SGN Tier 1 Stubs Re-opener

Version: 1.1

Date: October 2023

Classification: Public

Contents

1. Introduction

Executive Summary

This application is for the purpose of SGN's Tier 1 Stubs Repex policy Re-opener for both our Southern and Scotland Networks. Within the contents of this document, we aim to demonstrate our approach and reasoning for this application, as well as deliver assurance on how we will continue to manage the risk of our Tier 1 Stubs in line with the Health and Safety Executive (HSE) iron mains risk reduction programme (IMRRP) and our Licence obligation.

As part of our licence obligation, we would like to take this opportunity within the re-opener window to request funding of [redacted] in Southern and [redacted] in Scotland to for the last two years of GD2. This allows continuity of the programme into the next price review period.

Table 1 Table of Requirements

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1.2,2-5	Needs Case / Problem statement
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1.4-1.8	Engineering justifications
1.10	Stakeholder engagement and whole systems Opportunities
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1.1. Background

Licence condition

As part of the Final determination for GD2 a licence condition was set for Tier 1 Stubs under a Repex policy Re-opener (STUBt). This means that a reopener can be triggered where costs are incurred relating to the decommissioning of Tier 1 Stubs during the Price Control Period.

As set out in the special conditions[1] of this licence, an application may be submitted for the following:

a) adjusting the value of the STUBt term;

(b) amending the values in Special Condition 3.10 (Tier 1 Mains decommissioned Price Control Deliverable); or

(c) amending the values in Special Condition 3.11 (Tier 1 Services Repex Price Control Deliverable)

This application is time bound to between 25th January 2023 and 31st January 2023, and during such later periods as the authority may direct. A further re-opener submission window was authorised by Kate Warrilow at Ofgem on the 1st of September 2023 for an updated submission between the 25th of October 2023 and 31st October 2023.

[1] Gas Transporter Licence Special Conditions

As stated in Table 1 above, we have adhered to the requirements stated in the licence for the application of a Tier 1 Stubs Repex policy Re-opener and followed the RIIO-2 Re-opener Guidance and Application Requirements Document as closely as reasonably possible.

Repex programme

The Repex programme is the largest area of workload in the network and makes up for more than a third of our overall Totex expenditure. As a result, there are many crossovers where Repex has an impact on several other business areas such as emergency and repair, Connections, Environmental Action plan, customers and many more.

Within the Repex programme there are several categories of mains, some of which are part of the mandatory replacement programme detailed below, and others which are discretionary and subject to an asset management and cost benefit analysis approach.

Tier 1 Stubs are a part of our mandatory work, meaning they are part of our risk managed assets which must be decommissioned along with the remaining Tier 1 mains by the end of the Iron Mains Replacement Programme (IMRRP).

Iron mains replacement programme

SGN is currently two thirds through the HSE metallic iron mains replacement programme, which began in 2002. The IMRRP mandates that all iron pipes that lay within 30 metres of a habitable building must be decommissioned by the end of 2032.

This programme was established following an increase in the number of incidents, gas explosions, relating to Iron pipe failures, some of which led to fatalities. The highest profile of these incidents was at Larkhall in Scotland where a family of 4 was killed in December 1999.

In addition to the IMRRP, we also have a responsibility and a ‘duty of care’ of maintaining the pipeline network in efficient working order and good repair which we are bound to this by law under the Health and Safety at Work Act 1974 as a Duty of Care and Regulation 13 of the Pipelines Safety Regulations (PSR, 1996).

Just prior to the commencement of RIIO-GD1 Ofgem and HSE undertook a mid-point review of the programme and de-scoped the majority of the larger diameter mains from mandated replacement. This change is covered in greater depth in section 1.4 below.

1.2. Situational circumstance

After the initial phase of the iron mains programme, at around the 5-year point, it was agreed with the HSE and Ofgem to move away from a top-down approach, where the highest risk pipes were decommissioned in order, to an approach where the networks were allowed to group pipes together in efficiently designed projects. Part of delivering these pipes potentially out of risk-order in efficiently designed, larger projects was the expectation that there would be an increase in the annual decommissioning length and an associated reduction in replacement costs.

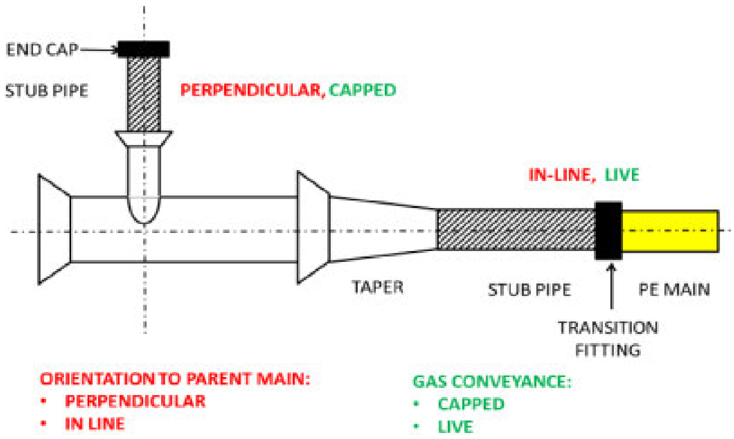
Part of the agreement above included the practice across all the Gas Distribution Networks (GDNs) to leave short lengths of Tier 1 (small diameter) iron where it was connected to a larger diameter iron pipe that was not yet planned for replacement. This avoided the considerable additional costs of cutting into the large diameter iron main to remove the entire section of small diameter iron pipe, particularly where the parent main was in heavily trafficked roads. It was accepted that this short length would be decommissioned when the large diameter main was due for replacement before the 2032 deadline.

As a result of the above practice SGN have a population of short lengths of Tier 1 iron mains remaining in our distribution network that we are mandated to replace. These short lengths are connected to larger diameter Tier 2 or 3 “parent” main that, following the mid-point review, are no longer time bound for replacement. The replacement of these stubs is the focus of this reopener submission.

1.3. Definition of a Tier 1 Stub

The above approach resulted in short length of Tier 1, small diameter, mains being left behind, which are now known as Tier 1 stubs. As seen in figure 1, a Tier 1 stub will be either a ‘perpendicular’ pipe connected to the parent main via a tee piece, or an ‘in-line’ pipe extending from the end of a parent main. Both types of stub could be either ‘live’ still conveying gas to other parts of the network or ‘capped’ while still under live gas pressure.

Figure 1 Tier 1 stub



There are various components that may be found in the construction of a stub, the configuration differs on every occasion but can be seen in figure 1 above and generalised by:

- Tier 1 Stub: a single length of Tier 1 pipe that is shorter than a whole pipe length, which was left behind during a historical replacement project
- Tee: a component / fitting which allows the gas pipe to be split into two directions. For a stub arrangement this fitting will be a component of the Tier 2 or Tier 3 parent main, with a perpendicular outlet to the short Tier 1 iron main
- Taper (if present): a fitting to reduce the diameter of the pipe to allow connection to a smaller diameter downstream section of which there could be several tapers in series to allow for a significant reduction in diameter. The stub is connected directly to the taper or tee depending on the arrangement.
- Transition fitting: if the arrangement is still live, and conveys gas to the rest of the replaced network, there is a fitting that allows a connection to be made from the iron stub to a PE main
- Parent main assembly: Components that are classified as being part of the parent main (i.e., Tee, Taper)

Figure 2 Tier 1 stub configuration

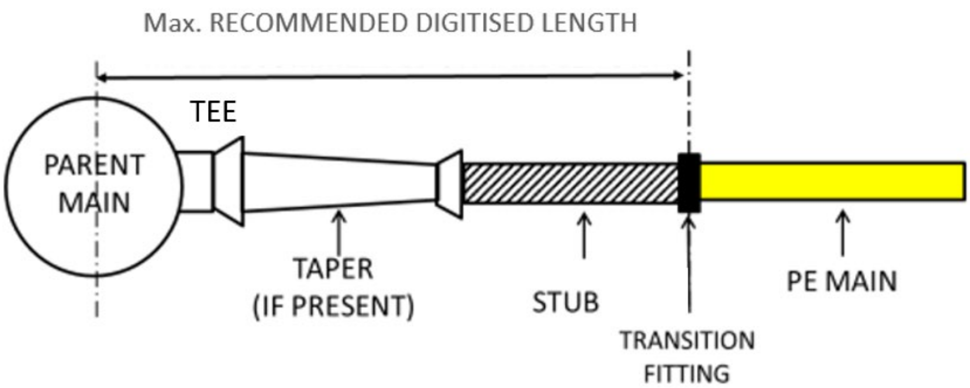


Figure 2 shows the most common perpendicular arrangement and indicates how the overall length of the stub is measured, known as the digitised length. It is taken from the middle of the parent main to the last non-polyethylene component.

