Blythe Hub Development
Environmental Statement
Additional Information

This document relates to the original Blythe Hub Development Environmental Statement (ES) issued for public consultation on 15th February 2018 and contains Additional Information that is now being offered for public consultation.

The document is being issued by IOG North Sea Limited and IOG UK Ltd and has been prepared with input from Fugro GB Marine Limited, Environmental Consultants.

Contents

1 Introduction

This document describes changes to the planned Blythe Hub Development that have been made in the period since the original ES was issued for public consultation, together with the conclusions drawn from an assessment of the impact of those changes on the original environmental impact assessment.

The document also provides clarification of some information contained within the original ES following comments and requests from consultees.

This Additional Information has been provided together with a brief outline of the relevant parts of the Environmental Statement, however, the document should be considered in the context of the whole, previously issued, ES.

2 Summary of changes potentially affecting environmental impacts

This section provides a summary of all changes to the project that have occurred since the publication of the original ES, and which may have the potential to affect the original outcomes and conclusions. These changes are discussed in more detail in the numbered section headings at each listed bullet point.

- **Seabed impacts from the infrastructure (see section 5.1 below)**

  Whilst the overall infrastructure configuration remains unchanged from that described in the original ES, pipeline and umbilical diameters have been changed marginally in the period following publication of the original ES, as a result of more detailed engineering and design.

  The original ES stated that there would be no rock dumping for the stabilisation and protection of pipelines, and whilst IOG remains committed to the use of removable mattresses for such purposes, it has proved necessary to allow for a small amount of rock dumping in order to deal with certain pipeline crossings.

  These marginal changes in pipeline diameters, together with a small addition of pipeline rock dump, plus a variation in the area of anticipated platform footing consequent upon moving to a suction can foundation design for the Blythe platform (ref section 5.4), have led to a re-assessment of overall seabed impact which is presented in section 5.1.

- **Power Generation (see 5.2 below)**

  The original ES anticipated provision of a small wind and solar power generation facility on the Blythe platform that would partially meet the power demand of the platform; the remaining demand being met by a small diesel generator. This will no longer be the case and power to the platform will be solely supplied by the small diesel generator.

- **Production Chemicals Pipeline (see 5.3 below)**

  The original ES anticipated that an existing pipeline located near to the proposed Blythe platform - namely the Lancelot Area Pipeline System (LAPS) - could potentially be used for the transportation of Monoethylene Glycol (MEG) to the Blythe platform. This option is no longer being sought and MEG will instead be transported to the platform by supply vessel.

  The MEG will be used to prevent the formation of gas hydrates in the export pipeline system connecting the Blythe Hub Development to the onshore terminal at Bacton. At the Bacton terminal the MEG will be separated out, regenerated and re-used.

- **Impact piling and Blythe platform footings (see 5.4 below)**

  The original ES anticipated the use of driven piles as foundation footings for the Blythe platform and considered the associated environmental impacts of noise.

The Blythe platform will now be installed using suction footings – described in section 5.4 - which will significantly reduce the expected environmental noise impacts. Consequently, the generation of underwater noise is no longer considered to be a potential issue of concern requiring detailed assessment in the Environmental Statement.

The suction footings and associated anti scour protection skirt

- **Anticipated Field Life (see 5.5 below)**

  The original ES included oil and condensate production projections over a projected 12 year 'life-of-field'. The economic 'life-of-field' is now anticipated to be 18 years.

3 Summary of clarifications

This section provides a summary of clarifications that were requested during the public consultation of the original ES. Where appropriate, these clarifications are discussed in more detail in the numbered section headings at each listed bullet point.

- **Option Selection (see 6.1 below)**

  Additional Information is provided which expands upon the reasons underpinning the option selection process.

- **Seabed disturbance from drilling rig activities (see 6.2 below)**

  Expanded information is provided on the justification for the quantity of graded rock placement that was referenced in the original ES as being necessary to provide stable footings for the drilling rig. A brief note on anchoring management is also provided.

- **Flaring and venting (see 6.3 below)**

  Whilst it remains the case, as stated in the original ES, that there will be no flaring from the platform, and that the only flaring to take place will be from the drilling rig during the initial start-up of wells, information is provided to clarify how the associated atmospheric emissions have been assessed for this flaring and venting.

- **Marine Plans (see 6.4 below)**

  The original ES did not make reference to the relevant Marine Plans.

  A discussion of the proposed development in respect of the East Offshore Marine Plan is provided.

- **Survey Data (see 6.5 below)**

  In the period following publication of the original ES, Environmental Baseline and Habitat surveys have been completed.

  A summary of the results of survey is provided and copies of the full survey reports are being made available on the IOG website for the duration of the public consultation period accompanying the Additional Information.

- **Benthic impacts (see 6.6 below)**

  A section is included that expands upon the potential benthic impacts presented in the original ES.

- **Incorporation of Southwark field development**

  Following a decision by IOG to incorporate a development of the Southwark field alongside the Blythe Hub Development, the *Blythe Hub Development ES Addendum -Southwark Field Development* - was issued for public consultation on 11th September 2019.

  The Blythe Hub Development and the Southwark Field Development together comprise the *IOG SNS Gas Hubs Development – Phase 1*, for which a Field Development Plan (PDF) has been submitted to the OGA for approval.

  Figure 4.3 in the project synopsis (section 4) below, shows the Blythe Hub Development in the context of the whole *IOG SNS Gas Hubs Development – Phase 1*

- **Farm-in to Licences by CALEnergy Resources (UK) Limited**

  In the period following submission of the original ES, the Independent Oil and Gas plc group of companies agreed a farm-in arrangement to some of its development field licences held by companies within the group.

  The Blythe Hub Development ES, comprising the Blythe and Elgood field licences, was originally published by IOG North Sea Limited (a wholly owned subsidiary of Independent Oil and Gas plc) as 100% owner of the fields. Following a farm-in agreement, the Blythe and Elgood field licences are now held in 50% equity by IOG North Sea Limited and 50% equity by CalEnergy Resources (UK) Limited.

  [Note that the *Blythe Hub Development ES Addendum -Southwark Field Development* was originally published by IOG UK LTD (a wholly owned subsidiary of Independent Oil and Gas plc) as 100% owner of the Southwark field. Following a farm-in agreement the Southwark field is held in 50% equity by IOG UK LTD and 50% equity by CalEnergy Resources (UK) Limited]

- **Project Schedule**

  The original ES anticipated that offshore activities would commence with installation of field facilities and infrastructure in Q1 2019, followed by drilling and the production of 'first gas' in Q1 2020.

  The present project schedule is that offshore activities will commence in Q3 2020 with the laying of the pipeline infrastructure, to be followed in Q1 of 2021 with the installation of the Blythe platform and the drilling of the Elgood and Blythe wells. The production of 'first gas' is now planned for Q3 2021.

4 Project Synopsis

The Blythe Hub Development comprises the Blythe and Elgood fields situated within United Kingdom Continental Shelf (UKCS) Blocks 48/23 and 48/22, in the southern North Sea (Figure 4.1 and 4.2). The nearest landfall to the development area is the north Norfolk coast, approximately 35 km to the south-west of the Blythe field. At its nearest point, the UK/Netherlands median line is situated approximately 105 km east of the development area.

The original ES was issued for public consultation on 15th February 2018 and presented the findings of an Environmental Impact Assessment (EIA).

