

Isle of Sheppey IP Gas Main Replacement

Summary of Route Options across the River Swale relating to Availability of Easements

January 2021



Executive Summary

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1. Overview

The SGN Intermediate Pressure (IP) gas main supply serving the Isle of Sheppey, going under the River Swale via a service tunnel within the Kingsferry Bridge to Brielle Way City Gate, is considered by SGN to be in poor condition with possible low resilience to failure. This exposes the network to potential gas supply failure. SGN also have a directive to consider, where possible, the removal of assets from third party structures and tunnels.

Following a detailed feasibility study, SGN had approved the development of the necessary studies, easement agreement and detailed design for a new 400mm SDR9 HDPE pipeline under the River Swale by Horizontal Directional Drill (HDD) techniques.

As part of this design development easement agreement negotiations have commenced and in the latter part of the negotiations several parties have become more commercially aggressive in providing SGN easement rights to enable the project to be delivered.

2. Key Issues

Peel Ports (PP) are owner of rights associated with drilling under the River Swale. [REDACTED]

Doobar and Knauf are landowners and main tenant respectively of the Kemsley Park Business Estate [REDACTED]

Following a review of options in April 2020 it was concluded that to maintain progress in the overall project development that an application for a Compulsory Purchase Order (CPO) was necessary. The application for a CPO would give notice to landowner's that SGN have both the time and serious intent to resolve these issues [REDACTED]

[REDACTED]. SGN Land Agent, Dalcour Maclaren (DM), have advised that a strategy to initiate a CPO process should now be considered and progress concurrently with any ongoing negotiation. It has been indicated that a full CPO process could take in the order of 15 to 18 months.

A further review of the original routes combined with a further review of potential routes would be undertaken to ensure all viable options have been considered. In considering further routes SGN could fully demonstrate during any CPO process their diligence in considering all options prior to seeking rights to the preferred route to the south of Kingsferry Bridge.

3. Strategy Review

Given the potential for significant time delays and commercial impacts due to a CPO process for the preferred route, a further visit to site was undertaken to investigate viable alternative options. Two further potential routes were identified, and the routes were walked to determine their viability and comparison to the preferred option taking into consideration the following.

- Environmental Impact
- Engineering Difficulty
- Land Ownership and Access/Egress requirements
- Commercial Viability

Identified Alternative Options

Option A – Summary of Route (Appendix 1)

- Anticipated route Length 2100m, 1300m HDD and 800m open cut which is 3 times longer than other proposed routes
- The area locally is marshland within a SSSI, and a full environmental survey will be necessary
- Dewatering of work area during works (approximately 600m) will be required.
- The need to drill under both Highways England and Network Rail structures where tolerances associated with any ground settlement as a consequence of the works would need to be agreed in advance and further tested as being practical at the construction stage of the works
- Land Interests: - J Plumtree, Queensborough Fisheries Trust, Swale Borough Council, KCC, Highways England (freehold), Unregistered Land, Network Rail, EJM Properties (B Nash)



Option A - Summary of Key Issues

- The route is not perpendicular to the Track and offers further engineering difficulties, its orientation would be challenged by Network Rail.
- The Network Rail asset crossing would require an easement to be agreed. This option requires an Under-Track Crossing [REDACTED]
- The route is within a SSSI site where further surveys and mitigation would be necessary for great crested newts, water voles, nesting birds, flora, and fauna.
- The new gas main will cross Highways England and Network Rail assets and consents for the works would be required and could be refused based on their proximity.
- There are multiple small areas of unregistered land impacted by this route option which also increases the potential viability, risk and costs associated with this option.
- The main landowner, Queensborough Fisheries Trust, are an unknown entity at this stage and there is limited historic information available to indicate the terms that they will be prepared to agree to.

- Complex negotiations with Highways England are anticipated in respect of their freehold ownership on the Isle of Sheppey side of the project to secure both access and further land for pipe stringing.
- From a practical perspective the route and associated working areas are within wet grassland and marshes and access routes would be further complicated due to the distance from the main highway and need for significant haul roads.
- Construction of rafted access/egress routes associated with pipe stringing and monitoring present significant environmental risk and are demanding in both construction and remediation post works.
- Navigation Rights within the River Swale would require further negotiation with Peel Ports.
- Access rights across third party land would be required on the Isle of Sheppey. This will lead to the access arrangements attracting both significant time and costs in relation to any legal rights and compensation.
- Costs would be incurred dewatering the primary work areas (launch reception pits).

Required Additional consents:

Navigation Authority	A River Work Licence will be required from Peel Ports which assesses the practicalities and risk to the navigation channel posed by the works.
Flood Defences	The EA would need to provide technical consent as the drill will pass under the sea flood defences.
Network Rail	Subject to the route not being affected by Bridge foundations, further, consents would be required to cross under the rail lines and depending on access routes utilise a private level crossing for machinery access.
Highways England	Again, subject to the route not being affected by bridge foundations, consent to cross under the structure would be needed.

It is considered that the engineering challenges and the length of the HDD mean that this option is not practically or commercially viable.

Option B – Summary of Route (Appendix 2)

- Anticipated route Length 650m which is 50% less than Option A (Red route).
- A raised grassland area on the mainland however this is located within both the Highways England and Network Rail bridge structures where protracted negotiations and engineering difficulties would need to be investigated and agreed. Any costs incurred during this element could be without benefit if the proposed route could not be agreed/proven.
- On the Isle of Sheppey, the route is within a SSSI site where further surveys and mitigation would be necessary for great crested newts, water voles, nesting birds, flora, and fauna.
- Dewatering of work area during works and the need to drill under the Network Rail track where tolerances associated with any ground settlement as a consequence of the works would need to be agreed in advance and further tested as being practical at the construction stage of the works.
- Land Interests: - KCC, Highways England (freehold), large area of unregistered land, Queensborough Fisheries Trust, KCC, Highways England (freehold), Network Rail, EJM Properties (B Nash).



Option B – Summary of Key Issues

- There is insufficient space to allow a full pipe stringing operation in advance of installation. This would mean the main would have to be installed in sections as opposed to being installed in full. Because of this the main will not have been pressure tested which is in contravention of industry standards.
- The final drill shot under the railway line is only 90m long. A 200m bend radii is the maximum that could be employed based on pipe type, considering Network Rail would request the drill to be a minimum of 12m below their asset and therefore the minimum drill distance would be 135m. This means the pipe would not be in the required location local to the tie in point and would be exiting the ground vertically.
- Network Rail asset crossing would also require an easement to be agreed. As with Option A this would require an Under-Track Crossing [REDACTED]
- Should Network Rail ultimately agree to an Under-track Crossing, it is considered that the risks associated with unknown ground strata below the railway track which could be encountered during the directional drill are high. This risk could not be mitigated during any advance investigation works.
- The site is relatively constrained in respect of working area on the mainland side. When considering the size and depth of any launch/reception pit, there would likely need to be interaction with Highways England and Network Rail to secure consent to work in very close proximity to their operational assets.
- It is anticipated complex negotiations will be necessary with Highways England in respect of their freehold ownership for land at both the launch and reception areas. Again, further land would need to be secured to enable pipe stringing.
- The Queensborough Fisheries Trust are an unknown entity at this stage and there is limited historic information available to indicate the terms that they will insist upon.
- There are areas of unregistered land impacted by this option which also increases risk and costs associated with referencing.
- The access route on the Isle of Sheppey is complex and would require improvements in respect of the surface and security arrangements.
- Navigation Rights within the River Swale would require further negotiation with Peel Ports.

Additional consents:

Navigation Authority	A River Work Licence will be required from Peel Ports which assesses the practicalities and risk to the navigation channel posed by the works.
Flood Defences	The EA will need to provide technical consent as the drill will pass under the sea flood defences.
Network Rail	Consent will be required to cross under the rail lines
Highways England	Consent to work in close proximity to the Sheppey Bridge on the mainland side.

Summary of the original feasibility study

Two options were considered to pre-emptively replace the 12” steel IP main that is running within the structure of the Kingsferry bridge with a new supply via horizontal directional drilling (HDD) techniques.

- Option 1 - Crossing the River Medway from the Isle of Grain to the Isle of Sheppey
- Option 2 - Crossing the River Swale from Kent to the Isle of Sheppey

The approach taken has been to liaise with the SGN Asset Team to collate available information on the existing IP gas main route and condition. Informed by the original feasibility study and a series of site visits, both routes were assessed by specialist contractors and Land Agents to review if it was technically viable to replace the IP gas main by employing HDD.