1.4. Change to Iron main programme

In 2012, prior to the commencement of the RIIO-GD1 price control period, the HSE and Ofgem undertook an mid-point review of the iron mains programme. This resulted in a modification to the previous approach, detailed in the above sections, to the Iron Mains Risk Reduction Policy (IMRRP) which saw the introduction of the three-tier approach. As a result of this change, the larger diameter pipes now referred to as Tier 2 and Tier 3 were no longer time-bound for completion by 2032. Instead, these larger diameter pipes would be replaced following asset management decisions and underpinned by an economic assessment, which often means that larger diameter mains would remain in service with no planned decommissioning date.

This change in policy leaves a significant number of Tier 1 stubs, which would have been replaced with the parent main under the original programme, still requiring to be decommissioned by the end of the programme. If the Tier 1 stubs were to be left in service it would contravene the remainder of the IMRRP which mandates the replacement of all small diameter, Tier 1, iron by 2032.

The operational practicalities of replacing these short, isolated tier 1 sections should not be underestimated. They almost exclusively lay in difficult to access locations and have atypical Tier 1 replacement costs, are numerous within the network and often require the need to intervene on the parent main. The unit costs are therefore not relatable to that usually seen for large scale Tier 1 replacement and are more akin to complex Tier 2 and Tier 3 replacement.

1.5. DNV analysis

DNV are a renowned independent gas Industry consultant who expertise in assurance and risk management.

In 2019, DNV were engaged by the GDNs to conduct a theoretical study and risk assessment[2] of the integrity and levels of risk associated with the Tier 1 stubs. The DNV assessment of Tier 1 stubs identified that,

The stress (hence integrity) of the stub varies with length, diameter, and support:

- As the diameter of a stub is increased, the stress is reduced and therefore the overall integrity is increased.
- As the length of a stub is decreased, the stress is reduced and therefore the overall integrity is increased.
- If the stub is supported at both ends, then the stresses are less compared to a stub only supported at one end.

Based on this theory and a comparison with the weakest non-mandatory main, DNV were able to produce tables containing the recommended allowable lengths for stubs assuming the worst case for support and loading conditions. Generally it can be assumed that live stubs (conveying gas to a main downstream to a polyethylene network) are connected and supported at both ends, whereas capped stubs (not required for conveying gas) are only connected and supported at one end and therefore the recommended allowable length for a capped stub is shorter than that of a live stub.

The analysis that DNV conducted references all these factors in detail and to summarise their findings they produced four tables which recommend maximum lengths for each tier 1 stub diameter and its supporting connection (Tapers, fitting, or Tee).

Once it is determined whether a stub requires intervention, it is then necessary to identify a suitable intervention option according to the whether the main was live or capped. Historically, the only method

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available to remediate these stubs was to apply a full cut out of the parent main but this may be unfavourable due to the cost and the disruption this operation can cause in the highway.

The development of more cost-effective innovations by industry approved suppliers has provided several different intervention techniques that can now be utilised. However, ductile iron stubs remain an exception to this, as corrosion is the dominant failure mode, and as a result many of the innovation techniques cannot be used. With ductile iron stubs the type of intervention is limited to either a composite pipe wrapping, a trusted repair technique within the oil and gas pipeline industry that creates a load bearing shell around the pipe, or to carry out a full parent main cut out.

Table 2 provides an illustration of what remediation options are available based upon the size, material, and configuration of the stub. However, these techniques cannot be used in every situation (mainly because of either buried plant, or the location hindering the operation), this then means a full parent main cut out becomes the default and the most cost-effective alternative.

Table 2 Summary of available remediation techniques

Material	Type	Intervention Type
All Iron	Live	1. Remove stub pipe from network by cutting out fitting from parent main
	Capped	1. Use innovation technique [redacted] live service Isolator – abandonment of small diameter pipes. 2. Remove stub pipe from network by cutting out fitting from parent main
Cast/ Spun Iron	Live	1. Use innovation technique [redacted] Sealback (SEALBACK) – insertion in larger diameter pipes. 2. Cut stub pipe back to within exemption length (shortening) 3. Remove stub pipe from network by cutting out fitting from parent main
	Capped	1.Use innovation technique [redacted]: 'Eseal' – abandonment in larger diameter pipes. 2. Cut stub pipe back to within exemption length 3. Remove stub pipe from network by cutting out fitting from parent main
Ductile Iron	Live	1. Deploy Team Inc, a specialist service provider, to apply a composite wrapping over the stub (carbon fibre wrapping) 2. Remove stub pipe from network by cutting out fitting from parent main
	Capped	1. For stubs less than 1 meter in length: Deploy Team Inc, a specialist service provider, to apply a composite wrapping over the stub (carbon fibre wrapping) 2. For stubs greater than 1 meter in length: Deploy Team Inc, a specialist service provider, to apply a composite wrapping over the stub (carbon fibre wrapping) Or Use innovation technique [redacted]: 'Eseal' – abandonment in larger diameter pipes. 3. Remove stub pipe from network by cutting out fitting from parent main
[redacted] **Refer to 1.3 for definition of Live/Capped**		

1.6. Stub Lengths

From the theoretical study undertaken by DNV, combining the recommended maximum stub lengths with standard cast iron tee/taper dimensions, and assuming tapered pipes were only used in construction when no alternative pipe diameter reduction was available, it has been possible to estimate the maximum length for a stub to be safely left in the ground dependent on specific requirements detailed in table 3 below.

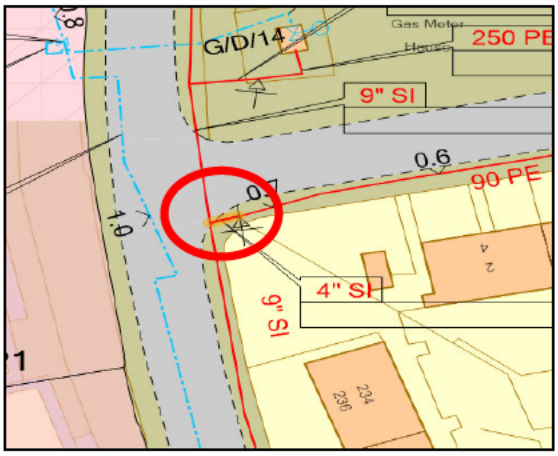
As discussed in section 1.5, the theory-based assessment provided the means of assessing the integrity of the iron elements (tapers and pipe stub) and applying assumptions for pipe support and loading conditions.

These were used to create exemption lengths tables for 'in line' and 'perpendicular' stubs based upon whether they are live or capped. Illustrated in table 3 below, is an example of one of the tables showing the recommended exemption length that can remain following intervention.

As an example, we have taken a tier 1 stub located at York Road in Greenock, as can be seen in Figure 1, the stub is a 4" cast iron connected to a 9" spun iron Tier 2 parent main and is classed as a live perpendicular configuration. Figure 3 provides us with a digitised length of 2.93m.

Applying these factors to (DNV) table 3, for live perpendicular assemblies below, it shows the diameter of the stub and parent main highlighted in purple, this provides us the recommended maximum digitised length, highlighted in green, of 2.2m and a maximum stub length of 2.0m, highlighted in red. Therefore, using remediation techniques from table 2 above we have the options of either shortening the stub to 2.0m or less, inserting the stub using the [redacted] Sealback method, or carrying out a full parent main cut-out.

Figure 3 Map view of Tier 1 Stub



It can also be observed in these tables that some of the maximum recommended digitised lengths exceed the originally defined maximum stub length of 3.0 meters, an example of this is highlighted in blue on table 3 below. Fittings and tapers used within varying configurations of a stub connection may become an extension of the stub itself, and therefore these longer recommended lengths could also be considered as having acceptable integrity, based on the structural analysis approach.