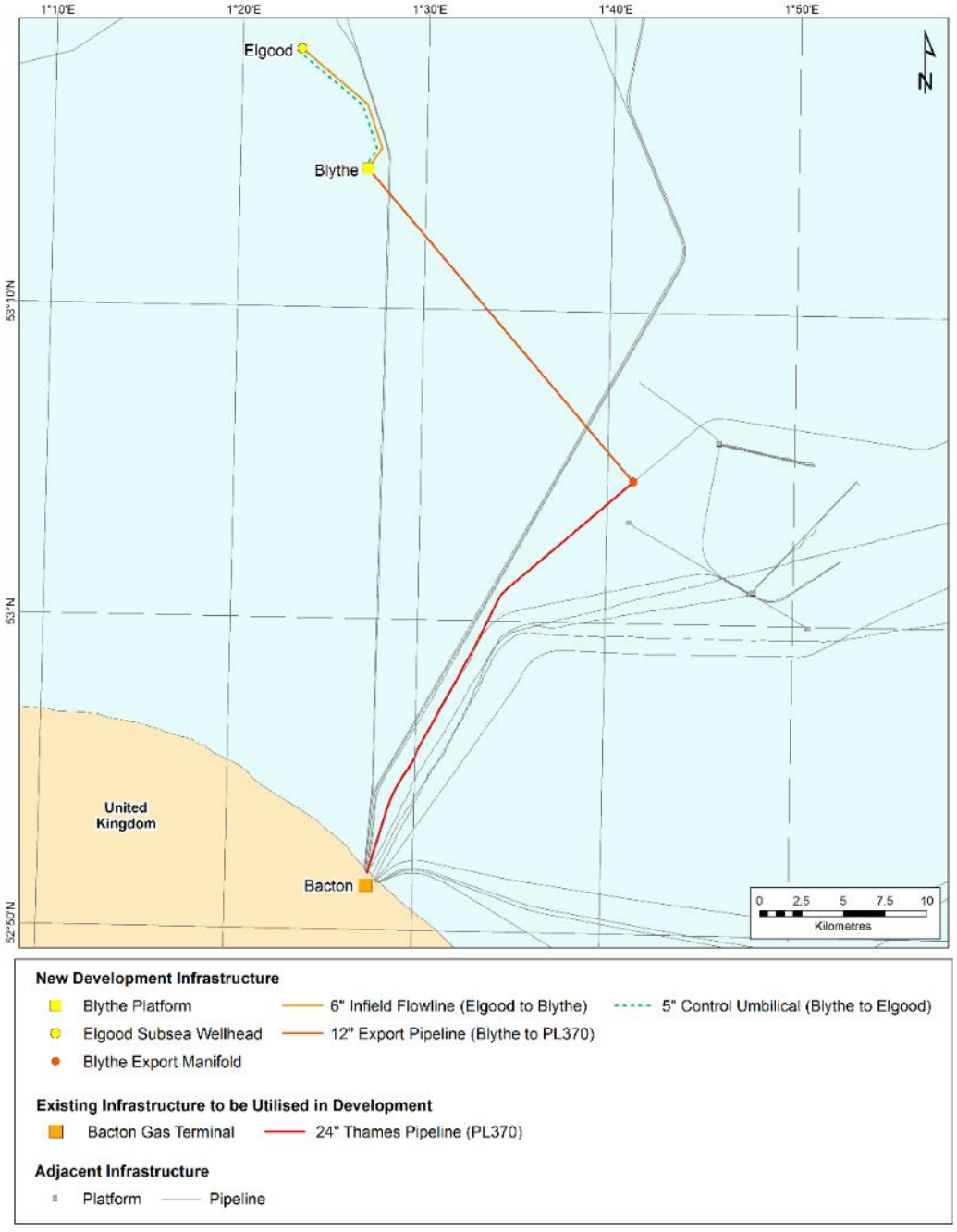

Figure 4.1 Outline Configuration of the Blythe Hub Development infrastructure

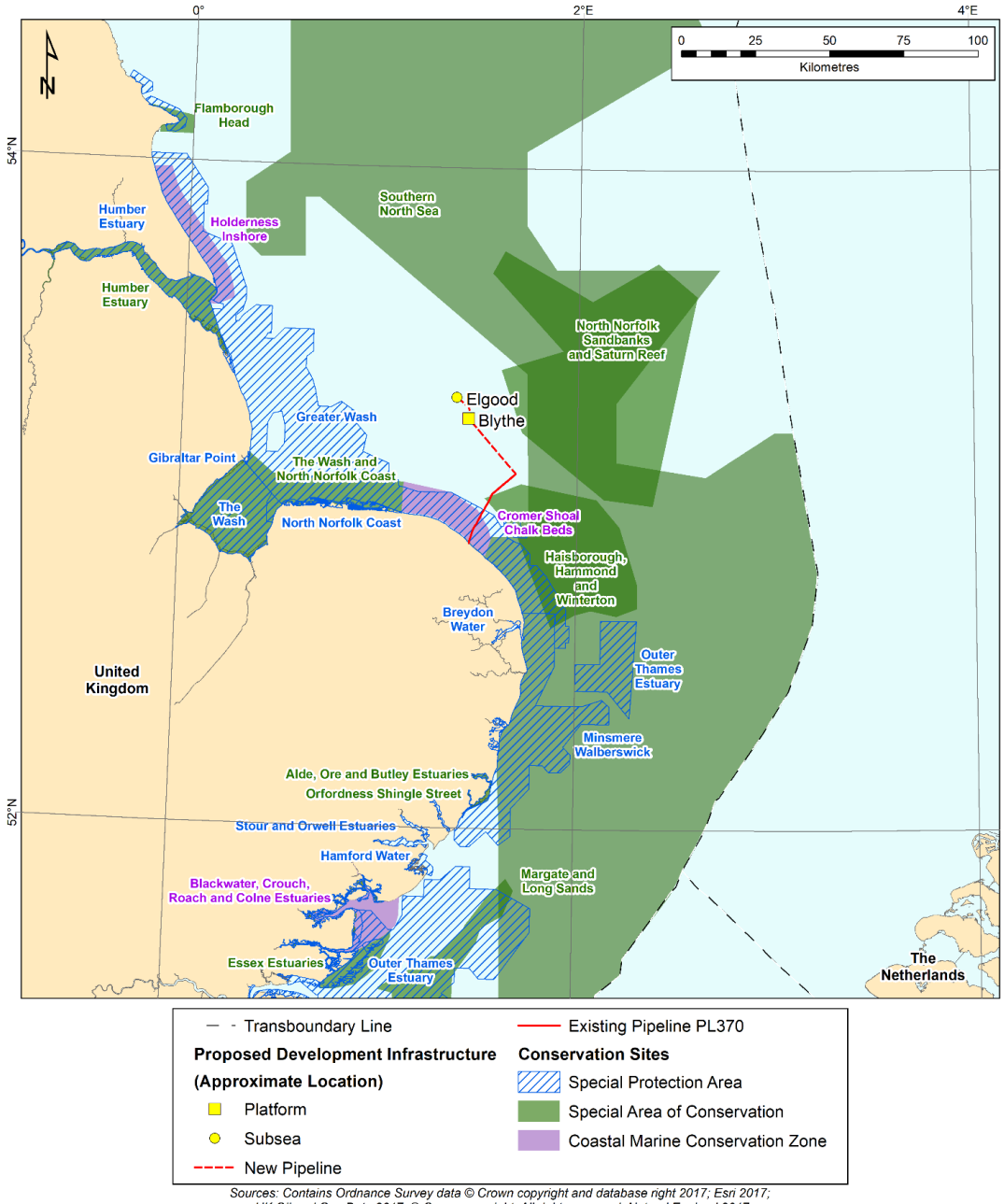

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Figure 4.2 General location of the Blythe Hub Development in relation to designated conservation areas

Note :- For clarity and in response to requests to show the development in relation to the 'Harbour Porpoise SAC', the official charting in the figure above includes the Southern North Sea SAC which is the formal designation for one of a group of SACs that are sometimes referred to as 'Harbour Porpoise SAC'.

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An offshore production platform will be constructed at Blythe which is designed so as not to require continual manning during normal production operations. The platform will be designed to provide emergency overnight accommodation and allow for routine maintenance visits.

The Blythe field will be developed via a single production well, the surface location of which will be beneath the Blythe platform.

A single subsea well will also be developed in the Elgood field, the surface location of which will be approximately 6.5 km to the north west of the Blythe platform and which will be enclosed by a subsea wellhead protection structure. The Elgood well will be tied back to Blythe via a 6" subsea flowline and controlled from Blythe by an umbilical.

Both the Blythe well and the Elgood well will be drilled using a jack-up drilling rig - a standard type of drilling rig commonly used in the southern North Sea where water depths are relatively shallow.

Produced gas from the two fields will be comingled at Blythe and exported via a newly installed 12" pipeline into the existing Thames export pipeline (PL370) which links to the Bacton onshore gas reception facilities in north Norfolk.

The 24" Thames export pipeline (PL370) which previously transported production from the offshore Thames field to the onshore gas processing terminal at Bacton, is currently decommissioned. IOG proposes to re-use the pipeline for the transport of production from its *SNS Gas Hub Development-Phase 1* to the UK gas network via the onshore Bacton Terminal (Figure 4.1). Re-use of the Thames pipeline (PL370) for the transport of hydrocarbons requires significant examination, proving and testing of the suitability of the pipeline and these activities lie outside of the scope of the ES.

Figure 4.3 shows the layout of the *IOG SNS Gas Hubs Development – Phase 1* in its entirety and which comprises the Blythe, Elgood and Southwark developments.

It should be noted that this document addresses Additional Information concerning the Blythe Hub (i.e Blythe and Elgood) Development component only.

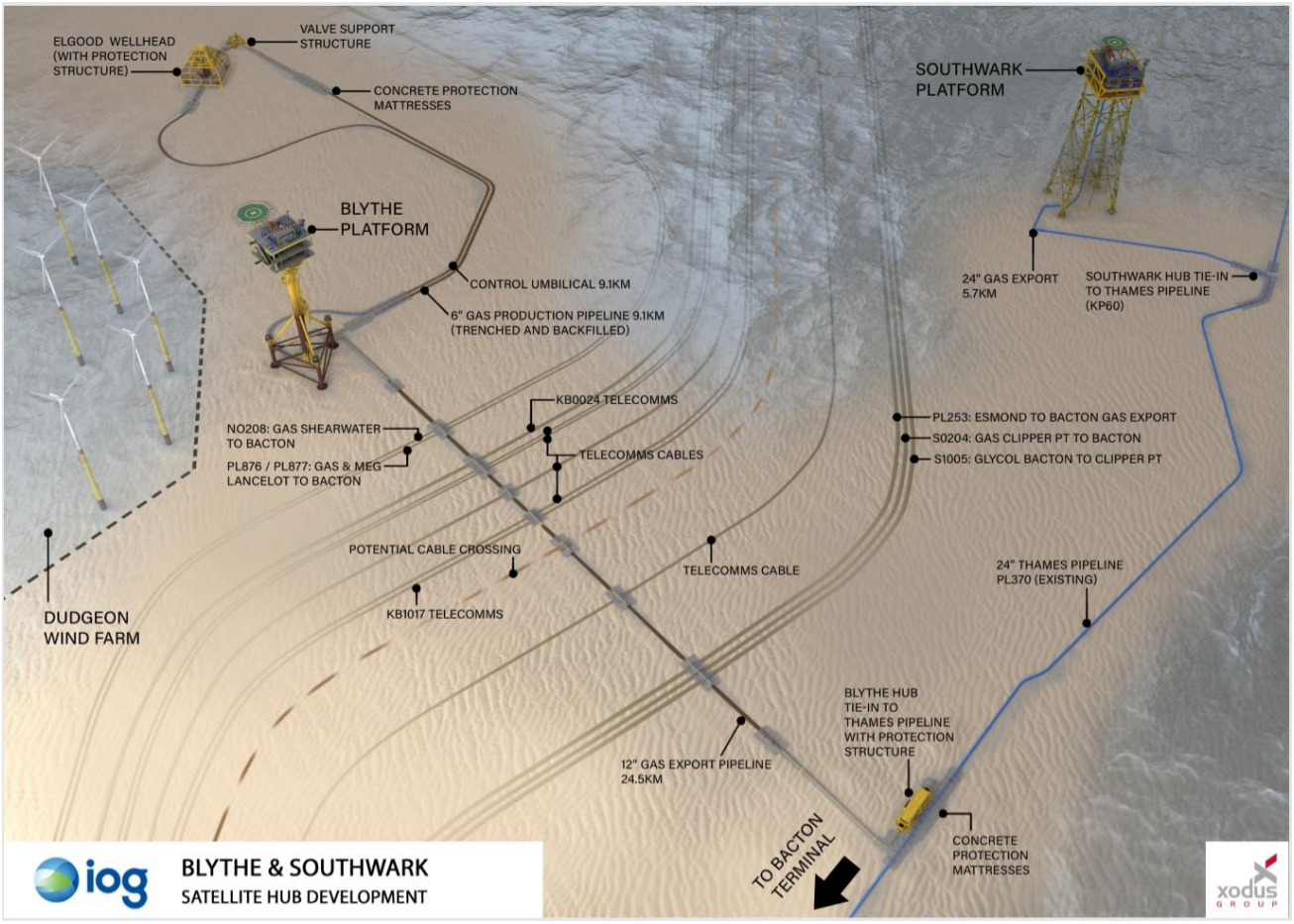


Figure 4.3 Layout of the overall IOG SNS Gas Hubs Development Phase 1, comprising Blythe, Elgood and Southwark.

Table 4.1 itemises the infrastructure that is to be used for the Blythe Hub Development and highlights where changes have been made to that described in the original ES.

Table 4.1 Proposed Blythe Hub Development Infrastructure and noting changes

Element	Description
Blythe platform	Small minimum facilities platform, comprising a jacket and topsides. Originally proposed as a 4 leg pile-driven structure, the platform jacket is now of a monotower design supported on 3-legs with a suction can foundation.
Blythe Well	A single well into the subsurface Blythe field reservoir structure, with the surface location beneath the platform. The wellhead will be situated on the platform.
Elgood Well	A single well into the subsurface Elgood field reservoir structure, with the surface location approximately 6 km to the North West of the Blythe platform, where a subsurface 'tree' and wellhead system will be situated and enclosed by a wellhead protection structure.
Elgood Subsea wellhead	A subsea 'tree' and wellhead system on the seabed, covered by a protection system (below)

Element	Description
Elgood wellhead protection structure	A subsea protection structure will be installed to protect the subsea wellhead. The protection structure will be approximately 4.5 m x 4.5 m on the sea-bed, extend approximately 3 m in height and be designed to withstand the following fishing gear interaction loads: Trawlboard snag: 600 kN (0° to 20° horizontal) Trawl ground rope snag: 1000 kN (0° to 20° horizontal) Trawlboard snag on sealine: 600 kN (Vertical) Trawl gear impact energy: 13 kJ (Horizontal)
6" in-field flow-line from Elgood to Blythe	Originally proposed as an 8” flow-line of 9.3 km in length, more detailed engineering has enabled a 6" diameter trenched and buried flow-line approximately 9.1 Km in length. The flow-line – which will be trenched and buried - will convey the Elgood production gas and fluids from the Elgood subsea installation to the Blythe platform
6" riser at Blythe platform	A subsea 6" diameter riser will connect the 6" in-field subsea flow-line from Elgood to Blythe, to the Blythe platform
5" Blythe to Elgood control umbilical	Originally of unspecified diameter and 9.3 km in length, the umbilical has now been designed as 5” diameter and 9.1 km in length. The umbilical - which is to be trenched and buried – is a hydraulic control umbilical that will also convey methanol (MeOH) and mono-ethylene glycol (MEG) to Elgood.
12" Blythe to PL370 export pipeline	Originally proposed as a 10” diameter pipeline, detailed engineering has specified a 12” diameter line which remains 24.5 km in length. The pipeline – which is to be trenched and buried – will convey produced gas and fluids from the Blythe platform to the existing Thames to Bacton 24" pipeline (PL370).
Blythe Export Manifold	Originally described as a T-piece connection for the Blythe export pipeline to the existing Thames to Bacton pipeline (PL370), engineering design has now progressed to specify a manifold that will be clamped to the PL370 and enable a cold-tap connection.
Blythe Export manifold protection structure	An omission from the original ES, a structure will be installed to provide physical protection for the Blythe export pipeline tie-in manifold to the PL370 pipeline. The protection structure will be approximately 12 m x 9 m in seabed area and designed to withstand the following fishing gear interaction loads: Trawl net friction: 4 × 200 kN (0° to 20° horizontal) Trawl gear pull-over: 300 kN (0° to 20° horizontal) Trawl gear impact energy: 13 kJ (Horizontal)

5 Changes potentially affecting environmental impacts

5.1 Seabed impacts from the infrastructure

This section sets out the general engineering process which has resulted in marginal changes to the design diameters of the pipelines and umbilical together with a more detailed description of the pipeline trenching process than that presented in the original ES. An explanation is also given of how the necessity for a small amount of rock dumping for pipelines has arisen in the period following publication of the original ES, and revised estimations for the quantity of necessary mattress protection of pipelines are given which have arisen as a result of worst case estimations of the number and type of pipeline and cable crossings likely to be encountered.

A table (table 5.4) is provided at the end of this section which sets out the overall total anticipated sea bed impacted by the development, and the variation with that incorporated in the assessment contained in the original ES is discussed.

Options for pipeline, routing, sizing, installation, stabilisation and protection were considered by a multidisciplinary team of pipeline, marine, safety and environmental engineers as part of a study commissioned by IOG and undertaken by the Subsea & Export Systems Group of Wood Group UK Ltd – an established and reputable pipeline consulting firm, selected by IOG for their specific expertise in supporting offshore oil & gas pipeline projects from concept through design and commissioning.

The engineering analysis performed by the Wood Group and IOG's pipeline engineering department considered the options for the in-field flowline from Elgood to Blythe, the Blythe to Elgood control umbilical, and the Blythe to PL370 export pipeline and all associated connections, and took into account the results of pipeline route survey work that was conducted in April 2018, after the original ES was published.