Option 1 - Isle of Grain to the Isle of Sheppey (Appendix 3)

A connection from the gas network on the Isle of Grain to the Isle of Sheppey was considered by SGN as detailed below.

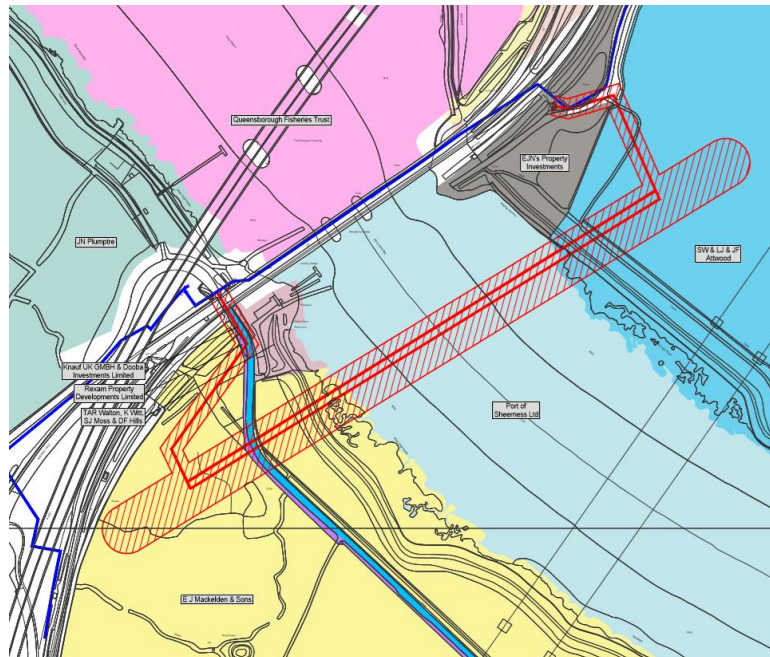


This option was discounted for the following key reasons:

- The crossing would be at least 2.5 to 3 km and a challenge, given that it is at the limits of HDD techniques (typically 1.5 km).
- Ground conditions are unknown and would require an extensive detailed site investigation
- The viable crossing intersects a busy shipping lane is very likely to be rejected by interested parties.
- The drill and reception sites for the HDD were likely to be within commercial development land and interface with significant existing infrastructure.
- If this option were undertaken, the existing gas main from Kent within the Kingsferry Bridge and under the River Swale would still need to be replaced.
- The route would incur negotiations with Network Rail to agree any crossing under the railway track local to the National Grid LNG terminal entry. [REDACTED]
- There are both High Pressure gas pipelines and Aviation fuels which would need to be navigated as part of the works. The latter being a strategic feed to Heathrow Airport.
- There strategic relevance of the Isle of Grain would necessitate 24hr access to key fuel suppliers located in the area, all of these access points would need to be crossed.
- The route is in land owned by National Grid and would need approval. On being contacted to negotiate access in advance of the works to survey the proposed route National Grid categorically denied SGN access and advised that any consents made to agree a route would be rejected.
- Consultation would be necessary with the Environment Agency with respect to breaching existing flood defences, in particular at the shoreline on the Isle of Grain.
- The proposed route would affect the A249 in Sheerness which has recently been resurfaced. A 3-year embargo is imposed on resurface works to carriageways by the Local Authority.
- In trying to avoid damage to the A249, an alternative route has been identified, however this route is heavily habited by Japanese Knotweed.

Option 2 - Sittingbourne to the Isle of Sheppey

The scope of the works is to install a new 400mm SDR9 HDPE pipeline under the River Swale by HDD techniques. This HDD main needs to be installed at a depth of 17m with the drilling shot being circa 370m in length. As detailed below, the sites will need to extend in both directions to accommodate pipeline stringing and accommodation works. Upon completion, the main within Kingsferry Bridge will be decommissioned as required by the terms of the Network Rail easement agreement.



It was therefore considered that this solution presented the most commercially viable option whilst employing minimal engineering complexity in maintaining future gas supplies to the Isle of Sheppey.

Summary of Key Progress to date

This route and impacted parties have been well progressed, and the likely complexities are understood. The proposal would utilise open cut trench works under an existing Network Rail bridge where a trench would be excavated under the existing SEJ2/743 structure. Network Rail acknowledge that the open cut proposal is distinctly preferable from their perspective rather than the constructing of a new Under Track Crossing. Trial holes will be necessary at this location to fully determine this option as the most viable and preferred route. Progress to date can be summarised as follows:

- Progression from outline to detailed design.
- An outline route from the initial phase has been developed to Cowstead Corner.
- A geotechnical survey and the utilisation of existing borehole to support HDD drilling completed.
- Q10 reports have been prepared and determined that the local pipe integrity is suitable for tie in points for Phase 1.
- Design for phase one of the works (the crossing of the River Swale at Kingsferry Bridge) has been completed by SGN designer, GPH Systems (GPH), and is currently being reviewed internally ahead of the PS6 review.

- Advanced communications with the local authorities and studies for Natural England are well advanced by DM in agreeing procedures and mitigation to enable the scheme to progress to the construction phase.
- Completion of the following surveys and associated reports,
 - Environmental Impact Assessment (EIA) Screening Opinion Request (SOR) applications scheduled for submission
 - Great crested newt survey, bat surveys (abutments), reptile surveys, breeding bird surveys, vegetation and botany surveys, wintering bird surveys
 - Habitat Regulation Assessment (HRA), archaeological surveys.
- Agreements in principle have been reached with the agent of the agricultural landowner's affected by the route.

Required Additional consents:

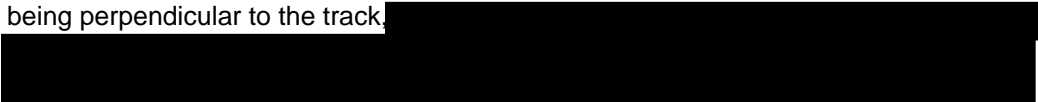
Navigation Authority	A River Work Licence will be required from PP which assesses the practicalities and risk to the navigation channel posed by the works.
Flood Defences	The EA will need to provide technical consent as the drill will pass under the sea flood defences.
Network Rail	Consent will be required to cross under the NR bridge structure with an open cut trench. Trial holes will be necessary in advance of construction to finalise the Design. A permit will be needed from the local authority and consents to excavate in the private road.
Network Rail	Removal of SGN assets. -This work will be included within the tender for the main works. A separate site visit is to be scheduled in January/February 2021 to enable a scope of work to be defined and budget costs and timescales established.

4. Overall Summary of Alternative Route Options

Alternative Route Options

All three route options recently investigated introduce several significant risks, some of which could not be fully removed in advance of any construction work. Notwithstanding these options.

- Many of the risks identified present operational difficulties , which in time may be overcome, but any impact to existing third party assets cannot be removed and the asset owners (in particular Network Rail) could refuse consent for the alternative options particularly given the original preferred route avoids these interfaces.
 - Further negotiation would be necessary with Highways England and Network Rail to gain consents for working near bridge structures. Their approval would be further complicated when dealing with 2 separate authorities with differing engineering needs associated with their assets.
 - Network Rail approvals, licensing and engineering constraints associated with Under Track Crossing (UTX). These would be difficult to obtain based on the routes not being perpendicular to the track,



