THAMES COMPLEX

DECOMMISSIONING

PROGRAMMES

DOCUMENT CONTROL

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	(Inst. = Installations. P/L = Pipelines)			
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A. TABLE OF TERMS AND ABBREVIATIONS

Abbreviation	Explanation
AP	Alpha Production (The Production Platform, AP)
AR	Alpha Reception (The Riser Platform, AR)
AW	Alpha Wellhead (The Wellhead Platform, AW)
CoP	Cessation of Production
DECC	Department of Energy and Climate Change
DPs	Decommissioning Programmes
DSV	Diving Support Vessel
ES	Environmental Statement
ESDV	Emergency Shut Down Valve
FPSO	Floating Production, Storage and Offloading System
HLV	Heavy Lift Vessel
LAT	Lowest Astronomical Tide
M	Metres
MEG	Monoethylene Glycol
NUI	Normally Unattended Installation
OGUK	Oil & Gas UK
OPEP	Oil Pollution Emergency Plans
ORSL	Oil Spill Response Ltd
OSPAR	Oslo and Paris Convention
Perenco	Perenco (UK) Ltd
P & A	Plug and Abandonment
PL	Pipe Line
QRA	Quantitative Risk Assessment
SLV	Sheer Leg Vessels
SNS	Southern North Sea
SWAT	Suspended Well Abandonment Tool
UKCS	UK Continental Shelf

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1. EXECUTIVE SUMMARY

1.1 Combined Decommissioning Programmes

This document contains two Decommissioning Programmes (DPs). (1) the Thames Complex Installations and (2) the Thames pipelines. A separate programme for each set of associated notices under Section 29 of the Petroleum Act 1998 is incorporated within this document.

Thames area Decommissioning Project activities include Thames Complex, Arthur, Gawain, Horne and Wren, Wissey, Thurne and Orwell work scopes. There may be constraints that require some fields for the well and facility decommissioning to be stand alone projects. There are separate Decommissioning Programmes associated with the whole Thames area Decommissioning

The Cessation of Production (CoP) date was 14th May 2014. The CoP documentation was approved by DECC.

PUK have explored all avenues for continuing production, these include the addition of offshore compression, greater liquid handling and subsea well stimulation. Therefore PUK concluded that due to reduction of gas production, operations were uneconomical so CoP was declared in preparation for decommissioning.

1.2 Requirement for Decommissioning Programme(s)

Installation: In accordance with the Petroleum Act 1998, Perenco (UK) Ltd (Perenco) as operator of the Thames field complex and on behalf of the Section 29 notice holders are applying to the Department of Energy and Climate Change (DECC) to obtain approval for decommissioning the Thames complex installations detailed in Section 2 of this document. (See also Section 8 - Partner(s) Letter(s) of Support).

Pipeline(s): In accordance with the Petroleum Act 1998, Perenco as operator of the Thames field complex export line PL370, Bure 'O' PL371, Yare 'C' PL372, Bure West PL1635 and Thurne PL1637 pipelines and Bure 'O' PL374, Yare 'C' PL373, Bure West PL1636 and Thurne PL1638 umbilicals (see Table 2.3) and on behalf of the Section 29 notice holders are applying to DECC to obtain approval for decommissioning the pipelines detailed in Section 2 of this document. (See also Section 8 – Partner(s) Letter(s) of Support).

In conjunction with public, stakeholder and regulatory consultation, the decommissioning programmes are submitted in compliance with national and international regulations and DECC guidelines. The schedule outlined in this document is for a five year decommissioning project plan due to begin in Quarter 3 2014.

1.3 Introduction

The Thames field complex is in Block 49/28 of the Southern North Sea, 80 kilometres North East of the Bacton Terminal off the coast of Norfolk. The co-ordinates of the Thames AP Platform are: Latitude: 53° 05' 02.2214" N, Longitude: 02° 32' 53.4770" E, equivalent UTM co-ordinates are: 5881816.8 North, 469664.2 East. (See table 2.1)

It comprises of five fields surrounding the Thames platform: Thames, Bure Oscar, Bure West, Yare, Wensum and Thurne. Field development began in the 1980s, with first gas from the Thames field (platform wells) in 1986 and subsequent subsea wells tied back and brought online, the last in 2008.

The Deben field was originally part of the Thames complex and installed and commissioned in 1998. Gas was exported back to the Thames platform via the Deben wellhead until 1998. In 2007 the Deben wellhead was used for the Thurne field and renamed the Thurne subsea well.

All gas from the fields is produced through the Thames three bridge-linked platforms: the wellhead (AW) platform, the processing and quarters (AP) platform and the reception platform (AR). After separation and metering, production is exported through a 24" pipeline to the Perenco gas terminal at Bacton, Norfolk.

Thames Platform Estimated Weights, Tonnes			
	AP	**AW**	**AR**
Topsides	6,488	2,035	406
Jacket	1,100	950	600

The Thames complex installation acts as the gathering station for the subsea wells Bure O, Bure West, Gawain, Orwell, Arthur, Yare C, Thurne, Wissey and the Horn and Wren NUI.

The Thames complex installation is a normally attended platform which can accommodate up to 47 personnel onboard.

The Thames complex is approximately 19.5m from LAT to the cellar deck and 43m from LAT to the Helideck. The jacket is in 32.5m water depth.

Following public, stakeholder and regulatory consultation, the decommissioning document for the Thames complex installation is submitted without derogation and in full compliance with DECC guidelines. The decommissioning document explains the principles of the removal activities and is supported by an Environmental Impact Assessment.

The Environmental Impact Assessment covers the whole Thames infrastructure which spans across 13 blocks (48/28-30, 49/26-30, 50/26, 52/3, 53/2-4), the Thames Platforms and the subsea installations Bure O, Bure West, Thurne, Wissey, Yare C, Arthur, Orwell, Gawain and the satellite platform Horne & Wren. This Decommissioning Programme is for the Thames Platforms and subsea installations Bure O, Bure West, Yare C and the Thurne protection frame, flowline and umbilical.

1.4 Overview of Installation(s)/Pipeline(s) Being Decommissioned

1.4.1 Installation(s)

Table 1.1: Installation(s) Being Decommissioned					
Field Name	Thames	Quad/Block	49/28	Number of Platforms	3
Distance from nearest UK coastline (km)	80	Distance to median (km)	230	Platform type	Small Steel Jackets
Number of Subsea Installation(s)	5	Number of Drill Cuttings Pile(s):	None	Topsides Weight (Te): Jacket Weight (Te):	8929 4823
Number of Wells: Platform: Subsea:	5 Platform Wells 4Subsea Wells (including 1 subsea suspended well under the AW jacket)	Production Type (Oil / Gas /Conde)	Gas	Water Depth (m)	32.5

Note: Jacket weight includes the total weight of the piles @ 2173 Te
Topsides weight includes the weight of the bridges @ 243 Te

Table 1.2 Installation(s) Section 29 Notice Holders Details		
Section 29 Notice Holder(s)	**Registration Number**	**Equity Interest (%)**
Perenco UK Ltd	04653066	23.33
Tullow Oil SK Ltd	05287330	66.67
Centrica Resources Limited	02855151	10
GB Gas Holdings	03186121	0
Tullow Oil Plc	03919249	0

1.4.2 Pipeline(s)

Table 1.3: Pipeline(s) Being Decommissioned		
Number of Pipeline(s)/ Umbilical(s)	5/4	(See Table 2.3)

Table 1.4: Pipeline(s) Section 29 Notice Holders Details		
Section 29 Notice Holder(s)	**Registration Number**	**Equity Interest (%)**
Perenco UK Ltd.	04653066	23.33
Tullow Oil SK Ltd.	05287330	66.67
Centrica Resources Limited	02855151	10
GB Gas Holdings	03186121	0
Tullow Oil Plc	03919249	0

1.5 Summary of Proposed Decommissioning Programme(s)

Table 1.5: Summary of Decommissioning Programmes		
Selected Option	Reason for Selection	Proposed Decommissioning Solution
1. Topsides		
Complete removal, re-use or recycle	Complies with OSPAR requirements and maximizes recycling of materials.	Decontaminate the topsides and remove the topsides and linking bridges either by HLV or combination of crane vessel and piece small dismantling. Re-use followed by recycle and then landfill will be the prioritised options for the topsides.
2. Jackets		
Complete removal, re-use or recycle	Leaves clean seabed, removes a potential obstruction to fishing operations and maximizes recycling of materials. To comply with OSPAR requirements.	Jacket legs will be removed and dismantled at an onshore location. Re-use followed by recycle and then landfill will be the prioritised options. Piles will be severed at least -3.0m below the seabed. If any practical difficulties are encountered PUK will consult DECC.
3. Subsea Installations		
Wellhead protection frames will be removed by HLV or crane vessel	To remove all seabed structures and leave a clean seabed. To comply with OSPAR requirements.	Wellhead protection frames will be removed along with the top sections of piles. Piles for wellhead protection structures will be severed below the seabed level at such a depth to ensure that any remains are unlikely to become uncovered. Piles will be severed at least -3.0m below the seabed. If any practical difficulties are encountered PUK will consult DECC

Table 1.5: Summary of Decommissioning Programmes – cont'd		
Selected Option	Reason for Selection	Proposed Decommissioning Solution
4. Pipelines, Flowlines & Umbilical		
The 24" export trunk line (PL370) will be pigged, flushed and left buried in situ. Interfield pipelines and umbilicals (see table 2.3 for detailed list) will be flushed and left buried in situ.	Minimal seabed disturbance, lower energy usage, reduced risk to personnel engaged in the activity, pipelines are sufficiently buried and are stable.	The 24" export line along with the interfield flowlines and umbilicals will be left in situ, with the cut ends re-buried below the seabed level at such a depth to ensure that any remains are unlikely to become uncovered. Surveys indicate pipelines and umbilicals will remain buried with flooding. Degradation will occur over a long period within seabed sediment and not expected to represent a hazard to other users of the sea. North Norfolk District Council and Crown Estates will be consulted regarding the decommissioning of the export line from the low water mark to Bacton terminal.
5. Well Abandonment Operations		
Plug and abandoned to comply with the HSEs "Offshore Installations and Wells (Design and Construction, etc) Regulations 1996" and in accordance with O&GUK for the Suspension and Abandonment of Wells.	Meets DECC and HSE regulatory requirements.	A Master Application Template (MAT) and the supporting Subsidiary Application Template (SAT) will be submitted in support of works carried out. A PON 5 will also be submitted to DECC for application to abandon the Wells.
6. Drill Cuttings		
Leave in place to degrade naturally	Cuttings were widely dispersed and fall below OSPAR 2006/5 thresholds.	Left undisturbed on seabed
7. Interdependences		
Not applicable.		

1.6 Field Location/Layout and Adjacent Facilities

Figure 1.1: Thames location within Southern North Sea

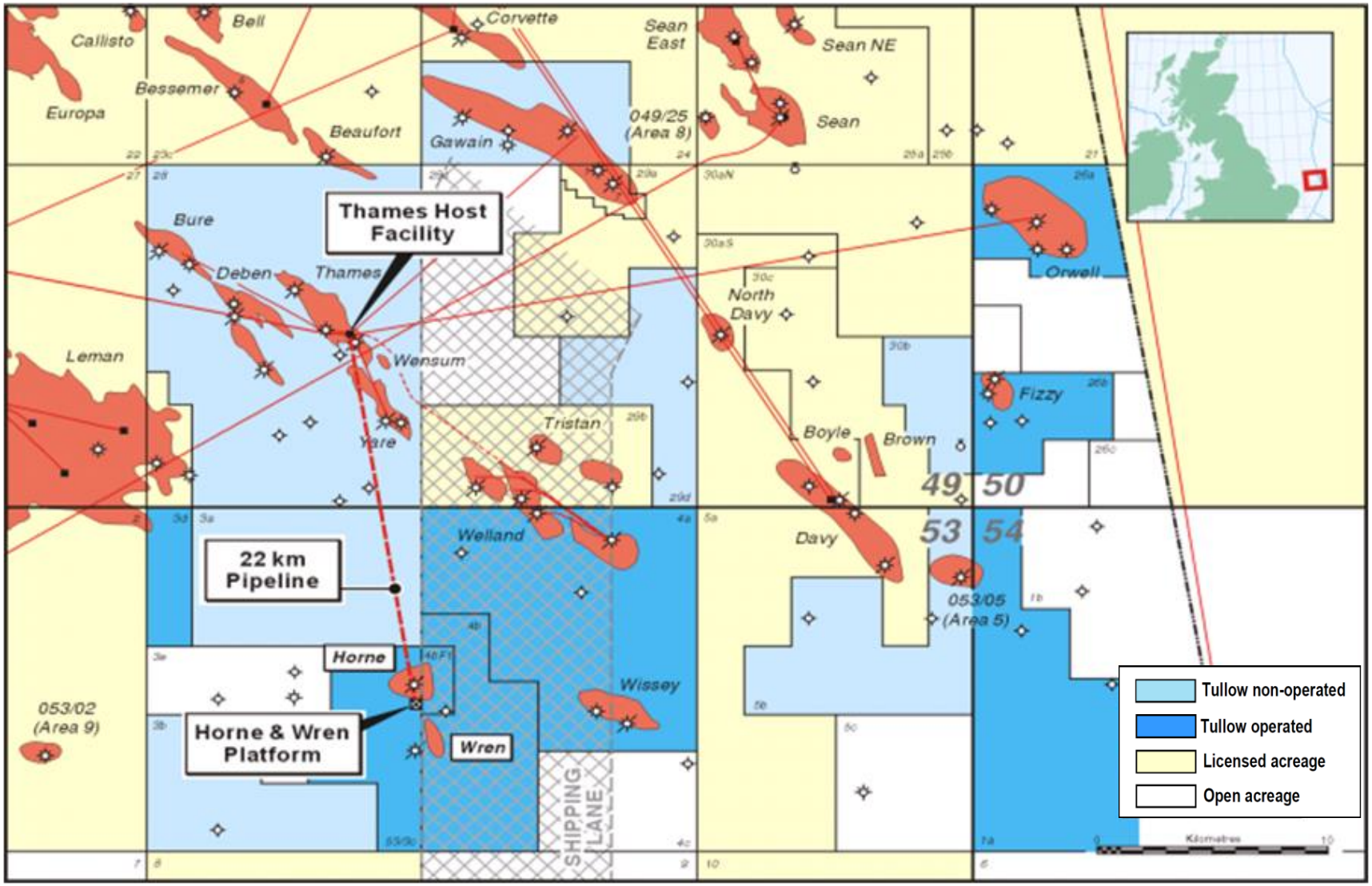
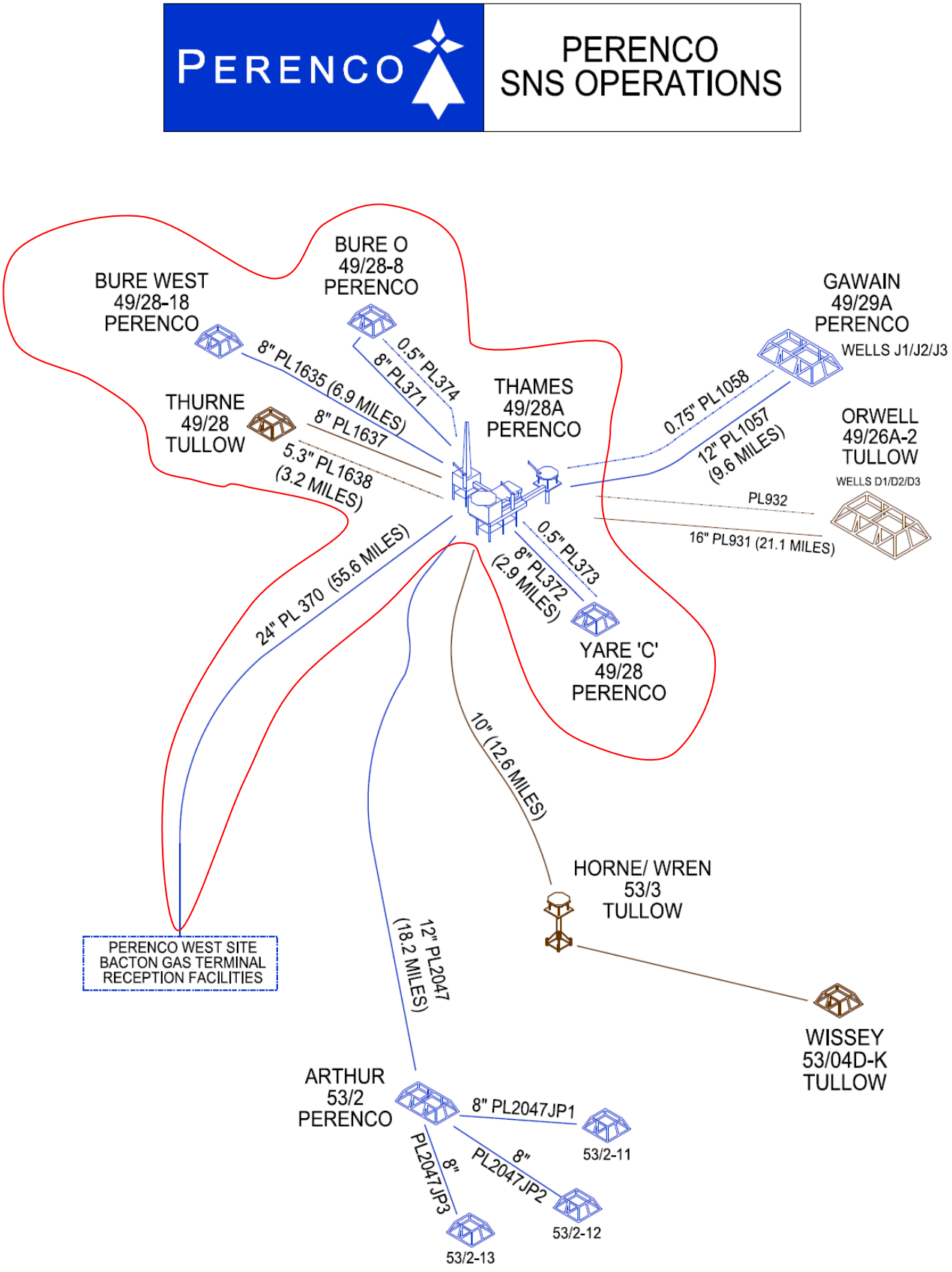


Figure 1.2: Field Layout



Key: Red line indicates the assets affected by this decommissioning programme.

Figure 1.3 – Field layout schematic

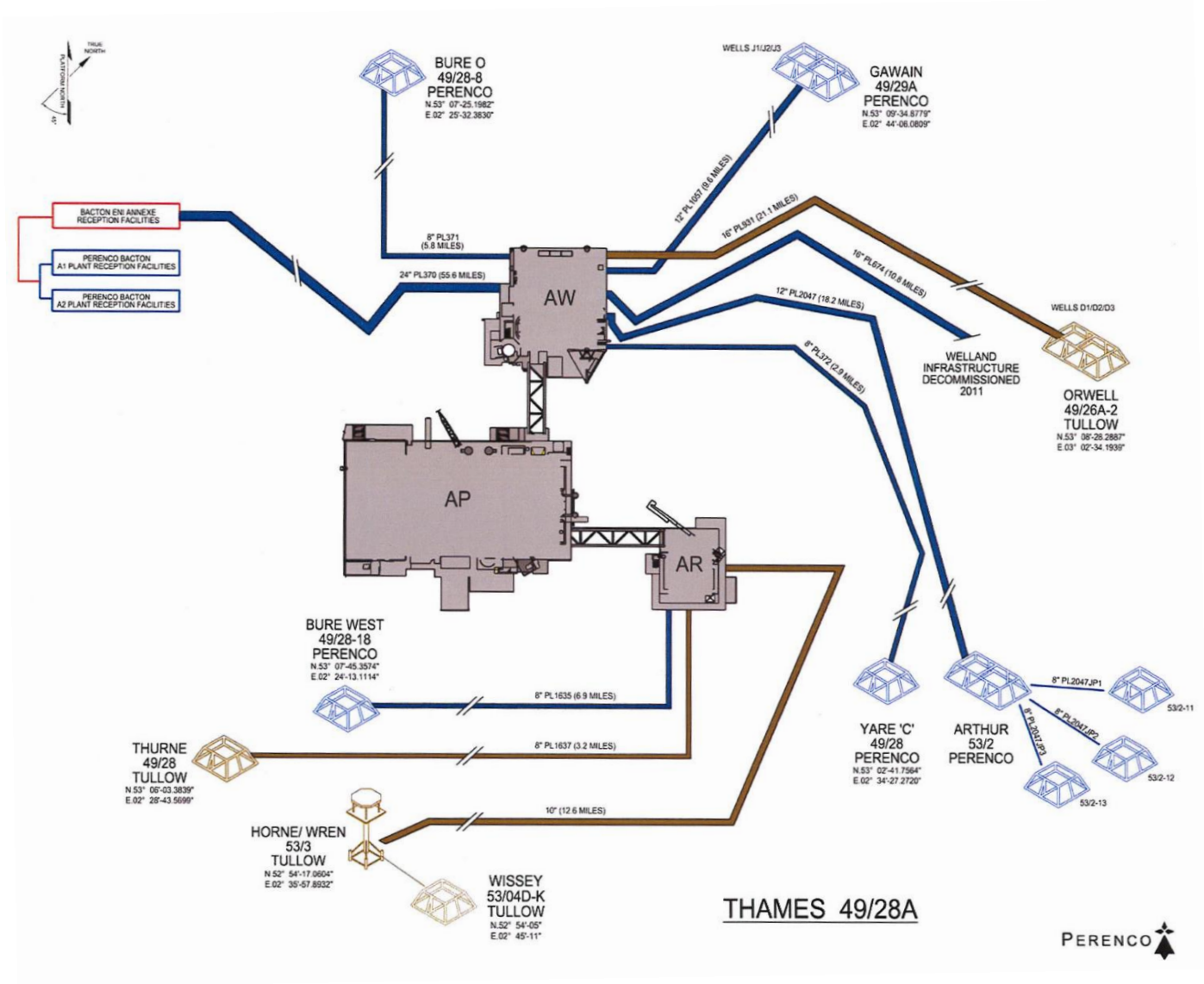
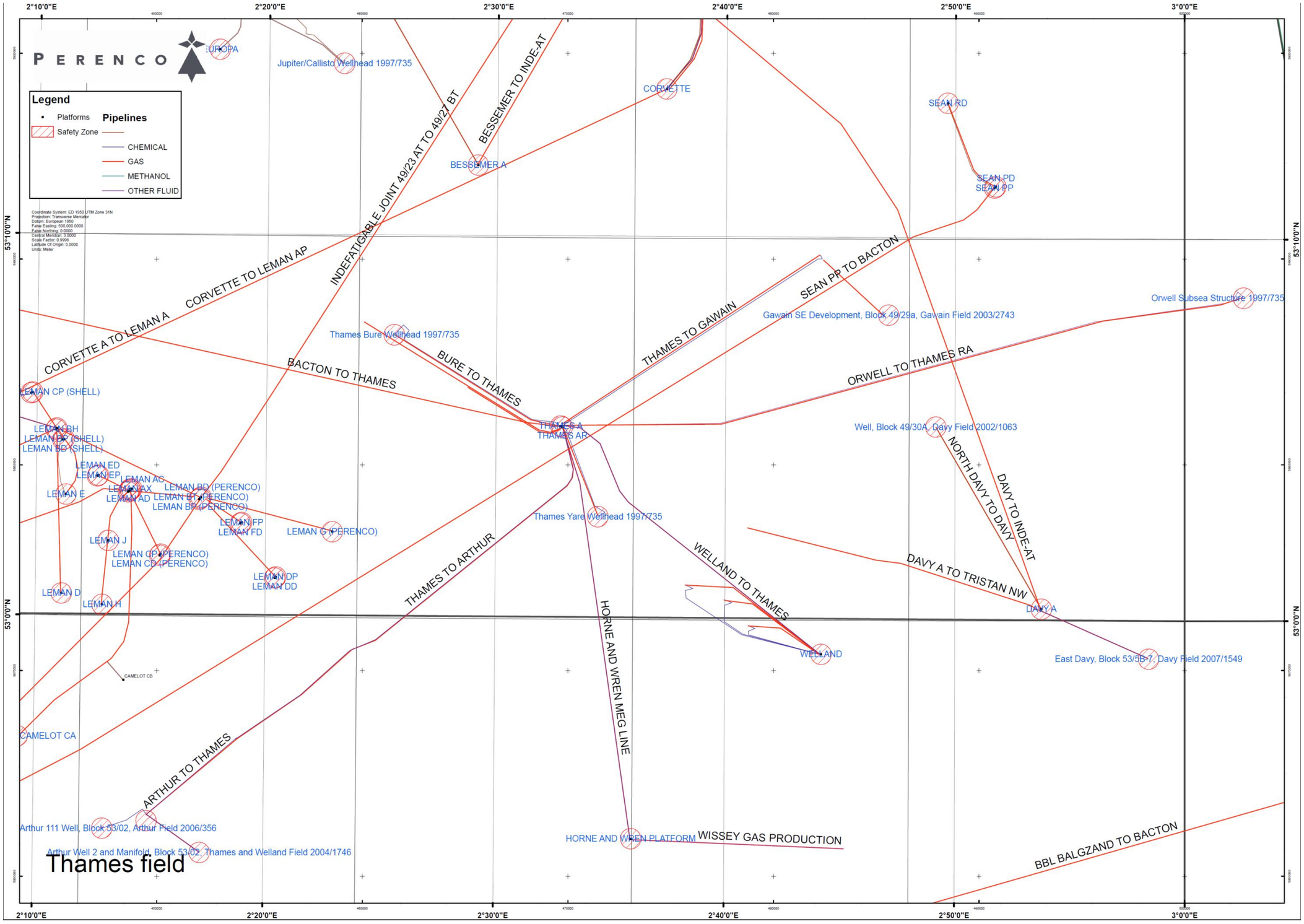


Table 1.6 List of Adjacent Facilities					
Owner	**Name**	**Type**	**Distance/Direction**	**Information**	**Status**
Perenco	Gawain	Subsea well	From Gawain well to Thames is 15.4km East North East from Thames. 53° 09' 34.8779" North 02° 44' 06.0809" East	Gas production from Gawain subsea wells flows into Thames AW platform	Operational
Tullow	Orwell	Subsea well	From Orwell well to Thames is 34km East from Thames. 53° 08' 28.2887" North 03° 02' 34.1939" East	Gas production from Orwell flows into Thames AW platform	Not Operational
Tullow	Thurne	Subsea well	From Thurne well to Thames is 5.2km North North East from Thames. 53° 06' 03.3839" North 02° 28' 43.5699" East	Gas production from Thurne flows into Thames AR platform	Operational
Tullow	Horne & Wren	NUI	From Horne & Wren to Thames is 20.3km South East of Thames 52˚ 54 06 North 02˚ 35 57 East	Gas production from Horn & Wren flows into Thames AR platform	Operational
Tullow	Wissey	Subsea well	From Wissey to Thames is 30.9km South East of Thames 52˚ 54 05 North 02˚ 45 11 East	Gas production from Wissey flows into Horn & Wren NUI	Operational
Perenco	Arthur	Subsea well	From Arthur well to Thames is 29.3km South West from Thames. 52° 54' 47.6811" North 02° 14' 56.5181" East	Gas production from Arthur flows into Thames AW platform.	Operational
Perenco	Davy	NUI	From Davy platform to Thames is 22km South East of Thames	Gas production from Davy flows into Inde 23A platform	Operational
Decommissioning of these pipelines will have no impact to adjacent facilities.					