Whilst sizing of these lines was determined – in the case of the in-field flow-line and export pipeline - by fluid flow modelling, a primary physical factor considered was the quality of the seabed, particularly in this part of the southern North Sea where seabed mobility can lead to unpredictable sand wave features, leaving previously buried pipelines exposed and unsupported or, conversely, leaving previously exposed pipelines buried and inaccessible for future inspection, maintenance or modification. Other factors considered, particularly with regard to pipeline sizing and routing, included physical limitations and seabed topography, environmentally sensitive zone demarcation, and geohazards.

Initial designs for the pipelines, flow-lines and umbilical were carried out by desk study using available data including regional geological and navigational maps, bathymetry and fishing charts. These initial designs were then subsequently refined following the results of the specifically commissioned geophysical and geotechnical route surveys and seabed sampling carried out by IOG.

The possibility of southern North Sea surface laid pipelines forming free-spans due to the sea bed mobility and scouring action of waves and currents was taken into account in the export pipeline design and installation specification, although it is widely recognised (Pidduck et al., 2017) that the

complexity of variables associated with such sea bed movements and currents within the area means that there are significant uncertainties in predicting the nature and location of future free-span occurrence.

The engineering analysis and considerations resulted in the determination of an optimal design whereby the pipelines and umbilical will be installed using a trench and bury process to provide stabilisation and protection:

- The Blythe to PL370 export pipeline to be sized to 12" diameter and buried to a depth of 1 metre, measured from the top of the pipe to the sea-bed;
- The in-field flow-line from Elgood to Blythe to be sized to 6” diameter and buried to a depth of 0.5 m measured from the top of the pipe to the sea-bed;
- The Blythe to Elgood control umbilical to be sized to 5” diameter and buried in a separate trench, also to a depth of 0.5 m, measured from the top of the umbilical to the sea-bed.

The trench and bury process involves laying the pipeline/umbilical within a trench that has been cut by a specialised subsea trenching and pipelay machine.

The selected option of trenching offers the best combination of minimising possible adverse consequences for other users of the sea, particularly the fishing industry, whilst at the same time protecting the integrity of the pipelines from mechanical damage and returning the seabed to its environmental baseline condition, as described in Section 5 (Physical Presence) of the original ES.

The pipelines that are to be installed, have also been engineered for the local sea conditions in order to minimise seabed disturbance through, for example, undue ‘snaking’ during the pipelay operation, and also in order to ensure a suitably stable ‘seating’ of the pipeline within the seabed trench.

Trenching will be conducted using the ‘i-Trencher’ machine which cuts the trench in the seabed using a combination of water jetting and chain cutting. As the trench is cut the pipe is lowered into the trench. Backfilling of the trench occurs naturally, due to the prevailing tide and current action on the seabed sediment which has been characterised by survey as being fine to coarse locally gravelly sand with fine to medium gravel-sized shell fragments.

Risks to other users of the sea arising from the trenching activity have been considered and it is planned to provide guard vessel protection and navigation warning for the duration of the trenching activity, and to monitor the recovery of the sea-bed to the pre-trenched condition and avoid the introduction of additional risks of fishing gear snagging.

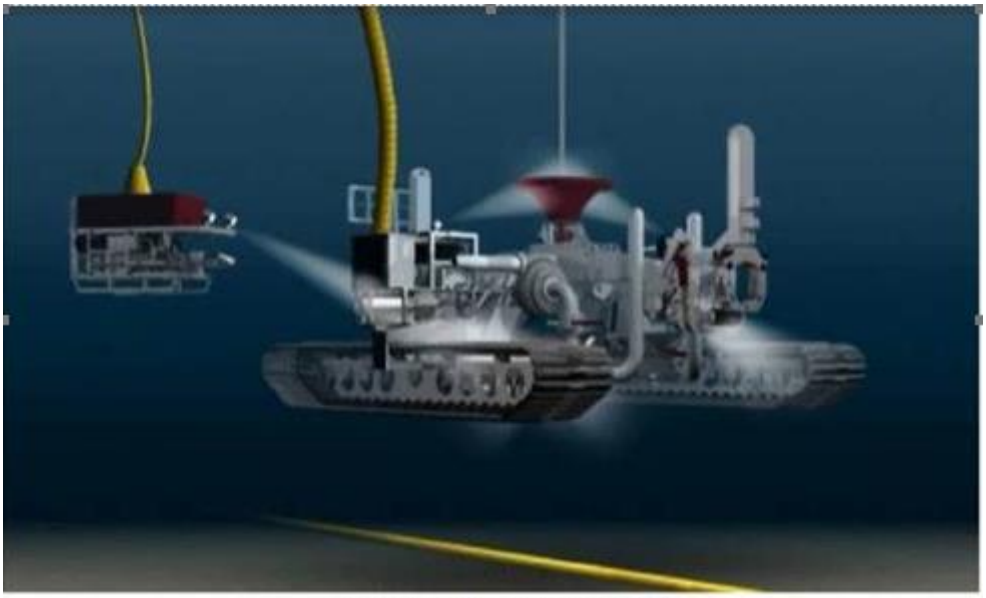


Figure 5.1 Subsea 7 i-Trencher proposed for use during pipeline installation operations

Table 5.1 sets out the total worst case expected sea-bed disturbance arising from trenching operations and is calculated on the basis of the whole length of each line being trenched, whereas in reality the area disturbed will be less than this as some parts of the lines will provide surface crossing points, as noted in the paragraphs that follow. The values are reproduced in the overall seabed impact table 5.4 below.

Table 5.1 Footprint of Trenching Activities

Pipeline/Umbilical	Length [km]	Installation Method	Trench Width (m)	Area Disturbed [km^2]	Track/Skid Width (m)	Area Compacted [km^2]	Total Area Affected [km^2]
Blythe to PL370 12" Export	24.50	Trenching vehicle	1.07	0.026	2	0.049	0.075
Elgood to Blythe 6" Flow-line	9.30	Trenching vehicle	1.07	0.010	2	0.019	0.029
Blythe to Elgood 5" Control Umbilical	9.30	Trenching vehicle	1.07	0.010	2	0.019	0.029
						Total	**0.132**

The route of the 12" Blythe to PL370 export pipeline encounters several crossing points with existing seabed pipelines and cables. Whilst the original ES noted that “mattresses will be used at the tie-in points at the base of the platform and at the tie-in with PL370, and at all pipeline and cable crossing points” it was not possible at that time to provide a reasoned engineered estimation of quantity and impact. The original ES also set out an undertaking not to use rock dump for pipeline protection and this was because IOG’s intent is to use concrete mattresses in preference to rock dumping on the basis that mattresses are removable at the point of decommissioning or sooner and that any associated use of grout or sand bags can involve biodegradeable materials wherever possible. Appendix 1 provides an overview of the planned mattress cover at the tie-in points for Blythe-to-PL370.

Further survey and more detailed engineering has enabled a more precise estimation of the required extent of pipeline stabilisation and protection required at tie-in points and at crossings. Neither the in-field flow-line from Elgood to Blythe, nor the control umbilical from Blythe to Elgood have any crossings along their route. The in-field flow-line from Elgood to Blythe will run parallel to three existing pipelines, PL1570, PL876 and PL877 around the eastern corner of the Dudgeon Offshore Wind Farm, separated by approximately 325 m. Appendix 2 presents an overview of the Elgood tie-in point.

It should be noted that a particularly complex crossing point occurs where the 12" Blythe to PL370 export pipeline intersects with the 34" Shearwater to Bacton (SEAL) gas pipeline, the 20" Lancelot to Bacton Gas Export Line and the 3" Bacton to Lancelot MEG Line which is one of the crossings noted on Figure 4.3 above. Here it will be necessary to use rock placement in order to provide a sufficiently stable supporting structure where the pipeline 'bridges' those intersections. The proposed design of this particular crossing point (referenced as PLX1) is presented in Appendix 3.

Table 5.2 Pipelines Crossed by the Blythe to Thames 12" Export pipeline

Pipeline	Ref	Fluid	Diameter	Operator	Crossing Point
Shearwater to Bacton (SEAL) Gas Line	PL1570	Gas	34"	Shell	PLX1
Lancelot to Bacton Gas Export	PL876	Gas	20"	Perenco	PLX1
Bacton to Lancelot MEG Line	PL877	Chemical	3"	Perenco	PLX1
Esmond to Bacton Gas Export Line	PL253	Gas/Condensate	24"	Perenco	PLX2
Clipper PT to Bacton Gas Line	PL632	Gas	24"	Shell	PLX2
Bacton to Clipper PT Glycol Line	PL996	Chemical	3.5"	Shell	PLX2

Table 5.3 Submarine communications cables crossed by the Blythe to Thames 12" Export pipeline

Cable	Holder of Cable
STRATOS	BT/BAE
Unknown	Unknown
Unknown	Unknown
Unknown	Unknown
Unknown	Unknown
Weybourne to Esbjerg (Abandoned)	Unknown
Unknown	Unknown

The above submarine communications cables have been identified for planning purposes, using the recognised Kingfisher Information Service – Offshore Renewable & Cable Awareness project (KIS-ORCA) and the results of IOG pipeline route survey. Appendix 4 shows the location of the charted submarine cables in the development area. The table represents the worst case anticipated cable crossings likely to be encountered and resulting in sea-bed impact due to installation of a suitable crossing design. KIS-ORCA is a joint initiative between the European Subsea Cables Association (ESCA) and the Kingfisher Information Service of Seafish. ESCA membership represents much of the subsea telecommunications and offshore renewable energy industry and they work with industry bodies like Renewable UK who recognise the benefit and value of the KIS-ORCA project.

The provision of this Additional Information also enables IOG to expand upon its proposals in the use of concrete mattresses for pipeline protection and stabilisation, as follows.

Concrete mattresses provide a recognised engineering solution for several of the challenges faced in subsea pipeline construction and umbilical deployment. In particular, concrete mattresses provide :

- Protection from dropped objects
- Added weight and stabilisation
- Protection from Trawl Boards
- Scour prevention
- Crossover support and separation for pipelines and umbilicals

The type of mattress installed will depend on the precise detail of each location, however it is anticipated that mats comprising high strength concrete profiled blocks in a brick pattern matrix will typically be used. Such mattresses closely follow the contours of a pipeline/umbilical and the seabed, thereby minimising the seabed footprint. Tapered edge elements can additionally offer an improved overtrawlabilty profile. At locations where seabed scour might be expected, or proves to be particularly problematic, then fronded mattressing which replicate the natural effects of seaweed in reducing local water velocity can be deployed.

Table 5.4 details total seabed area impacted by the Blythe Hub Development. The table includes worst case estimates of sea bed area expected to be impacted by deposits associated with the pipelines and umbilical, including deposits that may be necessary over the duration of the planned 18 year life-of-field in order to treat issues (for example free-spanning) that may arise due to the action of tidal and current forces, including seabed scour. Engineering layout drawings, showing the configuration of seabed deposits at the tie-in points are compiled for reference and are appended to this document. Whilst, as mentioned previously, it is widely recognised (Pidduck et al., 2017) that the complexity of variables associated with such sea bed movements and currents within the area means that there are significant uncertainties in predicting the nature and location of future free-span occurrence, it has nevertheless been possible to generate a worst case estimate based upon the service history of the buried Thames pipeline, and bearing in mind that the majority of the Blythe Hub Development pipelines will be stabilised by burial, leaving crossing and tie-in points as the most potentially exposed to sea-bed dynamics.