- Should a UTX permit be secured, no advance ground survey work could be achieved under the railway lines. If an obstruction were encountered in this area whilst undertaking the HDD there would be no alternative other than to abandon the route and re-drill at a different profile. This would be both time consuming and costly.
 - Temporary works would need to be developed to comply with the demands of both asset holders for launch/reception pits near to the bridge structures should consent for the works be agreed.
 - Industry Standards with respect to pipe testing in advance of the works would have to be ignored.
 - Further negotiations would be necessary to agree access rights and land to enable pipe stringing.
 - Dewatering of marshland is necessary local to both alternative routes, the practicalities of which can be overcome during installation but would generate further environmental risks and engineering challenges both during construction and for future maintenance work.
 - By default, the risks associated with any directional drill increase in tandem with the length of the route. With operating pressures having to rise to continue progression of the drill head the risk of a drill fluid breakout occurring become more considerable, with the route being in SSSI RAMSAR areas drill lengths need to be kept to a minimum to manage the risk.
 - Multiple agreements for access would be necessary within marshland for both construction and future maintenance works as required.
 - Lengthy negotiation would be necessary with Crown Estates.
 - National Grid are reluctant to enter dialogue with respect to any route impacting their land.
 - There is an increased Environmental risk where the route enters Ramsar etc. by virtue of the routes being longer
 - The welding and testing of pipe prior to installation would contravene industry standards by means of the main being installed without the necessary pressure test regime.
 - By virtue of options being longer in length when the drilling technique is longer, the risks associated would be higher.
 - Any compensation to landowners would increase again based on the routes being longer.
- The alternative routes would enter an area of SSSI and marshland where further investigation would be necessary and the consent of Natural England. This would be required prior to engaging with both Network Rail and Highways England.
 - Permissions and consent for further boreholes and ground surveys would be necessary to ascertain the technical viability of the alternative routes and to determine the extent of any environmental impact and the temporary works necessary to ensure risks are mitigated but still provide viable access and egress to the site and route.
 - Full new environmental, land, archeological and ecological surveys will be required, and extended areas would need to be managed during the entire project life in relation to fauna, flora, and wildlife.
 - In pursuing an alternative route, negotiations would be necessary with newly identified landowners and whatever route is agreed on land, it will always need to cross the River Swale to which Peel Ports have further rights to consent focusing on navigational routes.
 - Further investigation and an updated design as neither of the alternative routes would fully benefit from data/information gained to date.
 - Increase in material costs, both alternative routes are longer in length where costs in materials and rates for installation could double.

Summary

As part of the review, key advisors were employed by SGN to give further insight to the operational difficulties identified within each option. LMR Drilling and Dalcour Maclaren were requested to score each individual project on merit to further substantiate the most preferable option. The findings can be found in **Appendix 4** and are clearly demonstrative that the preferred option is to pursue the proposal south of Kingsferry Bridge, namely Option 2.

The project was confirmed as a named approved project by Ofgem in the SGN GD2 determination for construction within period of 2021 to 2026.

Further internal reviews with SGN Legal department were undertaken during October / November 2020 culminating in a formal letter being issued to PP on 26/11/20 confirming SGN's intent to progress a CPO should a reasonable commercial agreement not be secured.

PP have responded to SGN on 30/11/20 suggesting development of discussions to date are at odds with SGN's understanding but requested further information and a willingness to engage in further discussion to reach a commercial agreement [REDACTED]

[REDACTED]

[REDACTED]

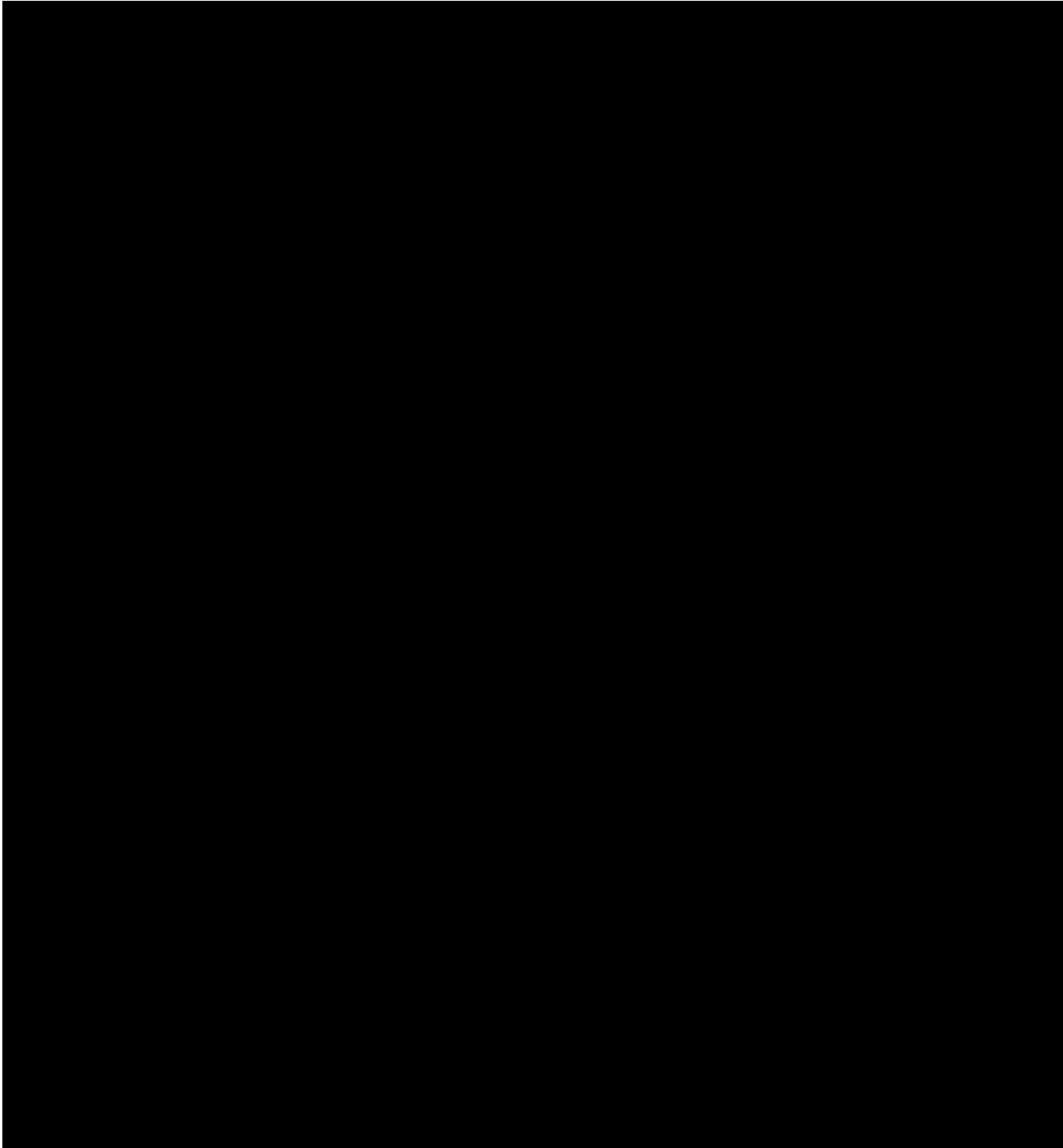
[REDACTED]

Further, consideration is also needed in relation to the development of the design, further ground investigations and the timescales this would attract for optional schemes, each alternative route would impact the Ramsar etc area, having already undertaken this work for the preferred schemes a further 18 months would be necessary for this to be completed and all seasons monitored.

It remains that the originally identified route, to the South of Kingsferry Bridge is the most practical to construct, has the least impact to the surrounding area in relation to Environmental impact and is the cost-effective option.

The team are currently progressing the next steps in tandem with the CPO process. This will include.

- Trial Holes – indicative locations have been identified. It is anticipated these works will be undertaken early in 2021.
- Redundant Asset removal from bridge structure – definition of scope of works.
- Complete Design appraisals.
- Preparation of a hand over pack for procurement and overall project programme update to reflect the CPO process



6. Appendices

Appendix 1	Option A - Kingsferry Bridge - Plumtree route Report	
	Appendices Option A	Appendix A - SGN 010919-010 Pipeline Route B
		Appendix B - Kingsferry Bridge Route B
		Appendix C - 20200916_RPT_Kingsferry_OPTION A (Land Interest)
		Appendix D - Kingsferry alternative routes Route A (Ecology - Planning)
Appendix 2	Option B Kingsferry Bridge - Between Bridges Report	
	Appendices Option B	Appendix A - SGN 010919-010 Pipeline Route C
		Appendix B - Kingsferry Bridge Route C
		Appendix C - 20200916_RPT_Kingsferry_OPTION B (Land Interest)
		Appendix D - Kingsferry routes Route B (Ecology - Planning)
Appendix 3	Option 1 Kingsferry Bridge - Isle of Grain to Isle of Sheppey route Report	
	Appendices Option 1	Appendix A - SGN 010919-010 Pipeline Route A
		Appendix B - Kingsferry Bridge Route A
		Appendix C - 20200916_RPT_Kingsferry_OPTION 1 (Land Interest)
Appendix 4	Sheppey Drill HDD Complications - Matrix 01-10-20	

05/01/2021

Isle of Sheppey IP Gas Main Replacement


Route Feasibility and Condition Survey

Isle of Grain to Isle of Sheppey

August 2020



Executive Summary

1. Overview
2. Summary
3. Route
4. Observations
- 
6. Summary of major risks identified
7. Recommendation
8. Appendices

1. Overview

The SGN Intermediate Pressure (IP) gas main supply serving the Isle of Sheppey, going under the River Swale via a service tunnel within the Kingsferry Bridge to Brielle Way City Gate, is considered by SGN to be in poor condition with possible low resilience to failure. This exposes the network to potential gas supply failure. SGN also have a directive to consider, where possible, the removal of assets from third party structures and tunnels.