Table 3 Live Perpendicular Stub: Maximum Recommended Digitised Lengths

: Live Perpendicular Assemblies

		TIER 1 NOMINAL BORE							
	T1 STUB LENGTH	3.00m	2.75m	2.50m	2.25m	2.00m	1.75m	1.50m	1.50m
		8"	7"	6"	5"	4"	3"	2.5"	2"
TIER 2/3 PARENT MAIN NOMINAL BORE	9"	3.2	3.0	2.7	2.5	2.2	2.0	2.3	2.3
	10"	3.2	3.0	2.7	2.5	2.2	2.0	2.3	2.3
	12"	3.3	3.0	2.8	2.5	2.3	2.0	2.4	2.4
	14"	3.3	4.0	2.8	3.5	2.3	2.6	2.4	2.4
	15"	3.3	4.0	2.8	3.5	2.3	2.7	2.4	2.4
	16"	3.3	4.0	2.8	3.5	2.3	2.7	2.4	2.4
	18"	3.4	4.0	2.9	3.5	2.3	2.7	2.4	2.4
	20"	3.4	4.0	2.9	3.5	3.3	3.0	3.4	3.4
	21"	3.4	4.0	2.9	3.5	3.3	3.0	3.4	3.4
	24"	3.4	4.1	2.9	3.6	3.5	3.9	3.6	3.6
	30"	3.6	4.2	4.0	3.7	3.5	3.9	3.6	3.6
	36"	4.6	4.5	4.4	5.0	4.8	4.5	4.9	4.9
	48"	5.9	5.7	5.4	5.3	5.9	5.6	6.0	6.0

Tier 1 Stubs

In summary, the following conclusions are drawn:

- Iron components (pipe stub and any tapered pipes) within the defined lengths of table 3 have been assessed as having acceptable integrity when compared to the reference case and represent a no worse case than the weakest Tier 2 pipe that may be permitted to remain in service under IMRRP.
- Where the current short Tier 1 main exceeds its recommended length, then in theory the excess stub length would require removal (shortening), however a judgement would be required of the risks and costs of this in relation to the reduction in risk.
- Where the current short main exceeds the recommended transition by more than a whole pipe length (typically 12'/3.65m), then the downstream "Tier 1 mains remnant" comprising the whole pipes(s) is theoretically no different from a Tier 1 main that would be subject to mandatory replacement, and an engineering justification cannot therefore be made for them to be retained in service.

Some of the maximum recommended digitised lengths exceed our search criteria for stub length (3.0m), Any pipes that lie between 3.0m and these longer recommended lengths could be considered as having acceptable integrity, based on the structural analysis approach.

1.7. Exemption

Following the theoretical study and risk assessment completed by DNV, the HSE granted an exemption for tier 1 iron stubs that fell within the acceptable parameters from the study. It is now accepted that all stubs that are within the exemption lengths and parameters can be considered as components, or fittings, of the parent main and therefore do not fall into the current iron mains risk reduction programme (Tier 1).

This exemption by the HSE allows any stub that meets the exemption length as designated by DNV in their independent study to be left in situ without any further intervention being needed. Stubs that fail to meet this exemption length require intervention. To assist the understanding of this approach, the diagrams below illustrate how the exemption lengths are applied to cast and spun iron stubs from the example table 3 above. Figure 4 below shows the measurement is taken from the centre line of the parent main, should the stub (and taper if fitted) fall within this measurement no further action is required as directed by the DNV analysis. However, as illustrated by Figure 5 below, if the is longer than this measurement then intervention is required to shorten this stub by applying the best cost option from the accepted methods as discussed in Table 2 above.

Figure 4

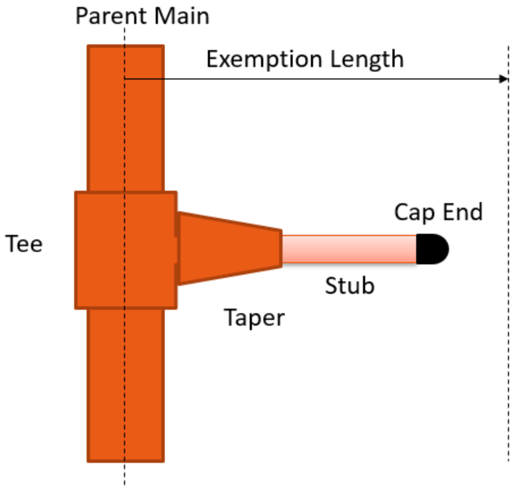
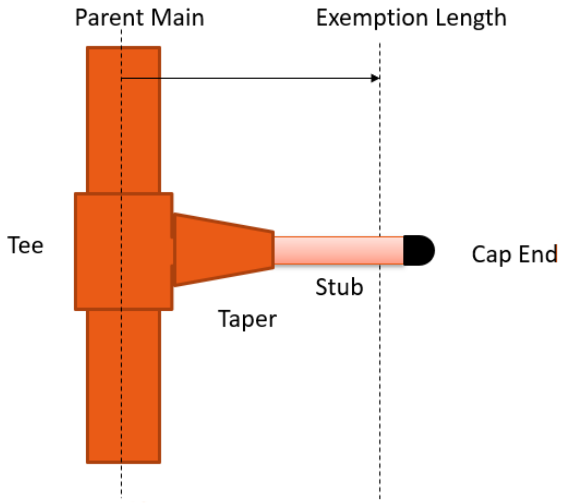


Figure 5



1.8. Additional data and long list

The DNV analysis was conducted on a data set of stubs with a digitised length of up to three metres, for SGN it resulted in an initial list of 1,625 potential stubs needing intervention. The list was sent to DNV as part of the evidence base for the study and as a result of the analysis they undertook it was returned with 514 stubs, 137 in Scotland and 377 in Southern, that still required intervention. This meant that rest of the 957 stubs in Scotland and 154 stubs in southern had adequate integrity, no longer required intervention and could be considered components of the parent main.

We have also come to realise that our original search criteria missed a number of potential compliant stubs. The study concluded that a compliant stub end could be up to 5.9 metres long in terms of digitised length, rather than the 3 metres as used in our original search. We have therefore gone back to our asset repository to collect a further dataset of assets between three and six metres in digitised length and that are connected to larger diameter parent mains. The same loss of replacement driver, where the driver to replace them had gone following changes to the iron mains programme, to produce a long list of potential interventions. From this long list and from an additional map check to ascertain the orientation we will conduct checks against the exemption lengths to

Based on this assumption, we now recognise that there is another cohort of stubs that exist between the 3- and 6-metre lengths. These could be compliant, but also could require intervention. This data wasn't produced by us to DNV at the beginning of the study as the exact parameters were not fully understood, our stub data is dynamic, and our understanding is continuing to improve overtime. As seen in the table 4 below our stubs population to date is 1,311 across SGN with a split circa 75/25 between Southern and Scotland networks.

Table 4 Stub population

Material	Length	Southern	Scotland	Total
DI	<=3m	80	39	**119**
CI/SI	<=3m	317	91	**408**
CI/SI	>3 to 6m	575	209	**784**
		972	**339**	**1311**

Additionally, we have undertaken a risk assessment of our stub population to prioritise workload over the course of RIIO-GD2. Our analysis was based on the DNV assessment of the integrity of stub pipes, noting that stubs of smaller diameter should be removed entirely and that there is no compliant length, or where we have seen historical failures. This has highlighted those 13 stubs in Scotland and 23 stubs in Southern that will need to be removed from the network by the end of the current price control period as a minimum. We have estimated that the levels of failures seen in this analysis is likely to continue into the future.

1.9. Final Determination and completed volumes to date

Due to the workload and cost uncertainties surrounding Tier 1 stubs at RIIO-GD2 Final Determinations, we were awarded baseline funding, equivalent to two years of our proposed programme, and a re-opener under license special condition 3.18. The purpose of this condition is to calculate the term STUBt (the Tier 1 Stubs Re-opener term). The effect of this condition is to establish a re-opener to be triggered by the licensee where the licensee incurs costs relating to the decommissioning of Tier 1 Stubs during the Price Control Period.

As Tier 1 stubs remain a mandatory deliverable under the iron mains risk reduction programme, it was considered reasonable to provide some initial funding whilst the DNV study was being undertaken and acknowledging that as a result the volume of interventions was not yet fixed. Additionally, costs for this comparatively inefficient work, compare to that of large-scale Tier 1 decommissioning, had not been fully established.

Final determinations did not establish a target number of stub remediations alongside the awarded baseline allowances of £1.16m and £2.53m in Scotland and Southern networks respectively.

