. MV Moray Endeavour removed two debris items that were found during the trawl sweep, neither of these had been identified in previous surveys.

Six small metallic items of debris were attempted to be recovered by ROV but due to the severe corrosion the debris disintegrated whenever recovery was attempted; their position is given in drawing EM-16772-DR-001, contained in section 8. The debris is too small to be detected by trawl sweep. In addition, MV Moray Endeavour lost some of its gear after snagging on a large boulder which had not been previously identified (see photograph below). The position of this boulder has been advised to Seafish Marine Services and is listed in the Hazard List within the Kingfisher Bulletin. The MV Moray Endeavour did not report any snags at the positions of the debris shown on the following photographs.

Note that the geographical co-ordinates given below are based on ED50, UTM Grid 31N, CM 3° E.



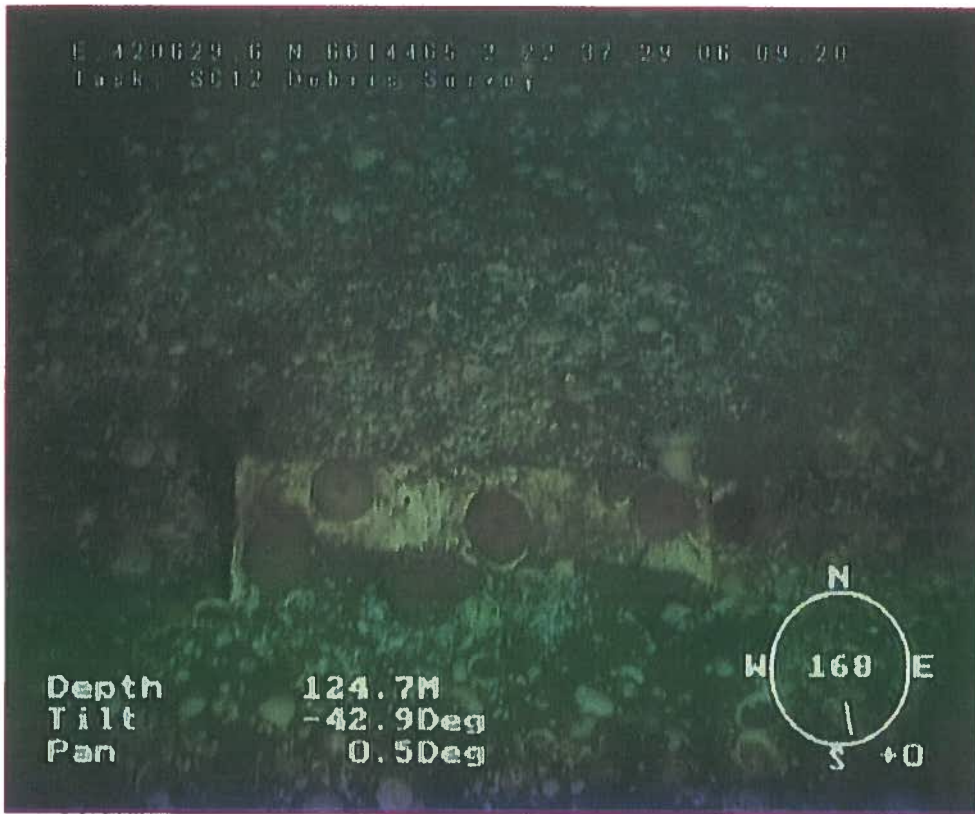
**Metallic and boulder debris at 419966E, 6615444N.**