The SGN objective is to ascertain if it is viable to replace the existing IP gas main thereby improving the network resilience and surety of gas supply to customers. SGN require the collation of information working closely with specialist contractors and SGN Land Agents to collate information to inform a technical feasibility study for the IP gas main replacement.

The IP gas main is in poor condition along its route as it is subject to gas leaks even though it is operating below its maximum gas pressure of 7 bar.

There is evidence of corrosion of the IP gas main and the steel support gantry in the service tunnel under the Kingsferry Bridge

It is considered by SGN to be at the end of its operational life having been installed around the 1950s. SGN also have concerns that the condition of the IP gas main could possibly cause further gas leaks that could possibly be a health and safety risk to SGN operatives responding to a fault.

SGN consider that there might be negative impact on the SGN corporate reputation due to possible gas leaks and gas supply failure to customers

The SGN corporate directive to remove assets from third party structures could be achieved as the existing IP gas main crossing the Kingsferry Bridge would become redundant and removed with the agreement of Network Rail at a time suitable to all parties and subject to the new assets being connected to the network and its operational reliability being restored.

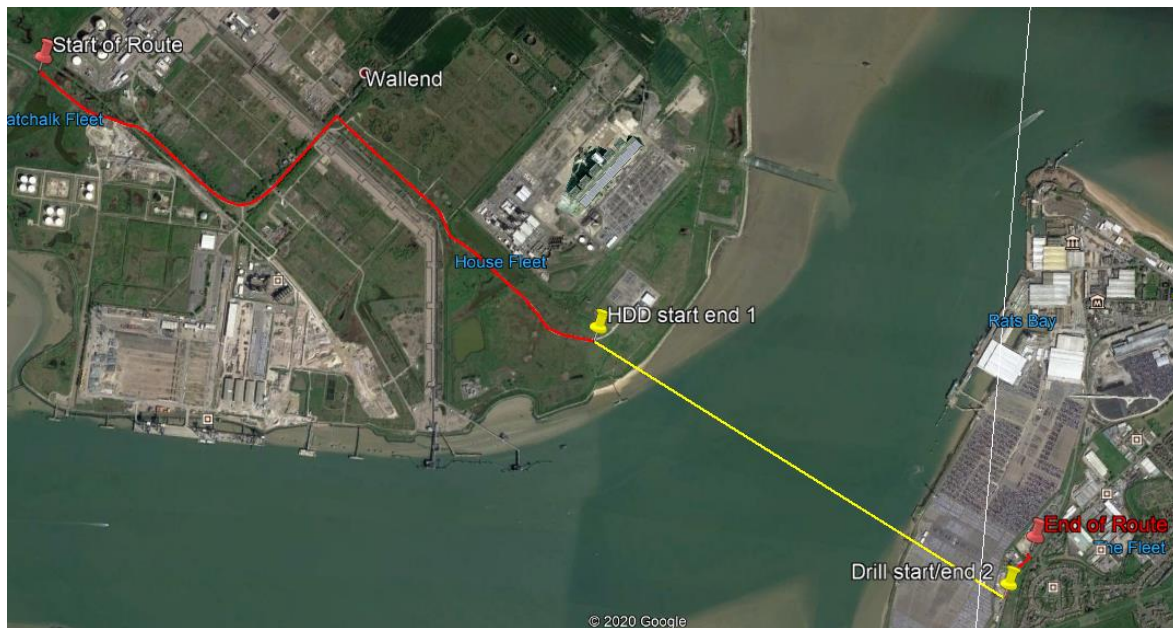
Following a desktop review to identify the most suitable routes to replace the deteriorating asset, three options have been chosen which offer Feasible options in laying a new 400-millimetre SDR 9 HDPE pipeline to the Isle of Sheppey.

2. Summary

This report is associated with the route from the Isle of Grain to the Isle of Sheppey, the obstacles and engineering difficulties associated with the construction on this route and includes a condition survey of the surrounding area and assets along the proposed route.

3. Route

Starting to the West of the main entry to the National Grid LNG facility the primary route for the laying of the new 400mm main would be by open cut within the constraints of the carriageways A228 and B2001 Grain Road, prior to entering National Grid land following the private road giving access to the Viking Power terminal'. At this location there would be for a launch reception pit to enable the directional drilling of the main under the River Medway into land currently occupied as a VW storage facility (owned by Peel Ports). A route drawing can be found in **Appendix A** of this report.



A further launch reception pit would be excavated to receive the pipe in a private lane between Rhino Asphalt Solutions and P&M Scaffolding on the A249 Sheerness. On receiving the pipe, the technique would again change from directional drill to open cut along the A249 terminating at the SGN gas holder site where the main would be reconnected to the existing network.

It is recognised that the A249 has recently being resurfaced and may be the subject of a section 58. As an alternative the directional drill could be extended to scrubland to the east of the A249 with a further directional drill north into the SGN holding site.

A full and comprehensive survey and narrative can be found in Appendix B detailing observations made during a walk of the entire route, along with planning, environmental, archaeology and ecology requirements identified. These are summarised in sections 4 and 6 below.

4. Observations

The entire route employing both open cut and HDD techniques would be more than 6km.

With an initial connection to the existing gas main needed local to the National Grid LNG site entrance, access and egress to the site would need to be maintained, if a 50m distance away from the site entry were to be enforced, the new route would cross a Network Rail line. For this work to proceed the Network Rail asset crossing would require an easement to be agreed. This option requires an Under-Track Crossing (UTX), this will be difficult to secure particularly given Network Rail are aware of other viable route options with less technical risks which would not affect their asset.





Access to the National Gris LNG site would have to be maintained 24hrs a day



05/01/2021

There are High Pressure gas pipelines local to the works where consents would be necessary.



There is an aviation fuel line feeding Heathrow Airport local to the route where consents would be necessary to enable works to progress at an early stage



05/01/2021

There is evidence of a new HV circuit within the constraints of the proposed route -carriageway



05/01/2021

There is evidence of both water and British Telecom within the constraints of the route – Carriageway and Footpath



05/01/2021

Access to Key Service Providers will need to be maintained 24hrs per day. (Power Station).



National Grid were not receptive in allowing access to their land to fully view the route, subsequent permissions to gain an easement and route would prove both complex and time consuming.



The HDD (directional drill) would be at least 2.5 to 3 km and a challenge, given that it is at the limits of HDD techniques (typically 1.5 km). The viable crossing intersects a busy shipping lane and is very likely to be rejected by interested parties or require significant scrutiny.



A drill of 2,300m introduces significantly greater risk than a drill of 500 metres. While the means by which a crossing of this length would be achieved depends to a great extent on the ground conditions, it is certainly possible that these would dictate the need for a drilling rig at both sides of the crossing and an intercept drill to be performed whereby drills are started from either end of the crossing and these are brought together below ground to form a single, 2,300m long bore. While this has been done many times (including, for example, the Solent Gas Transits), there is an increase in risk associated with the need for an intercept and the need for 2 no. drill spreads adds a significant level of cost to executing such a drill.

As a further measure and to mitigate unforeseen ground conditions (and the consequences thereof) as well as the increased technical challenges associated with a drill of such length. One other impact would be on the choice of pipe material. The tensile strength of a PE pipe is limited while the force required to install a PE pipe increases with length. For a crossing of this length either a steel pipe would need to be used or the SDR rating of the pipe would need to be increased. Competent drilling companies interviewed for the works have advised it would be necessary to increase the pipe wall thickness to provide greater tensile strength. In increasing the pipe wall thickness an increase in the diameter of the pipe to maintain the necessary bore would also be necessary.

05/01/2021

Peel Ports (PP) are owner of rights associated with drilling under the Medway and land on the Isle of Sheppey to which the route would travel through.



The route would involve clearance from the Environment Agency with respect to it travelling under flood alleviation gates protecting the Isle of Sheppey.



05/01/2021

The A249 local to the chosen route has recently been resurfacing meaning a Section 58 would be enforced by the Local Authority, a requisite of this is that if ground is broken in this area, the whole of the carriageway would have to be resurfaced and guaranteed for a further 3 year period.



The alternative route which would be employed local to the old disused Cromwell Rd to avoid works in the A249 would encroach an area where Japanese knotweed is present. The mitigation required to address this would extend to significant excavation and disposal within a limited number of Licenced disposal sites with restricted annual intake.