Over the course of RIIO GD2 to date; we have completed 23 stubs in our Scotland Network and 25 stubs in our Southern Network. Our initial programme of works was designed to capture a cross section of diameters, materials, locations, and remediation techniques used so that we obtained a good understanding of engineering difficulties and the resulting costs. This has allowed us to forecast our requirements for the remainder of RIIO-2 and therefore has underpinned this submission. As our workload and associated forecasted costs have exceeded this original awarded baseline allowance, we have prepared this re-opener to seek the additional funds required.

1.10. Stakeholder Engagement

The Ofgem Re-opener Guidance and Application Requirements Document does not require us to seek stakeholder engagement where there is a statutory obligation, as the below quote shows:

3.17 Stakeholder engagement may not be necessary where there is not a material impact on stakeholders, or where the application is driven by statutory obligations. In these circumstances a brief explanation of why stakeholder engagement was not considered appropriate must be provided.

However, as part of our ongoing consumer and stakeholder engagement, SGN have formed a group known as the Customer and Stakeholder Engagement Group (CSEG). This group has been established as a forum to both discuss delivery of our RIIO GD2 commitments, future workload proposals for the next regulatory period, customer focused initiatives and stakeholder led interests.

As part of our preparation for this submission, our initial programme of works and proposed plan for the submission of a re-opener was introduced to in the March of 2022 to the CSEG it was recognised that this was a mandatory workload, with clear safety drivers, that had to be completed by the conclusion of the iron mains programme.

2. Problem Statement

2.1. Introduction

As has been outlined in the introduction to this paper, the driver for removing Tier 1 stubs from our network has been impacted by changes to the Iron mains programme. Whilst we have been able to mitigate some of the impacts of these changes by instigating a study into the integrity of these short lengths of Tier 1 pipe and successfully lobbing for an exemption, the issue to deal with the remaining Tier 1 stubs still exists. These pipes, postponed for replacement at the time that adjacent pipes were replaced, will still need decommissioning before the end of the current programme in 2032.

2.2. Completed work in Years 1 and 2 of RIIO GD2

From our asset repository we have forecasted that approximately 972 stubs in Southern and 339 stubs in Scotland will need to be remediated as part of the 2032 iron mains programme. We have used the funding received as part of final determinations for the first 2 years of our programme, but will require additional funding to cover the planned programme over the final 3 years. This programme is essential to ensure that we build on our experience from the initial programme of works and ensure successful delivery into the next regulatory period and therefore achieve the 2032 completion date.

The key objective of years 1 and 2 of this programme is to assess a cross section of Tier 1 stub intervention to identify engineering difficulties and associated market costs. For this initial programme we sought to thoroughly document and validate our approach to stub intervention and to examine how best to deal with uncertainties in project delivery.

The scope of the initial programme was to deliver a package of stubs in both Scotland and Southern networks across a range of varying situations that have an impact to the market cost of intervention, such as:

- Area locations (Inner and outer urban areas)
- Road / Junction types

- Differing pipe materials (Cast, Spun and Ductile Iron)
- Differing diameters of parent mains
- Varying lengths (shorter lengths may create further engineering difficulties)
- Pipe configurations (capped and contiguous)

In addition to the full range of potential projects listed above, various intervention techniques, as detailed earlier in this document (see Table 2), were deployed to gain a comprehensive understanding of what is needed to deliver the overall Tier 1 stub end programme.

Our planning and selection process has ensured that we have intervened on a representative sample of stubs such that we can:

- Understand all the uncertainties that we may come across during the whole programme of work
- Establish an efficient and representative cost base to do the work
- Understand the productivity of this type of work and therefore the number of contracting teams required to hit the workload targets

2.3. Historical records

The following Table 5 shows the split of 1,625 stubs that were extracted from our asset records in 2018, where we have a completed map checks showing the orientation and parent main size. From this original extract, and the subsequent checks, we have been able to identify where the stub is either compliant or requires intervention.

Table 5 Historical stub population provided to DNV

Extract from historical data	Initial stub population as of 2018
Scotland	1094
Southern	531
SGN	**1625**

From the work completed to date we have come to realise that the greatest uncertainty in dealing with stubs is not being able to accurately identify what type of intervention will be required before excavations have been carried out. Only following excavation can this been ascertained for certain and we often found that a stub end differed from our records when it was fully exposed. Variances found during the projects completed include differing materials, diameters, lengths or location of the stub. In some instances, we have found that the stub end is not present at all, and a wider investigation of the area confirms that to be the case and our records are updated. However, the project still incurs the costs for excavation, survey, and reinstatement.

To provide an example of how an agile approach is necessary, a stub end remediation that we carried out at the beginning of the programme illustrates many of the difficulties we are likely to encounter over the course of the programme. As you can see in Figure 6, which is a planning document created for each stub end remediation, we had planned to remediate a capped perpendicular 4” Cast Iron stub with a length of 1.88m attached to a 9” cast Iron parent main using the [redacted] innovation known as ‘Seal back’.

Tier 1 Stubs

Figure 6 Planning document created by desk top analysis for project SCN11145

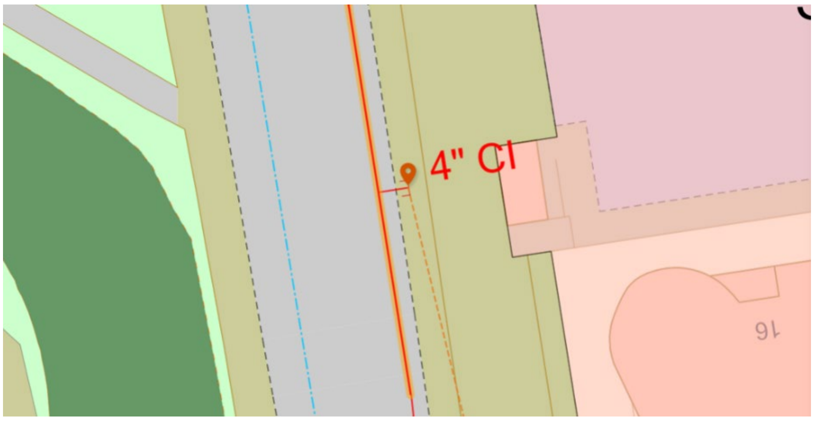
Pilot Number	Project Number	Construction Region	Network
SCO15	SCN11145	East	Scotland

Address	Pilton Drive, Edinburgh
Post code	EH5 2GA
Location	Next to 16 East Pilton Farm Rigg
Eastings/ Northings	323382/676054
Planners name	David Edgar
Short Description of work planned to be completed	Seal back
Proposed Intervention	1. Cast/Spun Iron - Live - SVI Sealback

Desk top- to be completed by Planning	PON Number	Diameter	Material	Digitised Length	Maximum Digitised Length	Maximum Tier 1 Stub pipe Length	Stub Orientation
Parent Main	466335187	9	Cast Iron	52			
Stub	650979046	4	Cast Iron	1.88	1.5	1.25m	Capped perpendicular

The location was expected to be as shown in the following map print, Figure 6, where the stub was identified to be approximately 0.5m from the kerb line in the carriage way.

Figure 7 *Map print of project SCN11145*



Our contractors excavated at the planned location and were not able to find a stub end. To confirm this, and to be able to accurately update our records, a camera survey was conducted 30 meters in either direction in attempt to locate the stub. After a camera survey the stub was found to be 20m from the original planned position. After a second excavation at the new location the stub was identified as a 6" stub instead of 4” and when measured it was 2.1m in length as opposed to 1.88m as originally indicated from our mapping system. Frustratingly, it also terminated at a closed valve, instead of a cap end, which additionally had been buried in the structure of a concrete of a road bridge and therefore could not be excavated, see Figure 7 and 8

Figure 8 Approach to road bridge

Figure 9 View from camera survey confirming the presence of a closed gate valve

Tier 1 Stubs

The planned method of remediation could not be applied as space was restricted due to an 8 metre drop from the bridge (see Figure 10) which would not allow the [redacted] Sealback equipment to be installed. After considering all options, the stub was cut back in length to a total length of 1.2m by use of a foam bag. (Figures 9, 10 &11)

Figure 10 8 metre Drop from bridge

Figure 11 Bagging operation

Figure 12 Stub end cut back and capped

From this example, we had a number of challenges which we will need to ensure that we have adequately addressed as part of the ongoing programme. The need for an agile approach is obvious from our experience of the work completed to date.