Figure 1.4: Adjacent Facilities and crossings



1.7 Industrial Implications

Pipeline cleaning (base case is to flush and clean from Thames complex back to individual fields. If this is not possible, the uncompleted scopes will be included in the DSV phase). The project includes the following key activities:

- DSV (pipeline severance; decommissioning of stabilisation materials).
- Well Plugging & Abandonment.
- Removal of subsea well heads and well head protection structures.
- Removal of platforms and jackets

The above activities will need to be planned carefully to recognise synergies and efficiencies, however the engineering and planning will be completed to understand the possibilities of potential integration of various activities.

Strategically, suppliers with working vessels and assets on the UKCS will be favoured. All contracts will be competitively tendered or novatated to either party.

Current operational contracts for items such as environmental permitting, potential vessel sharing and logistic support will be implemented to support decommissioning activities.

2 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

2.1 Surface Facilities (Topsides/Jacket(s)/FPSO etc)

Table 2.1: Surface Facilities Information

Name	Facility Type*	Location** ED50 Format	Topsides/Facilities		Jacket (if applicable)			
			Weight (Te)	No of modules	Weight (Te)	Number of Legs	Number of piles	Weight of piles (Te)
Thames AP	Fixed steel jacket	53°05'01.8086"N 2°32'49.6117"E	6488	1	1100	6	6	1050
Thames AW	Fixed steel jacket	53°05'03.5788"N 2°32'49.6254"E	2035	1	950	4	4	748
Thames AR	Fixed steel jacket	53°05'02.2214"N 2°32'53.4770"E	406	1	600	4	4	375

Note: Topsides/facilities weights include the bridges

2.2 Subsea Installations and Stabilisation Features

Table 2.2: Subsea Installations and Stabilisation Features				
Subsea installations and Stabilisation Features	Number	Size/Weight (Te)	Location(s) and SD50 Format	Comments/ Status
Wellhead(s)	4	42	Bure West, (53° 07' 45.3574" N 02° 24' 13.1114" E) Bure 'O', (53° 07' 25.1982" N 02° 25' 32.3830" E) Yare 'C', (53° 02' 41.7564" N 02° 34' 27.2720" E) Thames A5 (53°05'03.5788"N 2°32'49.6254"E)	Thames A5 is a suspended subsea well under the AW jacket
Protection Frame(s)	4	360	Bure West, Bure 'O', Yare 'C', Thurne	Piled
Template	1	45	Under Thames AW (53°05'03.5788"N 2°32'49.6254"E)	Attached to a conductor guide
Concrete mattresses	50	506	Within 500m of Thames complex (53°05'01.8086"N 2°32'49.6117"E)	Drawing enclosed
Grout bags	31	0.8	Within 500m of Thames complex (53°05'01.8086"N 2°32'49.6117"E)	Drawing enclosed
Frond Mats	40	456	Within 500m of Thames complex (53°05'01.8086"N 2°32'49.6117"E)	Drawing enclosed
Rock Dump	5	13,000	Within 500m of Thames complex (53°05'01.8086"N 2°32'49.6117"E)	Drawing enclosed

2.3 Pipelines / Flowlines / Umbilicals

Table 2.3: Pipeline/Flowline/Umbilical Information									
Description	Pipeline No. (as per PWA)	Diameter (inches)	Length (km)	Composition[1]	Contents[2]	From – To End Points	Condition	Status[3]	Contents[4]
Export line	PL370	24	89.5	Steel with concrete coating	Gas	Thames AW to Bacton	Trenched and buried, 7,942.4 meters exposed. Free spans 48. Total length of free spans 412.48 meters	Operational	Hydrocarbons
Bure O flowline	PL371	8	9.3	Steel with concrete coating	Gas	Bure O well to Thames AW	Trenched and buried, 83.51 meters exposed. No free spans	Operational	Hydrocarbons
Yare C flowline	PL372	8	4.8	Steel with concrete coating	Gas	Yare C well to Thames AW	Trenched and buried, 21.44 meters exposed. 1 free span 1.2 meters	Operational	Hydrocarbons
Bure West flowline	PL1635	8	11.2	Steel with concrete coating	Gas	Bure W well to Thames AR	Trenched and buried, 446.59 meters exposed. 6 free spans, total length of free spans 51.16 meters	Operational	Hydrocarbons

Table 2.3: Pipeline/Flowline/Umbilical Information – cont'd									
Description	**Pipeline No. (as per PWA)**	**Diameter (inches)**	**Length (km)**	**Composition[1]**	**Contents[2]**	**From – To End Points**	**Condition**	**Status[3]**	
Yare C Umbilical	PL373	4	4.8	Umbilical	Chemicals	Thames AW to Yare C well	Trenched and buried, 129.87 meters exposed. No free spans.	Operational	Chemicals in line
Bure O Umbilical	PL374	4	9.3	Umbilical	Chemicals	Thames AW to Bure O well	Trenched and buried, 906.14 meters exposed. No free spans	Operational	Chemicals in line
Bure West Umbilical	PL1636	5	11.2	Umbilical	Chemicals	Thurne to Bure West	Trenched and buried, 119.13 meters exposed. 1 free span, 3.52 meters	Operational	Chemicals in line
Thurne flowline	PL1637	8	4.6	Steel with Fusion Bonded Epoxy	Gas	Thames AR to Thurne	Trenched and buried, 86.6 meters exposed. No free spans.	Operational	Hydrocarbons
Thurne Umbilical	PL1638	5	4.5	Umbilical	Chemicals	Thames AR to Thurne (formally known as Deben)	Trenched and buried, 86.6 meters exposed. No free spans.	Operational	Chemicals in line

See Supporting Documents 3 'THAMES PIPELINE SURVEYS - C13021b' for details of pipeline conditions.

[1] e.g. Concrete; Steel; umbilical; Flexible; Bundle

[2] e.g. Oil; Gas; Water; Chemicals

[3] e.g. Operational; Out-of-use; Interim pipeline Regime

[4] e.g. Cleaned; Flushed; Hydrocarbons and/or Chemicals in line

Table 2.4: Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Number**	**Weight (Te)**	**Location(s)**	**Comments/ Status**
Concrete mattresses	111	1158	Flowlines to/from Bure West, Bure 'O', Yare 'C', Thurne (Deben), Crossings between Yare 'C' and Shell PL 311, between PL 370 and PL 1610, between Thurne and PL1367, and between PL 370 and PL 1173– outside 500m zone of Thames complex.	See enclosed drawings
Grout bags	306	8	Flowlines to/from Bure West, Bure 'O', Yare 'C', Thurne – outside 500m zone of Thames complex	
Frond Mats	30	208	Flowlines to/from Bure West, Bure 'O', Yare 'C', Thurne – outside 500m zone of Thames complex	
Rock Dump	No known rock dump	No known rock dump		No historical data

2.4 Wells

Table 2.5 Well Information			
Platform Wells	**Designation 1**	**Status**	**Category of Well**
49/28-A1 (Well 2)	Gas Production	Producing	PL1-1-1
49/28-A2 (Well 1)	Water Injection	Disposal	PL1-1-1
49/28-A3 (Well 3)	Water Injection	Disposal	PL1-1-1
49/28-A4 (Well 6) WENSUM	Gas Production	Producing	PL1-1-1
49/28-A6 (Well 4)	Gas Production	Suspended	PL1-1-1
Subsea Wells			
49/28-8 BURE O	Gas Production	Producing	SS-3-3-3
49/28-18 BURE WEST	Gas Production	Producing	SS-3-3-3
49/28-13 YARE C	Gas Production	Producing	SS-3-3-3
49/28-A5 THAMES	Dry development	Suspended	ML1

Category of well as per OGUK Guidelines for the suspension and abandonment of wells, Issue 4, July 2012.

2.5 Drill Cuttings

There are no drill cutting piles associated with the Thames Complex installation in the area. Drill cuttings that were generated during drilling activity have been distributed widely during drilling due to the local currents. Although there is no evidence of drill cuttings in the immediate vicinity of the wells, Perenco will be carrying out sea bed sampling to verify the absence of cutting debris that may affect the environment.

Should any evidence of drill cuttings be discovered, Perenco will contact DECC to review findings and extent and agree any necessary remedial actions.

2.6 Inventory Estimates

Figure 2.1a: Pie Chart of Estimated Topsides Inventories (Thames Complex Installations)

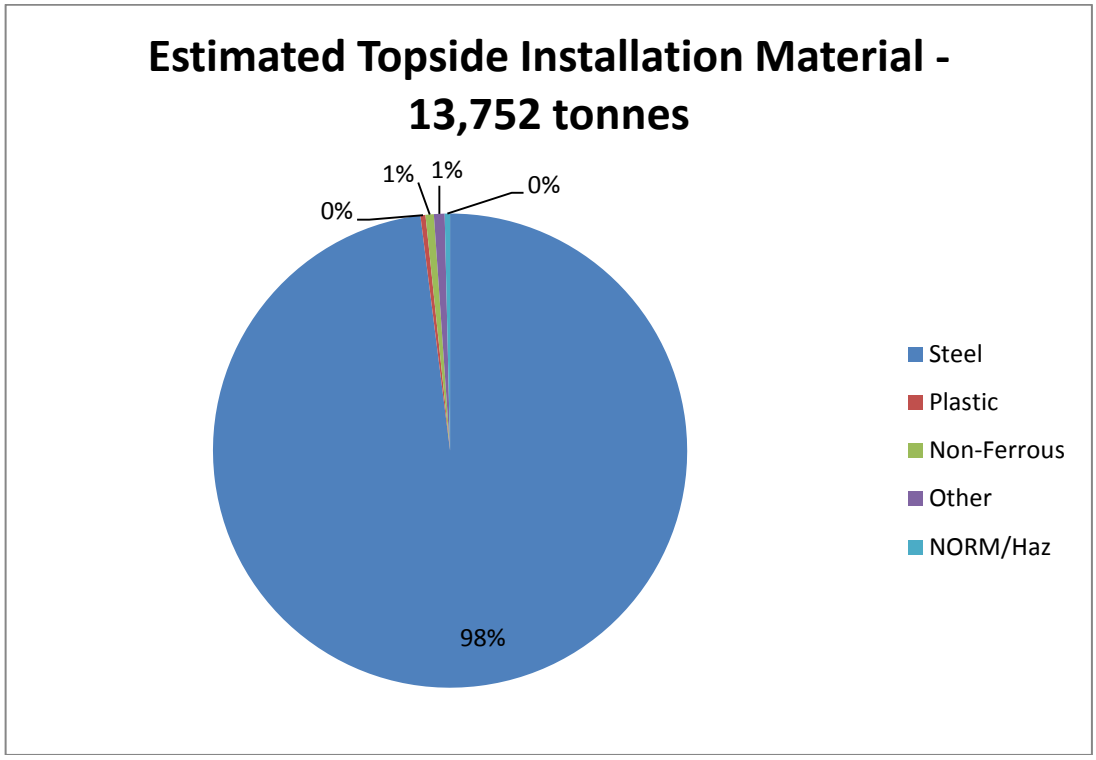


Figure 2.1b: Pie Chart of Estimated Subsea Inventories (Thames Complex Installations)

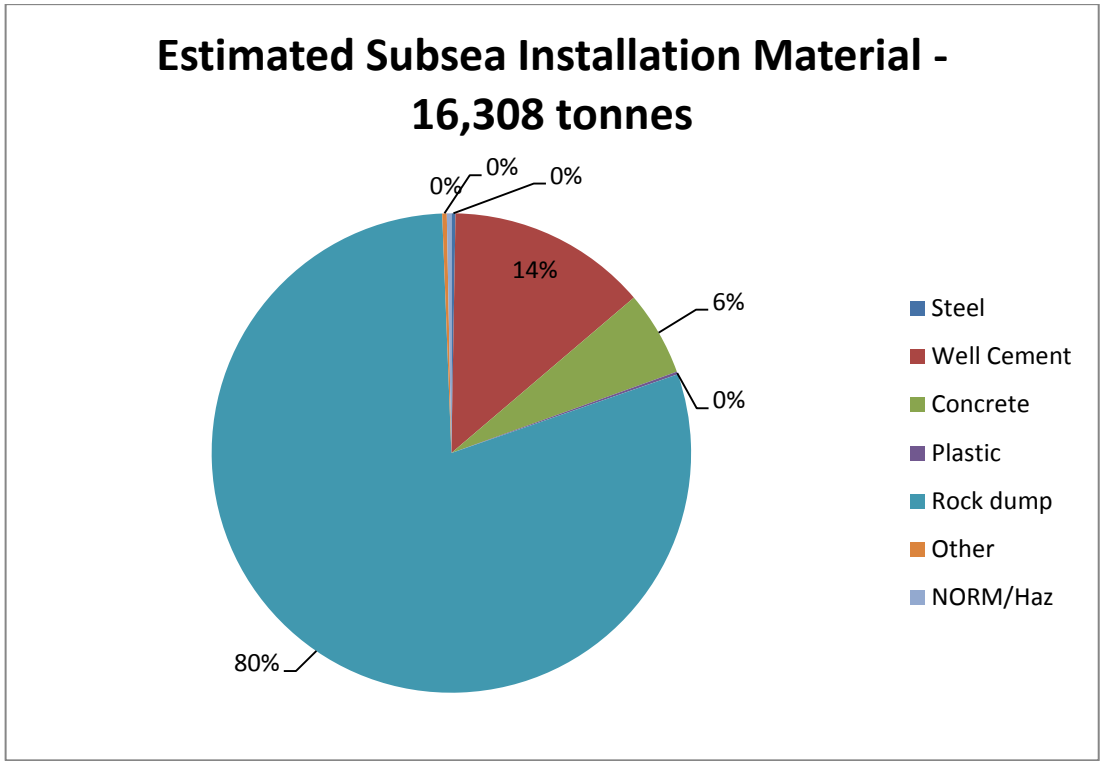
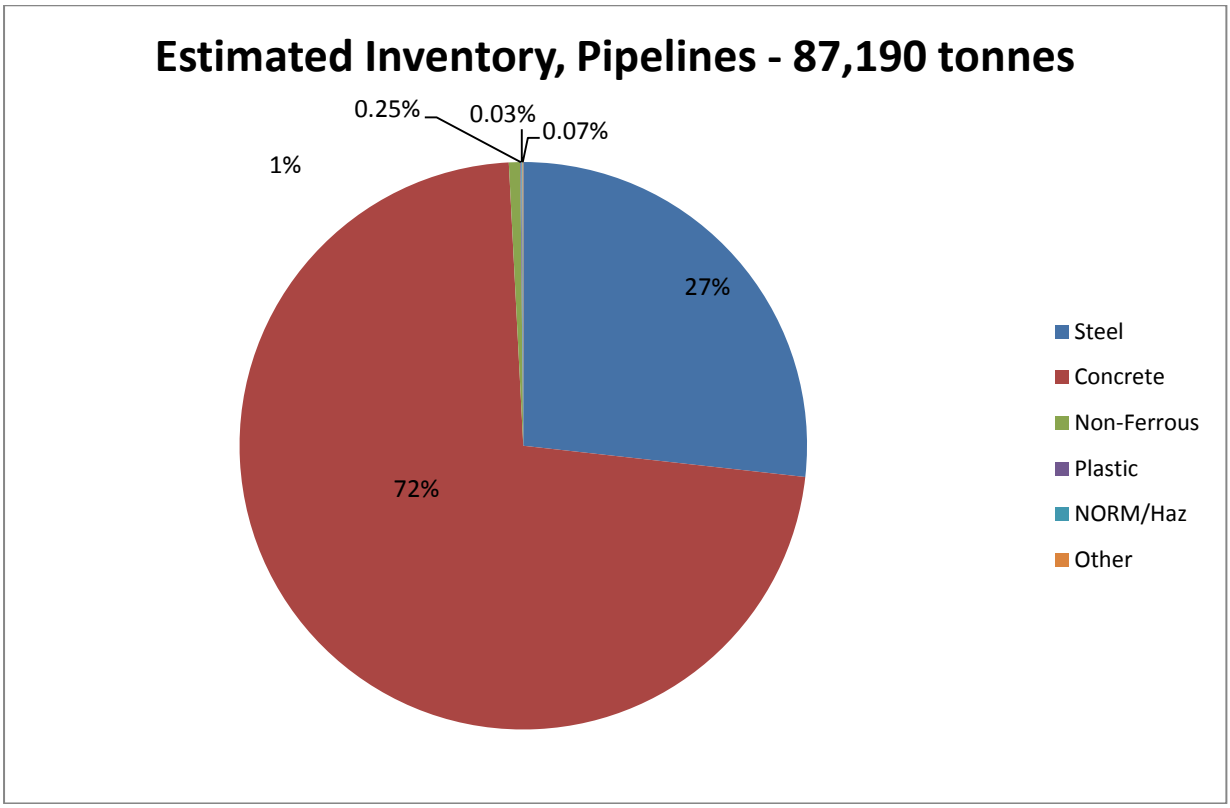


Figure 2.2: Pie Chart of Estimated Inventory (Pipelines)



3. REMOVAL AND DISPOSAL METHODS

In line with the waste hierarchy, the re-use of an installation (or parts thereof) was first in the order of preferred decommissioning options for assessment.

The Perenco Section 29 Notice Holders assessed options for extending the producing life of the platform, utilising it as an infrastructure hub for third party tie backs and enhanced recovery programmes, but none proved commercially viable.

The Perenco Section 29 Notice Holders then went onto assess options for the relocation of the platform as a producing asset, but concluded that due to its ageing process technology and the high cost of maintaining the fabric and structural integrity of the platform, no technically viable reuse option was available.

The Perenco Section 29 Notice Holders have reviewed, and will continue to review, the platform's equipment inventories to assess the potential for adding to their existing asset portfolio spares inventory or for resale to the open market.

Recovered material will be landed ashore for disposal by a contractor. It is not possible to forecast the wider reuse market with any accuracy or confidence this far forward. The Perenco Section 29 Notice Holders will continue to track reuse market trends in order to seize reuse opportunities at the appropriate time.

3.1 Topsides

Topsides Description: The 49/28 Thames complex installation comprises a series of three bridge-linked platforms which together form a natural gas production and compression installation, located approximately 80 km East North East of Bacton Terminal off the coast of Norfolk in the Southern North Sea.

The Thames complex installation provides facilities for the extraction and conditioning of gas from the subsea reservoirs, prior to export to the Perenco Bacton Terminal via a 24", 89 km long pipeline. Facilities are also provided to receive and treat gas produced by subsea completions in adjacent fields and from the Horn and Wren NUI.

AP Platform – Production platform

The AP platform comprises a six-legged three deck structure (main, mezzanine and cellar decks), supporting the accommodation module, production process, liquid handling equipment compression facilities and associated switch rooms and control room. Above the accommodation module is a Helideck with a D value of 22.2m and maximum takeoff weight of 9.3 Tons. Also on the platform are the main and emergency generators, firewater pumps, air compression equipment, battery room, radio room and store rooms. A pedestal mounted crane is located on the main deck. Access between levels is provided by stairways or ladders. A 6.1m long 78t bridge connects AP to AW and a 9.1m long 55t bridge connects AP to AR.

Weight of the AP Platform: 6,488 t
Dimensions of the AP Platform: 49.5 m x 25 m x 28.8 m high. Height from LAT 47 m.
Note: Two half sections of each bridge weight included in weight of platform.

AW Platform – Wellhead platform

The AW platform comprises a four-legged, three deck structure (main, mezzanine and cellar decks with 2 ESDV decks under), supporting 5 wellheads, reception facilities for export from the Arthur, Orwell, Gawain and Yare and Bure subsea completions. Also on the platform are production facilities for Arthur gas. Also on the platform are MEG, Methanol and Kinetic Hydrate Inhibitor (KHI) storage and injection facilities, production facilities, a single pedestal-mounted crane for general equipment handling and a vent tower. Access between platform levels is provided by stairways or ladders, and a bridge connects the platform to the adjacent production platform. As well as providing passage for personnel, the bridge carries pipework and cabling between the two platforms.

Weight of the AW Platform: 2,035 t
Dimensions of the AW Platform: 30 m x 20 m x 20.7 m high. Height from LAT 39 m.
Note: Half sections of each bridge weight included in weight of platform.

AR Platform – Riser platform

The AR platform comprises a four-legged Vierendeel tower, three deck structure (weather, mezzanine and cellar decks with an ESDV deck under), supporting reception facilities for export from Horne and Wren NUI, Bure West subsea completion and Thurne subsea completion. Also on the platform are production facilities, metering facilities and a Local Equipment Room (LER) which is an alternate muster point should the bridge be impaired. Access between levels is by stairways and ladders and a bridge connects the platform to the adjacent AP platform. As well as providing passage for personnel, the bridge carries pipework and cabling between the two platforms.

Weight of the AR Platform: 406 t
Dimensions of the AR Platform: 12.75 m x 10.6 m x 12.6 m high. Height from LAT 30 m.
Note: Half sections of each bridge weight included in weight of platform.

Preparation/Cleaning:

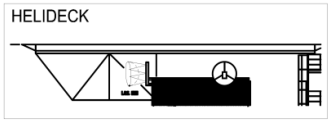
Table 3.1: Cleaning of Topsides for Removal		
Material Type	**Detail**	**Preparatory Activity**
Onboard hydrocarbons	Process fluids, fuels and lubricants	Flushed and drained to disposal wells on Thames
Other hazardous materials	NORM, and radioactive material, instruments containing heavy metals, batteries	Transported ashore for re-use/disposal by appropriate methods
Original paint coating	Lead-based paints	May give off toxic fumes/dust if flame-cutting or grinding/blasting is used so appropriate safety measures will be taken
Asbestos and ceramic fibre		Appropriate control and management will be enforced

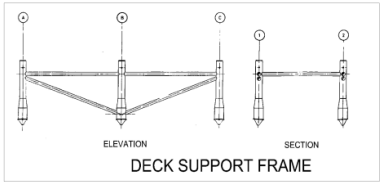
Removal Methods:

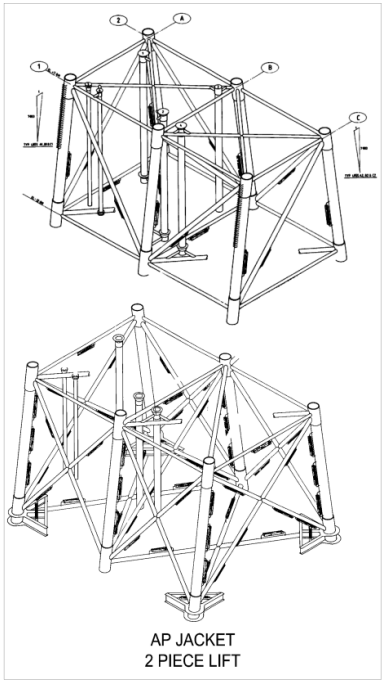
Table 3.2: Topsides Removal Methods	
1) HLV (semi-submersible crane vessel) ☑ 2) Mono-hull crane vessel ☑ 3) SLV ☑ 4) Piece small ☑ 5) Other ☐	
Method	Description
Single lift removal by SLV/HLV	Removal of topsides as complete units and transportation to shore for re-use of selected equipment, recycling, break up and/or disposal. Single lift dependant on vessel availability.
Modular removal and re-use/recycle by HLV	Removal of parts/modules of topsides for transportation and reuse in alternate location(s) and/or recycling/disposal
Offshore removal 'piece small' for onshore reuse/disposal	Removal of topsides by breaking up offshore and transporting to shore using work barge. Items will then be sorted for re-use, recycling or disposal.
Proposed removal method and disposal route	**Topsides will be removed to shore and disposed of at selected disposal yard to comply with relevant legislation and company policy. A final decision on decommissioning method will be made following a commercial tendering process. It is likely that for all 3 topsides, a combination of the above the methods will be deployed to provide the optimum safety/cost solution. The removal method listed below is based on one of the preferred options – exact removing sequence and methodologies will follow the detailed engineering study.**

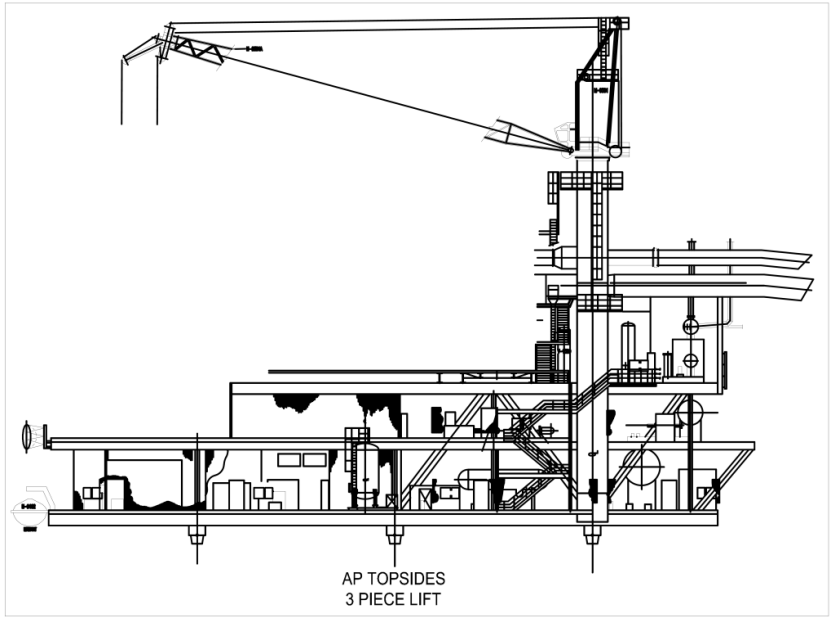
Note: Preliminary studies have indicated that the following methods are likely to be used.