**Metallic plate debris at 419958E, 6615293N.**



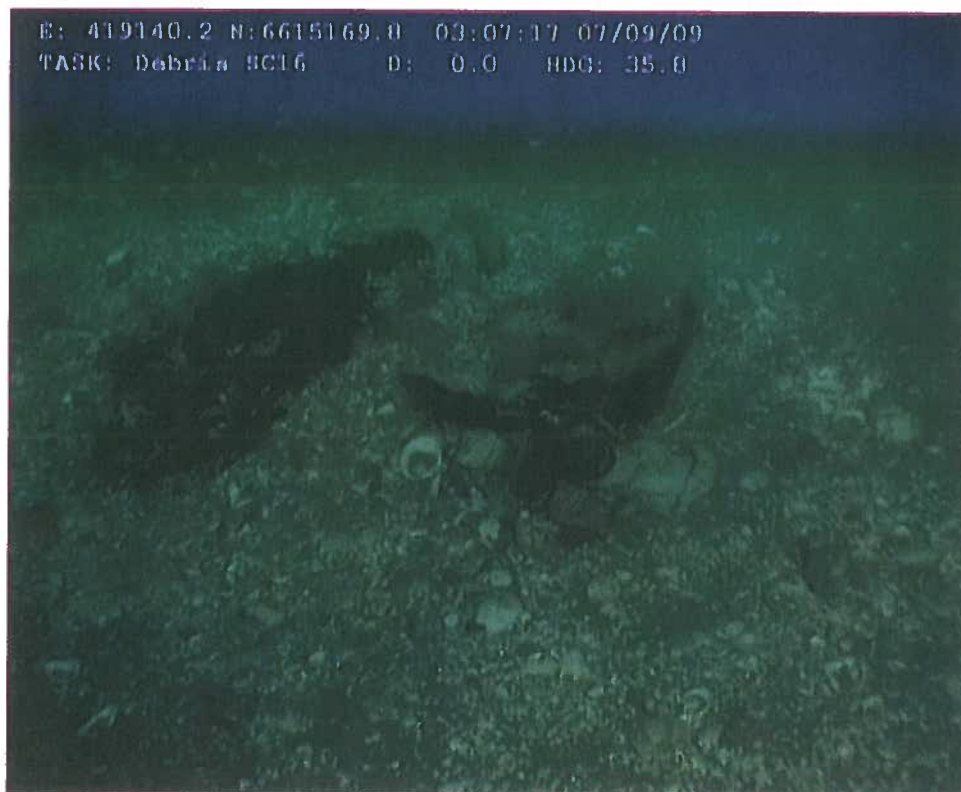
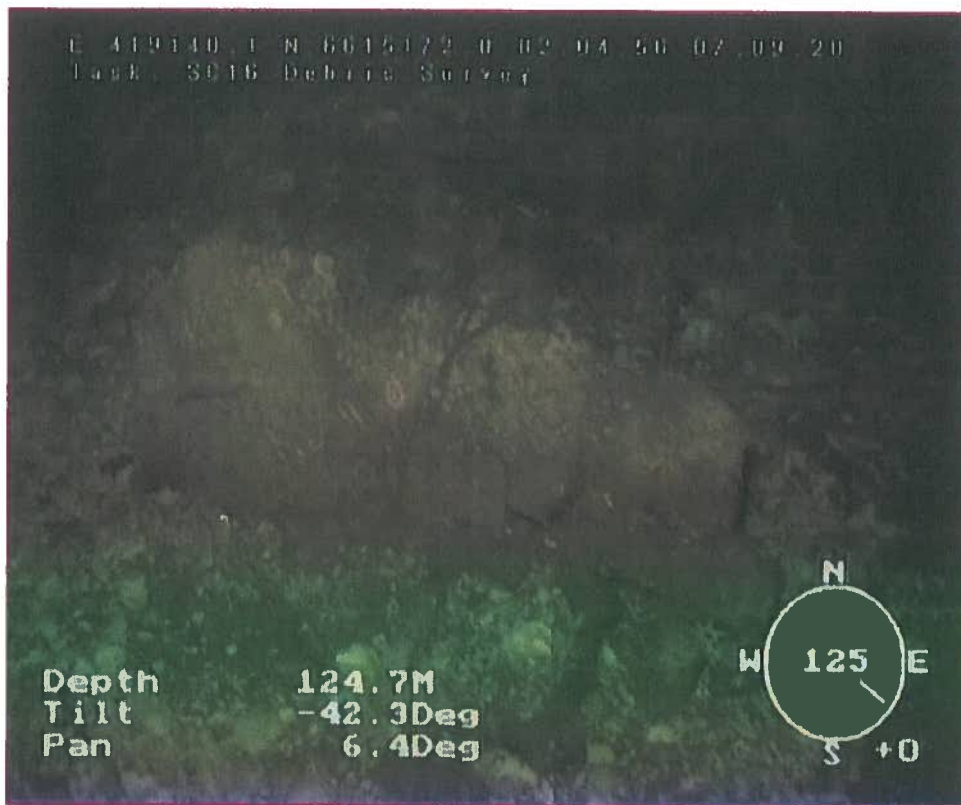
**Remains of oil drum at 419945E, 6615269N.**



Partially buried box debris at 420630E, 6614465N.



Grating debris at 418002E, 6613010N.



**Metallic debris at 419140E, 6615170N. The lower photograph shows the debris after it disintegrated when recovery was attempted by the ROV.**



**Large, approximately 3m x 3m x 2m, boulder and lost fishing gear at 418170E, 6613442N.**

## 4 ENVIRONMENTAL SURVEY

In August 2008, seabed samples were taken from a total of fifty-eight sites around the Linnhe Protection Structure, plus one reference site 500m from the Structure, and these were analysed to determine the presence and characteristics of the following;

- Hydrocarbon contamination; both total and aromatic hydrocarbons
- Heavy metal content (including barium)
- NORM
- Macrofauna

Analysis of the samples has been provided to DECC [Reference 2].