2.4. Managing projects

As discussed in 2.2, within the initial programme of work we found engineering complications to be common, the list below provides some of the more common complications we experienced:

- Stub not found at location – To be able to update our records accurately we had to be completely certain that the stub did not exist. For this type of scenario, we would need to conduct further onsite investigations, a camera survey, to completely confirm that no stub end existed in the location, with a data error form being produced to update our asset records and mapping system.
- Material / size differs from records – Material and size determines the type of remediation required. Onsite variability of the intervention is problematic, as when third party service providers have been organised and then at short notice need to be stood down, a mobilisation charge is incurred. Alternatively, we could seek to extend the duration of each project to allow for this, but it would result in either multiple excavations being required, firstly to ascertain the intervention, then later to complete the work, or alternatively an extended period of time with open excavations. However, with the latter there would be considerable knock-on impact of disruption to the public and potential for higher traffic management and lane rental costs.
- Buried plant preventing planned remediation technique – Space is required in the area surrounding the stub end to carry out certain remediations, if the space in the excavation cannot be achieved then alternative interventions will be needed and, in most cases, this led to a full cut out being applied. This will only be known once the stub has been excavated and the underground situation is known.

- Street furniture causing obstruction – the same as buried plant, in most cases, the restriction in space caused by street furniture (i.e., lamp posts) led to full cut outs being instigated to avoid the high cost of removal and reinstatement. Due to the variability in location of the stubs this issue cannot always be foreseen.

To provide a better insight in these complex projects, we developed a process that allowed us to capture and record all the relevant information and supporting evidence concerning a stub end remediation and the engineering complications encountered. This involved creating an engineering pack that documents all the outcomes throughout the project life cycle and accurately collect the absolute costs associated with the remediation.

The Engineering Pack is created at the planning stage outlining what was expected to be found on site in respect to location, pipe sizes and diameters, material, stub lengths and the proposed intervention to be carried out. (Appendix 1 provides a full Engineering pack as an example for each network). The Engineering pack also provided a means to collect information from the operations on site as to the 'as found' status of the stub end, the engineering difficulties encountered, and the remediation carried out with photographic evidence to support the capture process. Alongside the planning and 'as found' information, we also collated all the costs accredited to the individual stub with supporting evidence provided as scanned invoices from our contractors with a full breakdown of expenditure. Finally, this pack assisted the capture into our asset repository of the intervention undertaken which was fed into the RRP submission in July 2022.

2.5. Balancing contractual risk

To find the most cost-effective solution for our initial programme of work, we needed to appraise different options for resourcing this programme and what contracting strategy to take, this appraisal provided us with the following long list of options.

1. Use our direct labour teams and employ a specialist contractor when required.
2. Offer out to tender a 'turnkey' contract where the full financial risk is with the contractor.
3. Offer out to tender within a 'Major works' contract a category for stub end replacement.
4. Deploy our existing Tier 1 framework contractors.
5. Utilise our Dynamic Purchasing system (DPS).
6. Defer workload into next regulatory period

In later sections we will explore the above long list in detail.

2.6. Contracting situation in the Southern Network

In our southern network we have been experiencing constraints in the contractor market for a number of years. The availability of contracting resource is being constrained by the following challenges:

- Redistribution of our existing workforce to safety-critical operations, necessary for embedding fatigue requirements (16- and 12-hour working restrictions) as a fundamental part of the new ways of working, including shift patterns, as a priority
- Ongoing levels of competency are being mainly affected by an ageing workforce retiring, obtaining competency is driven by underpinning knowledge and experience being obtained over time. Ultimately this has led to a market shortfall of skilled craftsmen to carry out certain procedures on larger diameter mains.
- Increased market pressure from other utilities, but mainly the competition of fibre telecommunications installation.
- The general UK labour market issues, challenges in recruitment across SGN as a whole
- All of the above has been compounded by COVID recovery

We've explored options in our Southern network using our current framework contracts because that was the most expedient way of mobilising or initial programme of work. However, the current suite of contractors do not have the resource capacity to increase levels beyond this initial run rate. Instead, the framework contractors are currently concentrating on the resources required to fully deliver our Tier 1 programme.

2.7. Contracting situation in the Scotland Network

Following a review of all the options, and challenges above, and discussions with our contractors in the Scotland network for the initial workload, a combination of framework rates and day work rates (labour paid by the day) was applied as this 'de-risk' the uncertainties to our contractors.

There is sufficient capacity within the contract to market in Scotland to undertake this additional workload within GD2. Therefore, our solution could be to deliver the rest of the programme in our Scotland Network utilising our Tier 1 contractors. Where necessary this could be complimented by the use of our Dynamic Purchasing System (discussed below in section 2.8) as an option for stubs that have high complexities where contract rates do not or cannot be applied to an engineering project situation.

2.8. Flexible contracting methodology

Our Dynamic Purchasing System (DPS) provides a list of pre-vetted suppliers who are invited to tender (ITT) along with any other interested parties.

A DPS may be considered as a suitable route to market as an alternative to establishing a traditional multi-supplier framework. The key difference being that the tendering procedure used to establish a framework is not specific, whereas a DPS approach allows a set competitive rate to be applied for a specific package of works. These packages may be more attractive to smaller/new companies looking to establish themselves within the gas industry.

2.9. Engineering Options

From the DNV recommendation, to manage the risks posed by Tier 1 stubs a range of alternative intervention options have been identified and are detailed below.

- Sealant Injection e.g. [redacted] E-SEAL[3]/Live Service Isolation (for capped-off stubs)
- Stub shortening (for live stubs connected to PE mains downstream)
- PE Insertion (Sealback[4]) where the stub is still connected downstream to a live iron pipe
- Improved protective coating e.g., Composite Wrapping[5] (for higher risk Ductile Iron mains)
- Full cut-out from parent main

2.10. Procurement of Special services

As identified in 2.9, we require specialist services from third party suppliers namely [redacted] and TEAM inc. to conduct remediation techniques in some instances.

These services provide us with a greater range of techniques so that we can select the most cost-efficient method for remediation. These are available to us through our framework contracts and are part of our current process.

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[3] https://www.stevevick.com/services/gas/Sealback-eseal/
[4] https://www.stevevick.com/services/gas/Sealback-eseal/
[5] https://www.teaminc.com//service-solutions/maintenance-repair/composite-repair

2.11. Managing Risk

In 2.5 we have discussed how we are balancing contract risk; we have also identified additional risks we are mitigating and need to manage as best we possibly can. The risk register table 6 below details some of the steps that we've undertaken to try and reduce these risks down to minimum.

Table 6 Risk register

Risk	Impact	Likelihood	Mitigation
Failure on an existing stub end	High – Public reported gas escapes and leakage from network are reported as public reported gas escapes or on occasions we may excavate on a stub which is found to be leaking or stub fails during remediation	Low – Medium	Public safety is our first concern therefore we would invoke our emergency procedures to stop gas leakage at the earliest opportunity. Use of our existing network resource will then deal with these network failures. Monthly analysis of repairs on existing Stub end assets to understand failure trends. Prioritise highest failing assets for remediation Ensure that full remediation of stub occurs following failure.
Project uncertainty	High – Uncertainties encountered during planned operations impacts contractor cost and willingness to tender	Medium	Implement an agile contract approach – Provide visibility of Engineering packs Offer to tender within a 'Major works' contract a category for stub end replacement, this allows contractors to gain the experience in dealing with common uncertainties on a regular basis
Stub found to be different diameter	Low – potential change to planned remediation impacting on contractor costs and delays in project completion	Medium	Growing the experience of our contractors will allow identification of the best cost option at the earliest opportunity. Enhanced relationship with our third-party specialists to ensure an agile and speedy response minimising job duration and disruption to the public
Stub not found at original location	Medium – incurs further investigation work to be carried out to ensure no stub is present within the near vicinity	Medium	Internal camera surveys adopted so that an efficient site investigation is conducted to confirm no stub is present. These surveys provides us the assurance required to accurately update our records

Tier 1 Stubs

Stub found to be of different material (CI/SI vs DI)	High – The approach and remediation technique changes significantly when this situation arises as seen in table 2 specific techniques must be used dependent upon the material encountered.	Medium	Deploy Team Inc, a specialist service provider, to apply a composite wrapping over the stub (carbon fibre wrapping) or alternatively to remove the stub pipe from network by cutting out fitting from the parent main
Buried plant or street furniture found to be in close proximity to the stub	High - Some techniques require a substantial excavation for the equipment to be positioned. Buried plant impacts space available for some remediation techniques to be utilised	High	Alternative intervention would be required, likely to require the removal of the stub pipe from network by cutting out fitting from parent main Agile contracting strategy would be needed to allow for a change of intervention at short notice.
Integrity of stub not compatible – DI	High – If the Integrity of pipe is compromised by corrosion and graphitisation then this impacts the seals around the pipe to allow for specialist equipment to be used	Low	Ultimately when a gas tight seal cannot be achieved this allows gas to escape in confined spaces which puts our engineers at risk. In these instances, we have very few options other than to remove the stub pipe from network by cutting out the fitting from parent main

2.12. Data Analysis of completed work

The following analysis has been created by data collected from the initial programme of works, as you will see that we have a wide-ranging selection with differing materials, diameters and selecting the most cost-efficient solution for each remediation has provided a good spread of techniques applied. Our average 'as found' stub length for Scotland Network is 1.87m and for Southern 2.42m. These range of stubs have provided us with accurate costings based on current market rates across the whole cohort of stubs.