AP Platform – Removal Stages



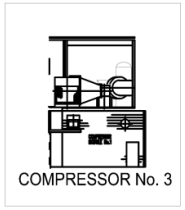


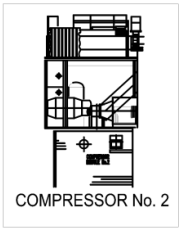


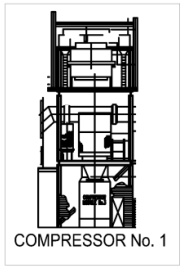


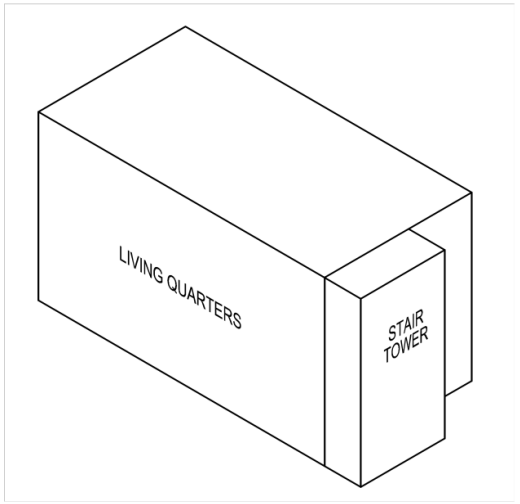
AP Platform - Removal Stages

1. Compression Modules 3
2. Helideck
3. Living Quarters
4. AP Topsides (3 piece lift)
5. DSF (single lift)
6. AP Jacket (2 piece lift)





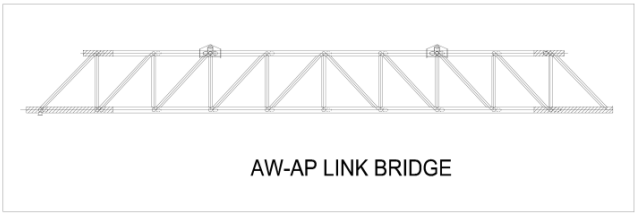




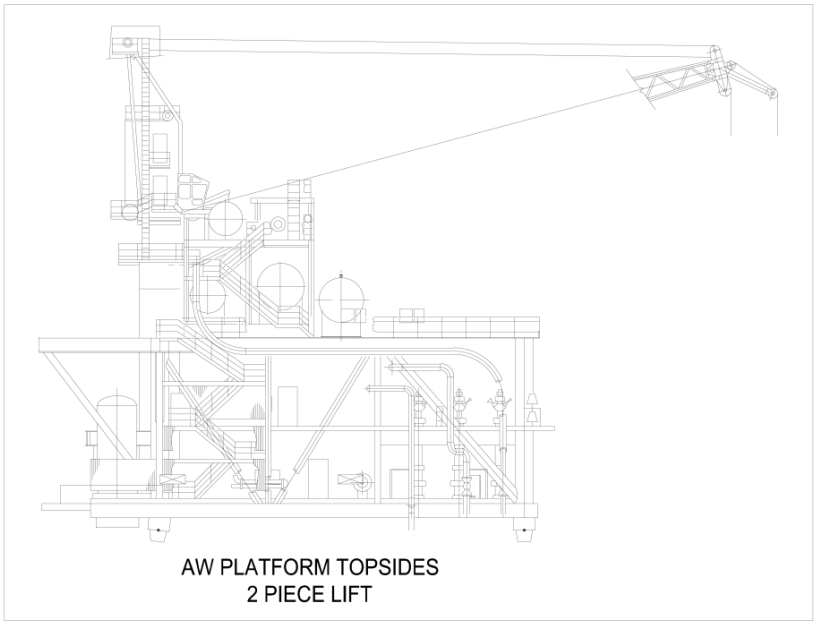
AW Platform – Removal Stages

AW Platform - Removal Stages

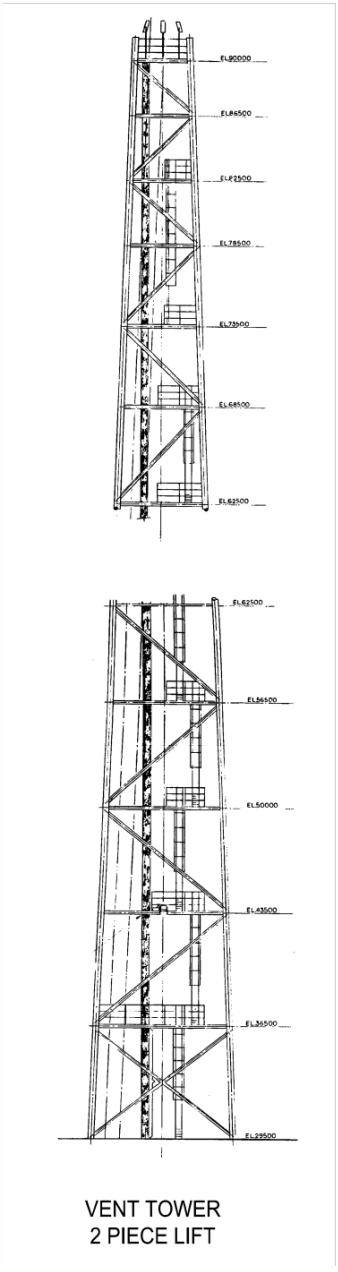
1. Vent Tower (2 piece lift)
2. AW-AP Link Bridge
3. AW Platform Topsides (2 piece lift)
4. DSF (single lift)
5. AW Jacket (2 piece lift)



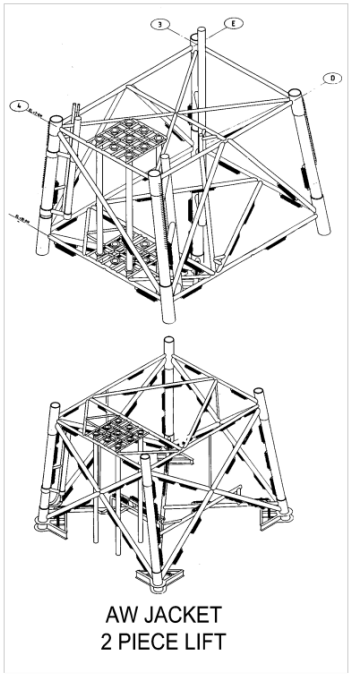
AW-AP LINK BRIDGE



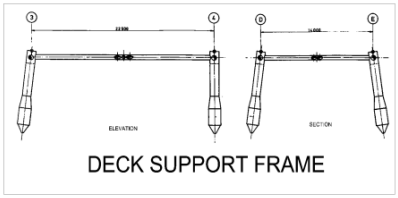
AW PLATFORM TOPSIDES
2 PIECE LIFT



VENT TOWER
2 PIECE LIFT

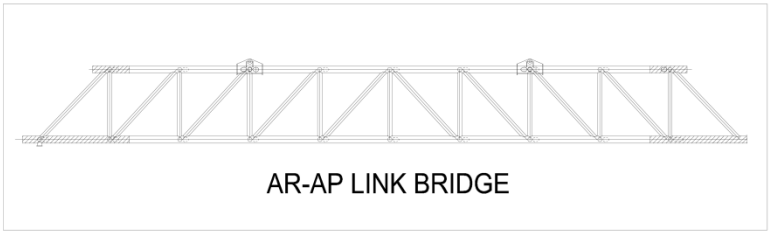


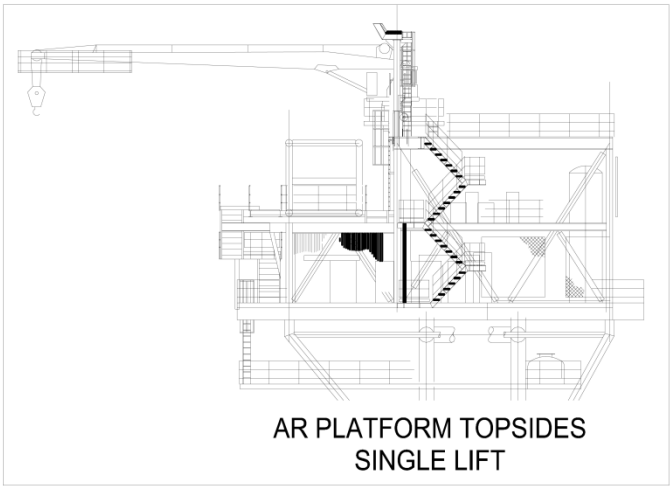
AW JACKET
2 PIECE LIFT

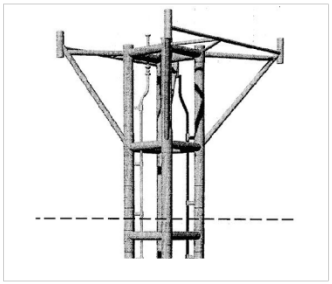


DECK SUPPORT FRAME

AR Platform – Removal Stages

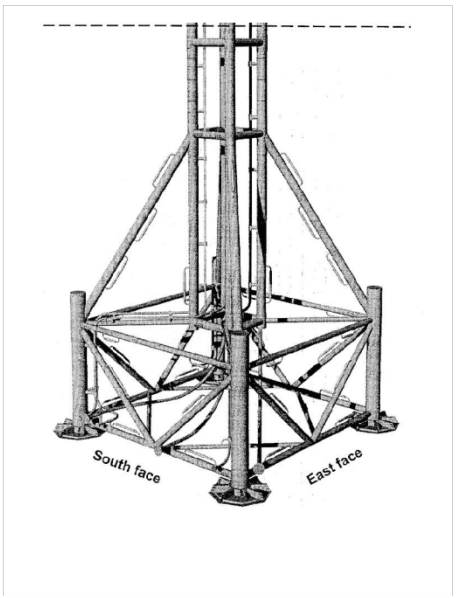






AR Platform - Removal Stages

1. AR-AP Link Bridge
2. AR Platform Topsides (single lift)
3. AR Jacket (2 piece lift)



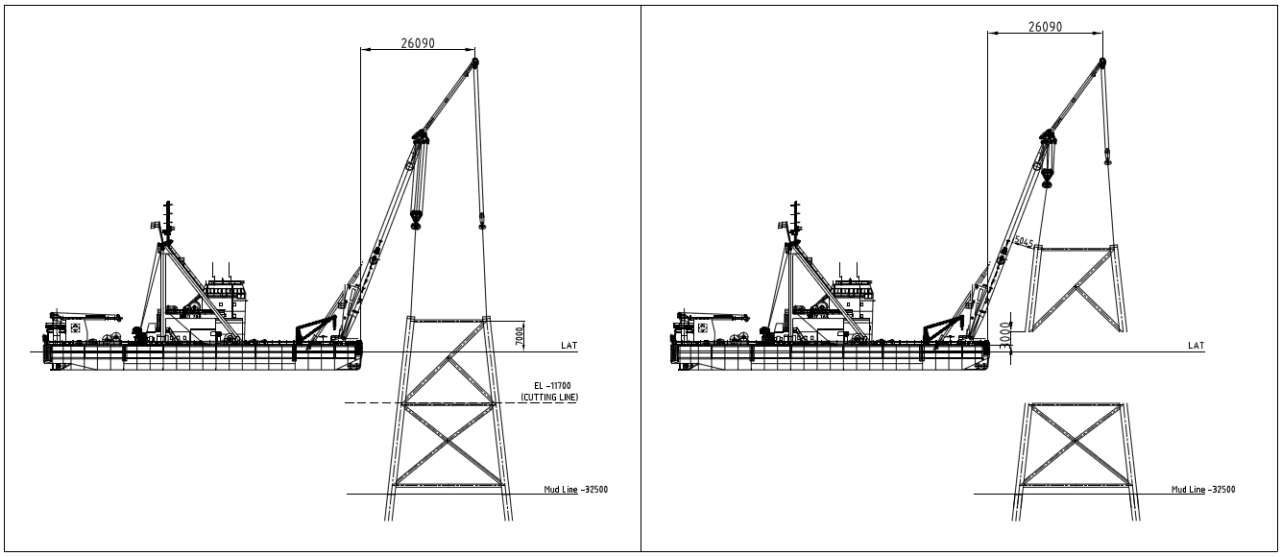
3.2 Jacket(s)

3.2.1 Jacket Decommissioning Overview

All three jackets AP, AW and AW (see drawings below) will be removed to shore for cleaning and disposal. The pile cuts will be made below the seabed level at such a depth to ensure that any remains are unlikely to become uncovered. The means of cutting could be diamond wire, oxyacetylene or high pressure water abrasive. Below the seabed level explosives may also be used as a means of cutting. The drawings below demonstrate one of the preferred removal options and the exact cutting points and removal method are subject to detailed engineering and commercial tendering.

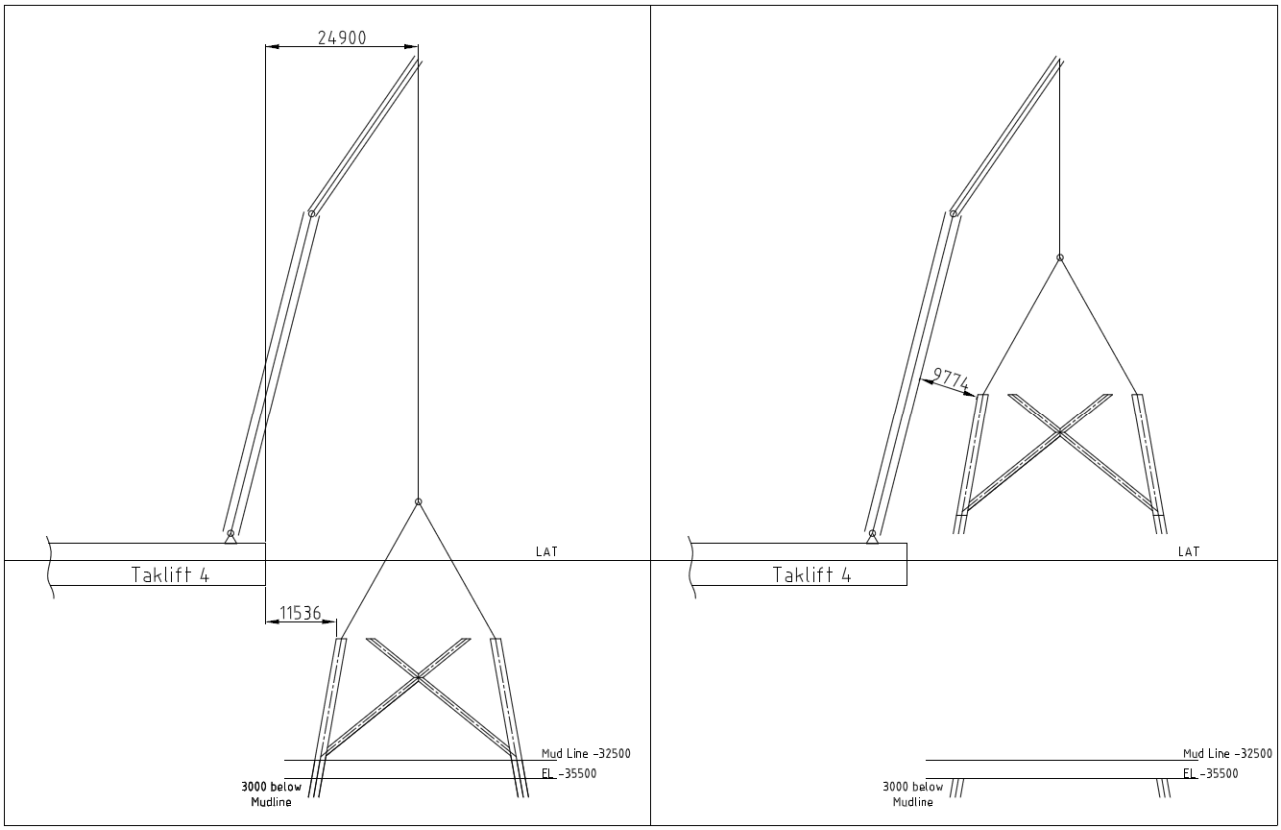
The AP jacket lift weight is 1,697t (including piles) and it is proposed to be removed in one or two lifts. If the jacket is cut in two sections it is proposed the jacket structure would firstly be cut at elevation -11.7m LAT for a lift weight of 691t then further below the seabed level for a lift weight of 1,1,006t. (These cuts/weights are indicative estimates)

Drawing showing the first AP jacket lift

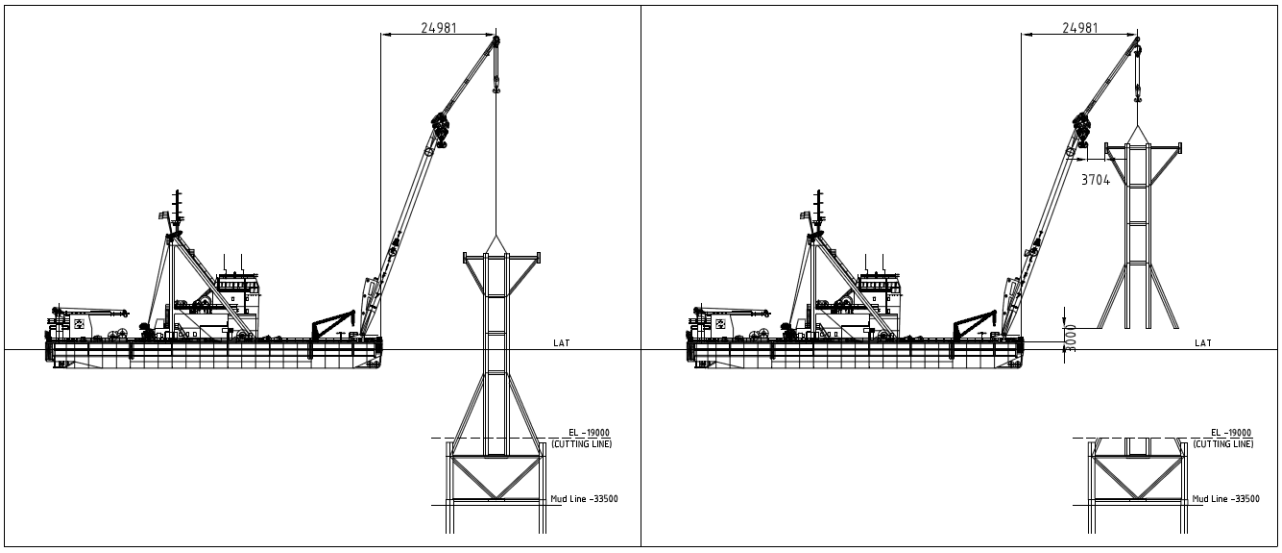


The AW jacket lift weight is 1,532t (including piles) and it is proposed to remove in one or two lifts. If the jacket is cut in two sections it is proposed the jacket structure would firstly be cut at elevation -12.57m LAT for a lift weight of 689t then further cuts below the seabed level for a lift weight of 843t. (These cuts/weights are indicative estimates)

Drawing showing the second AW jacket lift.



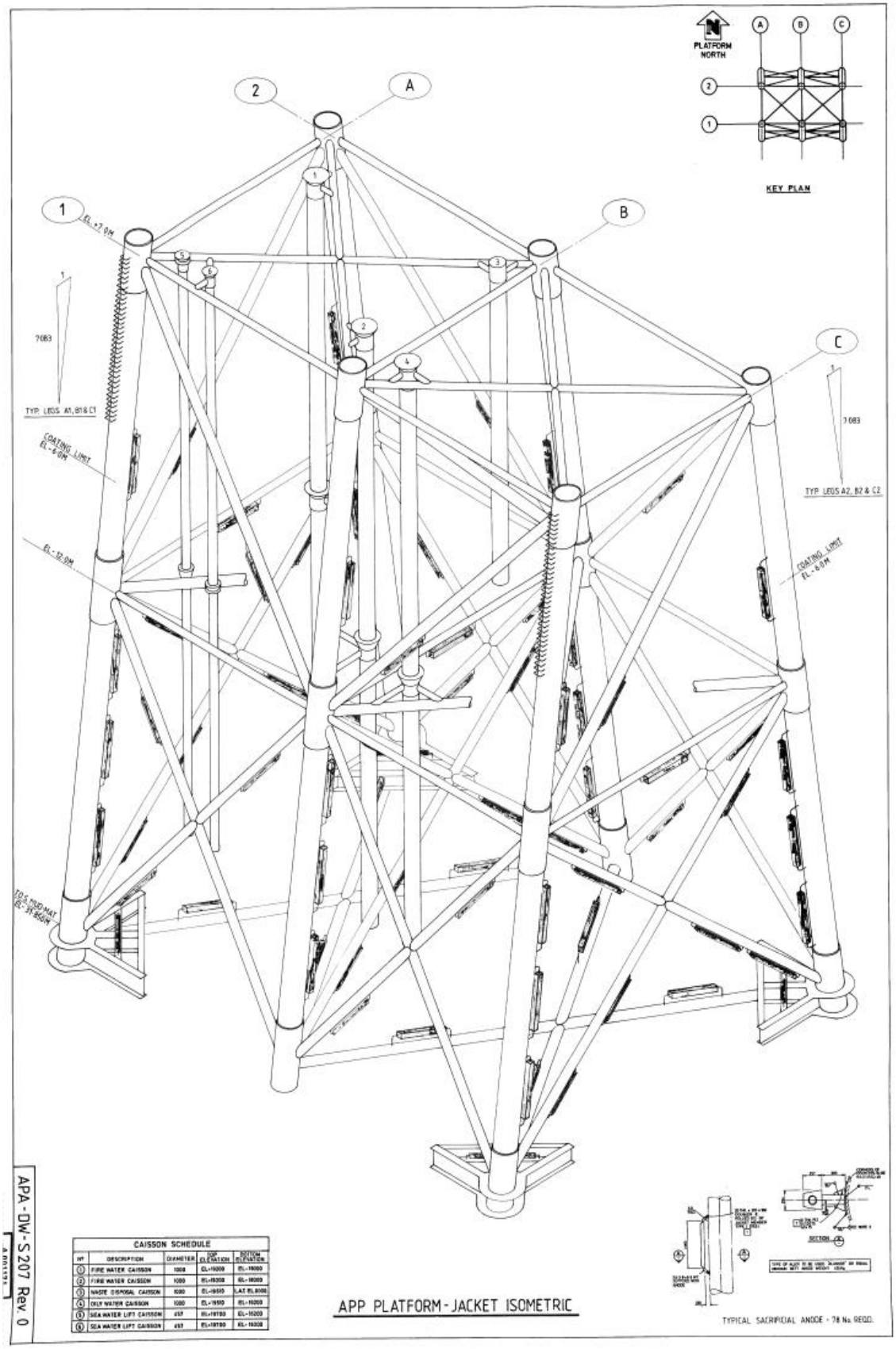
The AR jacket lift weight is 870t and it is proposed to remove in one or two lifts. If the jacket is cut in two sections it is proposed the jacket structure would firstly be cut at elevation -19m LAT for a lift weight of 435t then further cuts at below the seabed level for a lift weight of 435t. (These cuts/weights are indicative estimates)



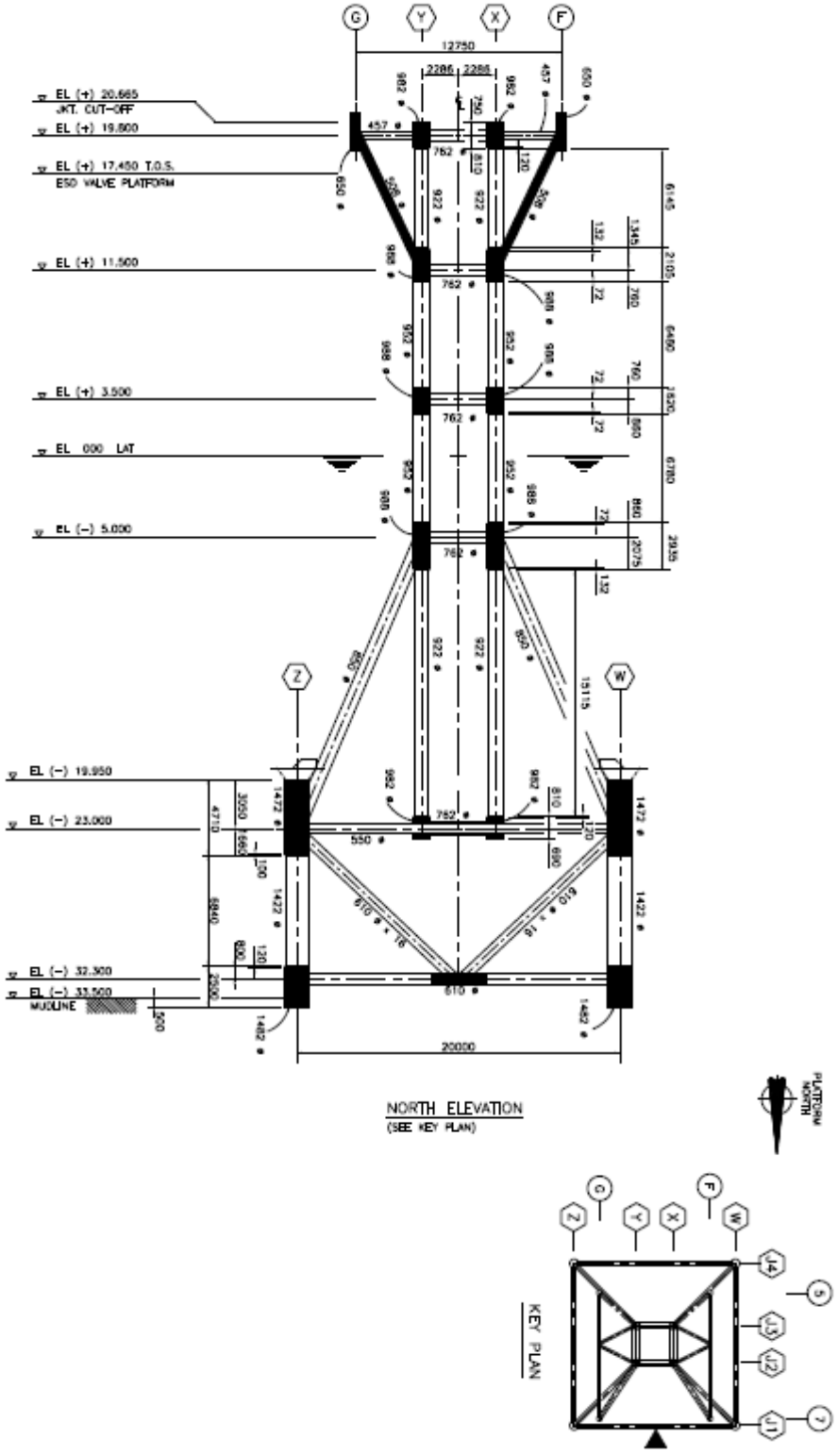
The engineering study 'Supporting Document 4' 'M0736-REP-10-01200_1000t_Sheerleg_ Removal_Method' contains further detail of the removal methodology.

Figure 3.1 AP, AW and AR Jackets Drawings

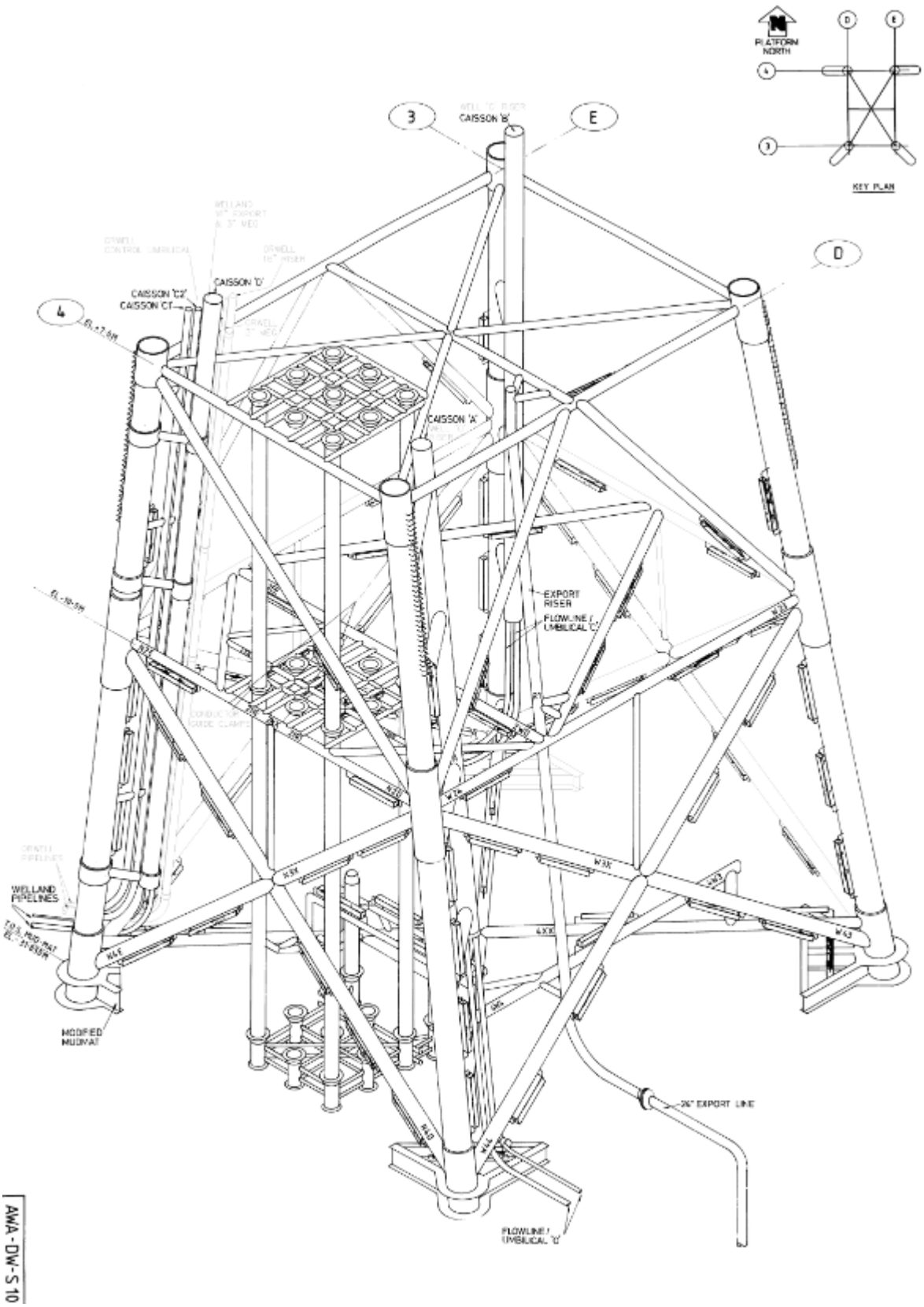
AP Jacket



AR Jacket drawing



AW Jacket Drawing



In line with the waste hierarchy, the re-use of an installation (or parts thereof) was first in the order of preferred decommissioning options for assessment.