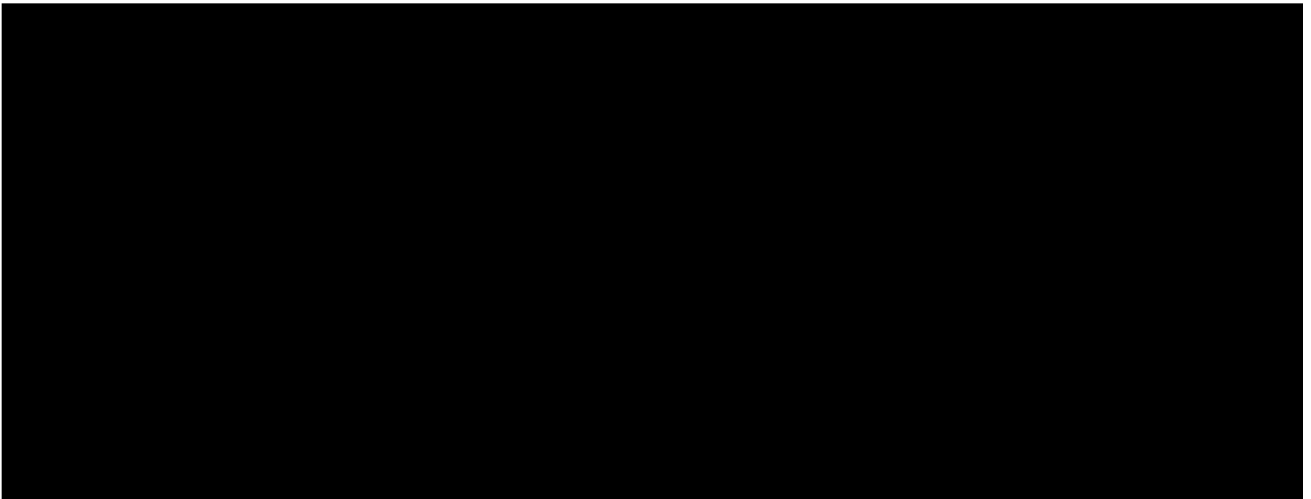
The drill and reception sites for the HDD were likely to be within commercial development land and interface with significant existing infrastructure.



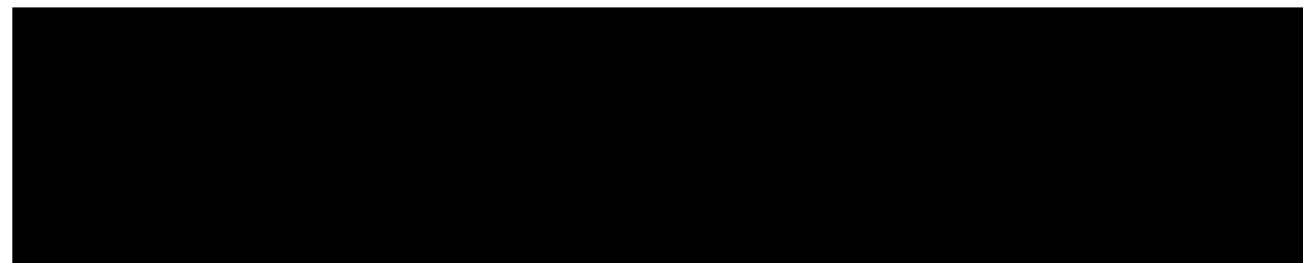
If this option were undertaken, the existing gas main from Kent within the Kingsferry Bridge and under the River Swale would still need to be removed once abandoned resulting in major excavation works at a secondary work site local to Kingsferry Bridge.


Required Additional consents:

CLH Pipelines	Aviation lines remain of strategic importance, consents to work near these assets would be necessary and have previously proven difficult to attain.
NTS – HP Gas lines	Consents, and a safe working distance/watching brief would be necessary.
Navigation Authority	A River Work Licence will be required from Peel Ports which assesses the practicalities and risk to the navigation channel posed by the works.
Flood Defences	The EA would need to provide technical consent as the drill will pass under the sea flood defences.
Network Rail	Consents would be required to cross under the rail lines and depending on access routes utilise a private level crossing for machinery access.
National Grid	Access, consents and approvals would be necessary associated with the route from the B2001 carriageway to the shoreline on the Isle of Grain.



6. Summary of Major Risks Identified



Consents would be necessary with Crown Estates. 

The route would incur negotiations with Network Rail to agree any crossing under the railway track local to the National Grid LNG terminal entry. 

There are both High Pressure gas pipelines and Aviation fuels which would need to be navigated as part of the works. The latter being a strategic feed to Heathrow Airport.

There strategic relevance of the Isle of Grain would necessitate 24hr access to key fuel suppliers located in the area, all of these access points would need to be crossed.

The route is in land owned by National Grid and would need approval. On being contacted to negotiate access in advance of the works to survey the proposed route National Grid categorically denied SGN access and advised the any consents made to agree a route would be rejected.

The proposed drill under the River Medway is at the extremities of normal drilling capabilities and would necessitate the need for 2 x HDD rigs as opposed to 1 rig being considered on alternative routes.

Consultation would be necessary with the Environment Agency with respect to breaching existing flood defences, in particular at the shoreline on the Isle of Grain.

The proposed route would affect the A249 in Sheerness which has recently been resurfaced. A 2-year embargo is imposed on resurface works to carriageways by the Local Authority.

In trying to avoid damage to the A249, an alternative route has been identified, however this route is heavily habited by Japanese Knotweed.

05/01/2021



Indicative costs identified to date which would be in addition to the existing budget secured would be [REDACTED]. It is considered that this indicative cost would increase should the feasibility move from a desk top study to full site investigation.

7. Recommendation

It is considered that the engineering challenges and the length of the HDD mean that this option is not practically or commercially viable. In reaching a conclusion in considering the risks above it remains that the originally identified route, to the South of Kingsferry Bridge is the most practical and cost-effective option.

8. Appendices

Appendix A	SGN 010919-010 Pipeline Route A
Appendix B	Appendix B - Kingsferry Bridge Route A Site Condition Pictures
Appendix C	20200916_RPT_Kingsferry_OPTION 1 (Land Interest)

05/01/2021

Isle of Sheppey IP Gas Main Replacement


Route Feasibility and Condition Survey

Mainland to Sheppey via Plumtree

August 2020



Executive Summary

1. Overview
2. Summary
3. Route
4. Observations
- 
6. Summary of major risks identified
7. Recommendation

1. Overview

The SGN Intermediate Pressure (IP) gas main supply serving the Isle of Sheppey, going under the River Swale via a service tunnel within the Kingsferry Bridge to Brielle Way City Gate, is considered by SGN to be in poor condition with possible low resilience to failure. This exposes the network to potential gas supply failure. SGN also have a directive to consider, where possible, the removal of assets from third party structures and tunnels.

The SGN objective is to ascertain if it is viable to replace the existing IP gas main thereby improving the network resilience and surety of gas supply to customers. SGN require the collation of information working closely with specialist contractors and SGN Land Agents to collate information to inform a technical feasibility study for the IP gas main replacement.

The IP gas main is in poor condition along its route as it is subject to gas leaks even though it is operating below its maximum gas pressure of 7 bar.

There is evidence of corrosion of the IP gas main and the steel support gantry in the service tunnel under the Kingsferry Bridge

It is considered by SGN to be at the end of its operational life having been installed around the 1950s. SGN also have concerns that the condition of the IP gas main could possibly cause further gas leaks that could possibly be a health and safety risk to SGN operatives responding to a fault.

SGN consider that there might be negative impact on the SGN corporate reputation due to possible gas leaks and gas supply failure to customers

The SGN corporate directive to remove assets from third party structures could be achieved as the existing IP gas main crossing the Kingsferry Bridge would become redundant and removed with the agreement of Network Rail at a time suitable to all parties and subject to the new assets being connected to the network and its operational reliability being restored.

Following a desktop review to identify the most suitable routes to replace the deteriorating asset, three options have been chosen which offer Feasible options in laying a new 400-millimetre SDR 9 HDPE pipeline to the Isle of Sheppey.

2. Summary

This report is associated with the route from the main land to Sheppey to the West of the A249 Sheppey Crossing, the obstacles and engineering difficulties associated with the construction on this route and includes a condition survey of the surrounding area and assets along the proposed route.