The sample sites were, to a large extent, at the same locations used in a previous seabed sampling survey, carried out in 1997 [Reference 3], and the analysis of the samples was similar to that carried out previously thereby allowing comparison of the analysis results between the two surveys.

Overall the analysis found a gross decrease in hydrocarbon and total barium contamination levels compared to the 1997 data. No NORM was found greater than the expected background level. The macrofaunal analysis found that, for the most part, the seabed communities comprised species indicative of undisturbed communities in the northern North Sea.

Seabed contamination by hydrocarbons, including OBM, was found to be between 21 and 35 times lesser than that recorded in 1997 and the area affected was similar in shape but over a lesser area. The greatest levels of contamination were within 200m of the protection structure, and the contamination was greatest towards the north east. The residual contamination,  $>50 \mu\text{g g}^{-1}$ , was found to be restricted to within 100m of the protection structure except on the north east axis, where it extended to 400m from the structure. The calculated persistence level was well below the OSPAR threshold value of  $500 \text{ km}^2\text{yr}$ .

The levels of man-made radio-nuclides were close to or below the limit of detection indicating no significant source of radiation, and all measured levels of radioactivity were within the 'radioactive and exempt' category of radioactive wastes.

The macrofauna was, with the exception of the sample site closest to the protection structure, to be similar to that expected in this area of the northern North Sea. At the closest sample site to the protection structure the analysis found very low numbers of taxa and individuals, and low diversity.

## 5 PROJECT COSTS

Gate 2 Estimate	Gate 3 Estimate	Actual Cost
£5,306k	£6,095k	£7,558k

### NOTES

1. The delay in completing the work between 2009 and 2010 required a guard vessel to be on station at Linnhe and the cost of this vessel is included here and was not envisaged in the Programme's cost estimate.
2. The cost difference is due to the execution of the work being in both 2009 and 2010 and a greater than estimated duration taken to carry out the work.
3. The Programme estimate envisaged the use of a dedicated supply vessel to receive materials offshore and transport to port. The DSV's and the normal Beryl Field supply vessel were used to transport the materials to shore for recycle/disposal.



## **6 FUTURE MONITORING AND SURVEYS**

### **6.1 Installation Surveys**

A survey of the Linnhe Protection Structure shall be planned to coincide with the pipeline survey in 2017. This survey shall extend to confirm the position of the severed piles.

### **6.2 Pipeline Surveys**

Agreement was made with DECC that a future post-decommissioning survey is required. This is scheduled for 2017.

In accordance with the Decommissioning Program, the pipelines within the Beryl Bravo safety (500m) zone shall be decommissioned at the time of the Beryl Bravo decommissioning.

### **6.3 Environmental Surveys**

The analysis of the seabed samples taken in 2008 found that the level of hydrocarbon contamination around Linnhe Field was between 21 and 35 times lower than that recorded in 1997. As there has been no drilling or hydrocarbon production activity at Linnhe since the cessation of production, in 1992, the level of hydrocarbon contamination is expected to continue to fall and therefore, no further environmental sampling and analysis is planned for Linnhe Field.

There is no plan for further environmental surveys of this area.

## 7

### REFERENCES

1. Linnhe Subsea Facilities Decommissioning Programme, document number BB/07/20/MP/001.
2. Linnhe Field Decommissioning Seabed Survey Summary Report, document number BB/07/M002/20/MP/010
3. Mobil Linnhe Field; Environmental Survey to Delineate the Extent of Drill Cuttings on the Seabed, December 1997, document number ERT 97/285/P003
4. Subsea 7 Evaluation of Trench Historical Survey Data, document number AB-S-RP-02246