The Perenco Section 29 Notice Holders assessed options for extending the producing life of the platform, utilising it as an infrastructure hub for third party tie backs and enhanced recovery programmes, but none proved commercially viable.

The Perenco Section 29 Notice Holders then went onto assess options for the relocation of the platform as a producing asset, but concluded that due to its ageing process technology and the high cost of maintaining the fabric and structural integrity of the platform, no technically viable reuse option was available.

The Perenco Section 29 Notice Holders have reviewed, and will continue to review, the jackets to assess the potential for future use or for resale to the open market.

Recovered jacket material will be landed ashore for disposal by a contractor. It is not possible to forecast the wider reuse market with any accuracy or confidence this far forward. The Perenco Section 29 Notice Holders will continue to track reuse market trends in order to seize reuse opportunities at the appropriate time.

3.2.2 Jacket Removal Methods

Table 3.3: Jacket Decommissioning Methods

1) HLV (semi-submersible crane vessel) ☑
2) Monohull crane vessel ☑
3) SLV ☑
4) Piece small ☐
5) Other – (describe briefly) ☑

Method	Description
Onshore disposal using HLV, Monohull crane vessel or SLV	Removal of all the jackets and transport ashore for break up and recycling of steel.
Other	A pull on barge removal method based on a submersible barge which is submerged on one end to the seabed. The jacket will then be pulled on to the barge/vessel by winch.
Proposed removal method and disposal route	**Jackets will be removed to shore and disposed off at selected disposal yard to comply with relevant legislation and company policy. The removal method listed in above drawings is one of the preferred options. The exact cutting points and removal methodology will follow the detailed engineering study.**

3.3 Subsea Installations and Stabilisation Features

All subsea installations will be removed to shore for disposal. Piles will be severed at least -3.0m below the seabed. If any practical difficulties are encountered PUK will consult DECC. The means of cutting could be diamond wire, high pressure water jet abrasive cutting or by explosives.

All mattresses will be decommissioned in accordance with the current DECC Guidance notes (Version 6 , March 2011).

Table 3.4: Subsea Installation and Stabilisation Features Decommissioning		
Subsea installations and stabilisation	**Option**	**Disposal Route (if applicable)**
Wellhead(s)	Remove	Transport ashore for disposal
Protection Frame(s)	Remove	Transport ashore for disposal
Concrete mattresses	All mattresses will be decommissioned in accordance with the current DECC Guidance notes (Version 6 , March 2011)	Transport ashore for disposal
Grout bags	All grout bags will be decommissioned in accordance with the current DECC Guidance notes (Version 6, March 2011).	Transport ashore for disposal
Formwork	Assess integrity and burial depth. If it is buried leave in situ. Otherwise bury & leave in situ	Not applicable.

Table 3.4: Subsea Installation and Stabilisation Features Decommissioning – cont'd		
Subsea installations and stabilisation	**Option**	**Disposal Route (if applicable)**
Frond Mats	All frond mats will be decommissioned in accordance with the current DECC Guidance notes (Version 6, March 2011).	Transport ashore for disposal
Rock Dump	Leave in situ	Leave in situ

3.4 Pipelines/Flowlines/Umbilicals

Decommissioning Options:

Table 3.5: Pipeline or Pipeline Groups/Decommissioning Options			
Pipeline or Group (as per PWA)	**Status of the line or characteristics of the pipeline group**	**Decommissioning Options considered**	**Whole or part of pipeline/group being decommissioned**
PL370	Trenched, buried	1,2,3,4,5	Whole pipeline to lower water mark at Bacton
PL371	Trenched, buried	1,2,3,4,5	Whole pipeline
PL372	Trenched, buried	1,2,3,4,5	Whole pipeline
PL1635	Trenched, buried	1,2,3,4,5	Whole pipeline

Table 3.5: Pipeline or Pipeline Groups/Decommissioning Options – cont'd			
Pipeline or Group (as per PWA)	**Status of the line or characteristics of the pipeline group**	**Decommissioning Options considered**	**Whole or part of pipeline/group being decommissioned**
PL373	Trenched, buried	1,2,3,4,5	Whole pipeline
PL374	Trenched, buried	1,2,3,4,5	Whole pipeline
PL1636.1-7	Trenched, buried	1,2,3,4,5	Whole pipeline
PL1637	Trenched, buried	1,2,3,4,5	Whole pipeline
PL1638.1-7	Trenched, buried	1,2,3,4,5	Whole pipeline

*Key to Options

1) Completely remove the line(s);
2) Trench and bury the exposed / uncovered areas of the line(s);
3) Rock dump the line in specific areas where the line is uncovered;
4) Partial removal of uncovered sections of the line;
5) Leave in situ with monitoring as agreed with DECC.

Comparative Assessment Method:

The Comparative Assessment process involved a multi-disciplinary team participating in a Comparative Assessment workshop and a preliminary Quantitative Risk Assessment (QRA) of the available decommissioning options. At the Comparative Assessment workshop, each decommissioning option has been scored against a set of assessment criteria using categories derived from DECC guidance: 1. Safety; 2. Environmental; 3. Technical; 4. Societal; 5. Commercial. The Comparative Assessment can be found in Section 7, Supporting Documents, Document 2.

The Comparative Assessment concluded the pipelines and umbilicals will be left in situ due to difficulty and cost to remove. They are predominantly trenched and buried. The pipelines will be monitored as agreed with DECC.

Outcome of Comparative Assessment:

Table 3.6: Outcomes of Comparative Assessment		
Pipeline or Group	**Recommended Option***	**Justification**
PL370	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Continual monitoring will be performed to confirm pipeline remains buried.
PL371	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Continual monitoring will be performed to confirm pipeline remains buried.
PL372	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Continual monitoring will be performed to confirm pipeline remains buried.
Pl1635	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Continual monitoring will be performed to confirm pipeline remains buried.
PL373	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Continual monitoring will be performed to confirm pipeline remains buried.
PL374	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Continual monitoring will be performed to confirm pipeline remains buried.
PL1636.1-7	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Continual monitoring will be performed to confirm pipeline remains buried.
PL1637	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Continual monitoring will be performed to confirm pipeline remains buried.
PL1638	Option 5	Line is buried and will be safe to leave in situ (5). End sections will be removed & exposures/spans rectified as required. Continual monitoring will be performed to confirm pipeline remains buried.

*Key to Options

1) Completely remove the line(s);
2) Trench and bury the exposed / uncovered areas of the line(s);
3) Rock dump the line in specific areas where the line is uncovered;
4) Partial removal of uncovered sections of the line;
5) Leave in situ with continuous monitoring.

3.5 Wells

Table 3.7: Well Plug and Abandonment
The wells which remain to be abandoned, as listed in Section 2.4 (Table 2.5) will be plugged and abandoned in accordance with Oil and Gas UK Guidelines for the suspension and abandonment of wells and a PON 5 will be submitted. A Master Application Template (MAT) and the supporting Subsidiary Application Template (SAT) application will be submitted in support of any such work that is to be carried out.

3.6 Drill Cuttings

Drill Cuttings Decommissioning Options: N / A
(Please refer to Section 2.5)

3.7 Waste Streams

Table 3.8: Waste Stream Management Methods	
Waste Stream	**Removal and Disposal method**
Bulk liquids	Removed from vessels and discharged to disposal wells or sent to Bacton via the export line for disposal. Vessels, pipework and sumps will be drained prior to removal to shore and shipped in accordance with maritime transportation guidelines. Package filtration equipment for disposal of liquids to sea may be utilised and relevant permits will be sought for such operations.
Marine growth	Removed offshore /onshore. Disposed of according to guidelines.
NORM/LSA Scale	Tests for NORM/LSA will occur offshore and will be dealt/disposed with according to guidelines and company policies.
Asbestos	Tests for asbestos will occur offshore and will be dealt/disposed with according to guidelines and company policies.
Other hazardous wastes	Detailed survey for other hazardous wastes will be undertaken offshore and will be dealt/disposed with according to guidelines and company policies.
Onshore Dismantling sites	Appropriate licensed sites will be selected. The chosen facility must demonstrate proven disposal track record and waste stream management throughout the deconstruction process and demonstrate their ability to deliver innovative recycling options.

Table 3.9 Inventory Disposition			
	Total Inventory Tonnage	**Planned tonnage to shore**	**Planned left in situ**
Installations	30,060	12,538	17,522
Pipelines	87,190	27	87,163

4 ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Environmental Sensitivities

Table 4.1: Environmental Sensitivities	
Environmental Receptor	**Main Features**
Conservation interests	**Marine Protected Areas (MPAs):** The Thames Infrastructure overlaps with the boundaries of three MPAs described below: • Cromer Shoal Chalk Beds rMCZ (NG2); • Haisborough, Hammond and Winterton cSAC; • North Norfolk Sandbanks and Saturn Reef cSAC. **Annex I Habitats:** Annex I shallow sandbanks may be present along some of the pipeline routes along with discrete populations of *S. spinulosa* identified in the side scan sonar mosaic and using seabed imagery. Overall the site survey identified some areas of 'low' to 'moderate reefiness' but no areas of high reefiness which has previously been found at the Saturn Reef to the north of the Thames field (outside of the current working area). Therefore, the survey data indicates that Annex I habitats from *S. spinulosa* reefs. **Annex II Species:** The Annex II species that could be present in the vicinity of the Thames Decommissioning Area include: • Harbour porpoise (*Phocoena phocoena*); • Grey seal (*Halichoerus grypus*); • The harbour (or common) seal (*Phoca vitulina*).

Table 4.1: Environmental Sensitivities – cont'd	
Environmental Receptor	**Main Features**
Seabed	Seabed imagery found that much of the surveyed area comprised bare sand with some areas of gravel and shell fragments (*CMACS, 2013*). Side scan sonar data demonstrated that sand waves across large areas of the seabed. This indicates strong seabed and water column currents, and subsequently highly mobile sediments (*CMACS, 2013*) which is consistent with the southern North Sea in general. The results of the chemical testing indicate that the concentrations of the individual PAH compounds all fall below the laboratory detection limits. Similarly, the aliphatic and aromatic total petroleum hydrocarbon (TPH) compounds also fall beneath lab detection limits, along with the other organic compounds and phenols listed. The organic content of sediments was generally low, ranging from 0.47 per cent to 1.54 per cent, with no discernible trend across the survey area (*CMACS, 2013*). Of all the metal contaminants, only arsenic was present above Level 1 thresholds (Cefas L1 threshold is 20 ppm) at the majority of stations. Elevated levels of arsenic can occur following geological inputs and/or industrial discharge (*CMACS, 2013*). Cadmium was the only other metal found at concentration above the Level 1 threshold with 0.4 ppm. Barium was detectable at all stations sampled with levels of between 6 and 36 ppm across the sites and no evidence of any 'hotspots' of barium concentration *(CMACS, 2013).*
Fish	There are potential fish spawning area in ICES rectangles 34F1, 34F2, 35F, 35F2 and 35F3 for cod (*Gadus morhua*), herring (*Clupea harengus*), lemon sole (*Microstomus kitt*), mackerel (*Scomber scombrus*), *Nephrops*, plaice (*Pleuronectes platessa*), sandeels (*Ammodytidae*), sole (*Solea solea*), sprat (*Sprattus sprattus*) and whiting (*Merlangius merlangus*) (*Coull et al., 1998; Ellis et al., 2012*). In addition to the spawning grounds described above, the waters of ICES rectangles 34F1, 34F2, 35F1, 35F2 and 35F3 also act as nursery areas for cod, herring, horse mackerel (*Trachurus trachurus*), lemon sole, mackerel, *Nephrops*, plaice, sandeels, sole, sprat, thornback ray (*Raja clavata*), tope shark (*Galeorhinus galeus*) and whiting (*Coull et al., 1998; Ellis et al., 2012*).

Table 4.1: Environmental Sensitivities – cont'd	
Environmental Receptor	**Main Features**
Fisheries	Specific fishing effort and landings data for ICES Rectangles 34F1, 34F2, 35F1, 35F2 and 35F3 indicated that annual fish landings were greatest in 2010 for ICES Rectangle 35F3 (328.5 tonnes), 2011 for ICES Rectangles 34F1 (2,527.3 tonnes), 34F2 (411.1 tonnes), and 35F2 (217.8 tonnes) and in 2012 for ICES Rectangles 35F1 (886.8 tonnes). Conversely, annual fishing catches by tonnage were lowest during 2009 in ICES Rectangles 34F1 (93.3 tonnes) and 35F1 (326.6 tonnes), during 2008 in ICES Rectangle 34F2 (35.4 tonnes) and during 2012 in ICES Rectangles 35F2 (36.4 tonnes) and 35F3 (53.7 tonnes) (*Marine Scotland, 2013*). On the whole, fishing activity for this area is low throughout the year. When averaged, catches by weight (tonnes) between 2008 and 2012 were highest during March and April in ICES Rectangle 34F1, December in ICES Rectangle 34F2, March to July in ICES Rectangle 35F1, January in ICES Rectangle 35F2 and January and November in ICES Rectangle 35F3. Species which were routinely caught in higher quantities (tonnes) during 2012 in ICES Rectangle 34F1 were whelks (38%) and crabs (C.P. mixed sexes; 27%), in ICES Rectangle 34F2 were sprats (83%), in ICES Rectangle 35F1 were whelks (81%), in ICES Rectangle 35F2 were plaice (63%) and in ICES Rectangle 35F3 were plaice (59%) and sole (23%).
Marine Mammals	According to Reid et al. (2003) three species have been previously been sighted in the area around the Blocks of Interest. Harbour porpoise, White-beaked dolphins and minke whale.
Birds	Within these Blocks, seabird vulnerability generally peaks to high (2 out of 4 on the JNCC scale) during February, March and December. The Blocks containing only pipeline follow a similar trend. The highest seabird vulnerability on the JNCC ranked scale (1 out of 4) only occurs in Blocks 48/28 and 52/3 during October.
Onshore Communities	All waste produced during the Thames Area Decommissioning will be transferred to an onshore decommissioning and waste facility for processing. Perenco will ensure the chosen facility is fully regulated and licensed with current legislation.

Table 4.1: Environmental Sensitivities – cont'd	
Environmental Receptor	**Main Features**
Other Users of the Sea	**Shipping:** Shipping movements in the vicinity of Blocks of Interest are regarded as very high to low throughout the year. Blocks 49/29, 49/30 and 53/4 lie within a deep water route. **Oil & Gas:** Previously, there has been significant oil and gas activity within and around the Blocks of Interest; **Military Activity:** The Blocks of Interest do not lie within any marine military exercise areas . However, part of the pipeline PL370 does within a military low flying zone. **Dredging and Dumping Activity:** There are no offshore dredging sites within the Blocks of Interest. The nearest offshore dredging site is the Lowestoft Extension Aggregates Application site approximately 31 kilometres to the southwest of the Arthur 2 wellhead. **Wind Farms:** There are no active windfarms in close proximity to the Blocks of Interest. The nearest active wind farm site is the Round 2, Dudgeon East site approximately 32 kilometres to the north west of the Thames to Bacton (PL370) pipeline (Crown Estates, 2013). This site is in the consent/authorisation phase (4COffshore, 2013). **Archaeology:** There are two charted wreck sites located within the Blocks of Interest.
Atmosphere	Atmospherics emissions will be generated during the Thames Area Decommissioning operations. However, it is expected that the emissions will be localised to the area of release.

4.2 Potential Environmental Impacts and their Management

The Environmental Impact Assessment provides a review of the key features of the environment in the proposed Thames Decommissioning Programme Area which is located across thirteen (13) UKCS Blocks (48/28-30, 49/26-30, 50/26, 52/3, 53/2-4) in the southern North Sea (SNS).

A key consideration when planning and finalising the decommissioning of the Thames field infrastructure is a clear understanding of the surrounding environment. In order to understand the potential for the project to interact with the environment, so that appropriate controls can be adopted to mitigate negative impacts, the physical, biological and socio-economic environments have been assessed.

The assessment has been conducted on two different levels: from within the UKCS Blocks 48/28-30, 49/26-30, 50/26, 52/3, 53/2-4 and in the surrounding area encompassing them, including along the adjacent coastline of the east coast of England.
It is largely based on data provided in published information sources, including:

- The DECC (formerly DTI) Offshore Strategic Environmental Assessment (SEA) Reports (2002-2011);
- The UK Digital Marine Atlas (*UKDMAP, 1998*);
- Fisheries Sensitivity Maps in British Waters (*Coull et al., 1998*);
- Spawning and Nursery Grounds of Selected Fish Species in UK waters (*Ellis et al., 2012*);
- The JNCC Cetacean Atlas of Cetacean distribution in north-west European waters (*Reid et al., 2003*);
- Scientific Advice on Matters Related to the Management of Seal Populations by the Special Committee on Seals (*SCOS, 2012*);
- SCANS-II 2008 data (in *DECC, 2009*);
- Seabird Vulnerability in UK Waters (*JNCC, 1999*); and
- Fishing Effort and Quantity and Value of Landings by ICES Rectangle (Marine Scotland, *2008-2013*);
- UK-DEAL (2012).

In addition to the above, Perenco has undertaken site specific geophysical, geotechnical and environmental (including Annex I habitat assessment) surveys within the proposed Thames Decommissioning Programme area (*Osiris Projects, 2013*), the results of which are discussed, where relevant, throughout this section of the ES.

Environmental Impact Assessment Summary:

Decommissioning project activities with the potential to cause environmental impacts were identified from discussions with the Perenco / Tullow project team, an informal scoping exercise with key stakeholders and from the EIA team's previous oil and gas EIA project experience.

Impacts associated with the Thames Area Decommissioning project have been grouped within the EIA under the following headings:

- Physical Presence;
- Seabed Impacts;
- Noise;
- Atmospheric Emissions;
- Marine Discharges;
- Unplanned Releases;
- Solid Wastes;
- Transboundary Impacts;
- Cumulative Impacts.

Any relevant social-economic issues have been assessed within these sections.

In summary, all residual impacts are considered to be of minor significance, provided the proposed mitigation and management measures, as identified within the ES, are implemented during the Thames Area Decommissioning.

The exception to this is in the event of an accidental spill, where there would be a release of condensate from the pipeline or diesel fuel loss from the drilling rig / SLV; here the residual impact has been assessed as moderate. In addition, the assessment of potential cumulative impacts indicated that there would be no significant impacts and no significant transboundary impacts are expected to occur as a result of the decommissioning operations.

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Overview:

Table 4.2 Environmental Impact Assessment Summary		
Activity	**Main Impacts**	**Management**
Topsides Removal	Energy use and atmospheric emissions Dropped object Accidental hydrocarbon release Production of waste Shipping and other users of the sea	Vessels will be audited as part of selection and pre-mobilisation. Work programmes will be planned to optimise vessel time in the field. A post decommissioning debris survey will be conducted and any debris recovered. As part of the OPEP Perenco have specialist oil spill response services provided by Oil Spill Response Ltd. (OSRL). Materials are reused and recycled where possible. Compliance with UK waste legislation and duty of care.

Table 4.2 Environmental Impact Assessment Summary – cont'd		
Activity	**Main Impacts**	**Management**
Jackets Removal	Energy use and atmospheric emissions Underwater noise Dropped object Accidental hydrocarbon release Production of waste Damage or loss of fishing gear Disturbance to the Seabed Shipping and other users of the sea	Vessels will be audited as part of selection and pre-mobilisation. Work programmes will be planned to optimise vessel time in the field. Offshore vessels will avoid concentrations of marine mammals. A post decommissioning debris survey will be conducted and any debris recovered. As part of the OPEP Perenco will have specialist oil spill response services provided by Oil Spill Response Ltd. (OSRL). Materials are reused and recycled where possible. Compliance with UK waste legislation and duty of care. Underwater cutting could be a potential source of sound, the operation of well-maintained equipment during decommissioning will ensure noise of operating machinery is kept as low as possible. Use of explosives underwater is expected to cause a significant source of sound. Consultation with JNCC and DECC will occur before agreement on any operation. Perenco will also conform to 'JNCC guidelines for minimising the risk of injury to marine mammals from using explosives.' An MMO will be onboard the vessel during cutting and/or explosive operation. UK Hydrographical Office and Kingfisher will be informed of all activities.

Table 4.2 Environmental Impact Assessment Summary – cont'd		
Activity	**Main Impacts**	**Management**
Subsea Installations Removal	Energy use and atmospheric emissions Underwater noise Dropped object Accidental hydrocarbon release Production of Waste Damage or loss of fishing gear Disturbance to the Seabed Shipping and other users of the sea	Vessels will be audited as part of selection and pre-mobilisation. Work programmes will be planned to optimise vessel time in the field. Offshore vessels will avoid concentrations of marine mammals. A post decommissioning debris survey will be conducted and any debris recovered. As part of the OPEP Perenco will have specialist oil spill response services provided by Oil Spill Response Ltd. (OSRL). Materials are reused and recycled where possible. Compliance with UK waste legislation and duty of care. Underwater cutting could be a potential source of sound, the operation of well-maintained equipment during decommissioning will ensure noise of operating machinery is kept as low as possible. Use of explosives underwater is expected to cause a significant source of sound. Use of explosives underwater is expected to cause a significant source of sound. Consultation with JNCC and DECC will occur before agreement on any operation. Perenco will also conform to 'JNCC guidelines for minimising the risk of injury to marine mammals from using explosives.' An MMO will be onboard the vessel during cutting and/or explosive operation. UK Hydrographical Office and Kingfisher will be informed of all activities.

Table 4.2 Environmental Impact Assessment Summary – cont'd		
Activity	**Main Impacts**	**Management**
Decommissioning Pipelines (left in situ)	Energy use and atmospheric Emissions Underwater noise Damage or loss of fishing gear Disturbance to Seabed Dropped object Accidental hydrocarbon release Shipping and other users of the sea	Pipelines have been pre-flushed with seawater and risk assessments will indicate the potential for any environmental impact. Pipeline ends and exposed areas will be buried in situ preventing the release of pipeline contents into the marine environment Rock placement will be deposited from a dedicated rock placement vessel. This will be applied for under a DEPCON application. Perenco will apply for a Marine Licence to cover the potential disturbance of the seabed. Perenco will ensure that disturbance is kept to a minimum during the operations. A post decommissioning debris survey will be conducted and any debris recovered. As part of the OPEP Perenco will have specialist oil spill response services provided by Oil Spill Response Ltd. (OSRL). Underwater cutting could be a potential source of sound, the operation of well-maintained equipment during decommissioning will ensure noise of operating machinery is kept as low as possible. An MMO will be onboard the vessel during cutting and/or explosive operation. UK Hydrographical Office and Kingfisher will be informed of all activities.

Table 4.2 Environmental Impact Assessment Summary – cont'd		
Activity	**Main Impacts**	**Management**
Decommissioning Stabilisation Features	Energy use and atmospheric Emissions Underwater noise Damage or loss of fishing gear Disturbance to Seabed Dropped object Accidental hydrocarbon release Shipping and other users of the sea	All mattresses will be decommissioned in accordance with the current DECC Guidance notes (Version 6, March 2011).
Decommissioning Drill Cuttings	Long-term presence of hydrocarbons in sediments Leaching of hydrocarbons into the surrounding sediments and water column	There are no drill cutting piles associated with the Thames Complex installation in the area. Should any evidence of drill cuttings be discovered, Perenco will contact DECC to review findings and extent and agree any necessary remedial actions.

5 INTERESTED PARTY CONSULTATIONS

Consultations Summary:
(This section will be updated when the consultation phase is completed).

Table 5.1 Summary of Consultee Comments		
Who	**Comment**	**Response**
INFORMAL CONSULTATIONS		
TBA		
TBA		
TBA		
STATUTORY CONSULTATIONS		
NFFO		
SFF		
NIFPO		
Global Marine Systems		
DECC		

6 PROGRAMME MANAGEMENT

6.1 Project Management and Verification

A Perenco Project Management team will be appointed to manage suitable sub-contractors for the execution of the Thames Complex Decommissioning Programmes work scopes. Perenco standard procedures for operational control and hazard identification and management will be used. Where possible the work will be coordinated with other decommissioning operations in the SNS. Perenco will monitor and track the process of consents and the consultations required as part of this process. Any changes in detail to the offshore removal programme will be discussed with DECC.

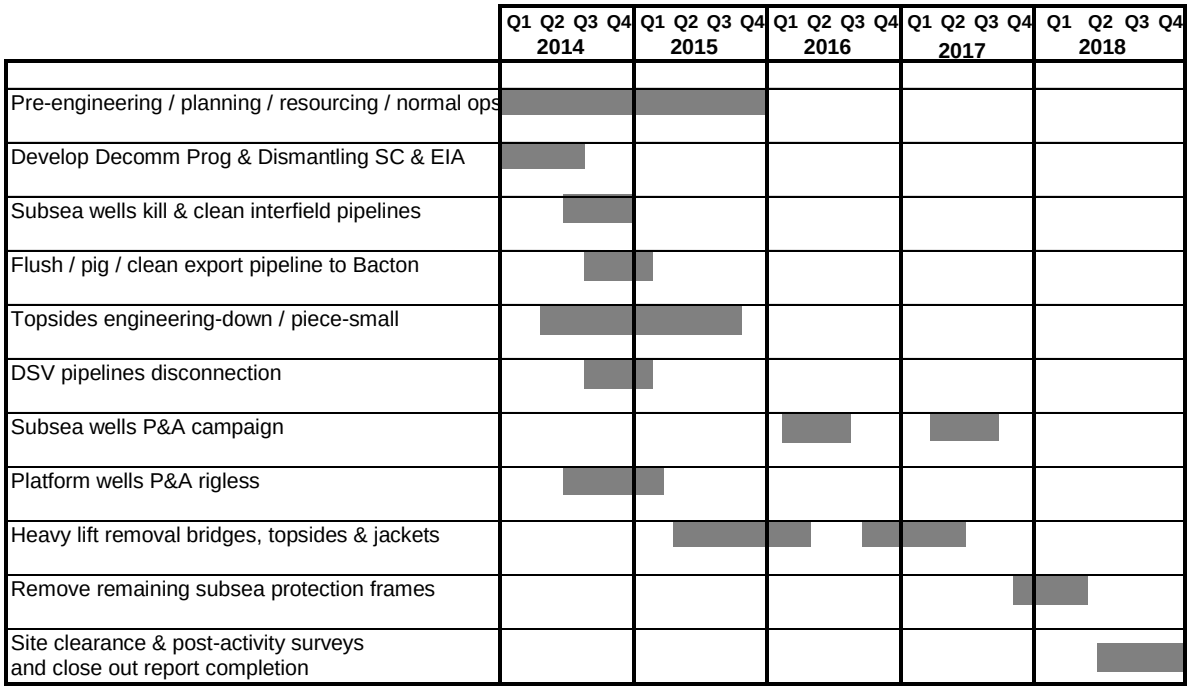
6.2 Post-Decommissioning Debris Clearance and Verification

A post decommissioning site survey will be carried out around 500m radius of Thames complex installation sites, 500m radius of subsea installation sites and a 200m corridor along each existing pipeline route. Oil and gas seabed debris will be recovered for onshore disposal or recycling in line with existing disposal methods. Independent verification of seabed state will be obtained by trawling the platform area. This will be followed by a statement of clearance to all relevant governmental departments and non-governmental organisations.