3. Route

Starting in scrub at a low level between Sheppey Way and the A249 Sheppey Crossing the main would be laid by open cut along the entry road to the boating club West towards the junction of Old Ferry Road before traversing within the constraints of the carriageway for approximately 300mm. At this point the trench would enter land owned by JN Plumtree, the route (continuing in open cut) would extend a further 400m before switching techniques to directional drill (HDD). A route drawing can be found in **Appendix A** of the report



Initial works would consist of approximately 800m of trench to be excavated by open cut technique in the carriageway. The directional drill would be approximately 1200m below the River Swale to the Isle of Sheppey into land under the ownership of Queensborough Fisheries before heading South Easterly a further 400m under the A249 Sheppey Crossing, Sheppey Way and also the Network Rail track to Old City Gate in land controlled by Mr B Nash.

A full and comprehensive survey and narrative can be found in **Appendix B** detailing observations made during a walk of the entire route, along with planning, environmental, archaeology and ecology requirements identified. These are summarised in sections 4 and 6 below.

4. Observations

The entire route employing both open cut and HDD techniques would be more than 2.1km.

The new gas main will cross Highways England and Network Rail assets and consents for the works would be required and could be refused based on their proximity.



The route would impact on traffic accessing the boating club and a private road serving the industrial estate. This is the only access route in the control of Ridham Docks and any interference with their tenant's operations could result to significant compensation in relation to business losses being payable.



Existing Utilities are local to work, a cluster of valves are indicative of an existing strategic crossing under the swale associated with potable water supplies to the Isle of Sheppey. There is a Deed of Grant between Kent County Council and Southern Water Authority dated 15th of June 1997. This provides full right and liberty to lay, maintain and repair a 600-millimetre diameter water main with all necessary valves and fittings. The proposed route of the new IP would be in close proximity to this Asset and would require further negotiation to determine the viability of the route.



05/01/2021

The existing carriageway shows evidence of deterioration, an existing record of its status would need to be agreed with the Local Authority in advance of the works.



Fly tipping is endemic on the route, Security may be necessary based on illegal activities. SGN would be liable to remedy any fly tipping within a working area within private land whilst in control of the site.



05/01/2021

There are multiple small areas of unregistered land impacted by this route option which also increases the potential viability, risk and costs associated with this option.



The route is within a SSSI site where further surveys and mitigation would be necessary for great crested newts, water voles, nesting birds, flora, and fauna.



05/01/2021

From a practical perspective the route and associated working areas are within wet grassland and marshes and access routes would be further complicated due to the distance from the main highway and need for significant haul roads. There is a high risk for significant soil structure damage and the need for extensive reinstatement works to be undertaken.



Construction of rafted access/egress routes associated with pipe stringing and monitoring present significant environmental risk and are demanding in both construction and remediation post works. Similarly, during the drilling stage, the high volume of drainage ditches (which presented considerable risk of drill fluid breakout while pilot drilling). Consultation would be necessary with the drainage board in the first instance. The environmental impact would be of a high risk when considering any contingency plans should a breakout occur due to inaccessibility of the land for excavators to position pumps etc. to manage such a breakout scenario. Should ground conditions lead to significant damage to the designated sites an extensive remediation plan and ongoing management plan would have to be agreed between landowners and Natural England. This would lead to significant costs being incurred for a number of years post works.



05/01/2021

Costs would be incurred dewatering the primary work areas (launch reception pits).



There is evidence of water voles local to the proposed work area.



05/01/2021

Navigation Rights within the River Swale would require further negotiation with Peel Ports.



05/01/2021

Access rights across third party land would be required on the Isle of Sheppey to both undertake the works and further to enable the welding and stringing of pipes. This will lead to the access arrangements attracting both significant time and costs in relation to any legal rights and compensation.



The main landowner, Queensborough Fisheries Trust, are an unknown entity at this stage and there is limited historic information available to indicate the terms that they will be prepared to agree to.



05/01/2021

There is Evidence of a HV electricity cables with interchangeable routes underground and mounted on poles.



Complex negotiations with Highways England are anticipated in respect of their freehold ownership on the Isle of Sheppey side of the project to secure both access and further land for pipe stringing.



05/01/2021

The Network Rail asset crossing would require an easement to be agreed. In finding stable dry ground to facilitate the HDD under the railway line the drill alignment under the track would be 40° from perpendicular as illustrated below.



Network Rail are highly resistant to any crossing below their lines at anything greater than 10° from perpendicular leading to the proposal being rejected given Network Rail being aware of other viable route options with less technical risks.

Timescales associated with the delivery of the entire Project would be considerable leading to long term disruptions to routes used by local business and the public in general

Required Additional consents:

Navigation Authority	A River Work Licence will be required from Peel Ports which assesses the practicalities and risk to the navigation channel posed by the works.
Flood Defences	The EA would need to provide technical consent as the drill will pass under the sea flood defences.
Network Rail	Subject to the route not being affected by Bridge foundations, further, consents would be required to cross under the rail lines and depending on access routes utilise a private level crossing for machinery access.
Highways England	Subject to the route not being affected by bridge foundations, consent to cross under the structure would be needed.

6. Summary of Major risks Identified

The new gas main will cross Highways England and Network Rail assets and consents for the works would be required and could be refused based on their proximity to foundations.

There is a Deed of Grant between Kent County Council and Southern Water Authority dated 15th of June 1997. This provides full right and liberty to lay, maintain and repair a 600-millimetre diameter water main with all necessary valves and fittings. The proposed route of the new IP would be in close proximity to this Asset and would require further negotiation to determine the viability of the route.

On entering land in the ownership of Mr Plumtree, the route is located within the Medway Estuary and Marshes SSSI, SPA and Ramsar. Consequently, a suite of surveys will need to be undertaken on the mainland in order to support any necessary EIA screening and HRA submission. On walking the route there is evidence of water voles being present

There is a non-designated heritage asset located immediately off Old Ferry Road along the route, comprising a sheepfold on the Ferry Marshes and the site of a former field barn with no associated yard (TQ 96 NW 1068).

Other Heritage features recorded within the immediate vicinity of the route include post-medieval heritage assets which comprise a mooring post (TQ 96 NW 1113) and two possible revetments (TQ 96 NW 1112; TQ 96 NW 1118), one recorded in the Ferry Marshes and another recorded on the Isle of Sheppey. Additionally, there is a modern pillbox located within the immediate vicinity of the north eastern end of Route A (MKE39148). All these areas would need to be further assessed, with consents gained for work in the proximity. An Archaeological watching brief may also be necessary. Should a watching brief be needed and the stop/start protocols employed within any such consents this would put the drilling operation at a high risk as stopping and starting of directional drilling can lead to snatching and increased pressures in moving both the drill head and pulling the pipe back on completion.

Construction of rafted access/egress routes associated with pipe stringing and monitoring of the drilling rig present significant environmental risk and are demanding in both construction and remediation post works where any.

05/01/2021

The high volume of drainage ditches could become polluted should there be a drill fluid breakout. Again, the stop/start nature of a watching brief if employed would further increase the risk of a drill fluid break out based on pressure increases. Any clean up would be both costly, damaging to the Environment and reputation of all parties involved in the scheme's delivery. The environmental impact would be of a high risk when considering any contingency plans should a breakout occur due to inaccessibility of the land for excavators to position pumps etc. to manage such a breakout scenario.

Given the proximity of the works to the River Swale flood defences and the number of drains located, it is recommend that liaison with the EA and the Internal Drainage Board (IDB) would be necessary at any early stage to discuss the proposals and determine the consents required.

Network Rail are highly resistant to any crossing below their lines at anything greater than 10° from perpendicular leading to the proposal being rejected. [REDACTED]

Indicative costs identified to date which would be in addition to the existing budget secured would be [REDACTED]. It is considered that this indicative cost would increase further should the feasibility move from a desk top study to full site investigation.

7. Recommendation

In reaching a conclusion in considering the risks above it remains that the originally identified route, to the South of Kingsferry Bridge is the most practical and cost-effective option.

8. Appendices

Appendix A	SGN 010919-010 Pipeline Route B
Appendix B	Appendix B - Kingsferry Bridge Route B Site Condition Pictures
Appendix C	20200916_RPT_Kingsferry_OPTION A (Land Interest)
Appendix D	Kingsferry alternative routes Route A (Ecology - Planning)

05/01/2021

Isle of Sheppey IP Gas Main Replacement


Route Feasibility and Condition Survey

Mainland to Sheppey between Bridges

August 2020



Executive Summary

1. Overview
2. Summary
3. Route
4. Observations
- 
6. Summary of major risks identified
7. Recommendation

1. Overview

The SGN Intermediate Pressure (IP) gas main supply serving the Isle of Sheppey, going under the River Swale via a service tunnel within the Kingsferry Bridge to Brielle Way City Gate, is considered by SGN to be in poor condition with possible low resilience to failure. This exposes the network to potential gas supply failure. SGN also have a directive to consider, where possible, the removal of assets from third party structures and tunnels.