It can be seen from the charts below that 12% in Southern (chart1) and 17% in Scotland (chart 2) of excavations led to no intervention being undertaken. This is due to either the diameter not meeting the Tier 1 requirement (diameter incorrect), lengths compliant with the exemption parameters, or a stub was not found (the subset shown on the figures below). In all cases this required an excavation to be opened up to ascertain that the intervention was not required.

Chart 1 *Southern Techniques*

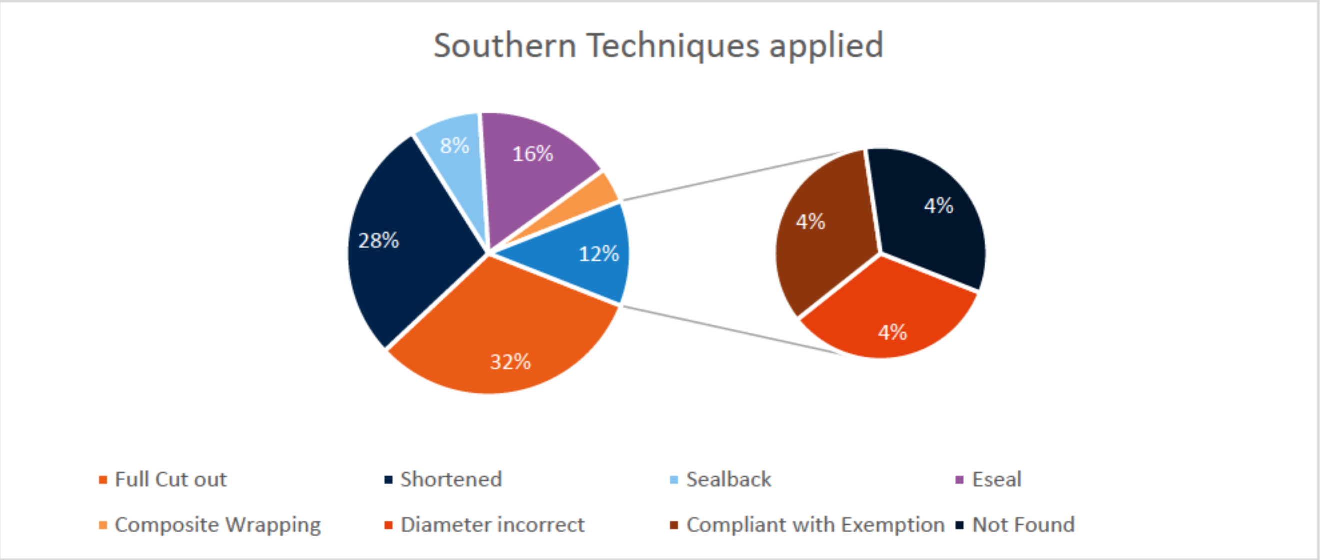
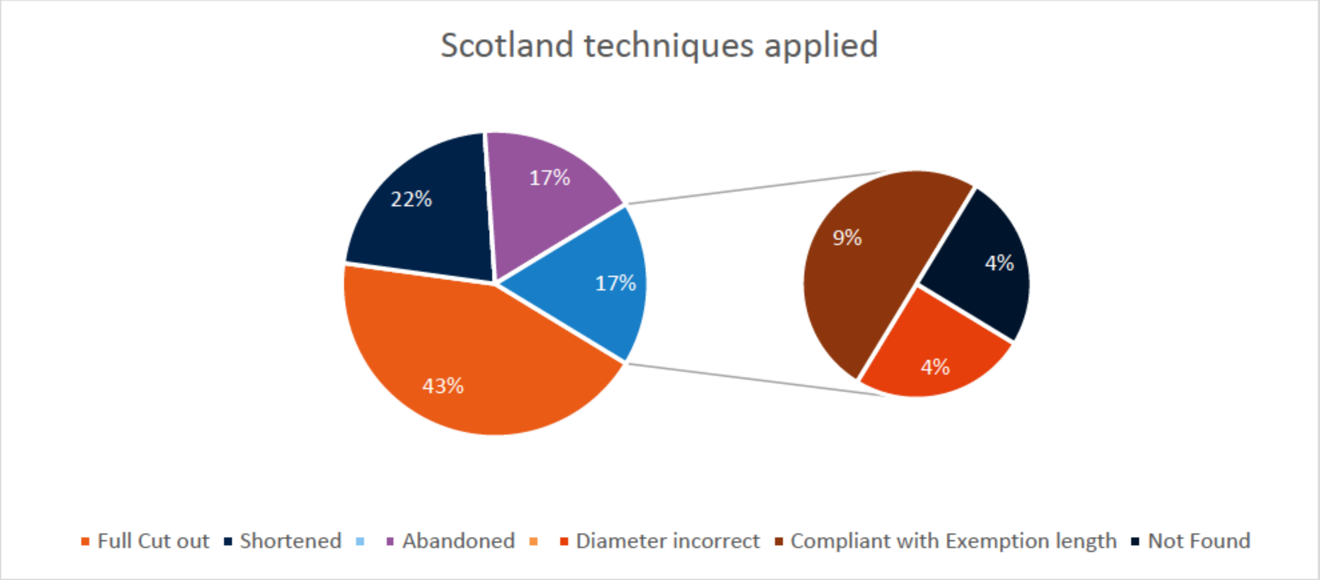


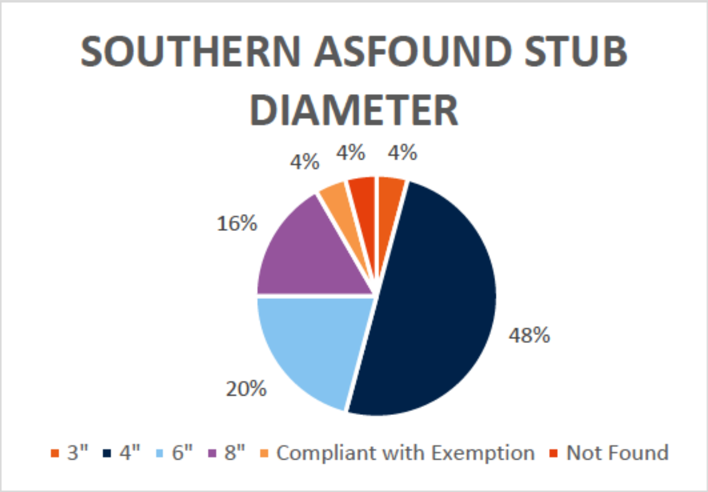
Chart 2 Scotland Techniques



Tier 1 Stubs

The following charts (3 and 4), provides an illustration of the mix of diameters and materials that have been encountered so far within the programme. It can be noted that this programme is applicable across all Tier 1 cohorts.