6.3 Schedule

Project Plan:

Figure 6.1: Gantt Chart of Project Plan



The current Thames Decommissioning Project is a 5 year plan. The availability of the key vessels including the heavy lift vessel and rig for wells plugging and abandonment drives the completion dates of the overall project.

6.4 Costs

Table 6.1 – Provisional Decommissioning Programme(s) costs	
Item	**Estimated Cost (£m)**
Platform(s) /Jacket(s) - Preparation / Removal and Disposal	43
Pipeline(s) and Umbilical(s) Infrastructure Decommissioning	6.6
Subsea Installation(s) and Stabilisation Feature(s)	6
Well Abandonment	40
Continuing Liability – Future Pipeline and Environmental Survey Requirements	0.5
TOTAL	**96.1**

6.5 Close Out

In accordance with the DECC Guidelines, a close out report will be submitted to DECC explaining any variations, from the Decommissioning Programme (normally within 4 months of the completion of the offshore decommissioning scope) including debris removal and independent verification of seabed clearance and the first post-decommissioning environmental survey.

6.6 Post-Decommissioning Monitoring and Evaluation

A post decommissioning environmental seabed survey, centred around sites of the wellheads and Thames complex installation, will be carried out. The survey will focus on chemical and physical disturbances of the decommissioning area and be compared with the pre-decommissioning survey which will be carried out before decommissioning commences. Results of this survey will be available once the work is complete, with a copy forwarded to DECC. All pipeline routes and structure sites will be the subject of surveys when decommissioning activity has concluded. The survey will include the 200m corridor along the pipeline routes, the complex 500m zone, wellheads and installation 500m radius zones. After the surveys have been sent to DECC and reviewed, the post-decommissioning monitoring regime to be discussed and agreed with DECC

7 SUPPORTING DOCUMENTS

Table 7.1: Supporting Documents	
Document Number	**Title**
1	Environmental Impact Assessment
2	Comparative Assessment
3	THAMES PIPELINE SURVEYS - C13021b
4	M0736-REP-10-012-00_1000t_Sheerleg_Removal_Method' contains further detail of the removal methodology

8. PARTNER(S) LETTER(S) OF SUPPORT

Tullow Oil plc

Centrica Energy

Tullow Oil SK Ltd

Tullow Oil plc

9, Chiswick Park, 566 Chiswick High Road, London, W4 5XT
Tel: +44 (0)203 249 9000 Fax: +44 (0)203 249 8801

Perenco (UK) Decommissioning Team
Thames House
Thamesfield Way,
Gt Yarmouth
Norfolk NR31 0DN

9 April 2014

RE: THAMES COMPLEX DECOMMISSIONING PROGRAMME

Dear Sir/Madam,

We acknowledge receipt of your decommissioning programme for the Thames Complex facilities.

We, Tullow Oil Plc confirm that we support the proposals detailed in the Thames Complex decommissioning programme dated 19th February 2014 which will be submitted to DECC by Perenco on behalf of Perenco and Partners under the requirement of section 29 of the Petroleum Act 1998.

Yours faithfully,
Mohamed Ayad

For and on behalf of Tullow Oil Plc

Registered in England and Wales: Number 3919249
Registered Office as above

centrica
energy

5th Floor
IQ Building
15 Justice Mill Lane
Aberdeen
AB11 6EQ
www.centrica.com

Frederic De Meo
Decommissioning Manager
Perenco UK Ltd.
Thames House
Thamesfield Way
Great Yarmouth
NR31 0DN

23rd May 2014

Dear Frederic,

I am writing to confirm that, as a licensee in Licence P.037 Block 49/28a REST, which contains the Thames Complex Field and Block 49/28a A, which contains the Thurne Deben Field, Centrica Resources Limited ("**Centrica**") hereby approves the attached Decommissioning Programme Document, as provided by Perenco UK Limited ("**Perenco**") to Centrica by FTP transfer on 23rd May 2014, and authorises Perenco, as Operator of Licence P.037 Block 49/28a REST and Block 49/28a A, to submit such Decommissioning Programme Document to the Secretary of State for Energy and Climate Change for approval under the Petroleum Act 1998.

Yours sincerely,

Colette Cohen
Director, Centrica Resources Limited

Tullow Oil SK Limited

9, Chiswick Park, 566 Chiswick High Road, London, W4 5XT
Tel: +44 (0)203 249 9000 Fax: +44 (0)203 249 8801

Perenco (UK) Decommissioning Team
Thames House
Thamesfield Way,
Gt Yarmouth
Norfolk NR31 0DN

3rd April 2014

RE: THAMES COMPLEX DECOMMISSIONING PROGRAMME

Dear Sir/Madam,

We acknowledge receipt of your decommissioning programme for the Thames Complex facilities.

We, Tullow Oil SK Limited confirm that we support the proposals detailed in the Thames Complex decommissioning programme dated 19th February 2014 which will be submitted to DECC by Perenco on behalf of Perenco and Partners under the requirement of section 29 of the Petroleum Act 1998.

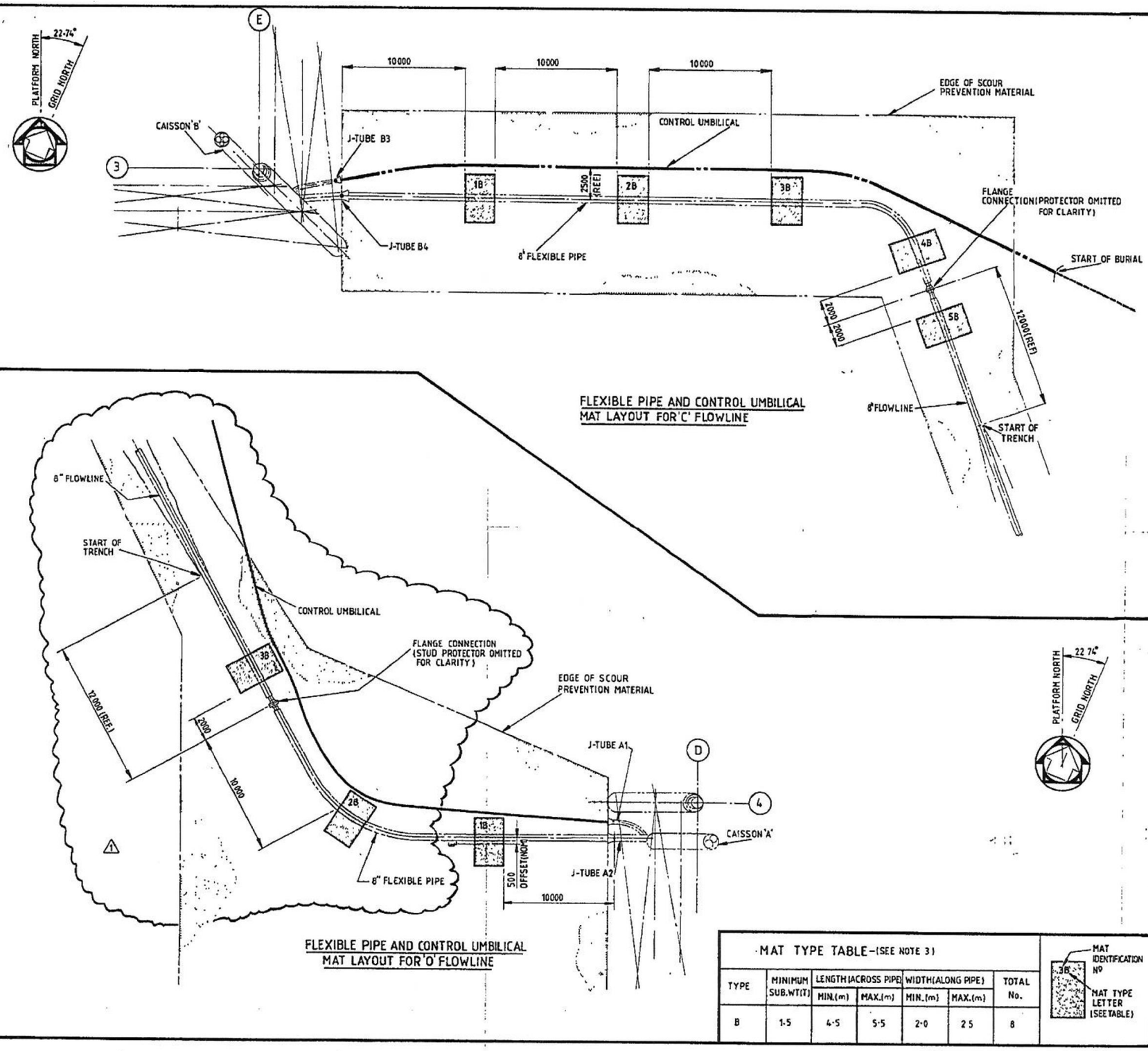
Yours faithfully,
Mohamed Ayad

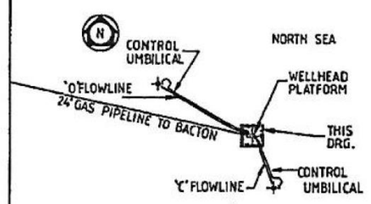
For and on behalf of Tullow Oil SK Limited

8. APPENDIX

Thames Mattress Drawings

A1





BLOCK 49/28 DEVELOPMENT

KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR DETAILS OF MAT COMPOSITION CONSTRUCTION AND MARKING SEE SPECIFICATION No. 4.4-AXX-SS-L809
3. ALL MAT SIZES AND WEIGHTS TO LIE WITHIN THE LIMITS SPECIFIED FOR THE RELEVANT MAT TYPE.
4. MAT NOS. 1-5 ('C' FLEXIBLE) AND 1-3 ('O' FLEXIBLE) ARE TO ACT AS TEMPORARY STABILISATION DURING CONSTRUCTION PERIOD AND SHOULD BE PLACED AS SOON AS POSSIBLE AFTER FLEXIBLE INSTALLATION.
5. MAT ARRANGEMENTS ASSUME INSTALLATION OF FLEXIBLE PIPE PRIOR TO UMBILICAL. THE UMBILICAL SHALL BE POSITIONED CLOSE TO THE FLEXIBLE MATS BUT SHALL NOT BE LEFT RESTING ON TOP OF ANY MATS.
6. ALL MATS TO BE PLACED CENTRALLY OVER PIPE UNLESS NOTED OTHERWISE
7. MAT ARRANGEMENTS ASSUME INSTALLATION OF ROCK DUMP PROTECTION BEFORE END OF CONSTRUCTION SEASON. IF FLEXIBLES AND UMBILICALS REMAIN EXPOSED THROUGH WINTER, ADDITIONAL STABILISATION MATS ARE REQUIRED.
8. THE FLEXIBLE PIPE AND UMBILICAL ON-BOTTOM STABILITY ANALYSIS IS PRESENTED IN DOC. No. 4.4-AFX-AC-L513.

MAT TYPE TABLE – (SEE NOTE 3)

TYPE	MINIMUM SUB.WT(T)	LENGTH ACROSS PIPE MIN.(m)	LENGTH ACROSS PIPE MAX.(m)	WIDTH (ALONG PIPE) MIN.(m)	WIDTH (ALONG PIPE) MAX.(m)	TOTAL No.
B	1·5	4·5	5·5	2·0	2·5	8

44-AFX-DW-L522	'C' FLOWLINE AND UMBILICAL PLATFORM RISERS G.A.
44-AFX-DW-L521	'O' FLOWLINE AND UMBILICAL PLATFORM RISERS G.A.
44-AFX-DW-L511	PLATFORM APPROACH LAYOUT

DRAWING No | TITLE

REFERENCE DRAWINGS

REV	DATE	REVISION	BY	CHK	ENG	QA	PM	DATE
1	23·5·86	'O' FLOWLINE & UMBILICAL REVISED	JBT					
0	7·2·86	APPROVED FOR CONSTRUCTION	MDH					
A	28·1·86	PRELIMINARY ISSUE	BK					

STAMP

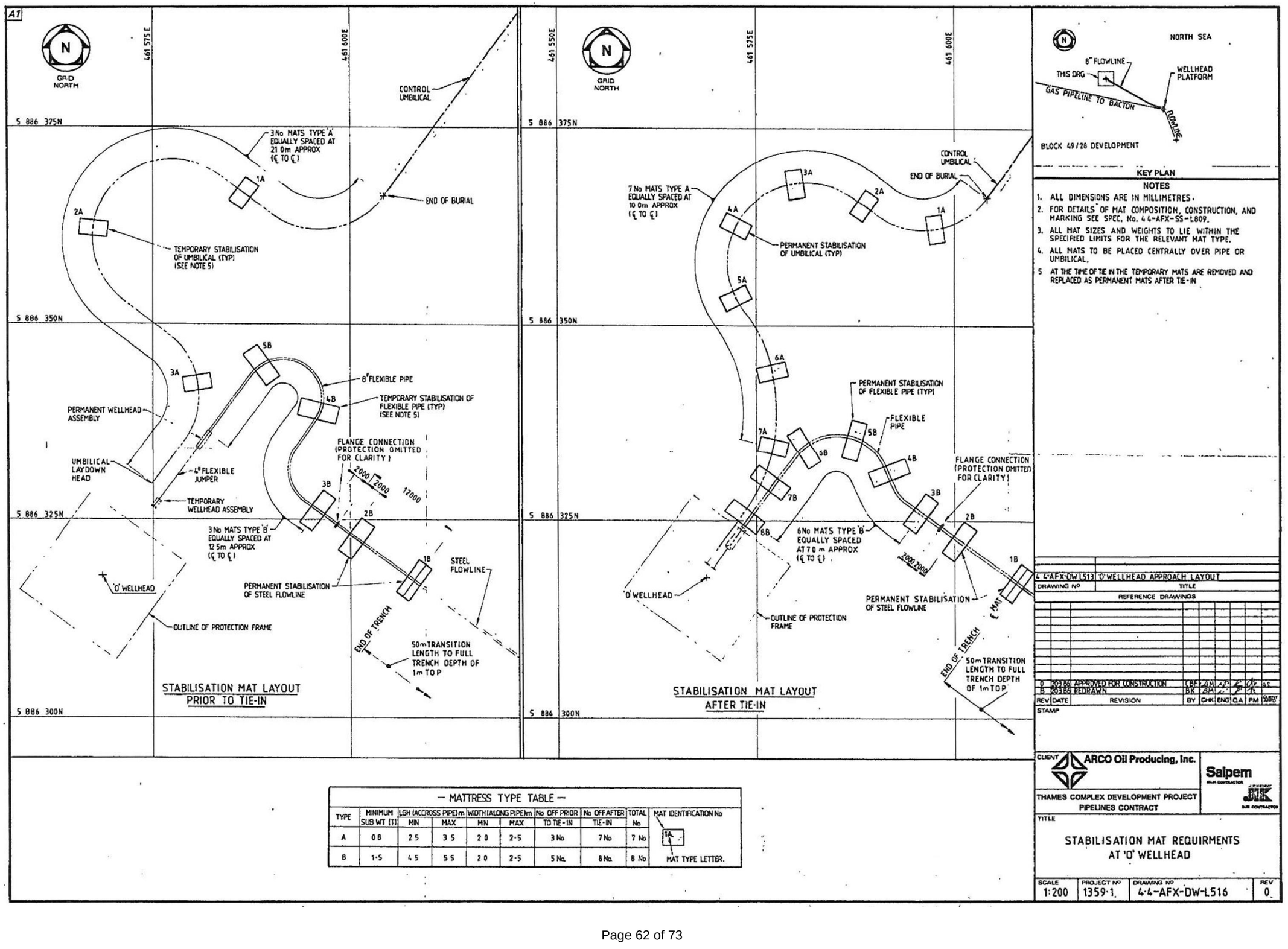
CLIENT: ARCO Oil Producing, Inc.

THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT

Salpem MAIN CONTRACTOR
JDK SUB CONTRACTOR

TITLE
TEMPORARY STABILISATION MAT REQUIREMENTS AT PLATFORM

SCALE	PROJECT No	DRAWING No	REV
1:150	1359·1	4·4-AFX-DW-L515	1



NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR DETAILS OF MAT COMPOSITION, CONSTRUCTION, AND MARKING SEE SPEC. No. 4 4-AFX-SS-L809.
3. ALL MAT SIZES AND WEIGHTS TO LIE WITHIN THE SPECIFIED LIMITS FOR THE RELEVANT MAT TYPE.
4. ALL MATS TO BE PLACED CENTRALLY OVER PIPE OR UMBILICAL.
5. AT THE TIME OF TIE IN THE TEMPORARY MATS ARE REMOVED AND REPLACED AS PERMANENT MATS AFTER TIE-IN.

— MATTRESS TYPE TABLE —

TYPE	MINIMUM SUB WT (T)	LGH (ACCROSS PIPE) m MIN	LGH (ACCROSS PIPE) m MAX	WIDTH (ALONG PIPE) m MIN	WIDTH (ALONG PIPE) m MAX	No OFF PRIOR TO TIE-IN	No OFF AFTER TIE-IN	TOTAL No
A	0 8	2 5	3 5	2 0	2·5	3 No.	7 No	7 No
B	1·5	4 5	5 5	2 0	2·5	5 No.	8 No.	8 No

MAT IDENTIFICATION No — 1A — MAT TYPE LETTER.

REV	DATE	REVISION	BY	CHK	ENG	Q.A	PM	CLIENT
0	20386	APPROVED FOR CONSTRUCTION	CBF	AM				
B	20386	REDRAWN	BK	AM				

STAMP

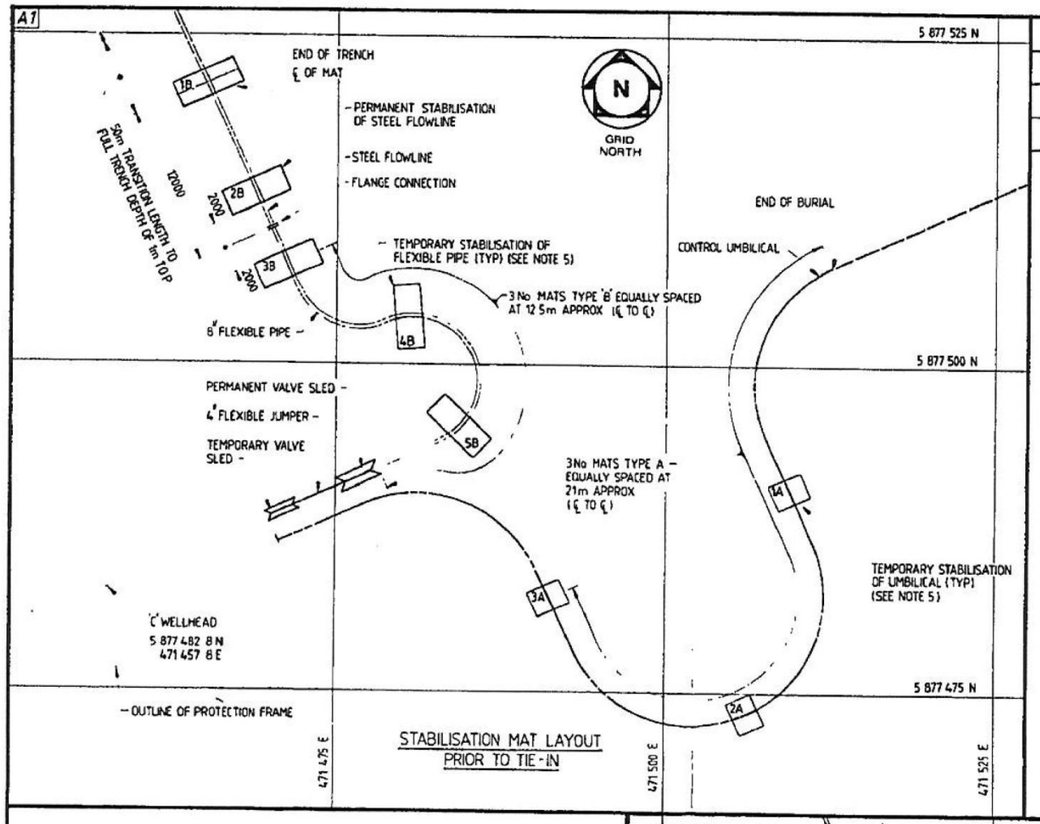
CLIENT: ARCO Oil Producing, Inc.
MAIN CONTRACTOR: Saipem
SUB CONTRACTOR: STENA OFFSHORE
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT

TITLE
STABILISATION MAT REQUIRMENTS AT '0' WELLHEAD

DRAWING No	TITLE
4-4-AFX-DW-L513	'0' WELLHEAD APPROACH LAYOUT

REFERENCE DRAWINGS

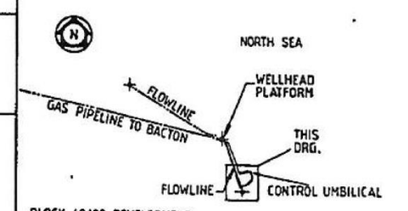
SCALE	PROJECT No	DRAWING No	REV
1:200	1359·1	4-4-AFX-DW-L516	0



— MATTRESS TYPE TABLE —

TYPE	MINIMUM SUB WT (T)	LGH (ACROSS PIPE) m MIN	LGH (ACROSS PIPE) m MAX	WIDTH (ALONG PIPE) m MIN	WIDTH (ALONG PIPE) m MAX	No OFF PRIOR TO TIE-IN	No OFF AFTER TIE-IN	TOTAL No
A	0 8	2 5	3 5	2 0	2 5	3 No	4 No	7 No
B	1 5	4 5	5 5	2 0	2 5	5 No	3 No	8 No

MAT IDENTIFICATION No: 1A (1 — MAT TYPE LETTER; A — MAT TYPE LETTER)



BLOCK 49/28 DEVELOPMENT

KEY PLAN

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR DETAILS OF MAT COMPOSITION, CONSTRUCTION, AND MARKING SEE SPEC. No. 44-AFX-SS-L809.
3. ALL MAT SIZES AND WEIGHTS TO LIE WITHIN THE SPECIFIED LIMITS FOR THE RELEVANT MAT TYPE.
4. ALL MATS TO BE PLACED CENTRALLY OVER PIPE OR UMBILICAL.
5. AT THE TIME OF TIE-IN THE TEMPORARY MATS ARE REMOVED AND THEN REPLACED AS PERMANENT MATS AFTER TIE-IN

44-AFX-DW-L512 'C' WELLHEAD APPROACH LAYOUT
DRAWING No | TITLE
REFERENCE DRAWINGS

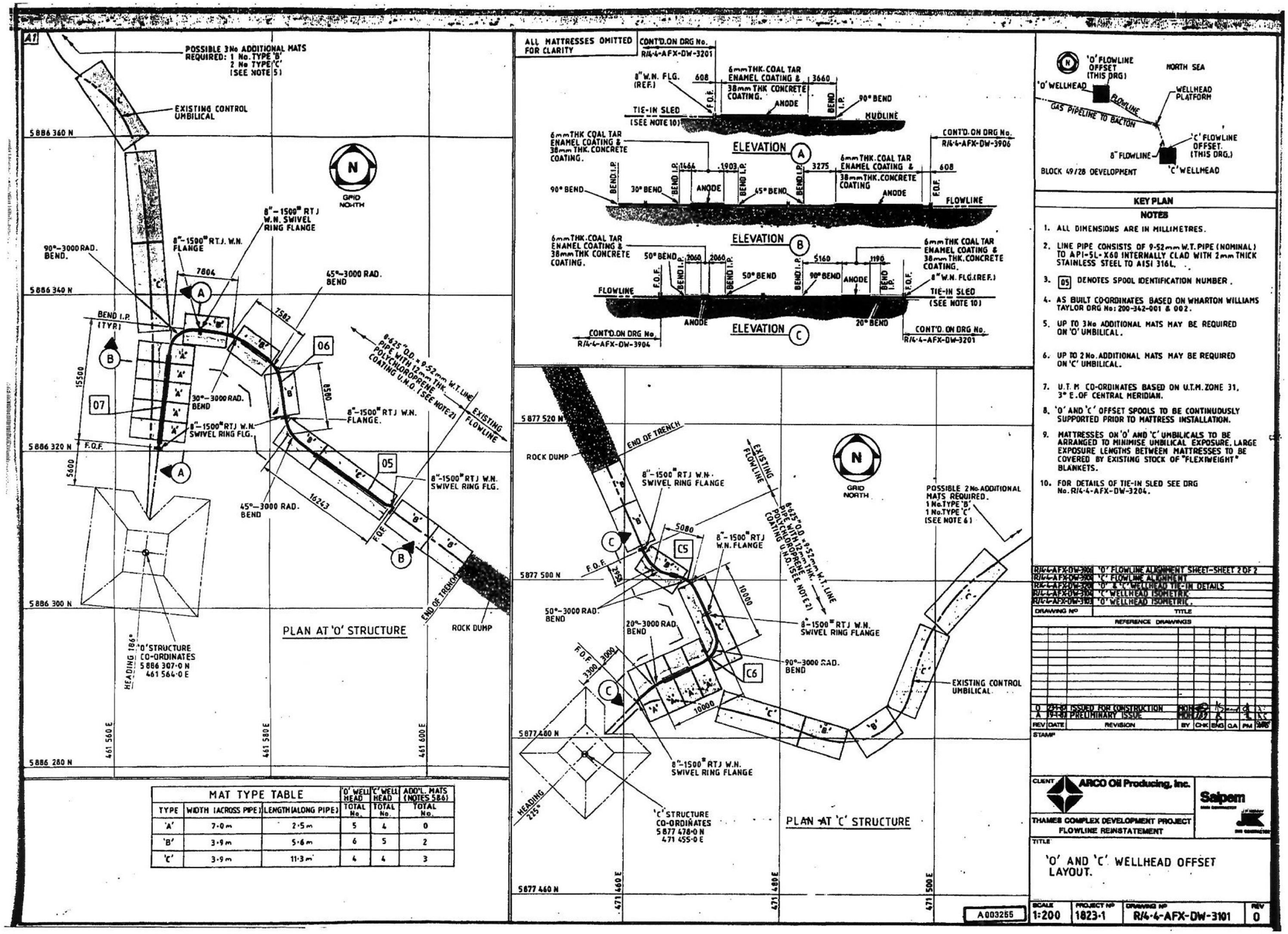
REV	DATE	REVISION	BY	CHK	ENG	QA	PM
0	20 3 86	APPROVED FOR CONSTRUCTION	CBF	AM			
A	20 3 86	REDRAWN	CBF	AM			

STAMP

CLIENT: ARCO Oil Producing, Inc.
MAIN CONTRACTOR: Saipem
SUB CONTRACTOR: JRK
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT

TITLE
STABILISATION MAT REQUIREMENTS AT 'C' WELLHEAD

SCALE	PROJECT No	DRAWING No	REV
1:200	1359-1	44-AFX-DW-L518	0



MAT TYPE TABLE			'O' WELL HEAD	'C' WELL HEAD	ADD'L MATS (NOTES 5&6)
TYPE	WIDTH (ACROSS PIPE)	LENGTH (ALONG PIPE)	TOTAL No.	TOTAL No.	TOTAL No.
'A'	7·0 m	2·5 m	5	4	0
'B'	3·9 m	5·6 m	6	5	2
'C'	3·9 m	11·3 m	4	4	3

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. LINE PIPE CONSISTS OF 9·52mm W.T. PIPE (NOMINAL) TO API-5L-X60 INTERNALLY CLAD WITH 2mm THICK STAINLESS STEEL TO AISI 316L.
3. 05 DENOTES SPOOL IDENTIFICATION NUMBER.
4. AS BUILT CO-ORDINATES BASED ON WHARTON WILLIAMS TAYLOR DRG No: 200-342-001 & 002.
5. UP TO 3No ADDITIONAL MATS MAY BE REQUIRED ON 'O' UMBILICAL.
6. UP TO 2 No. ADDITIONAL MATS MAY BE REQUIRED ON 'C' UMBILICAL.
7. U.T.M CO-ORDINATES BASED ON U.T.M. ZONE 31, 3° E. OF CENTRAL MERIDIAN.
8. 'O' AND 'C' OFFSET SPOOLS TO BE CONTINUOUSLY SUPPORTED PRIOR TO MATTRESS INSTALLATION.
9. MATTRESSES ON 'O' AND 'C' UMBILICALS TO BE ARRANGED TO MINIMISE UMBILICAL EXPOSURE. LARGE EXPOSURE LENGTHS BETWEEN MATTRESSES TO BE COVERED BY EXISTING STOCK OF "FLEXIWEIGHT" BLANKETS.
10. FOR DETAILS OF TIE-IN SLED SEE DRG No. R/4-4-AFX-DW-3204.