The SGN objective is to ascertain if it is viable to replace the existing IP gas main thereby improving the network resilience and surety of gas supply to customers. SGN require the collation of information working closely with specialist contractors and SGN Land Agents to collate information to inform a technical feasibility study for the IP gas main replacement.

The IP gas main is in poor condition along its route as it is subject to gas leaks even though it is operating below its maximum gas pressure of 7 bar.

There is evidence of corrosion of the IP gas main and the steel support gantry in the service tunnel under the Kingsferry Bridge

It is considered by SGN to be at the end of its operational life having been installed around the 1950s. SGN also have concerns that the condition of the IP gas main could possibly cause further gas leaks that could possibly be a health and safety risk to SGN operatives responding to a fault.

SGN consider that there might be negative impact on the SGN corporate reputation due to possible gas leaks and gas supply failure to customers

The SGN corporate directive to remove assets from third party structures could be achieved as the existing IP gas main crossing the Kingsferry Bridge would become redundant and removed with the agreement of Network Rail at a time suitable to all parties and subject to the new assets being connected to the network and its operational reliability being restored.

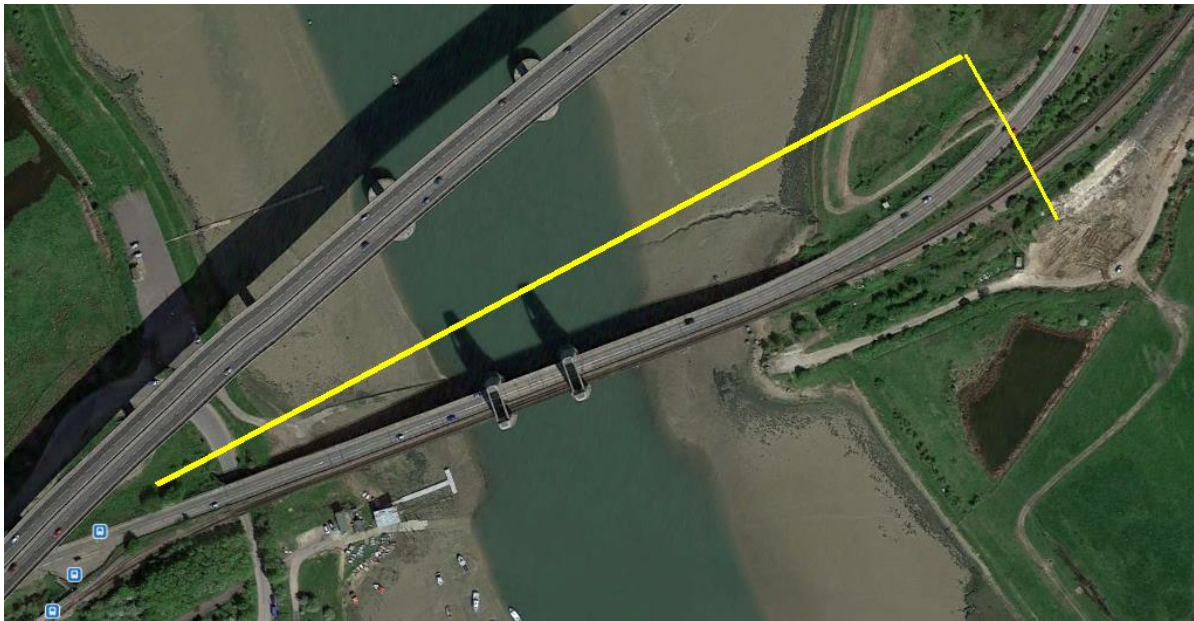
Following a desktop review to identify the most suitable routes to replace the deteriorating asset, three options have been chosen which offer Feasible options in laying a new 400-millimetre SDR 9 HDPE pipeline to the Isle of Sheppey.

2. Summary

This report is associated with the route from the [main-landmainland](#) to Sheppey following a corridor in between both bridge structures, namely the A249 Sheppey Crossing and Sheppey Way prior to drilling under Sheppey Way and the Network Rail track into old city gate, the obstacles and engineering difficulties associated with the construction on this route and includes a condition survey of the surrounding area and assets along the proposed route.

3. Route

Starting in scrub at a low level between Sheppey Way and the A249 Sheppey Crossing the main would be laid by directional drill (HDD) for approx. 450m before heading South Easterly a further 100m again using HDD techniques under Sheppey Way and also the Network Rial track to Old City Gate in land controlled by Mr B Nash. A full route drawing can be found in **Appendix A**.



A full and comprehensive survey and narrative can be found in **Appendix B** detailing observations made during a walk of the entire route, along with planning, environmental, archaeology and ecology requirements identified. These are summarised in sections 4 and 6 below.

4. Observations

The site is relatively constrained in respect of working area on the mainland side. When considering the size and depth of any launch/reception pit, there would likely need to be interaction with Highways England and Network Rail to secure consent to work in very close proximity to their operational assets. This consent again could be refused based on the route proximity to these assets and in particular the foundation structures.



05/01/2021

Pipe Stringing to support the drill would be restricted and would have to be undertaken in sections which would not allow for the pipe to be fully pressure tested ahead of it being installed. An excavator (15-23t) would be needed to work near the bridge piers to support the stringing route for the pipe. While it is not impossible for the string to be prepared in shorter lengths and for the drill to stop during pullback for intermediate welds, this is not without risk when drilling through predominately clayey soils (where there is a tendency for the clay to relax back into the hole and potentially 'grab' the pipe after periods of inactivity). It would certainly be preferable to conduct the pullback as a single, continuous operation.

It is anticipated complex negotiations will be necessary with Highways England in respect of their freehold ownership for land at both the launch and reception areas.



Access will be necessary on to land occupied by the boating club when tracking the drill profile, this area can become heavily congested with the public on an evening and at weekend participating in watersports.



05/01/2021

The Queensborough Fisheries Trust are an unknown entity at this stage and there is limited historic information available to indicate the terms that they will insist upon.



Information from the bridge asset owners would be necessary to determine the location of piles and supports. Their location could deem that the route cannot be achieved.



05/01/2021

There are areas of unregistered land impacted by this option which also increases risk and costs associated with referencing. This land is necessary to facilitate pipe stringing in advance of the works.



The access route on the Isle of Sheppey is complex and would require improvements in respect of the surface and security arrangements.



05/01/2021

Navigation Rights within the River Swale would require further negotiation with Peel Ports.



Local to the route is evidence of an existing water main.



05/01/2021

There is evidence at the reception point in Sheppey of HV power lines both below ground and pole mounted.

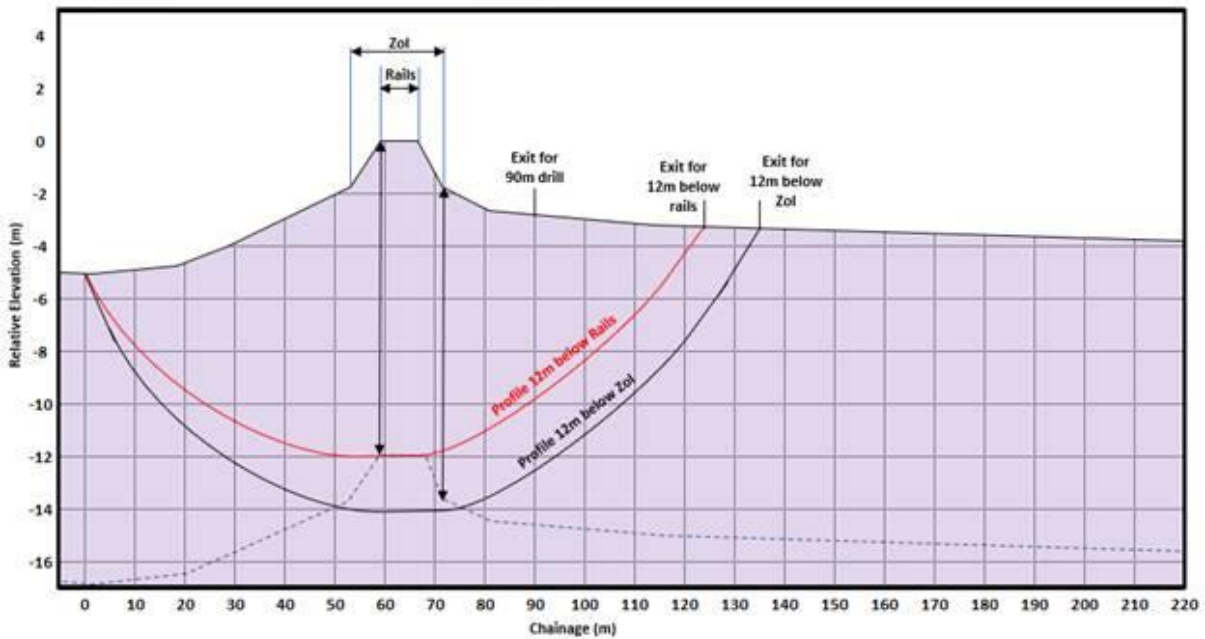


The Network Rail asset crossing would also require an easement to be agreed. This would require an Under-Track Crossing; [REDACTED]