Chart 3 Southern charts for 'as found stub' diameters and material



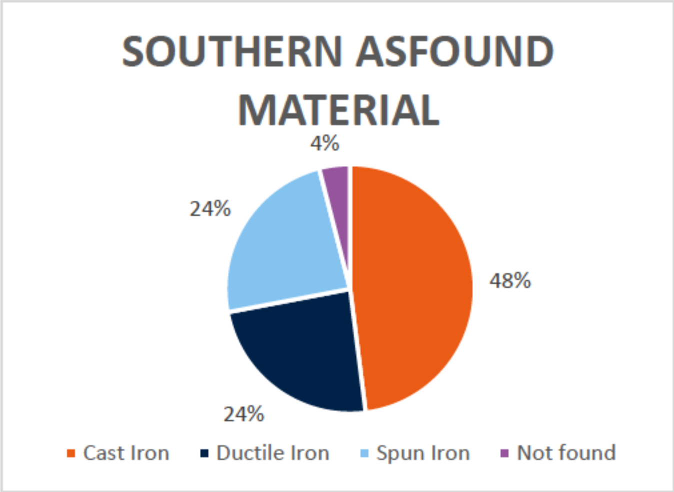
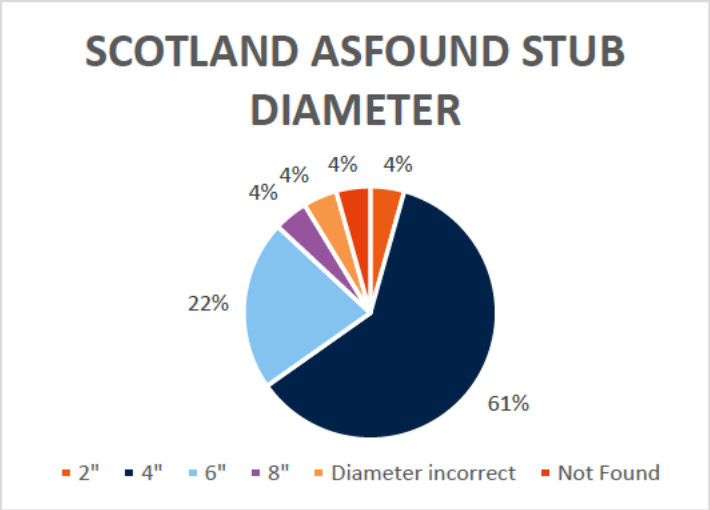
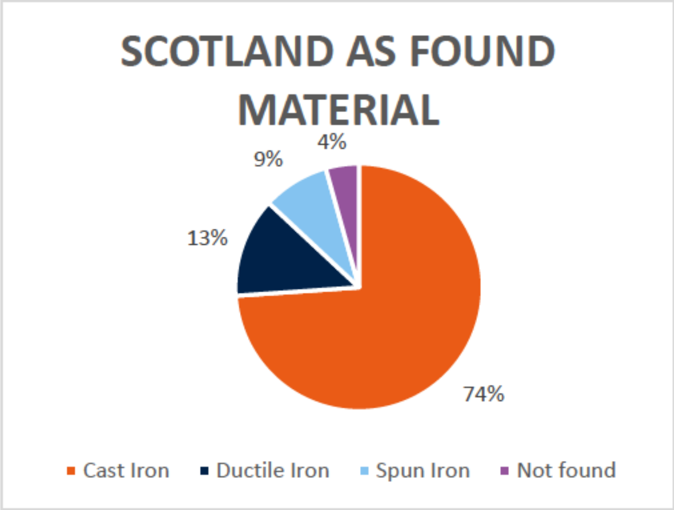


Chart 4 Scotland charts for 'as found' stub diameters and material





The following tables 7 and 8 provide details taken from initial programme of works in Scotland and Southern Networks, they demonstrate how our expectations at the planning stage compared to what was found at the time of the operation.

As you can see by the highlighted 'actual intervention' compared with the 'planned intervention', there was a number of instances due to engineering circumstances such as insufficient material length, buried plant and street furniture preventing the installation of equipment that hindered the use of a preferred technique. Stubs that were also too short in length in some cases prevented innovation techniques to be adopted resulting in an alternative best cost remediation option being applied. All these unforeseen differences, plus the excavations that led to no intervention as mentioned earlier in this section creates a high uncertainty in the programme.

Tier 1 Stubs

Table 7 Summary of stubs completed - Southern

Location		As Planned				As Found			Remediation
Network	Project Number	Stub diameter	Stub Material	Stub digitised length (m)	Planned Intervention	As found diameter Stub	As found material Stub	As found length Stub (m)	Actual Intervention Applied
Southern	[redacted]	8"	Spun Iron	2 59	[redacted] Eseal	8"	Spun Iron	2.7	Stub Shortening - Capped
Southern	[redacted]	3"	Spun Iron	2 26	[redacted] Sealback	3"	Spun Iron	2	Full Cut out applied
Southern	[redacted]	200mm	Ductile Iron	1 98	Composite Wrapping	200mm	Ductile Iron	7 5	Full Cut out applied
Southern	[redacted]	200mm	Ductile Iron	0.76	Composite Wrapping	200mm	Ductile Iron	1	Full Cut out applied
Southern	[redacted]	4"	Cast Iron	2.41	[redacted] Sealback	4"	Cast Iron	4	Full Cut out applied
Southern	[redacted]	4"	Ductile Iron	2 26	Composite Wrapping	4"	Ductile Iron	1	Stub Shortening - Capped
Southern	[redacted]	4"	Spun Iron	2.13	[redacted] Eseal	8"	Spun Iron	1 5	Full Cut out applied
Southern	[redacted]	4"	Spun Iron	2.8	[redacted] Sealback	4"	Spun Iron	16	Full Cut out applied
Southern	[redacted]	4"	Spun Iron	2 39	[redacted] Sealback	4"	Spun Iron	2 2	Live - [redacted] Sealback
Southern	[redacted]	4"	Ductile Iron	1 35	Composite Wrapping	4"	Ductile Iron	0 8	Engineered Composite wrapping
Southern	[redacted]	4"	Spun Iron	2 38	[redacted] Sealback	4"	Cast Iron	2	[redacted] Sealback
Southern	[redacted]	4"	Spun Iron	2 84	[redacted] Sealback	4"	Spun Iron	2 9	Live - Stub Shortening
Southern	[redacted]	4"	Cast Iron	2 52	[redacted] Sealback	4"	Cast Iron	2.52	Live - Stub Shortening
Southern	[redacted]	100mm	Ductile Iron	2.13	Composite Wrapping	100mm	Ductile Iron	2.13	Full Cut out applied
Southern	[redacted]	3"	Cast Iron	2 25	[redacted] Eseal	3"	Cast Iron	0.1	Stub compliant with exemption
Southern	[redacted]	6"	Ductile Iron	2.13	Composite Wrapping	4"	Cast Iron	2 2	Stub Shortening - Capped
Southern	[redacted]	6"	Cast Iron	2 89	[redacted] Sealback	6"	Cast Iron	2.89	Live - Stub Shortening
Southern	[redacted]	4"	Cast Iron	2.62	[redacted] Eseal	6"	Cast Iron	2.1	Stub Shortening - foam bag
Southern	[redacted]	4"	Cast Iron	3	[redacted] Sealback	6"	Cast Iron	6.4	[redacted] ESEAL
Southern	[redacted]	4"	Ductile Iron	0.62	Composite Wrapping	4"	Ductile Iron	0.64	[redacted] ESEAL
Southern	[redacted]	6"	Cast Iron	4 09	[redacted] Sealback	6"	Cast Iron	3	Full Cut out applied
Southern	[redacted]	4"	Cast Iron	3	[redacted] Eseal	4"	Cast Iron	3	[redacted] ESEAL
Southern	[redacted]	6"	Cast Iron	3.78	[redacted] Eseal	6"	Cast Iron	5	[redacted] ESEAL
Southern	[redacted]	200mm	Ductile Iron	0 84	Composite Wrapping	0	0	0	Stub not found - confirmed by camera survey
Southern	[redacted]	6"	Ductile Iron	0.64	Composite Wrapping	3"	Cast Iron	0 5	Stub compliant with exemption