Table 5.4 Table of seabed area impacted by the development

Infrastructure Item	Impact/Deposit Type	Seabed Area Affected	
		m2	km2
Blythe platform footings incl. scour protection skirt	Seabed loss from installation to decommissioning and removal	1,192	0.0012
Elgood wellhead protection structure	Seabed loss from installation to decommissioning and removal	20	0.0000
Blythe-to-Thames 12" export pipeline	Trenching seabed disturbance	75,215	0.0752
Elgood-to-Blythe 6" Flow-line	Trenching seabed disturbance	28,551	0.0286
Blythe-to-Elgood 5" Control Umbilical	Trenching seabed disturbance	28,551	0.0286
Jack-up drilling rig spudcan footprint - Blythe Well	Temporary compression	463	0.0005
Jack-up drilling rig spudcan stabilisation material -Blythe Well	Permanent graded rock deposition	896	0.0009
Jack-up drilling rig spudcan footprint - Elgood Well	Temporary compression	463	0.0005
Jack-up drilling rig spudcan stabilisation material -Elgood Well	Permanent graded rock deposition	896	0.0009
Blythe-to-Thames 12" export pipeline crossing PLX1	Permanent graded rock deposition	1,700	0.0017
Blythe-to-Thames 12" export pipeline; tie-in point at PL370	Removeable concrete mattresses	828	0.0008
Blythe-to-Thames 12" export pipeline; Protection Structure at tie-in point with PL370	Seabed loss from installation to decommissioning and removal	108	0.0001
Blythe-to-Thames 12" export pipeline; cable crossings	Removeable concrete mattresses	11,430	0.0114
12" Blythe-to-Thames 12" export pipeline PL370, crossing of PL253, PL632,PL996 (Ref. PLX2 on drawings)	Removeable concrete mattresses	378	0.0004
12" Blythe-to-Thames 12" export pipeline, crossing of PL1570, PL876,PL877 (Ref. PLX1 on drawings)	Removeable concrete mattresses	3,852	0.0039
Blythe-to-Thames 12" export pipeline connection at Blythe platform	Removeable concrete mattresses	774	0.0008
6" flow-line from Elgood to Blythe; connection at Blythe platform	Removeable concrete mattresses	720	0.0007
6" flow-line from Elgood to Blythe; Connection at Elgood wellhead	Removeable concrete mattresses	792	0.0008
5" Control Umbilical; Connection at Blythe platform	Removeable concrete mattresses	414	0.0004
5" Control Umbilical; Connection at Elgood wellhead	Removeable concrete mattresses	2,430	0.0024
Worst Case estimate of possible requirements for corrective stablisation and protection through life-of-field	Removeable concrete mattresses	1,081	0.0011
Total		160,755	0.1608

The original Blythe Hub Development ES estimated that complete loss of the underlying seabed communities would occur in an area of approximately 0.1414 km^2. The revised area of seabed potentially impacted by the Blythe development is now estimated (worst case) to be 0.1608 km^2

Areas of the seabed affected by the development will not be able to fully recover until cessation of the development and removal of the associated infrastructure. However, the disturbance will be localised, and the area affected small in relation to the surrounding undisturbed areas. There is expected to be strong potential for the recovery of the seabed over time via re-sedimentation and re-colonisation of benthos from the surrounding areas. The development area is also largely featureless and supports no habitats of conservation concern. Overall, the impact on the seabed from the placement of the development infrastructure is therefore considered to be minor and not significant, similar to the conclusions of the original ES.

Conclusions

Whilst the Blythe to PL370 export pipeline is now proposed to be of a larger 12" diameter, compared to 10" in the original ES, and the Elgood to Blythe flowline will be a reduced 6" diameter, compared to 8" in the original ES this will not affect the selected trenching equipment. Therefore, the area of seabed that will be impacted from the trenching activities have marginally reduced from an

estimated 0.134 Km^2 in the original ES to a new estimate of 0.132 Km^2, and the conclusions drawn from the original impact assessment remain low to negligible and thus not significant.

The original ES previously stated that rock dump would not be used for pipeline protection (Option Selection and Project Description, Section 2.2.5). As detailed above, IOG now proposes to utilise rock dump to protect a section of the 12" Blythe to PL370 export pipeline as it crosses the 34" Shearwater to Bacton (SEAL) gas pipeline, the 20" Lancelot to Bacton Gas Export Line and the 3" Bacton to Lancelot MEG Line. This rock dump will facilitate the "raising" of the 12" Blythe to PL370 export pipeline above the other pipelines referenced. The total area of seabed considered to be impacted by this rock dumping is estimated to be 0.0017 km^2.

The original ES included an assessment of the potential impacts arising from rock dumping operations to provide stabilisation for the drilling rig and to afford a degree of scour protection during the drilling operations. The area that would be affected by rock dumping operations for the drilling rig was estimated to be 0.00136 km^2; a figure that included the seabed area covered by the spudcan footprint and the area covered by the surrounding gravel berm, as can be seen from Table 6.1 in section 6.2 below. Allowing for two drilling locations (one for Blyth and one for Elgood) means that the total seabed impact from the drilling rig is 0.00272 km^2

The additional amount of rock dump for pipeline protection will be 0.0017 km^2. Therefore, the overall area of seabed affected by rock dump will now be 0.00442 km^2 compared with the zero figure implied in the original ES.

Any seabed disturbance and alteration impacts from rock dumping will be confined to the immediate vicinity of the area of operations, and will not affect any species or habitats of conservation significance. The increased area of seabed that will be impacted by the rock dumping undertaken for the pipeline does not alter the conclusions detailed in the original ES. Therefore, any impacts from these operations remain low to negligible and therefore not significant.

5.2 Power Generation

Updated information is provided in this section on the expected Blythe platform power demand and power generation facilities

In the original ES it was considered that the significant majority of atmospheric emissions would arise from the drilling and installation operations; the emissions during the production phase being considered insignificant given the nature of the minimum facilities platform at Blythe which has an estimated total maximum power demand of 35 kW.

The original ES described the provision of a small wind and solar power generation facility on the Blythe platform that would partially meet the total power demand of the platform, and that the remaining demand would be met by a small diesel generator. This will no longer be the case and power to the platform will be solely supplied by the small diesel generator. Given that the generator is expected to only consume a maximum of 7 litres per hour, the atmospheric emissions arising from the production phase are still considered to be materially insignificant (Table 5.5). Therefore, the conclusions of the original ES will not change, i.e: any local air pollution effects will remain to be negligible and the increase in global environmental effects, such as climate change, will be very small.

The overall combined emissions generated during the construction and operation of the Blythe Hub Development remain small in comparison to emissions at an industry wide level and are too small to be assessed in isolation. Therefore, the individual atmospheric emissions generated at the Blythe Hub Development and their resultant impacts are considered to be negligible and therefore not significant.

Table 5.5: Estimated atmospheric emissions from the Blythe diesel generator

		Annual Diesel Generator Emissions
Consumption [m^3]		61.3
Emissions ([tonnes]	CO_2	166.79
	CO	0.82
	NO_x	3.10
	N_2O	0.01
	SO_2	0.21
	CH_4	0.01
	VOC	0.10
	GWP	188.38

5.3 Production Chemicals Pipeline

The original ES described how necessary corrosion inhibitors and hydrate inhibitors will be delivered to the Blythe and Elgood wells and pipeline system from the Blythe platform. It was also expected that Monoethylene Glycol (MEG) would be brought to the platform from onshore by means of a new pipeline connection that was to be laid between the Blythe platform and the nearby existing 3" Lancelot Area Pipeline System (LAPS) which lands onshore at the Bacton terminal.

It has however not proved possible to use the LAPS line for this purpose and, consequently, the proposed pipeline tie-in between the Blythe platform and the LAPS line will no longer be installed. MEG will now be delivered and bunkered on the platform by routine supply vessel transport.

It is anticipated that there could be up to 16 supply vessel movements to the Blythe platform each year, for the purposes of transferring equipment and materials to the platform for planned maintenance activities. Although this vessel activity was considered as part of the assessment which resulted in the original ES, the requirement for regular transport of MEG to the platform by supply vessel merits a presentation of the environmental impacts of these vessel movements. The estimated emissions for these additional vessel movements is consequently presented in Table 5.6 below.

Table 5.6: Estimated operational atmospheric emissions

		Estimated Emissions from Supply Vessels During Production Operations (1 Year)
Consumption [m^3]		64
Emissions ([tonnes]	CO_2	204.80
	CO	0.51
	NO_x	3.78
	N_2O	0.01
	SO_2	0.26
	CH_4	0.02
	VOC	0.15
	GWP	**363.79**

Conclusions

The use of vessels to transport MEG to the Blythe platform will result in vessel trips to the area estimated to be approximately 16 per year (one vessel trip every three weeks) however these additional vessel movements do not alter the conclusions reached in the original ES of an insignificant effect on other users of the sea.

5.4 Impact piling and Blythe platform footings

The original Blythe platform design as described in the ES comprised a four-legged structure, the footings for which would have been piled into place using impact piling. This design consequently gave rise to detailed environmental assessment of potential noise impacts.

IOG now proposes to replace this design with a structure that will comprise suction pile footings. Although the original ES concluded that the planned piling operations to install the Blythe platform may cause avoidance response reactions in cetaceans within 9 km of the platform, any such effects were considered transient given the expected short duration of such activities. Nevertheless, the proposed replacement of piled footings with suction footings will significantly eliminate this risk.

The design incorporates three suction pile footings supporting a monotower which in turn supports the topsides structure.

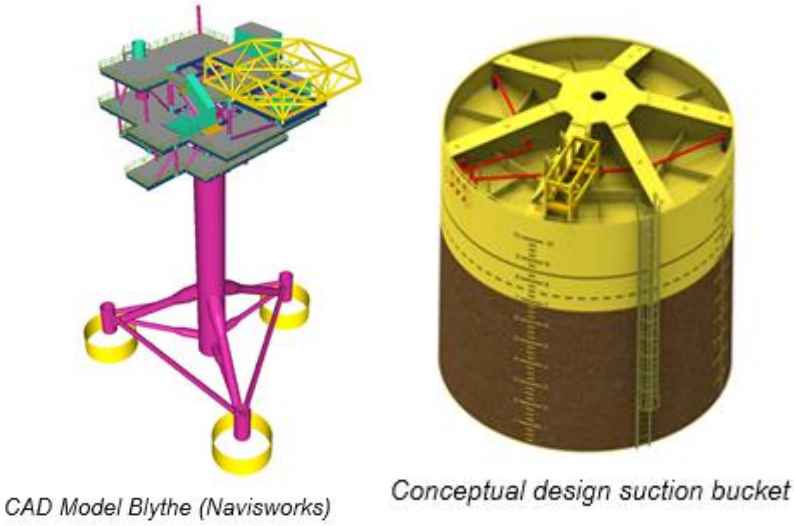


Figure 5.2 proposed Blythe platform foundation design

Each suction footing (sometimes referred to as a suction 'can' or 'bucket') comprises a metal cylinder 9 m diameter and approximately 7.5 m length with a watertight cap at the top. Suction footings will be jetted into the seabed, which has the effect of pumping out the seawater that lies between the seabed and the footing, thereby allowing hydrostatic pressure to force the suction footing firmly into the seabed sediment. This method does not require any impact piling and there are not expected to be any significant underwater noise impacts from this installation method.

Scour protection around the suction piles will be provided by a proprietary scour protection system that has been specially developed for suction footings and successfully tested at an offshore wind farm location in the North Sea. The system avoids the use of rock deposits by deploying frond mats to provide scour protection around the base of each suction footing.

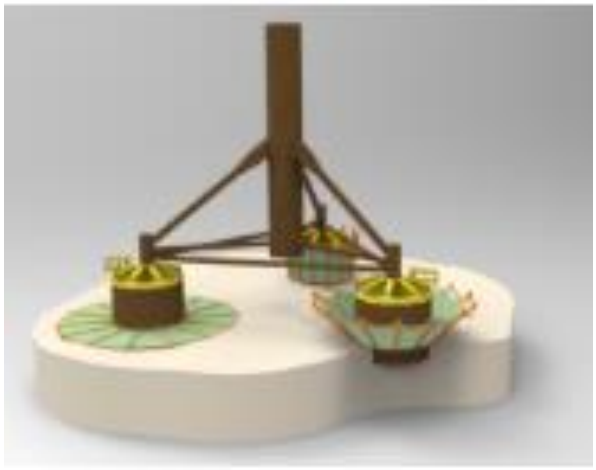


Figure 5.3 Scour protection 'skirts' around suction footings

The larger seabed footprint of suction footing and associated anti scour skirting compared to the footprint of the originally anticipated driven piles, means that the 64m^2 of total seabed area impacted by the driven piles as stated in the original ES has risen to 1,192m^2 being the total seabed area impacted by the suction footings and associated anti scour skirting. This area is included in Table 5.4 of total seabed deposits, presented earlier in this document.

Conclusions

The footprint of the originally planned Blythe platform was estimated to be approximately 64 m^2 based on a lattice jacket platform with four legs skirt piled to the seabed with two piles per leg and each pile cluster having a footprint of approximately 16 m^2. The revised design as set out above will result in an area of approximately 397 m^2 of seabed being impacted per suction footing resulting in a total impacted area of seabed of 1,192 m^2. Although this area of impact is greater than that assessed in the original ES it is not considered that this difference will affect the conclusions reached. Therefore, the impacts from the physical presence of the Blythe platform, with the revised topsides design, are considered to remain low to negligible and therefore not significant.

IOG originally proposed to undertake piling operations as part of the installation operations of the Blythe platform. The noise generated from piling was considered to represent the loudest anticipated sound source during these installation operations, with the potential to affect the behaviour of marine mammals in the area around the proposed development. However, driven piling operations are no longer planned and the platform will instead be installed by jetting suction footings into the seabed and the water remaining inside the footing pumped out. This process is inherently less noisy than driven piling operations and therefore the impacts of underwater noise are no longer considered to be a potential significant issue.

5.5 Anticipated Field Life

The original ES anticipated a 12 year 'life of field' for the Blythe Hub Development, with a 'high' or 'worst case' case total production from the Blythe and Elgood fields combined over the period of 2,506 Million m^3 of gas and 0.143089 Million m^3 of condensate.