05/01/2021

The under-track (UTX) crossing is not feasible based on the short length of drill proposed. Network Rail's (NR) minimum depth requirement is generally 12m when passing below their lines. how this is applied in a scenario where the line is on an embankment (i.e.i.e., if NR want a minimum depth of cover of 12m would this be just directly below the lines or below all of their land) and also the topography along the route. The drill site (between the railway and road) is circa 5m below the level of the railway and the exit point some 3m below the railway level and, therefore, 2m above the drill entry point. On the basis that NR would want a minimum depth of cover of 12m then viable drill profiles would be significantly longer than those shown in the proposal. The schematic below illustrates this principal. The drill profiles shown are based on 200m bend radii which is the minimum as to what can realistically achieved. Based on the topographical figures the drill would have to be extended from 50m to 135m. This would result in the IP main having to be laid back on itself to connect into the current grid entry point at City



Should Network Rail ultimately agree to an Under-track Crossing, it is considered that the risks associated with unknown ground strata below the railway track which could be encountered during the directional drill are high. This risk could not be mitigated during any advance investigation works.

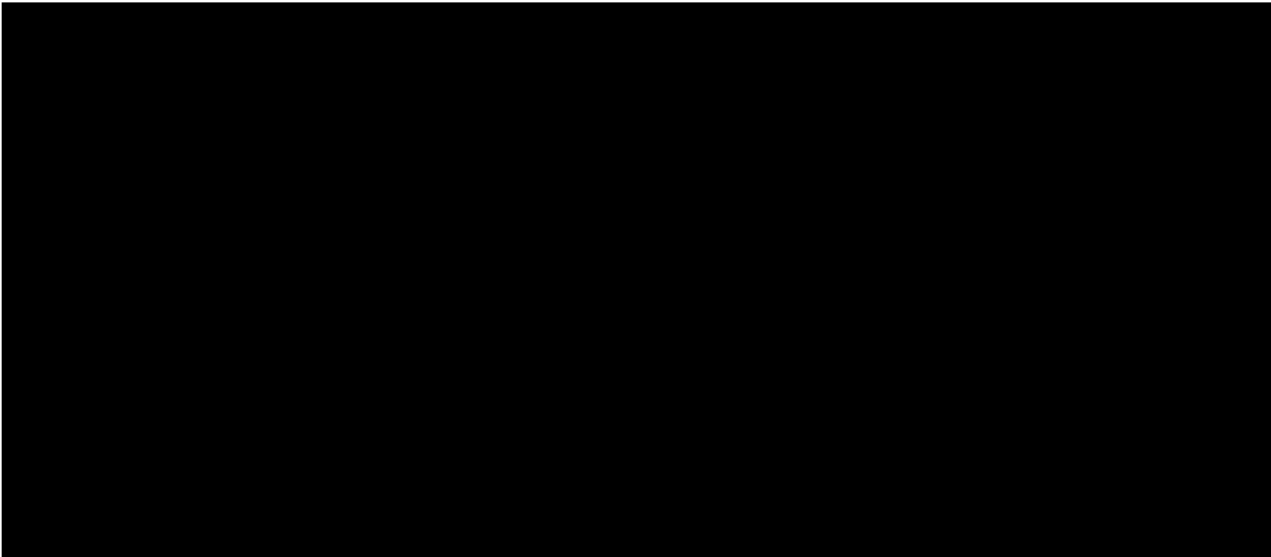


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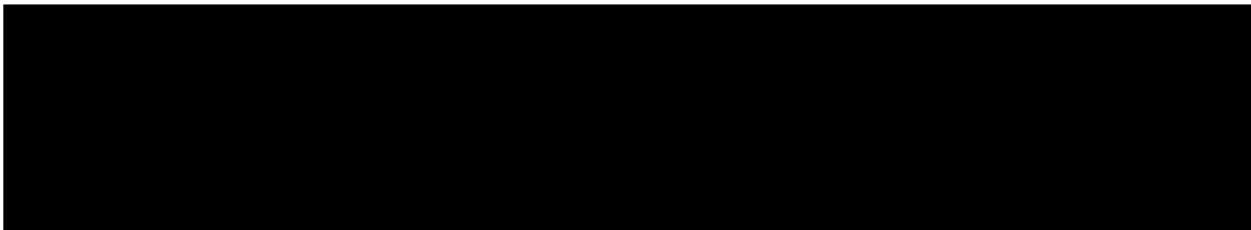


Additional consents:

Navigation Authority	A River Work Licence will be required from Peel Ports which assesses the practicalities and risk to the navigation channel posed by the works
Flood Defences	The EA will need to provide technical consent as the drill will pass under the sea flood defences
Queensborough Trust	Currently an unknown entity at this stage and there is limited historic information available to indicate the terms that they will insist upon.
Existing Utilities	Exclusion zones and approvals would be necessary to undertake the initial works combined with agreements necessary for any future maintenance
Network Rail	Consent will be required to cross under the rail lines
Highways England	Consent to work near the Sheppey Bridge on the mainland side.



6. Summary of Major risks identified



The new gas main will cross Highways England and Network Rail assets and consents for the works would be required and could be refused based on their proximity to foundations.

There is a Deed of Grant between Kent County Council and Southern Water Authority dated 15th of June 1997. This provides full right and liberty to lay, maintain and repair a 600-millimetre diameter water main with all necessary valves and fittings. The proposed route of the new IP would be in close proximity to this Asset and would require further negotiation to determine the viability of the route.

The route is located within the Medway Estuary and Marshes SSSI, SPA and Ramsar. Consequently, a suite of surveys will need to be undertaken on the mainland to support any necessary EIA screening and HRA submission.

05/01/2021

The available footprint to support pipe stringing would be insufficient to cater for the full line. This would mean the new gas main would be inserted without having being pressure tested which is an operational bad practice. Any failure in the test one the pipe is within the drill would lead to the pipe being abandoned and a further drill shot would be required.

The under-track (UTX) crossing is not feasible based on the 200m bend radii necessary to achieve the relevant distance from the Network Rail track. Based on the topographical figures the drill would have to be extended from 90min length to a minimum of 135m to meet the minimum requirement. It must also be noted that the pipes orientation in meeting this would be exiting the ground in an aggressive vertical rather than a preferred horizontal, which would introduce further design needs. This would result in the IP main having to be laid back on itself to connect into the current grid entry point at City Gate.

With no data being available of ground conditions below the Network Rail track the conditions to support HDD are unknown. More than one attempt to drill at this location may be necessary. As an alternative to HDD, micro tunnel could be considered, however the ground water conditions local to the area combined with the necessary depths needed would have to be further determined just to prove the viability of this option.

The above Network Rail associated activities are all reliant on Network consent. [REDACTED]

Indicative costs identified to date which would be in addition to the existing budget secured would be [REDACTED]. It is considered that this indicative cost would increase further should the feasibility move from a desk top study to full site investigation.

7. Recommendation

In reaching a conclusion, the drill profile of this proposal cannot be achieved in line with the relevant drilling and gas main testing ACOPS. It remains that the originally identified route, to the South of Kingsferry Bridge is the most practical and cost-effective option.

8. Appendices

Appendix A	SGN 010919-010 Pipeline Route C
Appendix B	Appendix B - Kingsferry Bridge Route C Site Condition Pictures
Appendix C	20200916_RPT_Kingsferry_OPTION B (Land Interest)
Appendix D	Kingsferry alternative routes Route B (Ecology - Planning)