DRAWING No	TITLE
R/4-4-AFX-DW-3006	'O' FLOWLINE ALIGNMENT SHEET-SHEET 2 OF 2
R/4-4-AFX-DW-3005	'C' FLOWLINE ALIGNMENT
R/4-4-AFX-DW-3204	'O' & 'C' WELLHEAD TIE-IN DETAILS
R/4-4-AFX-DW-3104	'C' WELLHEAD ISOMETRIK
R/4-4-AFX-DW-3103	'O' WELLHEAD ISOMETRIK.

REFERENCE DRAWINGS

REV	DATE	REVISION	BY	CHK	ENG	Q.A.	PM
0	23-8-91	ISSUED FOR CONSTRUCTION					
A	19-8-91	PRELIMINARY ISSUE					

STAMP

CLIENT: ARCO Oil Producing, Inc.

Saipem

THAMES COMPLEX DEVELOPMENT PROJECT
FLOWLINE REINSTATEMENT

TITLE: 'O' AND 'C' WELLHEAD OFFSET LAYOUT.

SCALE	PROJECT No	DRAWING No	REV
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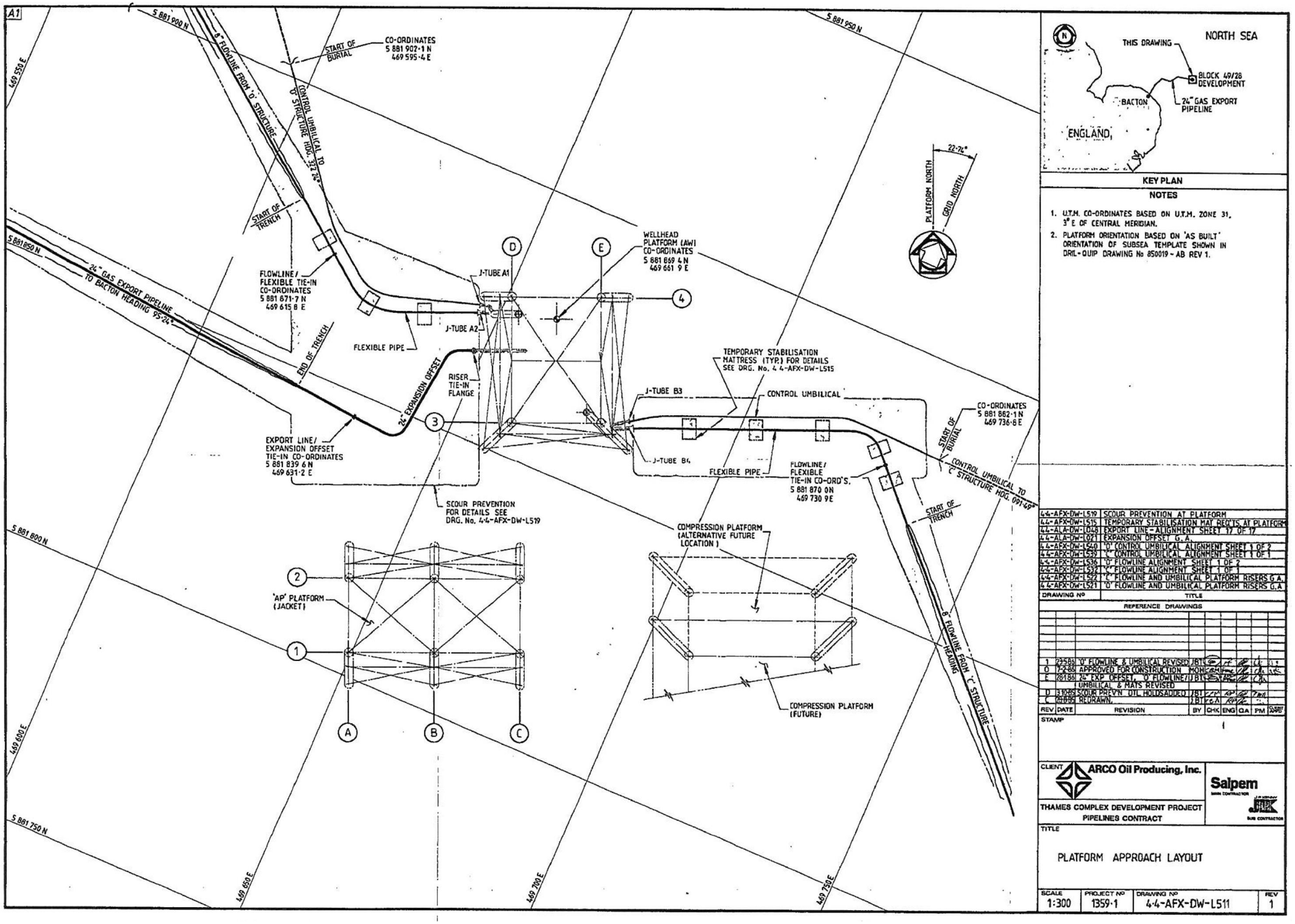
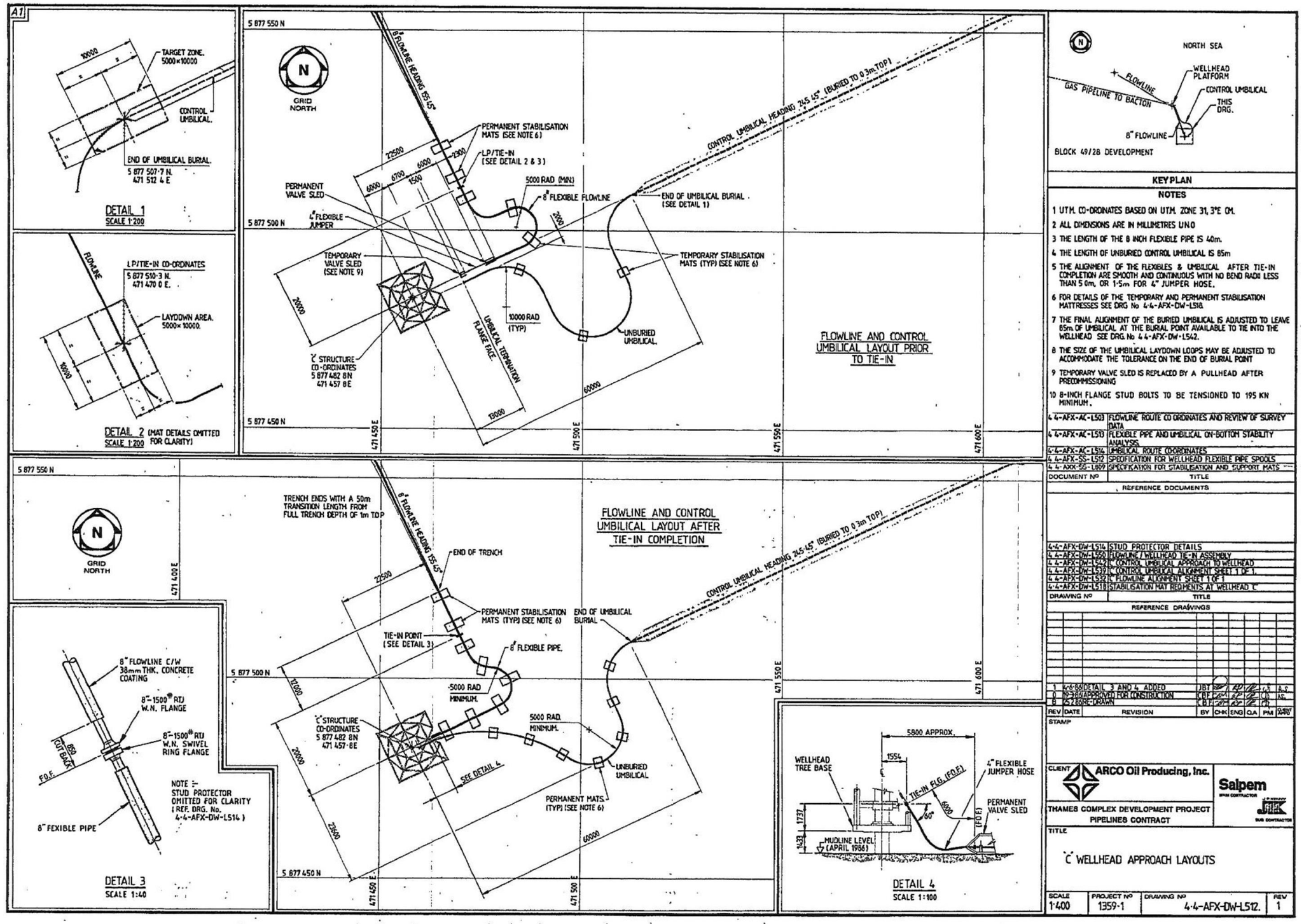
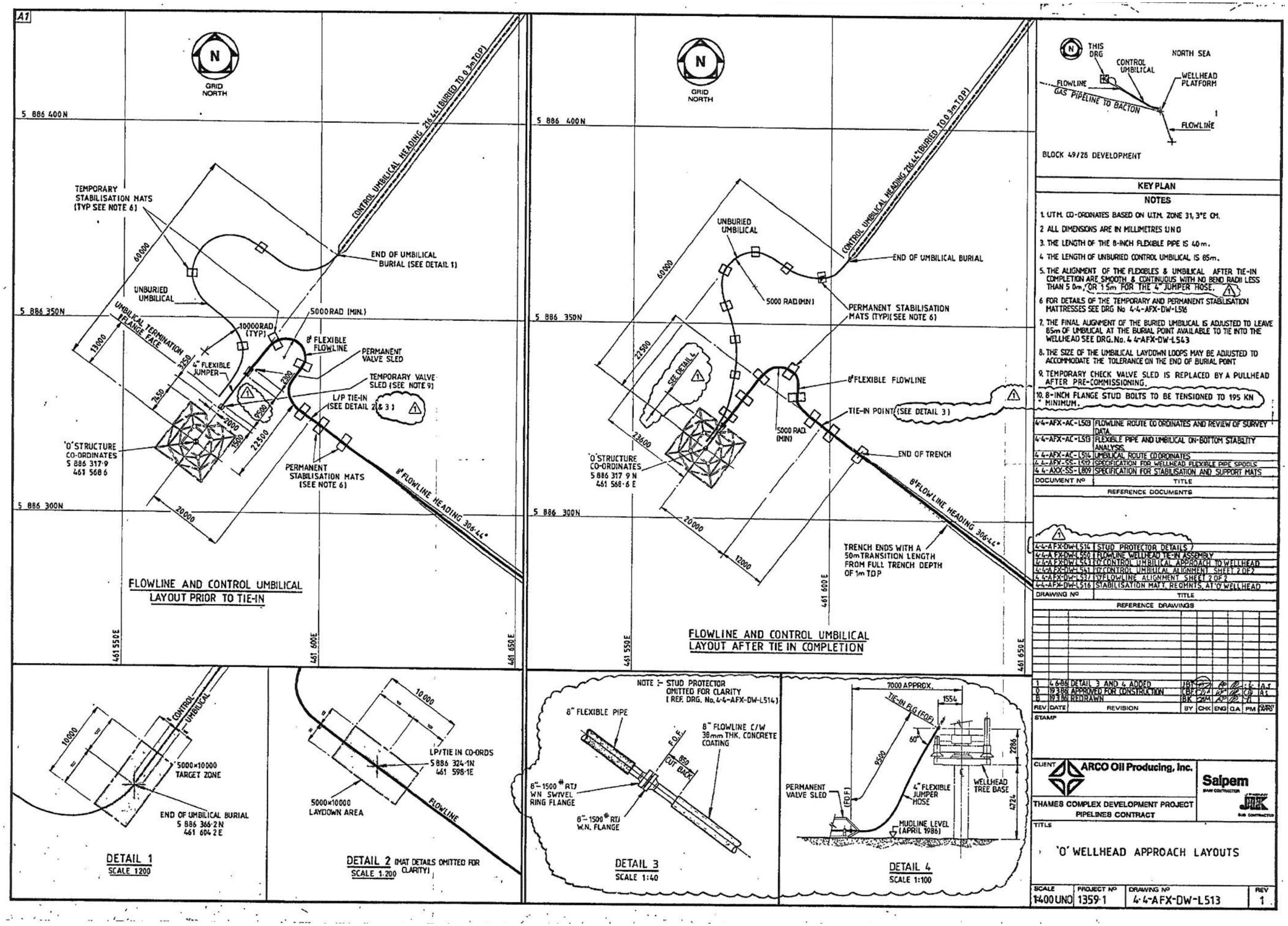
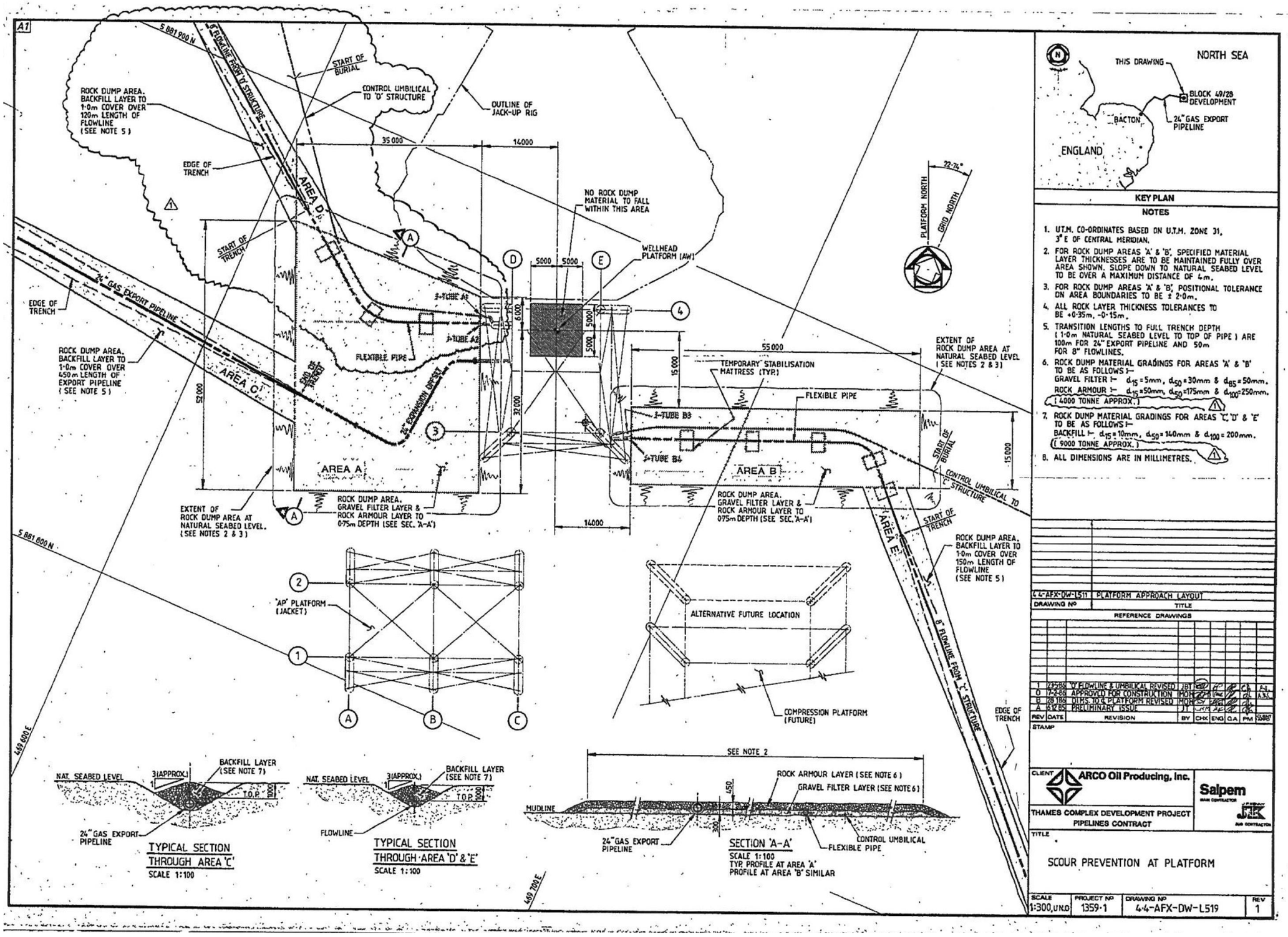
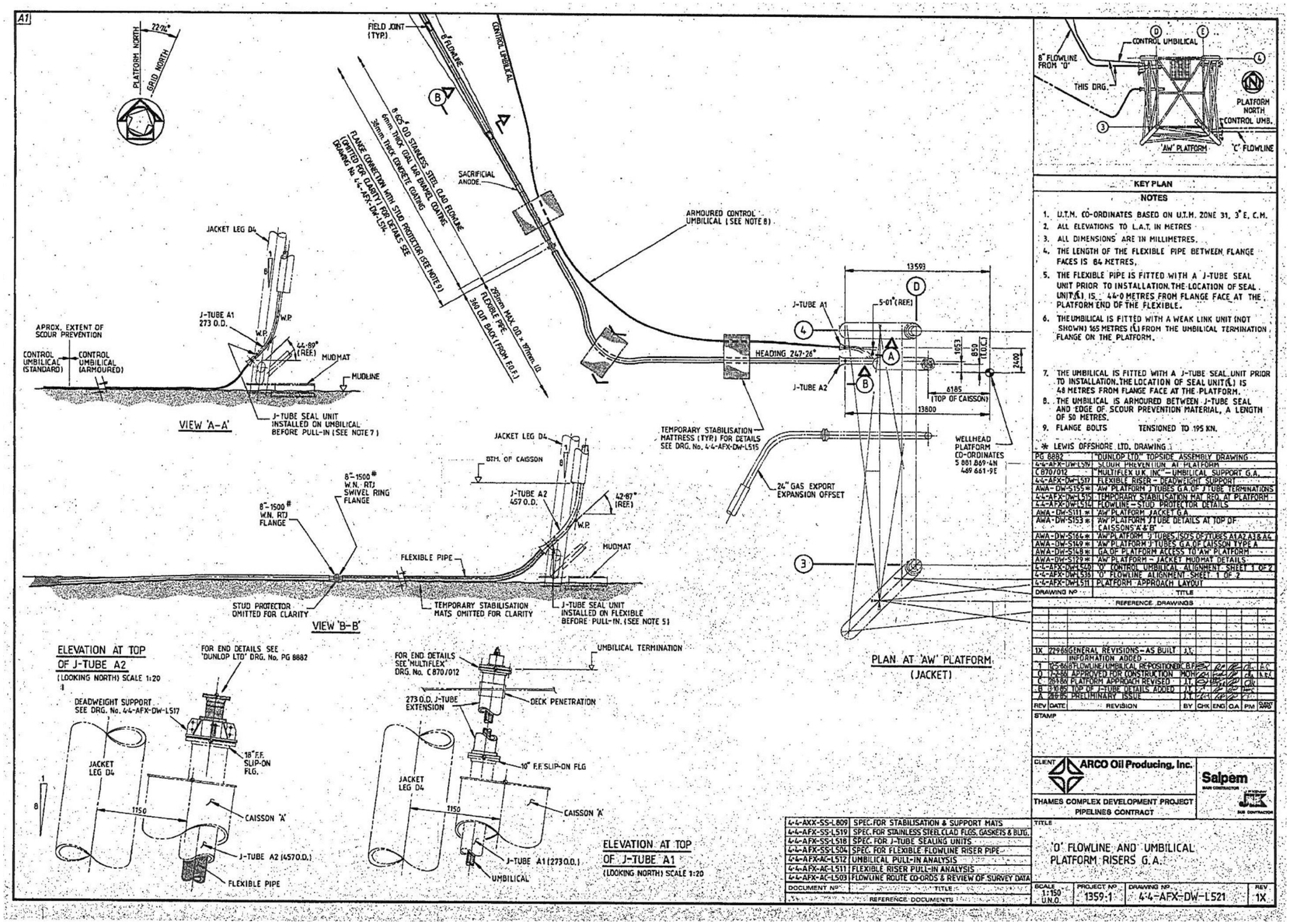
A 003255

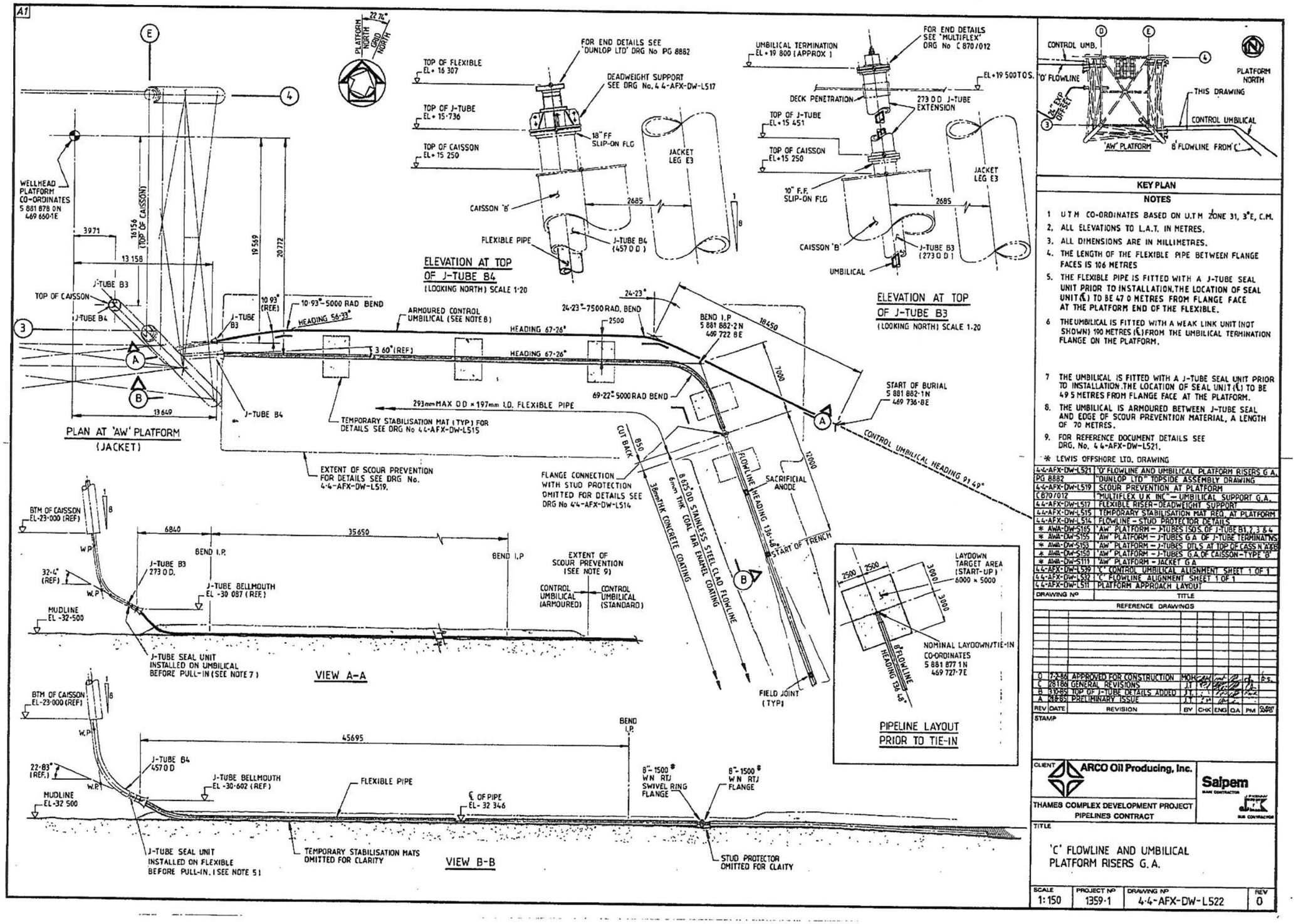

A1
S 881 900 N
469 550 E
8" FLOWLINE FROM 'C' STRUCTURE
START OF BURIAL
CO-ORDINATES
S 881 902·1 N
469 595·4 E
CONTROL UMBILICAL TO 'D' STRUCTURE HDG. 322·24°
START OF TRENCH
S 881 850 N
24" GAS EXPORT PIPELINE TO BACTON HEADING 95·24°
FLOWLINE / FLEXIBLE TIE-IN CO-ORDINATES
S 881 871·7 N
469 615 8 E
END OF TRENCH
FLEXIBLE PIPE
J-TUBE A1
J-TUBE A2
WELLHEAD PLATFORM (AW)
CO-ORDINATES
S 881 869 4 N
469 661 9 E
D
E
4
3
24" EXPANSION OFFSET
RISER TIE-IN FLANGE
TEMPORARY STABILISATION MATTRESS (TYP.) FOR DETAILS SEE ORG. No. 4 4-AFX-DW-L515
J-TUBE B3
CONTROL UMBILICAL
J-TUBE B4
FLEXIBLE PIPE
FLOWLINE / FLEXIBLE TIE-IN CO-ORD'S.
S 881 870 0N
469 730 9E
CO-ORDINATES
S 881 862·1 N
469 736·8 E
START OF BURIAL
CONTROL UMBILICAL TO 'C' STRUCTURE HDG. 091·69°
START OF TRENCH
6" FLOWLINE FROM 'C' STRUCTURE HEADING
EXPORT LINE / EXPANSION OFFSET TIE-IN CO-ORDINATES
S 881 839 6 N
469 631·2 E
SCOUR PREVENTION FOR DETAILS SEE DRG. No. 4-4-AFX-DW-L519
S 881 800 N
469 600 E
S 881 750 N
469 650 E
469 700 E
469 750 E
2
'AP' PLATFORM (JACKET)
1
A
B
C
COMPRESSION PLATFORM (ALTERNATIVE FUTURE LOCATION)
COMPRESSION PLATFORM (FUTURE)
S 881 950 N
22·74°
PLATFORM NORTH
GRID NORTH
N
NORTH SEA
THIS DRAWING
BLOCK 49/28 DEVELOPMENT
BACTON
24" GAS EXPORT PIPELINE
ENGLAND
KEY PLAN
NOTES
1. U.T.M. CO-ORDINATES BASED ON U.T.M. ZONE 31, 3° E OF CENTRAL MERIDIAN.
2. PLATFORM ORIENTATION BASED ON 'AS BUILT' ORIENTATION OF SUBSEA TEMPLATE SHOWN IN DRIL-QUIP DRAWING No 850019 - AB REV 1.
4-4-AFX-DW-L519 SCOUR PREVENTION AT PLATFORM
4-4-AFX-DW-L515 TEMPORARY STABILISATION MAT REQ'TS AT PLATFORM
4-4-ALA-DW-L048 EXPORT LINE - ALIGNMENT SHEET 17 OF 17
4-4-ALA-DW-L021 EXPANSION OFFSET G.A.
4-4-AFX-DW-L540 'D' CONTROL UMBILICAL ALIGNMENT SHEET 1 OF 2
4-4-AFX-DW-L539 'C' CONTROL UMBILICAL ALIGNMENT SHEET 1 OF 1
4-4-AFX-DW-L536 'D' FLOWLINE ALIGNMENT SHEET 1 OF 2
4-4-AFX-DW-L537 'C' FLOWLINE ALIGNMENT SHEET 1 OF 1
4-4-AFX-DW-L522 'C' FLOWLINE AND UMBILICAL PLATFORM RISERS G.A.
4-4-AFX-DW-L521 'D' FLOWLINE AND UMBILICAL PLATFORM RISERS G.A.
DRAWING No TITLE
REFERENCE DRAWINGS
1 23586 'D' FLOWLINE & UMBILICAL REVISED JBL
0 7-2-86 APPROVED FOR CONSTRUCTION MOH
E 28188 24" EXP OFFSET, 'D' FLOWLINE/UMBILICAL & MATS REVISED JBL
D 31085 SCOUR PREVN DTL HOLDS ADDED JBL
C 28185 REDRAWN JBL
REV DATE REVISION BY CHK ENG QA PM
STAMP
CLIENT ARCO Oil Producing, Inc.
Salpem MAIN CONTRACTOR
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT
SUB CONTRACTOR
TITLE
PLATFORM APPROACH LAYOUT
SCALE 1:300
PROJECT No 1359·1
DRAWING No 4-4-AFX-DW-L511
REV 1