It is now proposed that the Blythe and Elgood fields will – in the 'high' case – produce a combined 2,565 Million m^3 of gas and 0.1440068 Million m^3 of condensate over a field life of 18 years.

The following production profiles detailed in Tables 5.7, table 5.8 and Table 5.9, showing an anticipated 18 life-of-field, are taken from the Field Development Plan (FDP) submitted to the Oil & Gas Authority (OGA) and include all fields in the *IOG SNS Gas Hubs Development- Phase 1*, including Blythe and Elgood which are the subject of this Blythe Hub ES Additional Information.

The extended field life of the proposed Blythe Hub Development is not considered to alter any of the conclusions reached in the original ES.

Table 5.7: Blythe Hub Production Profile (High Case)

	Phase 1 - High Case (3P)							
	Southwark		Blythe		Elgood		Total	
	Gas	Condensate	Gas	Condensate	Gas	Condensate	Gas	Condensate
	MMcm	MMcm	MMcm	MMcm	MMcm	MMcm	MMcm	MMcm
TOTAL	3,462	0.02	1,580	0.09	985	0.06	**6,027**	**0.16**
Year	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d
2020	0	0.0	0	0.0	0	0.0	**0**	**0.0**
2021	316,319	1.4	406,508	22.8	360,811	20.3	**1,083,638**	**44.5**
2022	1,343,532	6.0	1,145,813	64.3	1,281,830	72.0	**3,771,175**	**142.3**
2023	1,009,756	4.5	703,224	39.5	190,960	10.7	**1,903,939**	**54.7**
2024	753,778	3.3	421,657	23.7	19,351	1.1	**1,194,786**	**28.1**
2025	599,094	2.7	245,256	13.8	19,700	1.1	**864,050**	**17.5**
2026	774,244	3.4	237,367	13.3	148,392	8.3	**1,160,003**	**25.1**
2027	796,756	3.5	427,860	24.0	455,873	25.6	**1,680,489**	**53.2**
2028	640,281	2.8	261,848	14.7	135,602	7.6	**1,037,731**	**25.2**
2029	540,872	2.4	173,626	9.7	40,233	2.3	**754,732**	**14.4**
2030	464,349	2.1	114,069	6.4	15,472	0.9	**593,890**	**9.3**
2031	404,303	1.8	68,998	3.9	9,210	0.5	**482,511**	**6.2**
2032	359,689	1.6	31,733	1.8	9,391	0.5	**400,812**	**3.9**
2033	320,070	1.4	25,065	1.4	0	0.0	**345,135**	**2.8**
2034	287,797	1.3	0	0.0	8,544	0.5	**296,341**	**1.8**
2035	257,581	1.1	22,574	1.3	273	0.0	**280,429**	**2.4**
2036	234,703	1.0	13,613	0.8	0	0.0	**248,316**	**1.8**
2037	213,265	0.9	8,798	0.5	0	0.0	**222,062**	**1.4**
2038	163,262	0.7	17,638	1.0	944	0.1	**181,844**	**1.8**

Table 5.8: Blythe Hub Production Profile (Mid Case)

Phase 1 - Mid Case (2P)								
	Southwark		Blythe		Elgood		Total	
	Gas	Condensate	Condensate	NGL	Gas	Condensate	Gas	Condensate
	MMcm	MMcm	MMcm	MMcm	MMcm	MMcm	MMcm	MMcm
TOTAL	2,689	0.01	1,169	0.07	784	0.04	**4,642**	**0.12**
Year	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d
2020	0	0.0	0	0.0	0	0.0	**0**	**0.0**
2021	293,887	1.3	395,782	22.2	360,811	20.3	**1,050,480**	**43.8**
2022	1,207,369	5.4	1,008,970	56.6	1,047,883	58.8	**3,264,222**	**120.8**
2023	858,671	3.8	518,675	29.1	54,046	3.0	**1,431,392**	**36.0**
2024	611,985	2.7	257,601	14.5	24,309	1.4	**893,896**	**18.5**
2025	463,928	2.1	81,013	4.5	10,238	0.6	**555,179**	**7.2**
2026	608,914	2.7	223,681	12.6	333,046	18.7	**1,165,641**	**34.0**
2027	639,890	2.8	316,947	17.8	226,987	12.7	**1,183,823**	**33.4**
2028	494,702	2.2	168,247	9.4	53,226	3.0	**716,176**	**14.6**
2029	403,160	1.8	92,647	5.2	15,235	0.9	**511,041**	**7.8**
2030	339,878	1.5	32,740	1.8	5,428	0.3	**378,046**	**3.7**
2031	290,324	1.3	22,058	1.2	1,352	0.1	**313,734**	**2.6**
2032	251,834	1.1	16,767	0.9	6,119	0.3	**274,720**	**2.4**
2033	219,463	1.0	11,080	0.6	0	0.0	**230,542**	**1.6**
2034	186,021	0.8	8,494	0.5	0	0.0	**194,515**	**1.3**
2035	154,306	0.7	17,854	1.0	1,486	0.1	**173,645**	**1.8**
2036	137,255	0.6	9,165	0.5	3,614	0.2	**150,033**	**1.3**
2037	129,425	0.6	8,541	0.5	1,746	0.1	**139,712**	**1.2**
2038	70,019	0.3	11,167	0.6	1,321	0.1	**82,507**	**1.0**

Table 5.9: Blythe Hub Production Profile (Low Case)

	Phase 1 - Low Case (1P)							
	Southwark		Blythe		Elgood		Total	
	Gas	Condensate	Gas	Condensate	Gas	Condensate	Gas	Condensate
	MMcm	MMcm	MMcm	MMcm	MMcm	MMcm	MMcm	MMcm
TOTAL	1,821	0.01	792	0.04	593	0.03	**3,206**	**0.09**
Year	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d	m3/d
2020	0	0.0	0	0.0	0	0.0	**0**	**0.0**
2021	263,746	1.2	374,768	21.0	360,811	20.3	**999,325**	**42.5**
2022	1,013,473	4.5	799,985	44.9	750,959	42.2	**2,564,416**	**91.6**
2023	641,415	2.8	282,244	15.8	11,682	0.7	**935,341**	**19.3**
2024	416,420	1.8	50,479	2.8	14,628	0.8	**481,527**	**5.5**
2025	294,619	1.3	26,124	1.5	13,109	0.7	**333,852**	**3.5**
2026	462,792	2.1	189,451	10.6	265,406	14.9	**917,648**	**27.6**
2027	456,093	2.0	230,544	12.9	167,172	9.4	**853,809**	**24.4**
2028	330,229	1.5	91,296	5.1	20,555	1.2	**442,080**	**7.7**
2029	257,308	1.1	21,260	1.2	3,980	0.2	**282,548**	**2.6**
2030	202,412	0.9	14,486	0.8	4,146	0.2	**221,044**	**1.9**
2031	156,830	0.7	13,156	0.7	1,476	0.1	**171,463**	**1.5**
2032	116,934	0.5	9,357	0.5	2,709	0.2	**129,000**	**1.2**
2033	86,389	0.4	9,130	0.5	1,205	0.1	**96,725**	**1.0**
2034	71,928	0.3	15,581	0.9	982	0.1	**88,491**	**1.2**
2035	67,655	0.3	10,531	0.6	961	0.1	**79,147**	**0.9**
2036	56,746	0.3	10,570	0.6	1,920	0.1	**69,235**	**1.0**
2037	49,909	0.2	11,496	0.6	821	0.0	**62,226**	**0.9**
2038	40,669	0.2	8,492	0.5	574	0.0	**49,735**	**0.7**

6 Clarifications

6.1 Option Selection

The following expands upon the information in Section 2.2 (Option Selection) of the original ES detailing the option selection process for the surface and subsurface infrastructure.

Three basic infrastructure options were considered when determining how best to take delivery of the gas and fluids drawn from the wells.

These were:

A Subsea installation(s) comprising necessary gas and fluids production and export equipment which sit on the seabed;

B Platform(s) which, whilst supported on the seabed, extend to structures above sea level which carry the necessary gas and fluids handling and export equipment;

C Floating facility(s) which hold the necessary gas and fluids handling and export equipment, and which are anchored to the seabed.

During the initial option screening it was determined that available environmental study data was inconclusive in indicating any differential environmental impact between options.
The technical aspects of each option, however, indicated a preference toward an element of platform facilities at the Blythe Development location (Option B above)
Option screening for the means of delivering the produced gas and fluids to market included a consideration of the environmental impacts of either constructing a new gas export pipeline to shore, or the re-use of the decommissioned Thames export pipeline (PL370) that is already connected to the onshore gas processing facility at Bacton on the north Norfolk coast. It was concluded that the re-use of the existing and decommissioned Thames export pipeline, provided that the integrity of the pipeline could be suitably assured, had environmental advantages over the construction and installation of a new pipeline, particularly when it was considered that the re-use of the Thames pipeline for the Blythe Development would have the additional environmental benefit of making it available for further gas hub development in the southern North Sea, hence reducing the need for new additional pipeline infrastructure.

Having determined an element of fixed platform for the Blythe Hub Development, together with re-use of the decommissioned Thames export pipeline, several variations on detailed field configuration were considered in order to determine the optimum configuration, as set out in Section 2.0 'Option Selection and Project Description' of the original ES.
The main elements of the Blythe Development infrastructure were determined as :-

- A single minimum facilities platform installation at the Blythe Field;
- A single subsea installation at the Elgood Field;

- A subsea flowline to convey the Elgood production gas and fluids from the Elgood subsea installation to the Blythe platform.

- A subsea control line umbilical to link the Elgood subsea installation to the Blythe platform, and enable control of the Elgood well from the Blythe platform;

- A subsea pipeline between the Blythe platform and the existing Thames export pipeline (PL370) to transport the combined production gas and fluids from Elgood and Blythe to the onshore Bacton terminal in Norfolk.

6.2 Seabed disturbance from drilling rig activities

Section 5.1.2 (Potential effects on Seabed Communities) of the original ES quoted a figure of 1,000 tonnes of stabilisation material required for each drilling rig leg. IOG can clarify that typical southern North Sea jack-up drilling rigs have three legs that are lowered to the seabed to raise the rig to a stable position above the sea surface, maintaining stability by its inherent weight. Each leg has a 'spudcan' at its base, which is a large lens-shaped disc to inhibit seabed penetration. Each spudcan has a large spike at the bottom to ensure lateral stability in the seabed. Typical spudcans are 14 m (46 ft) in diameter.

Stable granular material will need to be placed around each leg footing for stabilisation and scour protection prior to drilling operations commencing. Established industry experience of safe and stable jack-up rig placement in the southern North Sea demonstrates that approximately 1,000 tonnes of gravel deposit per leg is required for typical jack-up rigs on the seabed sediments confirmed by the results of an IOG geophysical and geotechnical site survey in 2018.

The jack-up rig's legs will be deployed to the seabed first, before stabilisation material (typically gravel of the order of 20 mm particle size) is deposited via chute from a vessel on sea surface. The gravel acts to fill voids under the footings and forms a shallow shelf or berm around the footing. The gravel deposition will typically form a shallow 5 m wide berm around each footing. The total seabed footprint for a three-legged jack-up rig is presented in Table 6.1.

Table 6.1: Total Seabed Footprint for a Three Leg Jack-up Rig

Seabed footprint type	*Area per can [m^2]*	*Total area [m^2]*
Spudcan	*154.38*	*463.14*
Stabilising gravel	*298.77*	*896.31*
Total	*453.15*	*1359.45*

The drill rig will be assisted to site and positioned with the aid of a tug boat. Anchoring may not necessarily be required to maintain the rig in position whilst the legs are deployed. If anchoring is required in the placement of the jack-up rig then exposure to seabed disturbance will be minimised by only running the minimum required amount of anchors and removal of the anchors once the rig is jacked down to its drilling draft

6.3 Flaring and Venting

The Non-Technical Summary of the original ES lists the potential impact considerations, which includes flaring, and Section 2.3.1 of the ES (Option Selection and Project Description) correctly states that there will be no flaring from the Blythe platform once installed.

However, flaring may take place from the drilling rig as part of operations to perform start-up of the wells after the completion of drilling operations. There will also be some very minor volumes of gas vented from the Blythe platform during planned maintenance activities.

Flaring during well start-up operations will take place from the jack up drilling rig and is not expected to exceed 1,132,674 m^3 (40 MMscf) per well. Flaring operations are expected to take less than 24 hours per well. Table 6.2 summarises the anticipated emissions associated with flaring during well start-up. The emissions calculations in Table 6.2 are based on the well fluids composition at Blythe and Elgood. Table 6.3 presents the amended estimated total for atmospheric emissions from the Blythe development including the estimated emissions arising from the well start-up operations, use of a diesel generator and supply vessels transiting to and from the Blythe platform.