## **8 ATTACHMENTS**

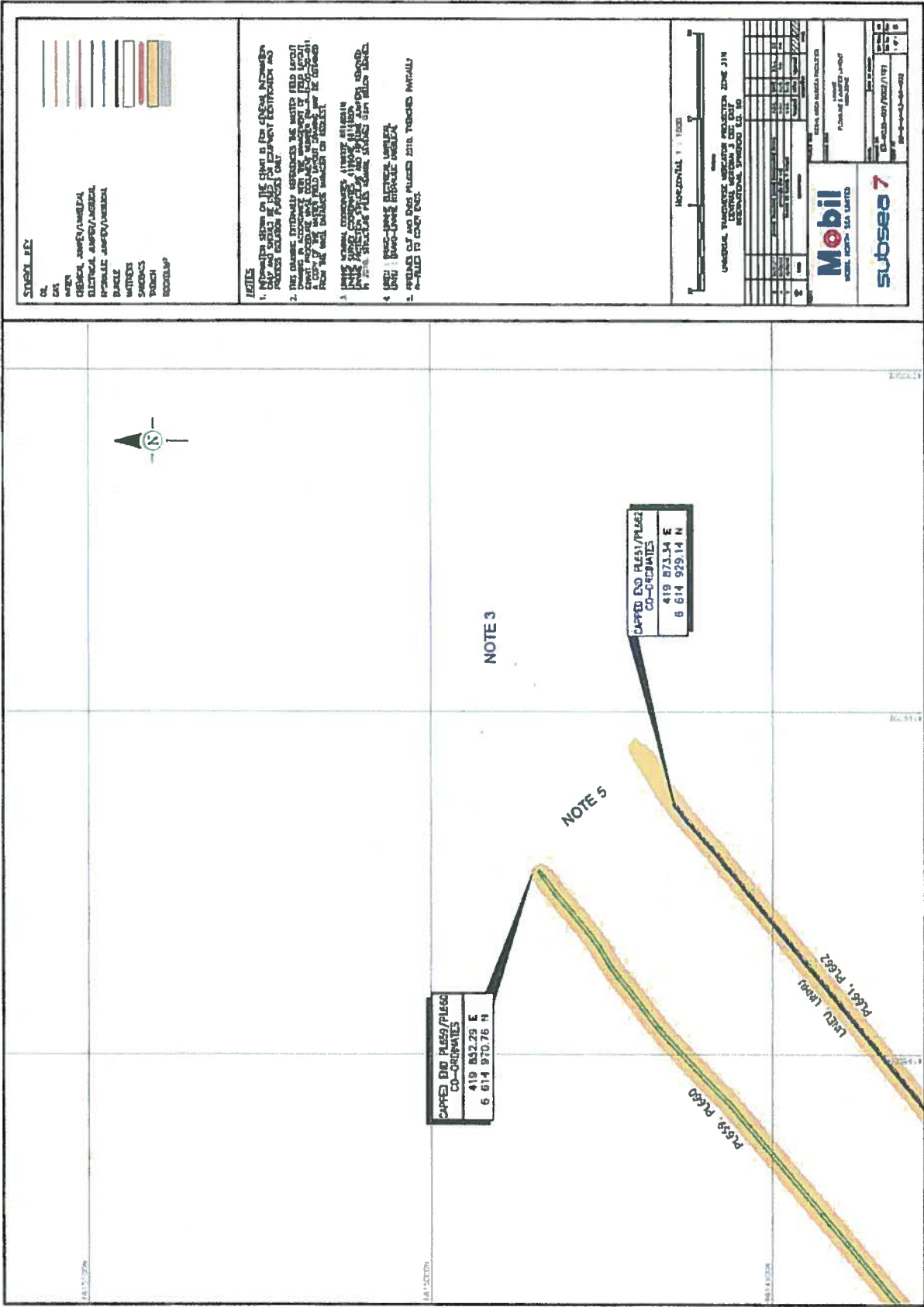
### **8.1 Drawings**

The following drawings are included overleaf;

EM-16772-DR-001, revision 4      Post Decommissioning Status

BB-D-U-63-GA-002, revision B      Linnhe Flowline & Jumper Layout 100m zone





10/11/2011

10/11/2011

10/11/2011

## 8.2 Clearance Certificate

### SFF SERVICES LIMITED

24 Rubislaw Terrace · ABERDEEN · AB10 1XE  
(Registered Office)

Telephone: 01224 646966 Fax: 01224 647078  
e-mail: [sffservices@sff.co.uk](mailto:sffservices@sff.co.uk)  
Website: [www.services.sff.co.uk](http://www.services.sff.co.uk)




Our ref: MJS/AMG

9 August 2010


#### MOBIL NORTH SEA LLC : LINNHE FIELD DECOMMISSIONING PROGRAMME : POST DECOMMISSIONING CLEARANCE / VERIFICATION TRAWL SWEEPS

This is to certify that the MV "Moray Endeavour" BCK 17 has carried out a post decommissioning sea bed / trawl verification sweep of the Linnhe Field concerning the area marked on the attached Chartlet (Appendix 1) and has found to the best of our knowledge and belief and using best endeavours and best practice available that there are no Linnhe related oilfield obstructions remaining that will affect current and future fishing activity in the defined area and that in all respects the Linnhe Field has been successfully cleared of all equipment / infrastructure. Observation Note (1) below refers:

Signed for on behalf of the Owners of the MV "Moray Endeavour" BCK17

  
.....  
Fraser Smith (Skipper)

Signed for on behalf of SFF Services Limited

  
.....  
Michael J Sutherland, Director of Operations

Note (1): A Severe Fast was encountered at position 59 deg 38.950 N, 01 deg 32.820 E. Subsequent investigation by an ROV Vessel contracted by Mobil North Sea LLC identified a naturally occurring feature at said location described as a large boulder (3 metres by 3 metres by 2 metres). Mobil North Sea LLC promulgated information to Fishermen on this natural hazard through the Kingfisher Fortnightly Bulletin.



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