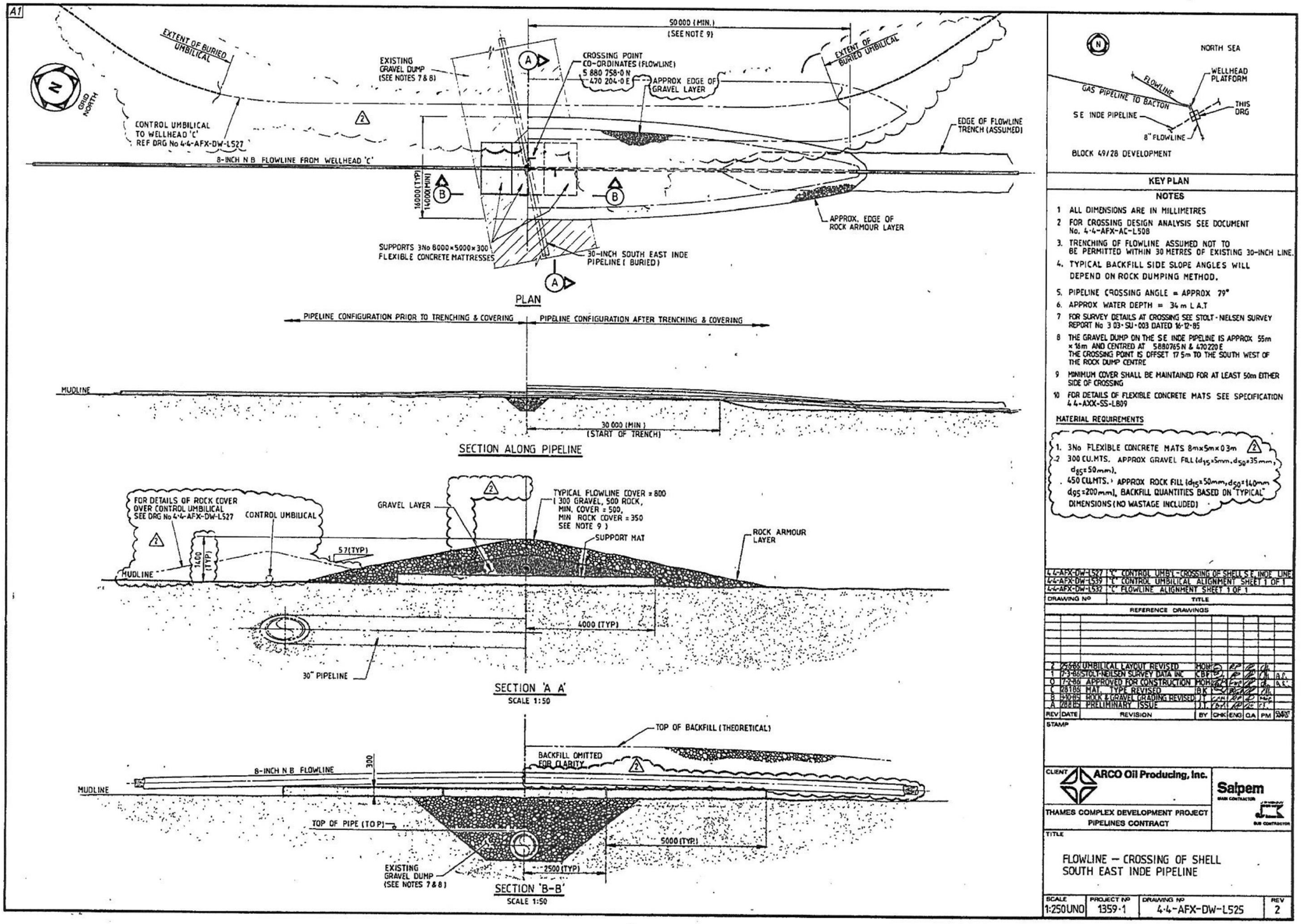

A1
DETAIL 1
SCALE 1:200
TARGET ZONE. 5000×10000
CONTROL UMBILICAL.
END OF UMBILICAL BURIAL.
5 877 507·7 N.
471 512 4 E
DETAIL 2 (MAT DETAILS OMITTED FOR CLARITY)
SCALE 1:200
FLOWLINE
LP/TIE-IN CO-ORDINATES
5 877 510·3 N.
471 470 0 E.
LAYDOWN AREA. 5000× 10000.
5 877 550 N
5 877 500 N
5 877 450 N
471 450 E
471 500 E
471 550 E
471 600 E
GRID NORTH
8" FLOWLINE HEADING 155·45°
CONTROL UMBILICAL HEADING 245·45° (BURIED TO 0·3m TOP)
PERMANENT STABILISATION MATS (SEE NOTE 6)
LP/TIE-IN (SEE DETAIL 2 & 3)
PERMANENT VALVE SLED
4" FLEXIBLE JUMPER
8" FLEXIBLE FLOWLINE
END OF UMBILICAL BURIAL (SEE DETAIL 1)
TEMPORARY VALVE SLED (SEE NOTE 9)
TEMPORARY STABILISATION MATS (TYP) (SEE NOTE 6)
℄ STRUCTURE CO-ORDINATES 5 877 482 8N 471 457 8E
UMBILICAL TERMINATION FLANGE FACE
10000 RAD (TYP)
UNBURIED UMBILICAL
22500
6000
6700
6000
7500
7300
5000 RAD (MIN)
2000
20000
60000
13000
FLOWLINE AND CONTROL UMBILICAL LAYOUT PRIOR TO TIE-IN
NORTH SEA
WELLHEAD PLATFORM
FLOWLINE
GAS PIPELINE TO BACTON
CONTROL UMBILICAL
THIS DRG.
8" FLOWLINE
BLOCK 49/28 DEVELOPMENT
KEY PLAN
NOTES
1 UTM. CO-ORDINATES BASED ON UTM. ZONE 31, 3°E CM.
2 ALL DIMENSIONS ARE IN MILLIMETRES UNO
3 THE LENGTH OF THE 8 INCH FLEXIBLE PIPE IS 40m.
4 THE LENGTH OF UNBURIED CONTROL UMBILICAL IS 85m
5 THE ALIGNMENT OF THE FLEXIBLES & UMBILICAL AFTER TIE-IN COMPLETION ARE SMOOTH AND CONTINUOUS WITH NO BEND RADII LESS THAN 5·0m, OR 1·5m FOR 4" JUMPER HOSE.
6 FOR DETAILS OF THE TEMPORARY AND PERMANENT STABILISATION MATTRESSES SEE DRG No 4-4-AFX-DW-L518.
7 THE FINAL ALIGNMENT OF THE BURIED UMBILICAL IS ADJUSTED TO LEAVE 85m OF UMBILICAL AT THE BURIAL POINT AVAILABLE TO TIE INTO THE WELLHEAD SEE DRG No 4 4-AFX-DW-L542.
8 THE SIZE OF THE UMBILICAL LAYDOWN LOOPS MAY BE ADJUSTED TO ACCOMMODATE THE TOLERANCE ON THE END OF BURIAL POINT
9 TEMPORARY VALVE SLED IS REPLACED BY A PULLHEAD AFTER PRECOMMISSIONING
10 8-INCH FLANGE STUD BOLTS TO BE TENSIONED TO 195 KN MINIMUM.
4 4-AFX-AC-L503 FLOWLINE ROUTE CO ORDINATES AND REVIEW OF SURVEY DATA
4 4-AFX-AC-L513 FLEXIBLE PIPE AND UMBILICAL ON-BOTTOM STABILITY ANALYSIS.
4·4-AFX-AC-L514 UMBILICAL ROUTE CO-ORDINATES
4 4-AFX-SS-L512 SPECIFICATION FOR WELLHEAD FLEXIBLE PIPE SPOOLS
4 4-AXX-SS-L609 SPECIFICATION FOR STABILISATION AND SUPPORT MATS
DOCUMENT Nº TITLE
REFERENCE DOCUMENTS
4·4-AFX-DW-L514 STUD PROTECTOR DETAILS
4 4-AFX-DW-L550 FLOWLINE / WELLHEAD TIE-IN ASSEMBLY
4 4-AFX-DW-L542 ℄ CONTROL UMBILICAL APPROACH TO WELLHEAD
4 4-AFX-DW-L539 ℄ CONTROL UMBILICAL ALIGNMENT SHEET 1 OF 1.
4 4-AFX-DW-L532 ℄ FLOWLINE ALIGNMENT SHEET 1 OF 1
4·4-AFX-DW-L518 STABILISATION MAT REQMENTS AT WELLHEAD ℄
DRAWING Nº TITLE
REFERENCE DRAWINGS
1 4·6·86 DETAIL 3 AND 4 ADDED JBT
0 10·3·86 APPROVED FOR CONSTRUCTION KBF
B 26·2·86 RE-DRAWN KBF
REV DATE REVISION BY CHK ENG QA PM
STAMP
CLIENT ARCO Oil Producing, Inc.
Salpem MAIN CONTRACTOR
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT
SUB CONTRACTOR
TITLE
℄ WELLHEAD APPROACH LAYOUTS
SCALE 1:400
PROJECT Nº 1359-1
DRAWING Nº 4·4-AFX-DW-L512.
REV 1
5 877 550 N
5 877 500 N
5 877 450 N
471 400 E
471 450 E
471 500 E
471 550 E
471 600 E
GRID NORTH
TRENCH ENDS WITH A 50m TRANSITION LENGTH FROM FULL TRENCH DEPTH OF 1m TOP
8" FLOWLINE HEADING 155·45°
END OF TRENCH
FLOWLINE AND CONTROL UMBILICAL LAYOUT AFTER TIE-IN COMPLETION
CONTROL UMBILICAL HEADING 245·45° (BURIED TO 0·3m TOP)
PERMANENT STABILISATION MATS (TYP) (SEE NOTE 6)
END OF UMBILICAL BURIAL
TIE-IN POINT (SEE DETAIL 3)
8" FLEXIBLE PIPE.
5000 RAD MINIMUM.
℄ STRUCTURE CO-ORDINATES 5 877 482 8N 471 457·8E
SEE DETAIL 4
UNBURIED UMBILICAL
PERMANENT MATS (TYP) (SEE NOTE 6)
22500
11000
20000
22800
60000
8" FLOWLINE C/W 38mm THK. CONCRETE COATING
8"-1500# RTJ W.N. FLANGE
8"-1500# RTJ W.N. SWIVEL RING FLANGE
850 CUT BACK
F.O.F.
8" FEXIBLE PIPE
NOTE :- STUD PROTECTOR OMITTED FOR CLARITY (REF. DRG. No. 4·4-AFX-DW-L514)
DETAIL 3
SCALE 1:40
5800 APPROX.
1554
WELLHEAD TREE BASE
TIE-IN FLG. (F.O.F.)
4" FLEXIBLE JUMPER HOSE
6000
60°
(F.O.F.)
PERMANENT VALVE SLED
1737
1433
MUDLINE LEVEL (APRIL 1986)
DETAIL 4
SCALE 1:100


A1
GRID NORTH
5 886 400N
5 886 350N
5 886 300N
461 550E
461 600E
461 650E
CONTROL UMBILICAL HEADING 216.44 (BURIED TO 0.3m TOP)
TEMPORARY STABILISATION MATS (TYP SEE NOTE 6)
END OF UMBILICAL BURIAL (SEE DETAIL 1)
UNBURIED UMBILICAL
UMBILICAL TERMINATION FLANGE FACE
5000RAD (MIN.)
10000RAD (TYP)
8" FLEXIBLE FLOWLINE
PERMANENT VALVE SLED
TEMPORARY VALVE SLED (SEE NOTE 9)
L/P TIE-IN (SEE DETAIL 2 & 3)
4" FLEXIBLE JUMPER
'O' STRUCTURE CO-ORDINATES 5 886 317.9 461 568 6
PERMANENT STABILISATION MATS (SEE NOTE 6)
8" FLOWLINE HEADING 306.44°
FLOWLINE AND CONTROL UMBILICAL LAYOUT PRIOR TO TIE-IN
END OF UMBILICAL BURIAL
5000 RAD (MIN)
PERMANENT STABILISATION MATS (TYP) (SEE NOTE 6)
SEE DETAIL 4
8" FLEXIBLE FLOWLINE
TIE-IN POINT (SEE DETAIL 3)
5000 RAD. (MIN)
END OF TRENCH
'O' STRUCTURE CO-ORDINATES 5 886 317 9 N 461 568.6 E
TRENCH ENDS WITH A 50m TRANSITION LENGTH FROM FULL TRENCH DEPTH OF 1m TOP
FLOWLINE AND CONTROL UMBILICAL LAYOUT AFTER TIE IN COMPLETION
CONTROL UMBILICAL
5000×10000 TARGET ZONE
END OF UMBILICAL BURIAL 5 886 366.2N 461 604 2E
DETAIL 1 SCALE 1200
LP/TIE IN CO-ORDS 5 886 324.1N 461 598.1E
5000×10000 LAYDOWN AREA
FLOWLINE
DETAIL 2 (MAT DETAILS OMITTED FOR CLARITY) SCALE 1.200
NOTE :- STUD PROTECTOR OMITTED FOR CLARITY (REF. DRG. No. 4-4-AFX-DW-L514)
8" FLEXIBLE PIPE
8" FLOWLINE C/W 38mm THK. CONCRETE COATING
F.O.F.
850 CUT BACK
8"-1500# RTJ WN SWIVEL RING FLANGE
8"-1500# RTJ W.N. FLANGE
DETAIL 3 SCALE 1:40
7000 APPROX.
TIE-IN FLG (FOF)
PERMANENT VALVE SLED
4" FLEXIBLE JUMPER HOSE
WELLHEAD TREE BASE
MUDLINE LEVEL (APRIL 1986)
DETAIL 4 SCALE 1:100
THIS DRG
NORTH SEA
CONTROL UMBILICAL
WELLHEAD PLATFORM
FLOWLINE
GAS PIPELINE TO BACTON
BLOCK 49/28 DEVELOPMENT
KEY PLAN
NOTES
1. U.T.M. CO-ORDINATES BASED ON U.T.M. ZONE 31, 3°E CM.
2 ALL DIMENSIONS ARE IN MILLIMETRES U.N.O
3. THE LENGTH OF THE 8-INCH FLEXIBLE PIPE IS 40m.
4 THE LENGTH OF UNBURIED CONTROL UMBILICAL IS 85m.
5. THE ALIGNMENT OF THE FLEXIBLES & UMBILICAL AFTER TIE-IN COMPLETION ARE SMOOTH & CONTINUOUS WITH NO BEND RADII LESS THAN 5 0m, OR 1.5m FOR THE 4" JUMPER HOSE.
6 FOR DETAILS OF THE TEMPORARY AND PERMANENT STABILISATION MATTRESSES SEE DRG No 4-4-AFX-DW-L516
7. THE FINAL ALIGNMENT OF THE BURIED UMBILICAL IS ADJUSTED TO LEAVE 85m OF UMBILICAL AT THE BURIAL POINT AVAILABLE TO TIE INTO THE WELLHEAD SEE DRG. No. 4 4-AFX-DW-L543
8. THE SIZE OF THE UMBILICAL LAYDOWN LOOPS MAY BE ADJUSTED TO ACCOMMODATE THE TOLERANCE ON THE END OF BURIAL POINT
9. TEMPORARY CHECK VALVE SLED IS REPLACED BY A PULLHEAD AFTER PRE-COMMISSIONING.
10. 8-INCH FLANGE STUD BOLTS TO BE TENSIONED TO 195 KN MINIMUM.
4-4-AFX-AC-L503 FLOWLINE ROUTE CO ORDINATES AND REVIEW OF SURVEY DATA.
4-4-AFX-AC-L513 FLEXIBLE PIPE AND UMBILICAL ON-BOTTOM STABILITY ANALYSIS
4 4-AFX-AC-L514 UMBILICAL ROUTE CO ORDINATES
4 4-AFX-SS-L512 SPECIFICATION FOR WELLHEAD FLEXIBLE PIPE SPOOLS
4 4-AXX-SS-L809 SPECIFICATION FOR STABILISATION AND SUPPORT MATS
DOCUMENT No TITLE
REFERENCE DOCUMENTS
4-4-AFX-DW-L514 STUD PROTECTOR DETAILS
4-4-AFX-DW-L550 FLOWLINE WELLHEAD TIE-IN ASSEMBLY
4-4-AFX-DW-L543 'O' CONTROL UMBILICAL APPROACH TO WELLHEAD
4-4-AFX-DW-L541 'O' CONTROL UMBILICAL ALIGNMENT SHEET 2 OF 2
4 4-AFX-DW-L537 'O' FLOWLINE ALIGNMENT SHEET 2 OF 2
4-4-AFX-DW-L516 STABILISATION MATT. REQMNTS. AT 'O' WELLHEAD
DRAWING No TITLE
REFERENCE DRAWINGS
1 4 6 86 DETAIL 3 AND 4 ADDED JBT
0 19 3 86 APPROVED FOR CONSTRUCTION CBF
B 19 3 86 REDRAWN BK
REV DATE REVISION BY CHK ENG QA PM CLIENT APPD
STAMP
CLIENT ARCO Oil Producing, Inc.
Saipem MAIN CONTRACTOR
JPK SUB CONTRACTOR
THAMES COMPLEX DEVELOPMENT PROJECT PIPELINES CONTRACT
TITLE 'O' WELLHEAD APPROACH LAYOUTS
SCALE 1:400 UNO
PROJECT No 1359.1
DRAWING No 4 4-AFX-DW-L513
REV 1


A1
5 881 900 N
5 881 800 N
469 600 E
469 700 E
24" FLOWLINE FROM 'D' STRUCTURE
START OF BURIAL
CONTROL UMBILICAL TO 'D' STRUCTURE
OUTLINE OF JACK-UP RIG
ROCK DUMP AREA. BACKFILL LAYER TO 1·0m COVER OVER 120m LENGTH OF FLOWLINE (SEE NOTE 5)
EDGE OF TRENCH
AREA D
START OF TRENCH
NO ROCK DUMP MATERIAL TO FALL WITHIN THIS AREA
WELLHEAD PLATFORM (AW)
24" GAS EXPORT PIPELINE
ROCK DUMP AREA. BACKFILL LAYER TO 1·0m COVER OVER 650m LENGTH OF EXPORT PIPELINE (SEE NOTE 5)
AREA C
END OF TRENCH
24" EXPANSION SPOOL
FLEXIBLE PIPE
3-TUBE A1
3-TUBE A2
3-TUBE B3
3-TUBE B4
TEMPORARY STABILISATION MATTRESS (TYP.)
EXTENT OF ROCK DUMP AREA AT NATURAL SEABED LEVEL (SEE NOTES 2 & 3)
AREA A
AREA B
ROCK DUMP AREA. GRAVEL FILTER LAYER & ROCK ARMOUR LAYER TO 0·75m DEPTH (SEE SEC. 'A-A')
EXTENT OF ROCK DUMP AREA AT NATURAL SEABED LEVEL. (SEE NOTES 2 & 3)
AREA E
ROCK DUMP AREA. BACKFILL LAYER TO 1·0m COVER OVER 150m LENGTH OF FLOWLINE (SEE NOTE 5)
8" FLOWLINE FROM 'C' STRUCTURE
EDGE OF TRENCH
'AP' PLATFORM (JACKET)
ALTERNATIVE FUTURE LOCATION
COMPRESSION PLATFORM (FUTURE)
PLATFORM NORTH
GRID NORTH
22·74°
35 000
14000
5000
55 000
15 000
32 000
6 000
NAT. SEABED LEVEL
BACKFILL LAYER (SEE NOTE 7)
3 (APPROX.)
TOP
1000
24" GAS EXPORT PIPELINE
FLOWLINE
TYPICAL SECTION THROUGH AREA 'C'
SCALE 1:100
TYPICAL SECTION THROUGH AREA 'D' & 'E'
SCALE 1:100
SEE NOTE 2
ROCK ARMOUR LAYER (SEE NOTE 6)
GRAVEL FILTER LAYER (SEE NOTE 6)
MUDLINE
650
300
CONTROL UMBILICAL
FLEXIBLE PIPE
SECTION 'A-A'
SCALE 1:100
TYP. PROFILE AT AREA 'A'
PROFILE AT AREA 'B' SIMILAR
THIS DRAWING
NORTH SEA
BLOCK 49/28 DEVELOPMENT
BACTON
24" GAS EXPORT PIPELINE
ENGLAND
KEY PLAN
NOTES
1. U.T.M. CO-ORDINATES BASED ON U.T.M. ZONE 31, 3° E OF CENTRAL MERIDIAN.
2. FOR ROCK DUMP AREAS 'A' & 'B', SPECIFIED MATERIAL LAYER THICKNESSES ARE TO BE MAINTAINED FULLY OVER AREA SHOWN. SLOPE DOWN TO NATURAL SEABED LEVEL TO BE OVER A MAXIMUM DISTANCE OF 4m.
3. FOR ROCK DUMP AREAS 'A' & 'B', POSITIONAL TOLERANCE ON AREA BOUNDARIES TO BE ± 2·0m.
4. ALL ROCK LAYER THICKNESS TOLERANCES TO BE +0·35m, -0·15m.
5. TRANSITION LENGTHS TO FULL TRENCH DEPTH (1·0m NATURAL SEABED LEVEL TO TOP OF PIPE) ARE 100m FOR 24" EXPORT PIPELINE AND 50m FOR 8" FLOWLINES.
6. ROCK DUMP MATERIAL GRADINGS FOR AREAS 'A' & 'B' TO BE AS FOLLOWS:-
GRAVEL FILTER :- d_{15} = 5mm, d_{50} = 30mm & d_{85} = 50mm.
ROCK ARMOUR :- d_{15} = 50mm, d_{50} = 175mm & d_{100} = 250mm.
(4000 TONNE APPROX.)
7. ROCK DUMP MATERIAL GRADINGS FOR AREAS 'C', 'D' & 'E' TO BE AS FOLLOWS:-
BACKFILL :- d_{15} = 10mm, d_{50} = 140mm & d_{100} = 200mm.
(9000 TONNE APPROX.)
8. ALL DIMENSIONS ARE IN MILLIMETRES.
4·4-AFX-DW-L511
DRAWING No
PLATFORM APPROACH LAYOUT
TITLE
REFERENCE DRAWINGS
REV DATE REVISION BY CHK ENG QA PM
1 23·7·86 'Y' FLOWLINE & UMBILICAL REVISED JBT
0 17-2-86 APPROVED FOR CONSTRUCTION MOH
B 28 1 86 DIMS. TO & PLATFORM REVISED MOH
A 6 2 86 PRELIMINARY ISSUE JT
STAMP
CLIENT
ARCO Oil Producing, Inc.
Salpem
MAIN CONTRACTOR
JTK
SUB CONTRACTOR
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT
TITLE
SCOUR PREVENTION AT PLATFORM
SCALE 1:300, U.N.O
PROJECT No 1359·1
DRAWING No 4·4-AFX-DW-L519
REV 1