Table 6.2 Estimated Atmospheric Emissions from Flaring Operations

		Well start up flaring at Blythe	Well start up flaring at Elgood
Consumption [m^3]		1,132,674	1,132,674
Emissions ([tonnes]	CO_2	2,504.12	2,533.75
	CO	6.29	6.39
	NO_x	1.13	1.14
	N_2O	0.08	0.08
	SO_2	0.01	0.01
	CH_4	13.21	13.09
	VOC	4.66	4.95
	GWP (Tonnes of CO_2-equivalent)	**2,881.50**	**2,908.81**

Table 6.3 Estimated Total Atmospheric Emissions from Blythe Development

		Original Estimated Emissions from Drilling, Installation Operations at Blythe and Elgood	Total well Emissions at well start-up Blythe and Elgood	Annual Diesel Generator Emissions	Estimated Emissions from Supply Vessels During Production Operations (1 Year)	Total Estimated Emissions from Blythe and Elgood
Consumption [m^3]		5,619.63	2,265,348	61.3	64	2,271,092.93
Emissions ([tonnes]	CO_2	17,982.81	5,037.87	166.79	204.80	23,392.27
	CO	45.55	12.68	0.82	0.51	59.56
	NO_x	271.93	2.27	3.10	3.78	281.08
	N_2O	1.24	0.16	0.01	0.01	1.42
	SO_2	22.48	0.02	0.21	0.26	22.97
	CH_4	1.10	26.30	0.01	0.02	27.43
	VOC	10.37	9.61	0.10	0.15	20.23
	GWP	21,667.02	5,790.31	188.38	**363.79**	28,009.50

The Blythe platform is designed as an automated platform that will only be manned for maintenance purposes and as such has no facilities for routine venting of the production system. Venting will only occur during intrusive maintenance procedures which will be an infrequent but planned manually controlled process.

Conclusions

In 2018, a total GWP of 14.63 million tonnes of CO_2 equivalent were released on the UKCS equating to approximately 3% of total UK emissions (Oil & Gas UK Environmental Report, 2019). The total estimated GWP of the proposed Blythe Hub Development, not including flaring operations, is approximately 28,009 tonnes or 0.19 % of the total overall annual exploration and production operations undertaken on the UKCS. Therefore, it is considered that there will not be any additional environmental impacts associated with this particular activity and the conclusions reached in the original ES remain valid.

Although there will be an increase in atmospheric emissions, the overall emissions will remain very low and any resultant impacts remain negligible and therefore insignificant. The conclusions of reached in the original ES are unchanged.

6.4 Marine Plans

The original ES did not provide a full discussion of the proposed development in respect of the East Offshore Marine Plan.

The UK government introduced a number of measures via the Marine and Coastal Access Act 2009 (MCAA) to deliver its vision of "clean, healthy, safe, productive and biologically diverse oceans and seas" for the whole of the UK. These measures included the introduction of a marine planning system, establishing the Secretary of State as the marine planning authority for the English Inshore and English Offshore marine planning regions with the power to delegate certain marine planning functions. The Secretary of State delegated these functions to the Marine Management Organisation (MMO) in April 2010. The aim of the Marine Plan is to help ensure the sustainable development of the marine areas through informing and guiding regulation, management, use and protection of the marine plan areas. There are 11 marine plan areas in England, each of which have an individual marine plan detailing the long-term view of activities within each area. Each marine plan sets out priorities, directions and guidance for sustainable future development within the plan area. Any licence application within a marine plan area must demonstrate that the marine plan has been considered and explain how the activity will contribute to achieving the objectives set out in the marine plan.

The Blythe Hub Development is situated within the East Offshore Marine Plan Area. The East Offshore Marine Plan Area is currently designated as having 'Good Environmental Status' in accordance with the Marine Strategy Framework Directive, with its relevant habitats and species considered to have a 'favourable conservation status', as required under the Habitats and Wild Birds Directives. The Marine Plan acknowledges that gas production in the area is an important activity with new technologies having the ability to maximise production of hydrocarbon reserves whilst continuing to ensure minimal environmental impacts (Defra, 2014).

The proposed Blythe Hub Development has been assessed against the following East Offshore Marine Plan objectives and oil and gas policies: 1, 2, 5, 6. 7, 8, 9, 10, 11, OG1 and OG2 and IOG will ensure compliance with these policies as set out below.

Objective 1:

To promote the sustainable development of economically productive activities, taking account of spatial requirements of other activities of importance to the East Marine Plan Areas. The Blythe Hub Development is in line with sustainable development principles and considers other users of the sea and impacts upon them, as discussed in Section 3 and 5 of the ES.

Objective 2:

To support activities that create employment at all skill levels, taking account of the spatial and other requirements of activities in the East marine plan areas. The Blythe Hub Development will provide jobs and tax revenue to the UK economy.

Objective 5:
To conserve heritage assets, nationally protected landscapes and ensure that decisions consider the seascape of the local area. There are no known wrecks or heritage sites within the development area, as discussed in Section 3 of the ES.

Objective 6:

To have a healthy, resilient and adaptable marine ecosystem in the East marine plan areas. IOG will ensure that any potential impacts associated with the proposed Blythe Hub Development will be kept to a minimum as discussed in Sections 5 to 9 of the ES.

Objective 7:

To protect, conserve and, where appropriate, recover biodiversity that is in or dependent upon the East marine plan areas. IOG will ensure that any potential impacts associated with the proposed Blythe Hub Development will be kept to a minimum as discussed in Sections 4 to 9 of the ES.

Objective 8:

To support the objectives of Marine Protected Areas (and other designated sites around the coast that overlap, or are adjacent to the East marine plan areas), individually and as part of an ecologically coherent network. IOG will ensure that any potential impacts to any protected species and sites, associated with the proposed development will be kept to a minimum as discussed in Section 4 of the ES.

Objective 9:

To facilitate action on climate change adaptation and mitigation in the East marine plan areas. IOG will ensure that any potential impacts to air quality and climate change associated with the proposed Blythe Hub Development will be kept to a minimum as discussed in Section 8 of the ES.

Objective 10:

To ensure integration with other plans, and in the regulation and management of key activities and issues, in the East marine plans, and adjacent areas. IOG will ensure integration with other plans and that any potential impacts on other sea users associated with the proposed Blythe Hub Development will be kept to a minimum as discussed in Section 5 of the ES.

Objective 11:

To continue to develop the marine evidence base to support implementation, monitoring and review of the East marine plans. IOG will ensure the continued use of the most up-to-date data and research when assessing the impact of the Blythe Hub Development, as demonstrated throughout the ES.

Policy OG1:

Proposals within areas with existing oil and gas production should not be authorised except where compatibility with oil and gas production and infrastructure can be satisfactorily demonstrated. The Blythe and Elgood gas fields were discovered in 1966 and 1990, respectively. IOG became owner of the Blythe and Elgood fields in 2016 and plans to develop the Blythe Hub around re-use of the previously decommissioned Thames to Bacton pipeline PL370, as set out in Section 1.1 of the ES.

Policy OG2:

Proposals for new oil and gas activity should be supported over proposals for other development. IOG plans to develop the Blythe Hub as part of a larger plan that includes developing two new UK gas hubs in the southern North Sea based around re-use of the previously decommissioned Thames to Bacton pipeline PL370, as set out in Section 1.1 of the ES.

6.5 Survey Data

Following publication of the original ES, IOG commissioned a series of site and pipeline route surveys at the Blythe Hub Development. Surveys were undertaken within UKCS Blocks 48/22 and 48/23 and focused on the proposed sites of the Blythe platform, the Elgood subsea well, the Elgood to Blythe pipeline and the Blythe to PL370 export pipeline. The surveys were undertaken between 26 January 2018 and 11 April 2018.

A high-level summary of the survey findings is provided below and more detail is provided in the Habitat Assessment and Environmental Baseline Survey reports which are being made available in full on the IOG website for the duration of the public consultation period accompanying the Additional Information.

6.5.1 Sediment Characterisation

The sediment type was broadly comparable across the Blythe Hub survey area with sandy sediments (medium, coarse or very coarse sand) reported throughout. Sand and gravel were the dominant sediment types recorded across the survey area.

6.5.2 Seabed Habitats

The seabed observed within all areas within the Blythe Hub were classified as the EUNIS biotope complex 'Circalittoral coarse sediment' (A5.14/SS.SCS.CCS). The remains of *Sabellaria spinulosa* tubes and live specimens were observed within grab samples acquired in the vicinity of the proposed Blythe platform and the pipeline routes. However, no *S. spinulosa* tubes and thus no 'reef' was observed in stills or video photography. Sand eels (*Ammodytes* sp.) were identified in the vicinity of the proposed Blythe platform and along the Blythe – Elgood pipeline route. No other potentially sensitive habitats or species were identified from the photographic data.

6.5.3 Macrofauna

The macrofaunal community across the stations was greatly variable, with low abundance recorded at most stations. The mollusc *Goodallia triangularis* and the annelid *Ophelia borealis* were the most abundant taxa across the Blythe Hub. Other common taxa included the annelid polychaetes *Travisia forbesii, Scoloplos armiger, Aonides paucibranchiata* and the arthropods *Urothoe elegans and U. marina*.

6.5.4 Survey Locations

The extent of the survey area and sampling locations at the Blythe and Elgood sites are shown in Figure 6.1, 6.2 and 6.3.

6.5.5 Summary

The environmental survey results demonstrate that the development footprint lies on a mobile sand substrate, with a varying proportion of gravel and shell fragments. Epifauna was extremely sparsely recorded throughout the survey area. In general, results demonstrated very low species richness, diversity or abundance across the survey area. No potential Annex I habitats were found to be present in the development area during the environmental baseline survey or habitat assessment surveys and he communities identified within the Blythe Hub was thought to be typical for the area and sediment types.

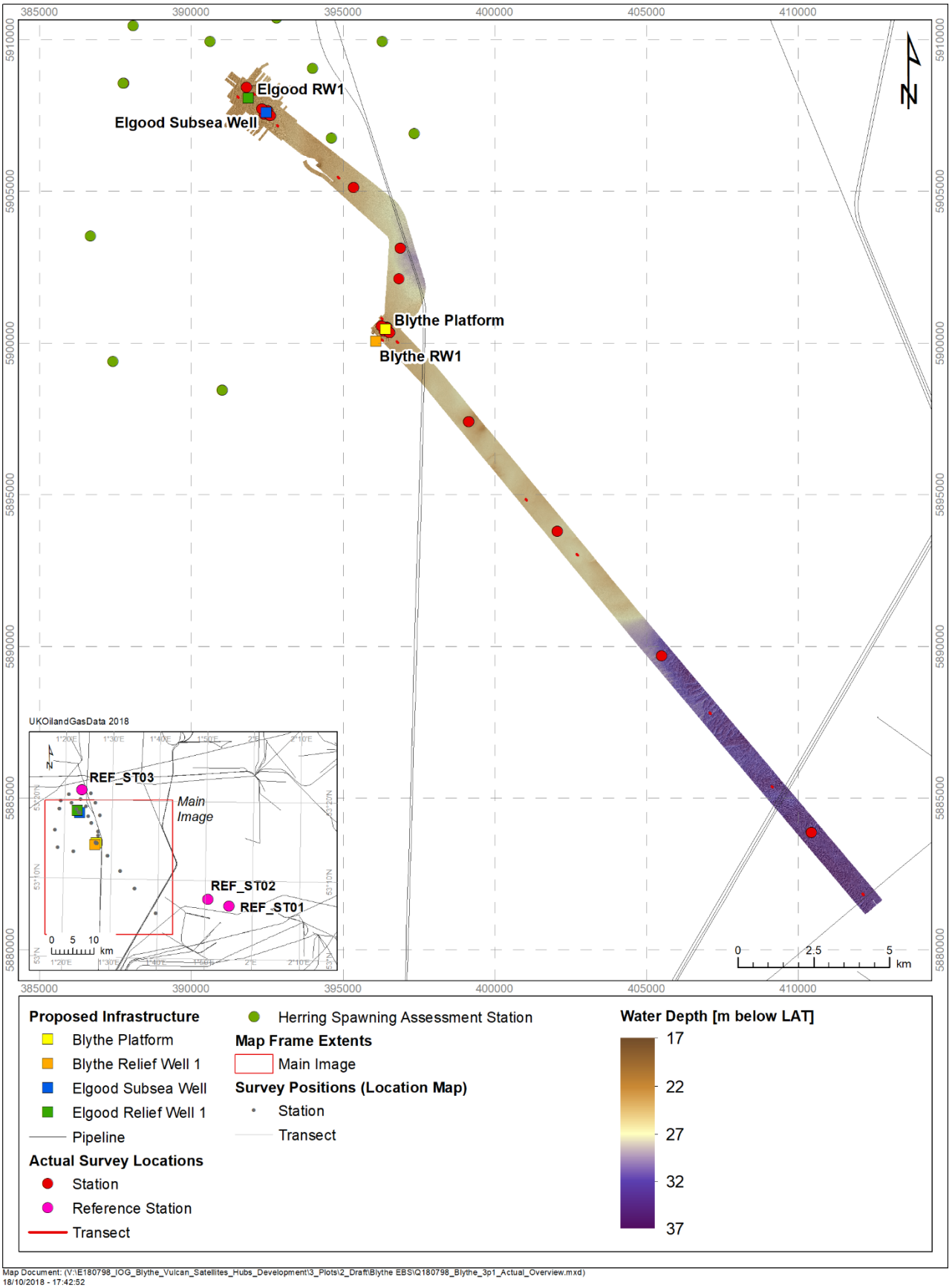


Figure 6.1 Proposed environmental survey locations, Blythe Hub

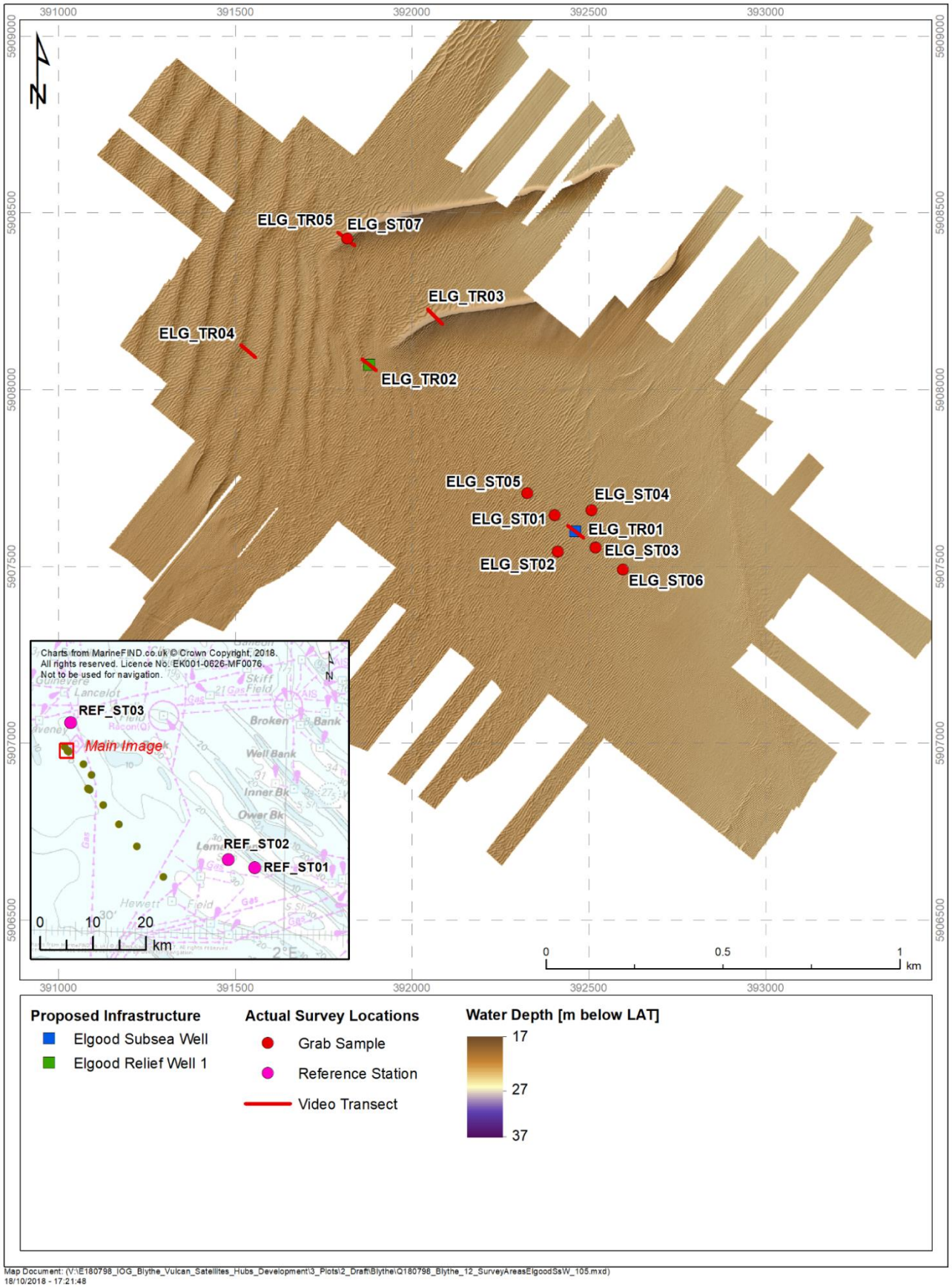


Figure 6.2 Bathymetry and completed environmental sampling locations, Elgood site

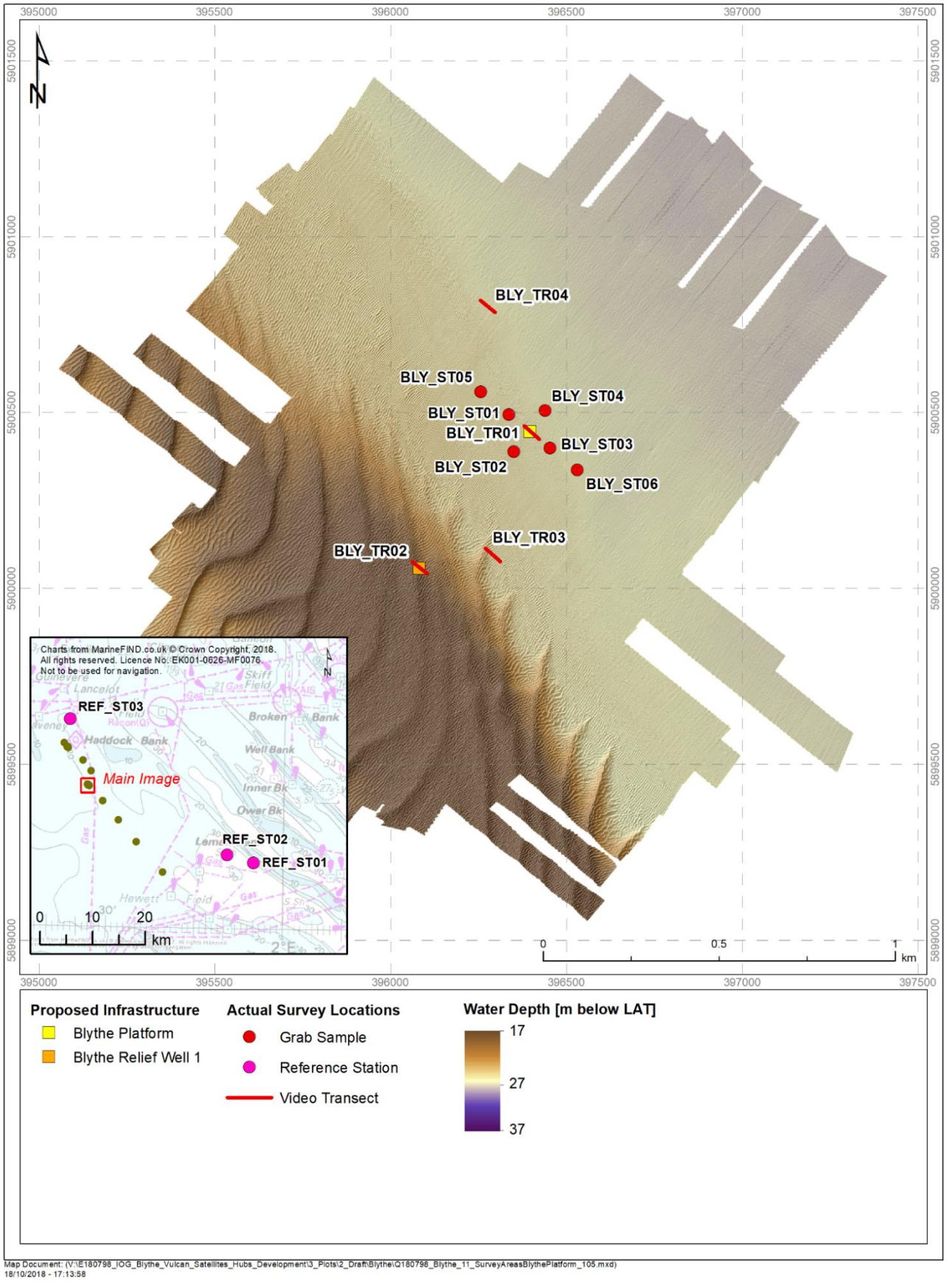


Figure 6.3 Bathymetry and completed environmental sampling locations, Blythe site

6.6 Benthic Impacts

This section provides further clarification on benthic impacts, as requested by OPRED after submission of the original ES.

Section 5.1.2 (Potential Effects on Seabed Communities) of the original ES noted that
it is expected that re-sedimentation processes will start to fill in depressions created by the temporary drilling rig footings
immediately after the rig has vacated the drilling location, quickly followed by re-colonisation of the benthos.

Re-colonisation of these areas will take place by the same species that were previously present, with mobile and opportunistic infaunal (such as polychaetes) and epifaunal species (such as starfish, brittlestars and hermit crabs) re-colonising the area first. Species characteristic of these mobile SS.SCS.CCS Circalittoral Coarse Sediment biotopes are typically resilient to sediment disturbance.

The seabed area affected by the development infrastructure is very small compared to the surrounding area of largely homologous seabed available for colonisation by seabed communities. This is supported by evidence from previous surveys and regional synoptic studies of the southern North Sea demonstrating the homogeneity of the region including:

- Callaway R, Alsvåg J, de Boois I, Cotter J, Ford A, Hinz H, Jennings S, Krönke I, Lancaster J. Piet G. Prince P & Ehrich S, 2002. Diversity and community structure of epibenthic invertebrates and fish in the North Sea. ICES Journal of Marine Science, 59: 1199 to 1214.
- Cranmer GJ, 1985. Recent Investigations into the Distribution of Regular Echinoids in the North Sea. Journal of the Marine Biological Association of the United Kingdom, 65: 351 to 357.
- Dyer MF, Frey WG, Frey PD & Cranmer GJ, 1983. Benthic Regions within the North Sea. Journal of the Marine Biological Association of the United Kingdom, 63: 683 to 693.
- Fugro, 2008. Rig Site Survey UKCS Block 48/25c. Prepared for UTEC SURVEY LTD, August 2008.
- Jennings S, Lancaster J, Woolmer A and Cotter J, 1999. Distribution, diversity and abundance of epibenthic fauna in the North Sea. Journal of the Marine Biological Association of the United Kingdom, 79: 385 to 399.

The environmental baseline and habitat assessment studies carried out at the Blythe and Elgood sites confirm these observations. The survey reports are to be made available on the IOG website for the duration of the public consultation accompanying the Additional Information.

Section 5.1.2 (Potential Effects on Seabed Communities) of the original ES also noted that the development will also provide new substrate, which may result in the establishment of more diverse epifaunal communities. This is supported by multiple references are available to support this statement, for example:

- BERR. 2008. Review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Farm Industry. Technical Report. A report published by the Department for Business Enterprise and Regulatory Reform in associated with DEFRA. January 2008.

- Bunker, F. StP. D. 2004. Biology & Video Surveys of North Hoyle Wind Farm Turbines. 11th – 13th August 2004. A report to CMACS Ltd by MarineSeen, Estuary Cottage, Bentlass, Hundleton, Pembrokeshire, SA71 5RN.
- EMU. 2008. Barrow Offshore Wind Farm Monopile Ecological Survey. Report No 08/J/1/03/1321/0825. A report prepared Emu Limited for Barrow Offshore Wind Ltd
- Lindeboom, H.J., Kouwenhoven, H.J., Bergman, M.J.N., Bouma, S., Brasseur, S., Daan, R., Fijn, R.C., de Haan, D., Dirksen, S., van Hal, R., Hille Ris Lambers, R., ter Hofstede, R., Krijgsveld, K.L., Leopold, M. & Scheidat, M. 2011. Short term ecological effects of an offshore wind farm in the Dutch coastal zone; a compilation. Environmental Research Letters, 6.
- Pidduck, E., Jones, R., Daglish, P., Farley, A., Morley, N., Page, A. and Soubies, H. 2017. Identifying the possible impacts of rock dump from oil and gas decommissioning on Annex I mobile sandbanks. JNCC Report No: 603

Section 5.4 (Physical Presence – Conclusions) of the original ES stated that benthic communities of the types directly under the footprint of the infrastructure on the seabed are common and widespread throughout the Southern North Sea. The Blythe and Elgood environmental baseline surveys confirm this statement. The habitat survey categorised the benthic communities in the development footprint predominantly as Level 4 biotope complex SS.SCS.CCS Circalittoral Coarse Sediment which is a common and widespread biotope in the southern North Sea.