A1
PLATFORM NORTH
GRID NORTH
227½°
FIELD JOINT (TYP.)
8" FLOWLINE
CONTROL UMBILICAL
8.625" OD STAINLESS STEEL CLAD FLOWLINE
6mm THICK COAL TAR ENAMEL COATING
38mm THICK CONCRETE COATING
FLANGE CONNECTION WITH STUD PROTECTOR (SEE NOTE 9) (OMITTED FOR CLARITY) FOR DETAILS SEE DRAWING No. 4-4-AFX-DW-L514.
SACRIFICIAL ANODE.
ARMOURED CONTROL UMBILICAL (SEE NOTE 8)
286mm MAX. OD x 97mm ID FLEXIBLE PIPE 360 CUT BACK (FROM F.O.F.)
HEADING 247·26°
13593
5·01° (REF.)
J-TUBE A1
J-TUBE A2
1053
850 (I.D.C.)
2400
6185 (TOP OF CAISSON)
13800
JACKET LEG D4
APROX. EXTENT OF SCOUR PREVENTION
CONTROL UMBILICAL (STANDARD)
CONTROL UMBILICAL (ARMOURED)
J-TUBE A1 273 O.D.
W.P.
44·89° (REF.)
MUDMAT
MUDLINE
J-TUBE SEAL UNIT INSTALLED ON UMBILICAL BEFORE PULL-IN (SEE NOTE 7)
VIEW 'A-A'
TEMPORARY STABILISATION MATTRESS (TYP.) FOR DETAILS SEE DRG. No. 4-4-AFX-DW-L515
WELLHEAD PLATFORM CO-ORDINATES
5 881 869·4N
469 661·9E
24" GAS EXPORT EXPANSION OFFSET
JACKET LEG D4
BTM. OF CAISSON
8"-1500# W.N. RTJ SWIVEL RING FLANGE
8"-1500# W.N. RTJ FLANGE
J-TUBE A2 457 O.D.
42·87° (REF.)
W.P.
MUDMAT
FLEXIBLE PIPE
STUD PROTECTOR OMITTED FOR CLARITY
TEMPORARY STABILISATION MATS OMITTED FOR CLARITY
J-TUBE SEAL UNIT INSTALLED ON FLEXIBLE BEFORE PULL-IN. (SEE NOTE 5)
VIEW 'B-B'
ELEVATION AT TOP OF J-TUBE A2
(LOOKING NORTH) SCALE 1:20
FOR END DETAILS SEE 'DUNLOP LTD' DRG. No. PG 8882
DEADWEIGHT SUPPORT SEE DRG. No. 4-4-AFX-DW-L517
JACKET LEG D4
18" F.F. SLIP-ON FLG.
1750
CAISSON 'A'
J-TUBE A2 (457 O.D.)
FLEXIBLE PIPE
FOR END DETAILS SEE 'MULTIFLEX' DRG. No. C 870/012
UMBILICAL TERMINATION
273 O.D. J-TUBE EXTENSION
DECK PENETRATION
10" F.F. SLIP-ON FLG
JACKET LEG D4
1750
CAISSON 'A'
J-TUBE A1 (273 O.D.)
UMBILICAL
ELEVATION AT TOP OF J-TUBE A1
(LOOKING NORTH) SCALE 1:20
PLAN AT 'AW' PLATFORM (JACKET)
8" FLOWLINE FROM 'D'
CONTROL UMBILICAL
THIS DRG.
PLATFORM NORTH
CONTROL UMB.
'AW' PLATFORM
'C' FLOWLINE
KEY PLAN
NOTES
1. U.T.M. CO-ORDINATES BASED ON U.T.M. ZONE 31, 3° E. C.M.
2. ALL ELEVATIONS TO L.A.T. IN METRES
3. ALL DIMENSIONS ARE IN MILLIMETRES.
4. THE LENGTH OF THE FLEXIBLE PIPE BETWEEN FLANGE FACES IS 84 METRES.
5. THE FLEXIBLE PIPE IS FITTED WITH A J-TUBE SEAL UNIT PRIOR TO INSTALLATION. THE LOCATION OF SEAL UNIT (℄) IS 44·0 METRES FROM FLANGE FACE AT THE PLATFORM END OF THE FLEXIBLE.
6. THE UMBILICAL IS FITTED WITH A WEAK LINK UNIT (NOT SHOWN) 165 METRES (℄) FROM THE UMBILICAL TERMINATION FLANGE ON THE PLATFORM.
7. THE UMBILICAL IS FITTED WITH A J-TUBE SEAL UNIT PRIOR TO INSTALLATION. THE LOCATION OF SEAL UNIT (℄) IS 48 METRES FROM FLANGE FACE AT THE PLATFORM.
8. THE UMBILICAL IS ARMOURED BETWEEN J-TUBE SEAL AND EDGE OF SCOUR PREVENTION MATERIAL, A LENGTH OF 50 METRES.
9. FLANGE BOLTS TENSIONED TO 195 KN.
* LEWIS OFFSHORE LTD. DRAWING
PG 8882 "DUNLOP LTD." TOPSIDE ASSEMBLY DRAWING
4-4-AFX-DW-L514 SCOUR PREVENTION AT PLATFORM
C 870/012 "MULTIFLEX U.K. INC." — UMBILICAL SUPPORT G.A.
4-4-AFX-DW-L517 FLEXIBLE RISER - DEADWEIGHT SUPPORT
AWA-DW-S155 * 'AW' PLATFORM J TUBES G.A. OF J TUBE TERMINATIONS
4-4-AFX-DW-L515 TEMPORARY STABILISATION MAT REQ. AT PLATFORM
4-4-AFX-DW-L514 FLOWLINE - STUD PROTECTOR DETAILS
AWA-DW-S111 * 'AW' PLATFORM JACKET G.A.
AWA-DW-S153 * 'AW' PLATFORM J TUBE DETAILS AT TOP OF CAISSONS 'A' & 'B'
AWA-DW-S146 * 'AW' PLATFORM J TUBES ISO'S OF TUBES A1, A2, A3 & A4
AWA-DW-S149 * 'AW' PLATFORM J TUBES G.A. OF CAISSON TYPE A
AWA-DW-S148 * G.A. OF PLATFORM ACCESS TO 'AW' PLATFORM
AWA-DW-S129 * 'AW' PLATFORM - JACKET MUDMAT DETAILS
4-4-AFX-DW-L540 'O' CONTROL UMBILICAL ALIGNMENT SHEET 1 OF 2
4-4-AFX-DW-L536 'O' FLOWLINE ALIGNMENT SHEET 1 OF 2
4-4-AFX-DW-L511 PLATFORM APPROACH LAYOUT
DRAWING Nº TITLE
REFERENCE DRAWINGS
1X 22/9/86 GENERAL REVISIONS - AS BUILT J.T.
INFORMATION ADDED
1 12/5/86 FLOWLINE/UMBILICAL RE-POSITIONED
0 17/2/86 APPROVED FOR CONSTRUCTION
C 28/1/86 PLATFORM APPROACH REVISED
B 3/10/85 TOP OF J-TUBE DETAILS ADDED
A 2/8/85 PRELIMINARY ISSUE
REV DATE REVISION BY CHK ENG QA PM
STAMP
4-4-AXX-SS-L809 SPEC. FOR STABILISATION & SUPPORT MATS
4-4-AFX-SS-L519 SPEC. FOR STAINLESS STEEL CLAD FLGS, GASKETS & BLTG.
4-4-AFX-SS-L518 SPEC. FOR J-TUBE SEALING UNITS
4-4-AFX-SS-L504 SPEC. FOR FLEXIBLE FLOWLINE RISER PIPE
4-4-AFX-AC-L512 UMBILICAL PULL-IN ANALYSIS
4-4-AFX-AC-L511 FLEXIBLE RISER PULL-IN ANALYSIS
4-4-AFX-AC-L503 FLOWLINE ROUTE CO-ORDS & REVIEW OF SURVEY DATA
DOCUMENT Nº TITLE
REFERENCE DOCUMENTS
CLIENT ARCO Oil Producing, Inc.
Salpem
MAIN CONTRACTOR
SUB CONTRACTOR
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT
TITLE
'O' FLOWLINE AND UMBILICAL PLATFORM RISERS G.A.
SCALE 1:150 U.N.O.
PROJECT Nº 1359:1
DRAWING Nº 4-4-AFX-DW-L521
REV 1X


PLAN AT 'AW' PLATFORM
(JACKET)
ELEVATION AT TOP OF J-TUBE B4
(LOOKING NORTH) SCALE 1:20
ELEVATION AT TOP OF J-TUBE B3
(LOOKING NORTH) SCALE 1:20
VIEW A-A
VIEW B-B
PIPELINE LAYOUT PRIOR TO TIE-IN
KEY PLAN
NOTES
1 UTM CO-ORDINATES BASED ON U.T.M ZONE 31, 3°E, C.M.
2. ALL ELEVATIONS TO L.A.T. IN METRES.
3. ALL DIMENSIONS ARE IN MILLIMETRES.
4. THE LENGTH OF THE FLEXIBLE PIPE BETWEEN FLANGE FACES IS 106 METRES
5. THE FLEXIBLE PIPE IS FITTED WITH A J-TUBE SEAL UNIT PRIOR TO INSTALLATION. THE LOCATION OF SEAL UNIT (L) TO BE 47.0 METRES FROM FLANGE FACE AT THE PLATFORM END OF THE FLEXIBLE.
6 THE UMBILICAL IS FITTED WITH A WEAK LINK UNIT (NOT SHOWN) 190 METRES (L) FROM THE UMBILICAL TERMINATION FLANGE ON THE PLATFORM.
7 THE UMBILICAL IS FITTED WITH A J-TUBE SEAL UNIT PRIOR TO INSTALLATION. THE LOCATION OF SEAL UNIT (L) TO BE 49.5 METRES FROM FLANGE FACE AT THE PLATFORM.
8. THE UMBILICAL IS ARMOURED BETWEEN J-TUBE SEAL AND EDGE OF SCOUR PREVENTION MATERIAL, A LENGTH OF 70 METRES.
9. FOR REFERENCE DOCUMENT DETAILS SEE DRG. No. 4·4-AFX-DW-L521.
* LEWIS OFFSHORE LTD. DRAWING
4·4-AFX-DW-L521 'O' FLOWLINE AND UMBILICAL PLATFORM RISERS G.A.
PG 8882 "DUNLOP LTD" TOPSIDE ASSEMBLY DRAWING
4·4-AFX-DW-L519 SCOUR PREVENTION AT PLATFORM
C870/012 "MULTIFLEX U.K. INC" — UMBILICAL SUPPORT G.A.
4·4-AFX-DW-L517 FLEXIBLE RISER-DEADWEIGHT SUPPORT
4·4-AFX-DW-L515 TEMPORARY STABILISATION MAT REQ. AT PLATFORM
4·4-AFX-DW-L514 FLOWLINE - STUD PROTECTOR DETAILS
* AWA-DW-S165 'AW' PLATFORM - J-TUBES ISO'S. OF J-TUBE B1, 2, 3 & 4
* AWA-DW-S155 'AW' PLATFORM - J-TUBES G.A. OF J-TUBE TERMINATIONS
* AWA-DW-S153 'AW' PLATFORM - J-TUBES DTLS AT TOP OF CASS'N 'A&B'
* AWA-DW-S150 'AW' PLATFORM - J-TUBES G.A. OF CAISSON-TYPE 'B'
* AWA-DW-S111 'AW' PLATFORM - JACKET G.A.
4·4-AFX-DW-L539 'C' CONTROL UMBILICAL ALIGNMENT SHEET 1 OF 1
4·4-AFX-DW-L522 'C' FLOWLINE ALIGNMENT SHEET 1 OF 1
4·4-AFX-DW-L511 PLATFORM APPROACH LAYOUT
DRAWING Nº TITLE
REFERENCE DRAWINGS
0 12-86 APPROVED FOR CONSTRUCTION
C 28186 GENERAL REVISIONS
B 31-285 TOP OF J-TUBE DETAILS ADDED
A 08-285 PRELIMINARY ISSUE
REV DATE REVISION BY CHK ENG QA PM CLIENT
STAMP
CLIENT ARCO Oil Producing, Inc.
Salpem MAIN CONTRACTOR SUB CONTRACTOR
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT
TITLE
'C' FLOWLINE AND UMBILICAL PLATFORM RISERS G.A.
SCALE 1:150
PROJECT Nº 1359·1
DRAWING Nº 4·4-AFX-DW-L522
REV 0



NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. FOR CROSSING DESIGN ANALYSIS SEE DOCUMENT No. 4-4-AFX-AC-L508
3. TRENCHING OF FLOWLINE ASSUMED NOT TO BE PERMITTED WITHIN 30 METRES OF EXISTING 30-INCH LINE.
4. TYPICAL BACKFILL SIDE SLOPE ANGLES WILL DEPEND ON ROCK DUMPING METHOD.
5. PIPELINE CROSSING ANGLE = APPROX 79°
6. APPROX WATER DEPTH = 34 m L.A.T
7. FOR SURVEY DETAILS AT CROSSING SEE STOLT-NIELSEN SURVEY REPORT No 3 03-SU-003 DATED 16-12-85
8. THE GRAVEL DUMP ON THE S E INDE PIPELINE IS APPROX 55m × 16m AND CENTRED AT 5880765 N & 470220 E THE CROSSING POINT IS OFFSET 17·5m TO THE SOUTH WEST OF THE ROCK DUMP CENTRE
9. MINIMUM COVER SHALL BE MAINTAINED FOR AT LEAST 50m EITHER SIDE OF CROSSING
10. FOR DETAILS OF FLEXIBLE CONCRETE MATS SEE SPECIFICATION 4 4-AXX-SS-L809

MATERIAL REQUIREMENTS

1. 3No FLEXIBLE CONCRETE MATS 8m×5m×0·3m (2)
2. 300 CU.MTS. APPROX GRAVEL FILL (d_{15}=5mm, d_{50}=35mm, d_{85}=50mm).
3. 450 CU.MTS. APPROX ROCK FILL (d_{15}=50mm, d_{50}=140mm d_{95}=200mm), BACKFILL QUANTITIES BASED ON 'TYPICAL' DIMENSIONS (NO WASTAGE INCLUDED)

DRAWING No	TITLE
4-4-AFX-DW-L527	'C' CONTROL UMBT - CROSSING OF SHELL S E INDE LINE
4-4-AFX-DW-L529	'C' CONTROL UMBILICAL ALIGNMENT SHEET 1 OF 1
4-4-AFX-DW-L532	'C' FLOWLINE ALIGNMENT SHEET 1 OF 1

REFERENCE DRAWINGS

REV	DATE	REVISION	BY	CHK	ENG	QA	PM	SNAG
2	25/6/86	UMBILICAL LAYOUT REVISED	MOH					
1	7-3-86	STOLT-NEILSEN SURVEY DATA INC	CBP					
0	17-2-86	APPROVED FOR CONSTRUCTION	MOH					
C	28/1/86	MAT TYPE REVISED	BK					
B	4/12/85	ROCK & GRAVEL GRADING REVISED	JT					
A	7/11/85	PRELIMINARY ISSUE	JT					

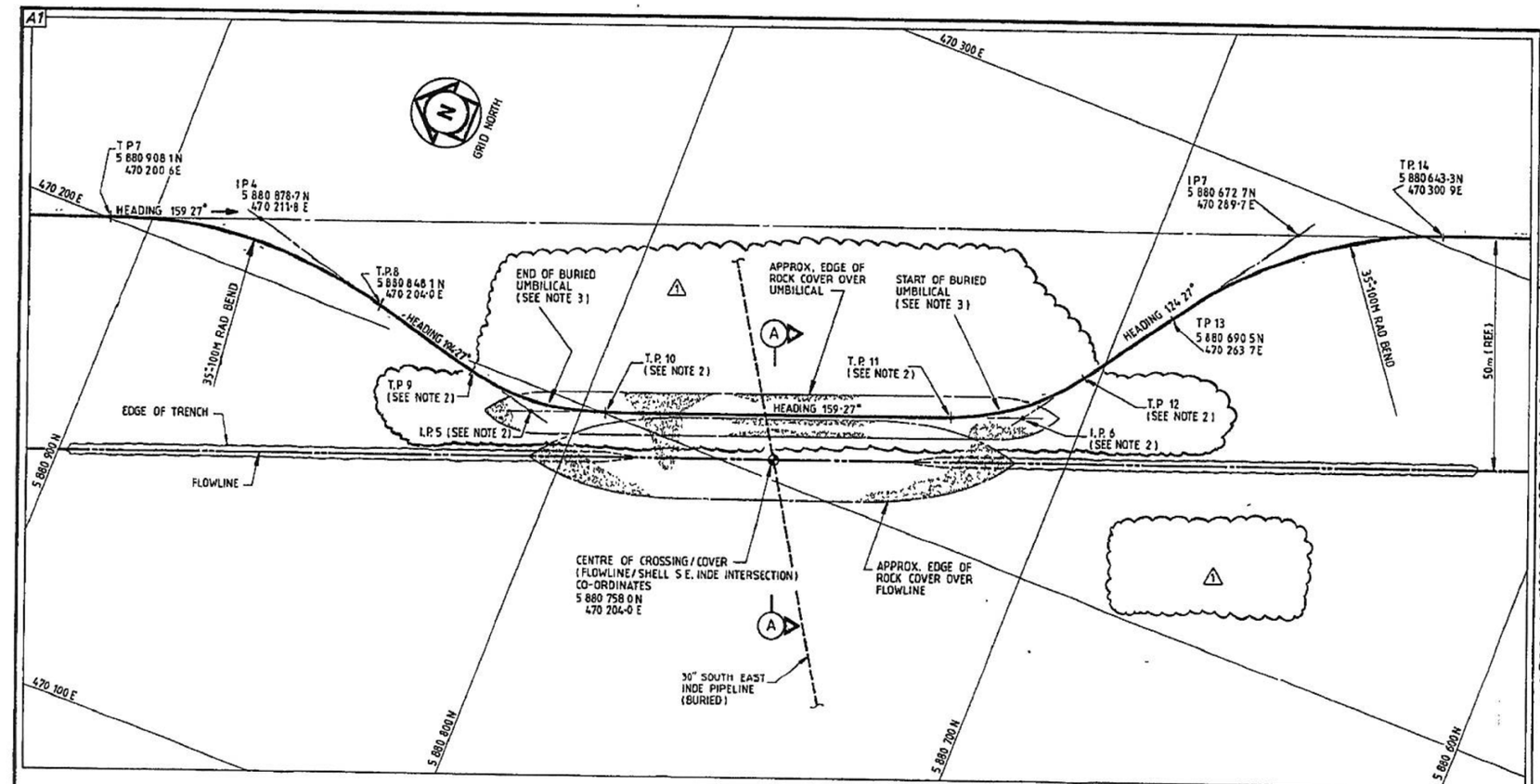
STAMP

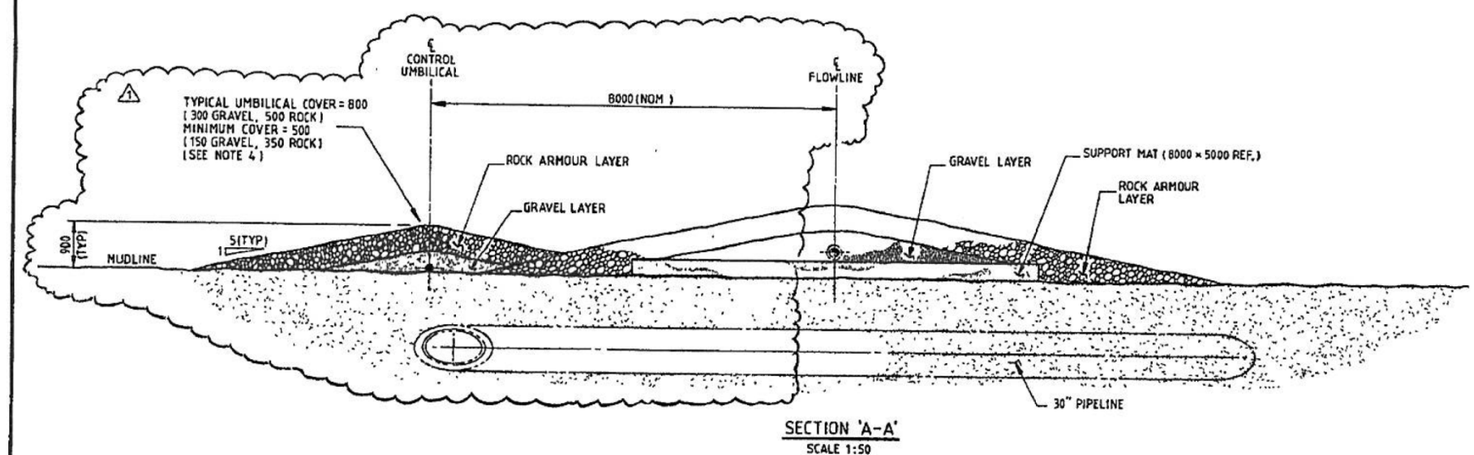
CLIENT: ARCO Oil Producing, Inc.
Saipem (MAIN CONTRACTOR)
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT
(SUB CONTRACTOR)

TITLE

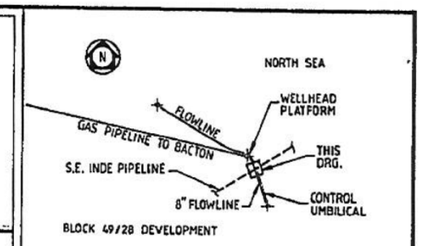
FLOWLINE – CROSSING OF SHELL SOUTH EAST INDE PIPELINE

SCALE	PROJECT No	DRAWING No	REV
1:250 UNO	1359-1	4-4-AFX-DW-L525	2





SECTION 'A-A'
SCALE 1:50



KEY PLAN

NOTES

1. UTM CO-ORDINATES BASED ON UTM ZONE 31, 3°E CM
2. CONTROL UMBILICAL TO BE LAID ALONG TOE OF ROCK MOUND COVERING 8" FLOWLINE. POSITIONS OF BEND I.P'S 5-6 AND T.P'S 9-12 TO BE ADJUSTED TO SUIT. BEND RADII TO BE 50m MINIMUM.
3. UNBURIED SECTION OF UMBILICAL TO BE MAXIMUM 100m IN LENGTH, CENTRED ON CROSSING POINT.
4. MINIMUM COVER TO UMBILICAL SHALL BE MAINTAINED FOR AT LEAST 50m EITHER SIDE OF CROSSING.
5. FOR FULL DETAILS OF BACKFILL OVER 8" FLOWLINE SEE DRG. No. 4-4-AFX-DW-L525.

MATERIAL REQUIREMENTS (UMBILICAL COVER ONLY)

1. 100 CU. METRES APPROX. GRAVEL FILL (d_{15} = 5mm, d_{50} = 35mm, d_{85} = 50mm)

350 CU. METRES APPROX. ROCK ARMOUR (d_{15} = 50mm, d_{50} = 140mm, d_{95} = 200mm)

QUANTITIES BASED ON TYPICAL DIMENSIONS OF ROCK MOUND.

APPROX. WEIGHTS FOR BULK DENSITY OF 1·75 TONNES / CU. METRE, ARE AS FOLLOWS :-

GRAVEL FILL = 180 TONNES
ROCK ARMOUR = 620 TONNES

NO ALLOWANCE FOR WASTAGE IS INCLUDED.

4-4-AFX-DW-L532	'C' FLOWLINE ALIGNMENT SHEET 1 OF 1
4-4-AFX-DW-L539	'C' CONTROL UMBILICAL ALIGNMENT SHEET 1 OF 1
4-4-AFX-DW-L525	FLOWLINE CROSSING OF SHELL S.E. INDE PIPELINE
DRAWING Nº	TITLE

REFERENCE DRAWINGS

REV	DATE	REVISION	BY	CHK	ENG	QA	PM	CLIENT APP.
1	24-6-86	UMBILICAL LAYOUT REVISED	JT					
0	7-2-86	APPROVED FOR CONSTRUCTION	MDH		PWM			
B	28-1-86	MAT DETAILS ADDED	JT					
A	20-1-86	PRELIMINARY ISSUE	JT	CH	AT			

STAMP

CLIENT: ARCO Oil Producing, Inc.

Saipem MAIN CONTRACTOR

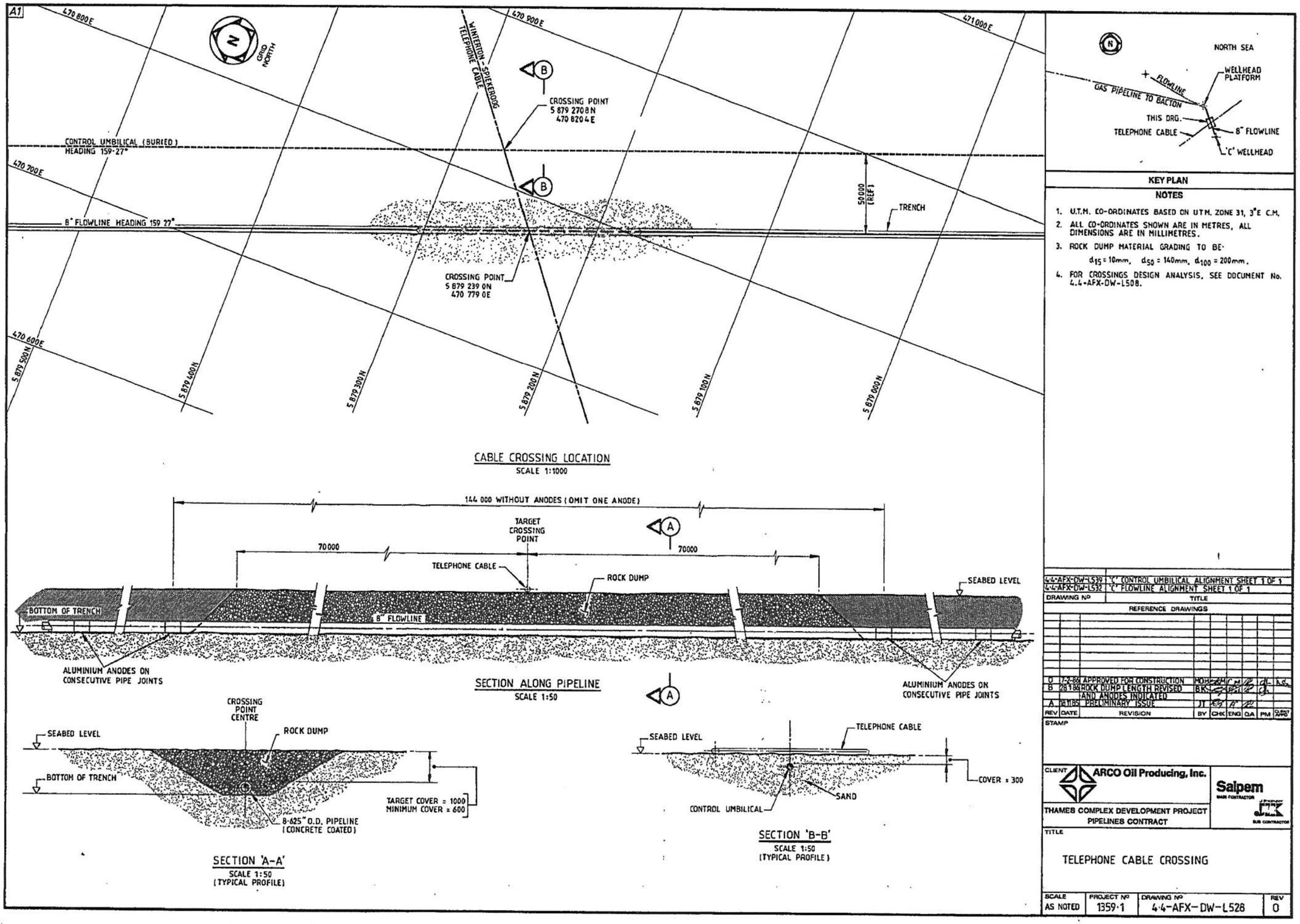
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT

SUB CONTRACTOR

TITLE

'C' CONTROL UMBILICAL – CROSSING OF SHELL SOUTH EAST INDE PIPELINE

SCALE	PROJECT Nº	DRAWING Nº	REV
1:500 U.N.O.	1359-1	4-4-AFX-DW-L527	1


A1
470 800 E
470 900 E
471 000 E
GRID NORTH
WINTERTON – SPIEKEROOG TELEPHONE CABLE
CROSSING POINT
5 879 270 8N
470 820 4E
CONTROL UMBILICAL (BURIED)
HEADING 159·27°
470 700 E
8" FLOWLINE HEADING 159 27°
50 000 (REF)
TRENCH
CROSSING POINT
5 879 239 0N
470 779 0E
470 600 E
5 879 500 N
5 879 400 N
5 879 300 N
5 879 200 N
5 879 100 N
5 879 000 N
CABLE CROSSING LOCATION
SCALE 1:1000
144 000 WITHOUT ANODES (OMIT ONE ANODE)
TARGET CROSSING POINT
70000
70000
TELEPHONE CABLE
ROCK DUMP
SEABED LEVEL
BOTTOM OF TRENCH
8" FLOWLINE
ALUMINIUM ANODES ON CONSECUTIVE PIPE JOINTS
ALUMINIUM ANODES ON CONSECUTIVE PIPE JOINTS
SECTION ALONG PIPELINE
SCALE 1:50
CROSSING POINT CENTRE
SEABED LEVEL
ROCK DUMP
BOTTOM OF TRENCH
TARGET COVER = 1000
MINIMUM COVER = 600
8·625" O.D. PIPELINE (CONCRETE COATED)
SECTION 'A-A'
SCALE 1:50
(TYPICAL PROFILE)
SEABED LEVEL
TELEPHONE CABLE
COVER = 300
SAND
CONTROL UMBILICAL
SECTION 'B-B'
SCALE 1:50
(TYPICAL PROFILE)
NORTH SEA
WELLHEAD PLATFORM
FLOWLINE
GAS PIPELINE TO BACTON
THIS DRG.
TELEPHONE CABLE
8" FLOWLINE
'C' WELLHEAD
KEY PLAN
NOTES
1. U.T.M. CO-ORDINATES BASED ON U.T.M. ZONE 31, 3°E C.M.
2. ALL CO-ORDINATES SHOWN ARE IN METRES, ALL DIMENSIONS ARE IN MILLIMETRES.
3. ROCK DUMP MATERIAL GRADING TO BE:
d_{15} = 10mm, d_{50} = 140mm, d_{100} = 200mm.
4. FOR CROSSINGS DESIGN ANALYSIS, SEE DOCUMENT No. 4.4-AFX-DW-L508.
4.4-AFX-DW-L539 'C' CONTROL UMBILICAL ALIGNMENT SHEET 1 OF 1
4.4-AFX-DW-L532 'C' FLOWLINE ALIGNMENT SHEET 1 OF 1
DRAWING Nº TITLE
REFERENCE DRAWINGS
0 7-2-86 APPROVED FOR CONSTRUCTION
B 28 1 86 ROCK DUMP LENGTH REVISED AND ANODES INDICATED
A 28 1 85 PRELIMINARY ISSUE
REV DATE REVISION BY CHK ENG QA PM
STAMP
CLIENT ARCO Oil Producing, Inc.
Saipem
THAMES COMPLEX DEVELOPMENT PROJECT
PIPELINES CONTRACT
TITLE
TELEPHONE CABLE CROSSING
SCALE AS NOTED
PROJECT Nº 1359·1
DRAWING Nº 4·4-AFX-DW-L528
REV 0