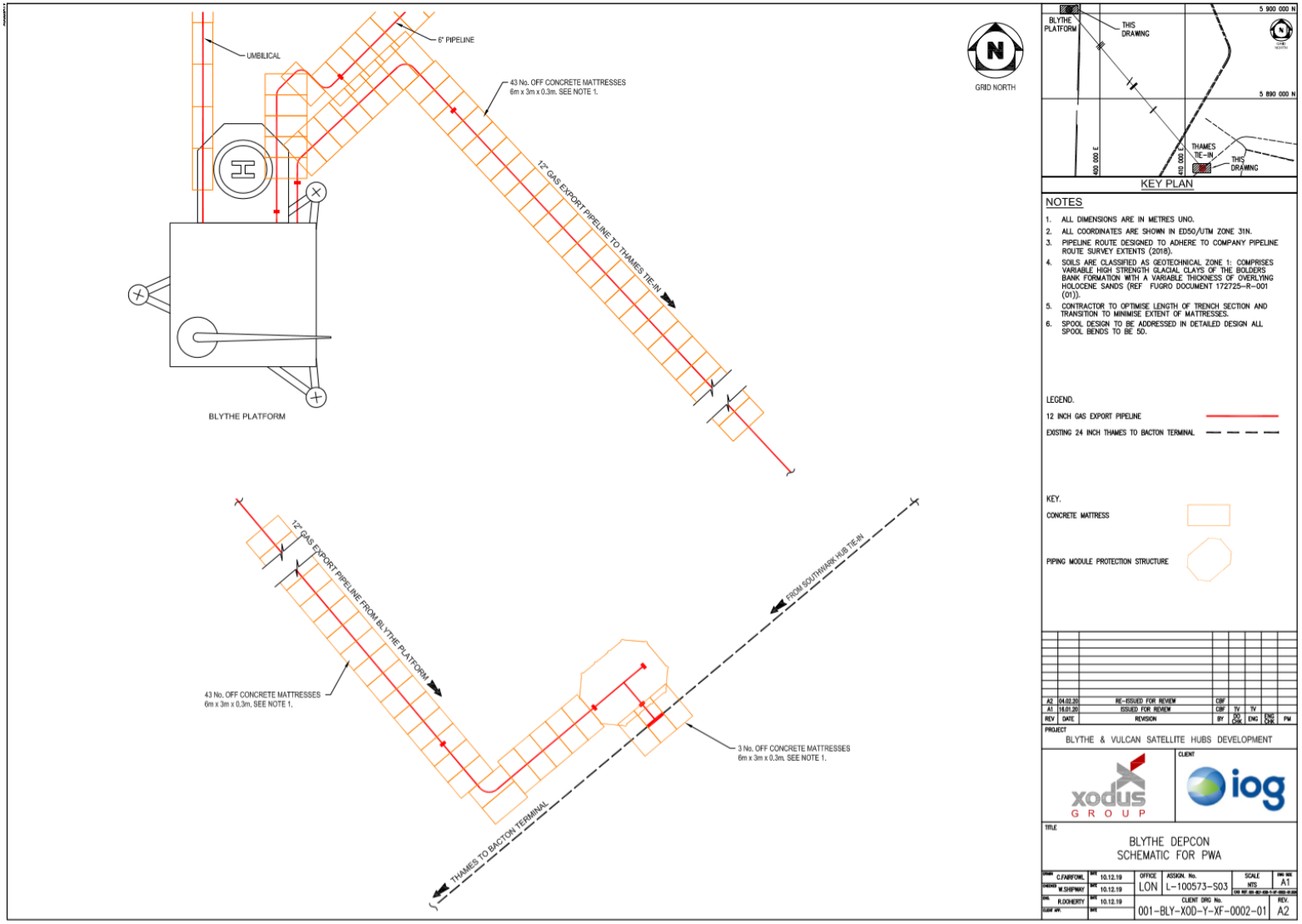
7 Overall Conclusion

The proposed changes to the development will result in a slight increase in atmospheric emissions and a larger physical footprint affecting the seabed, due to the requirement for rock deposition, and the slightly larger footprint of the suction piles of the proposed platform legs. However, these increases are all very small, when considering the wider environmental setting and the potential environmental receptors. The potential impacts of underwater noise will be considerably less, as the use of suction piles removes any requirement for piling operations. Therefore, the generation of underwater noise is no longer considered to be a potential issue of concern.

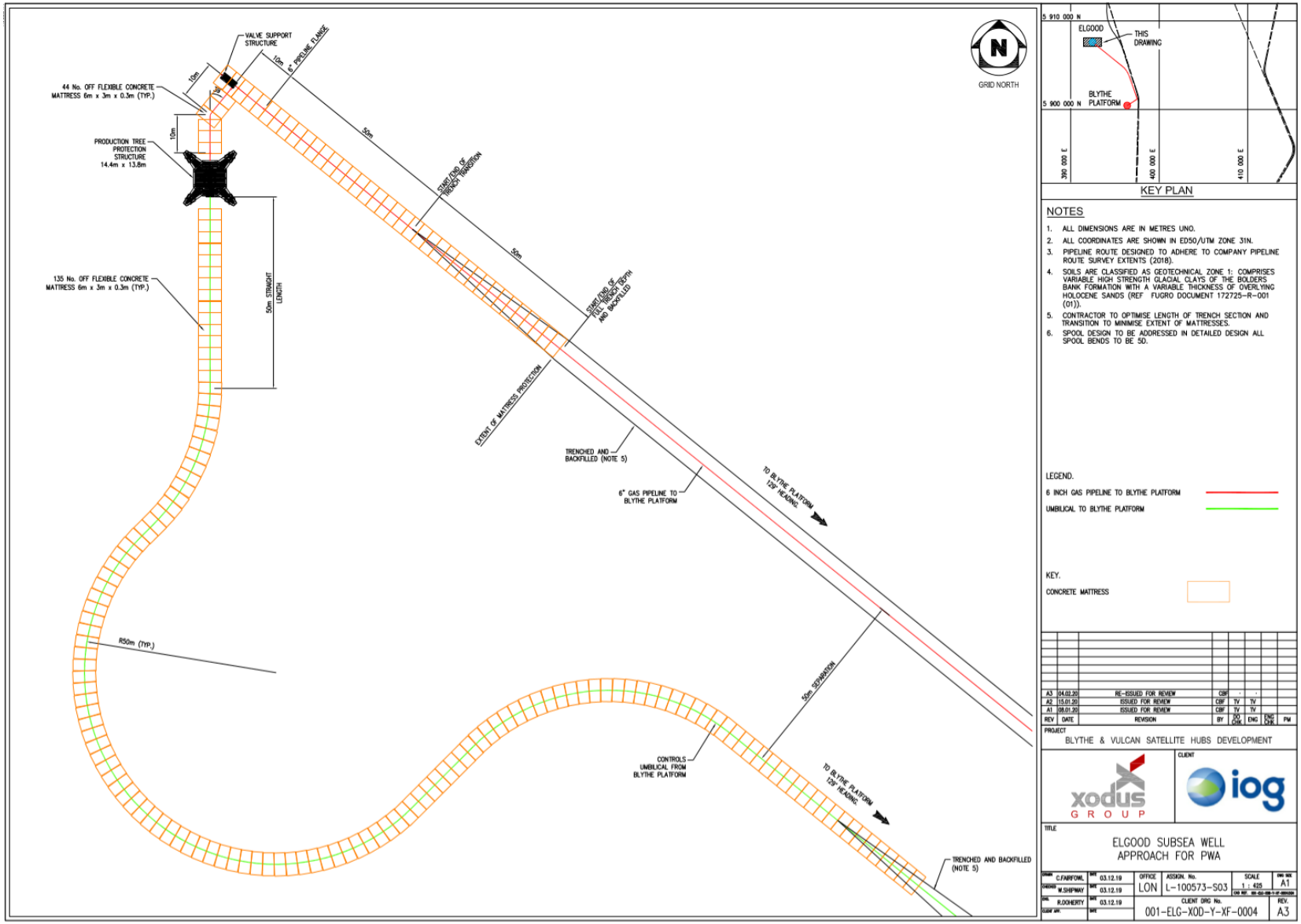
None of these proposed changes will alter the conclusions reached in the original ES. Therefore, it is concluded that the environmental impacts of the proposed Blythe Hub Development will not incur any significant long-lasting environmental effects.

8 Appendices

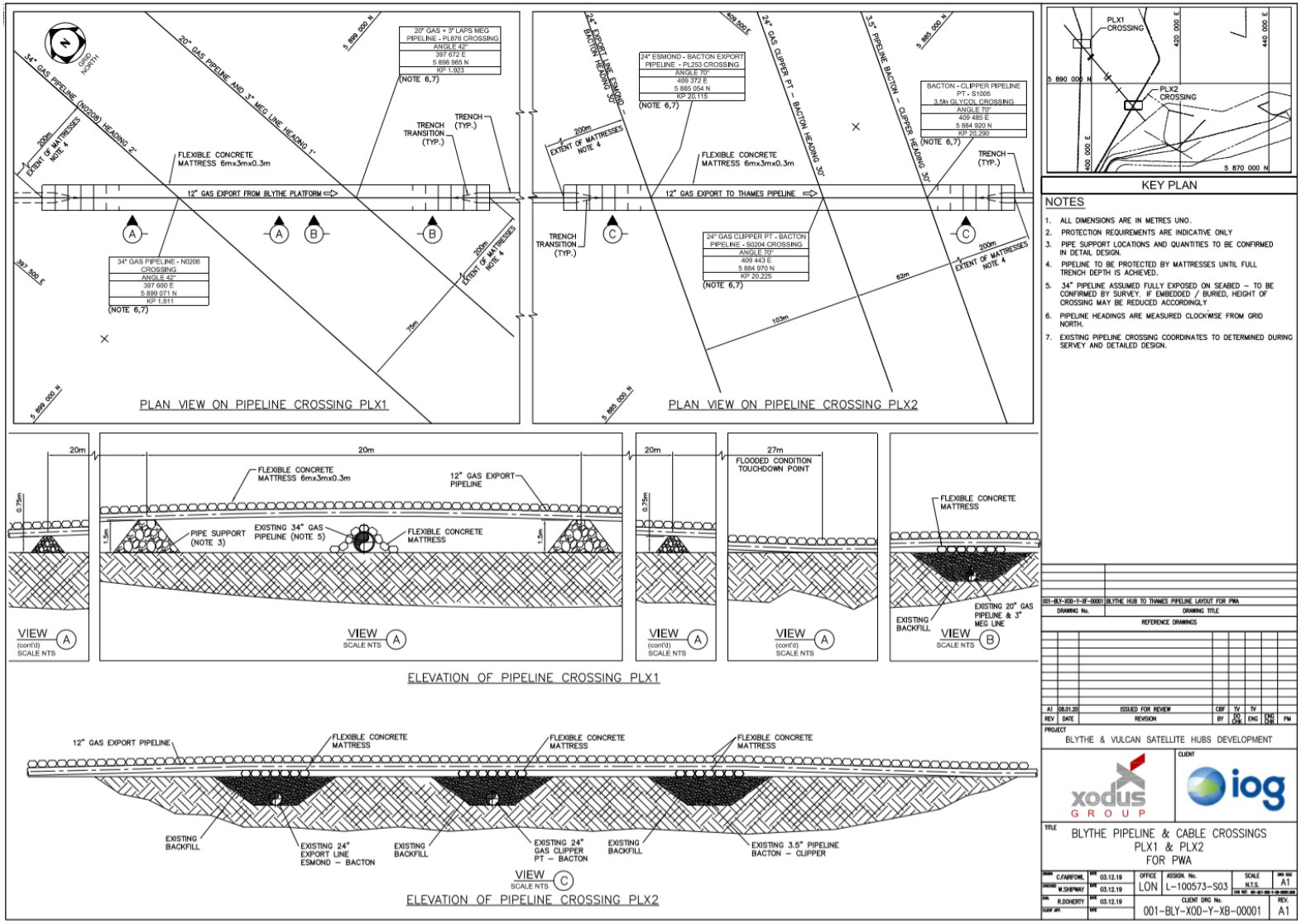
APPENDIX 1 - Plan of Tie-ins for Blythe-to-PL370 at the Blythe platform and at PL370



APPENDIX 2 - Plan of tie-in at Elgood



APPENDIX 3 - Crossing designs for Blythe-to-PL370 at PLX1 and PLX2



APPENDIX 4 - Blythe Hub Development Admiralty Chart