Tier 1 Stubs

Table 8 Summary of stubs completed – Scotland

Location		As Planned				As Found			Remediation
Network	Project Number	Stub diameter	Stub Material	Stub digitised length (m)	Planned Intervention	As found diameter Stub	As found Mat Stub	As found length Stub (m)	Actual Intervention Applied
Scotland	[redacted]	4"	Cast Iron	1.88	[redacted] Eseal	6"	Cast Iron	2.1	Stub Shortening - Foam Bag
Scotland	[redacted]	4"	Cast Iron	3	Full Cut Out	4"	Cast Iron	2 8	Full Cut out applied
Scotland	[redacted]	8"	Cast Iron	2.68	Full Cut Out	8"	Cast Iron	3	Full Cut out applied
Scotland	[redacted]	4"	Cast Iron	2.49	Full Cut Out	0	0	0	Stub not found - Confirmed by camera survey
Scotland	[redacted]	150	Ductile Iron	2.43	Full Cut Out	150	Ductile Iron	2 5	Full Cut out applied
Scotland	[redacted]	4"	Cast Iron	2.62	Full Cut Out	4"	Cast Iron	4	Full Cut out applied
Scotland	[redacted]	4"	Cast Iron	2.34	[redacted] Eseal	4"	Cast Iron	2 5	Stub Shortening
Scotland	[redacted]	4"	Spun Iron	1.83	Full Cut Out	4"	Cast Iron	2 8	Full Cut out applied
Scotland	[redacted]	4"	Cast Iron	2.02	Full Cut Out	4"	Cast Iron	2	Full Cut out applied
Scotland	[redacted]	4"	Cast Iron	2.61	[redacted] Eseal	4"	Cast Iron	2.7	Stub Shortening - Foam Bag
Scotland	[redacted]	4"	Cast Iron	2.27	Full Cut Out	4"	Cast Iron	2.27	Abandoned by valve closure, decommissioned, and removed stub and blanked.
Scotland	[redacted]	200	Ductile Iron	2.22	Full Cut Out	250	Ductile Iron	3	Found to be a Tier 2 stub
Scotland	[redacted]	100	Ductile Iron	2.37	Full Cut Out	100	Cast Iron	0 8	Stub compliant with exemption
Scotland	[redacted]	4"	Cast Iron	2.54	[redacted] Eseal	4"	Cast Iron	1 8	Stub compliant with exemption
Scotland	[redacted]	2"	Spun Iron	2.15	[redacted] LSI	2"	Spun Iron	0	Stub plugged at main
Scotland	[redacted]	150	Ductile Iron	2.11	Composite Wrap	150	Ductile Iron	2.11	Decommissioned by abandonment
Scotland	[redacted]	4"	Cast Iron	2.80	Abandonment	4"	Cast Iron	2.70	Stub plugged at main
Scotland	[redacted]	4"	Spun Iron	2.27	Full Cut Out	4"	Spun Iron	1.1	Full Cut out applied
Scotland	[redacted]	4"	Spun Iron	3	Full Cut Out	4"	Cast Iron	1	Stub shortened
Scotland	[redacted]	4"	Cast Iron	2.71	Full Cut Out	4"	Cast Iron	1 8	Stub shortened
Scotland	[redacted]	4"	Cast Iron	1.93	Full Cut Out	4"	Cast Iron	1 8	Full Cut out applied
Scotland	[redacted]	6"	Spun Iron	2.77	Full Cut Out	6"	Cast Iron	1.75	Full Cut out applied
Scotland	[redacted]	6"	Cast Iron	2.76	Full Cut Out	6"	Cast Iron	1.75	Full Cut out applied

2.13. Cost Analysis

During our initial programme of works and for each stub we have intervened on we have been careful to implement the most cost-effective of the available engineering solutions. In some instances, the intervention planned needed to change due to situational circumstance, but where this has occurred, we have maintained our approach of applying the most cost-effective solution.

From this approach we have been able to establish the average unit cost of a stub end carried out across a representative sample of stub configurations. For Southern Network this equates to [redacted] per stub with a breakdown of the costs being seen on table 9. For Scotland this equates to [redacted] per stub with a breakdown of the costs being seen on table 10 below.

[redacted] [redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

[redacted] [redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

2.14. Spend Boundaries

2.14.1. Southern Network

For our Southern network, we have completed 25 interventions and we plan to intervene on a further 200 stubs over the remaining 3 years of GD2. Our workload for the whole period of RIIO-GD2 will therefore be 225 stubs. Using the above calculated unit cost (see section 2.13 table 9) the programme will cost [redacted]. We were awarded £2.4m at final determinations and are therefore requesting an additional [redacted].

This workload has been based upon an assessment of reasonable scaling up of resources under a new contract whilst remaining efficient. It is our assessment that any additional workload would have resulted in an increase to unit cost and/or a risk to delivery.

We anticipate that the remaining volume of work will be included in our business plan for the next price review.

2.14.2. Scotland Network

For our Scotland network, we have completed 23 interventions and we plan to intervene on a further 129 stubs over the remaining 3 years of GD2. Our workload for the whole period of RIIO-GD2 will therefore be 152 stubs. Using the above calculated unit cost (see section 2.13 table 10) the programme will cost [redacted]. We were awarded £1.2m at final determinations and are therefore requesting an additiona [redacted].

This workload has been based upon an assessment of efficient delivery and available resources. Any additional workload would have resulted in an increase to unit cost.

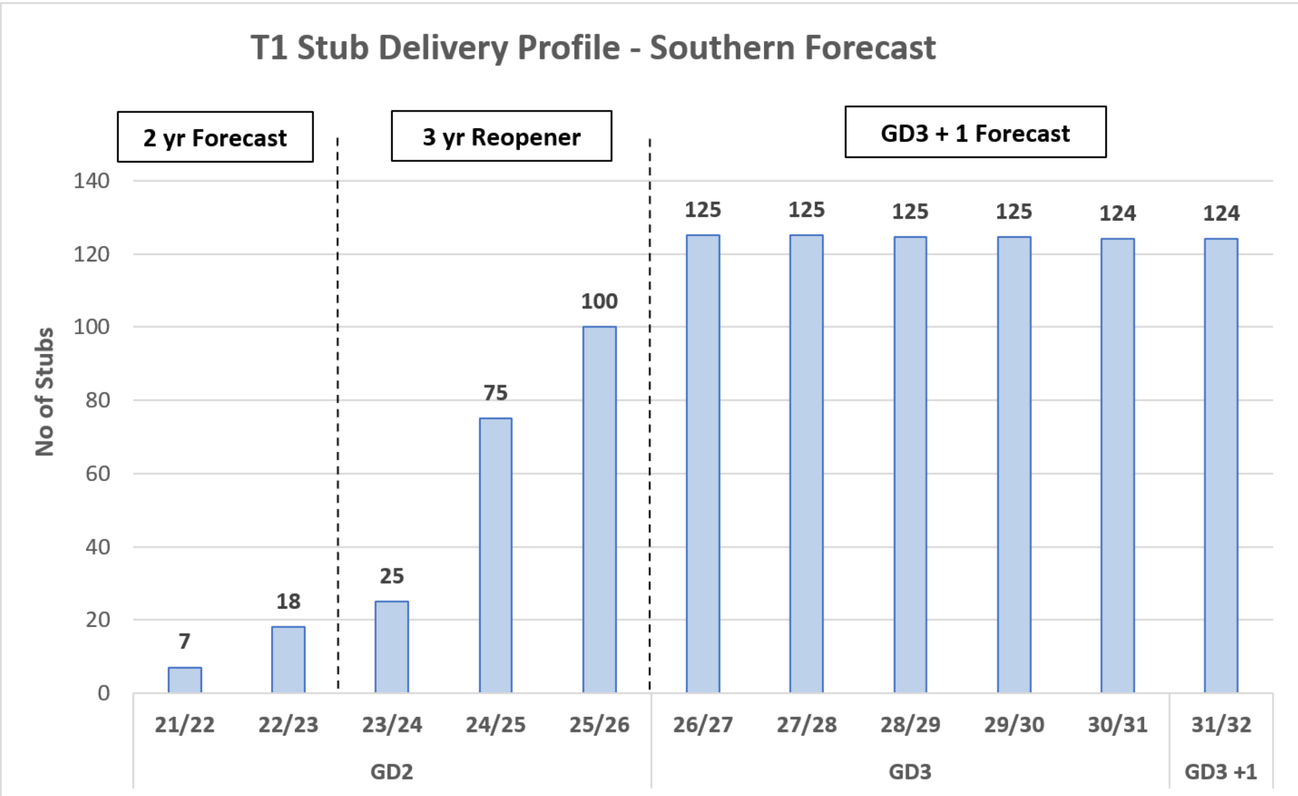
We anticipate that the remaining volume of work will be included in our business plan for the next price review.

2.15. Workload Projection

2.15.1. Southern Network workload projection

Our proposed delivery profile for the Southern Network is representative of the stress's we are experiencing in the contract market at present. As mentioned in 2.6 we have needed to take account that effective delivery from the contract market in the Southern Network is not feasible and a longer-term contracting strategy is required to deliver these volumes into the next price control period. We are therefore proposing as part of this re-opener for the remaining 3 years of GD2 that a volume of 200 stubs by means of an increasing profile over 3 years is applied with the remainder being delivered beyond GD2. (Figure 13)

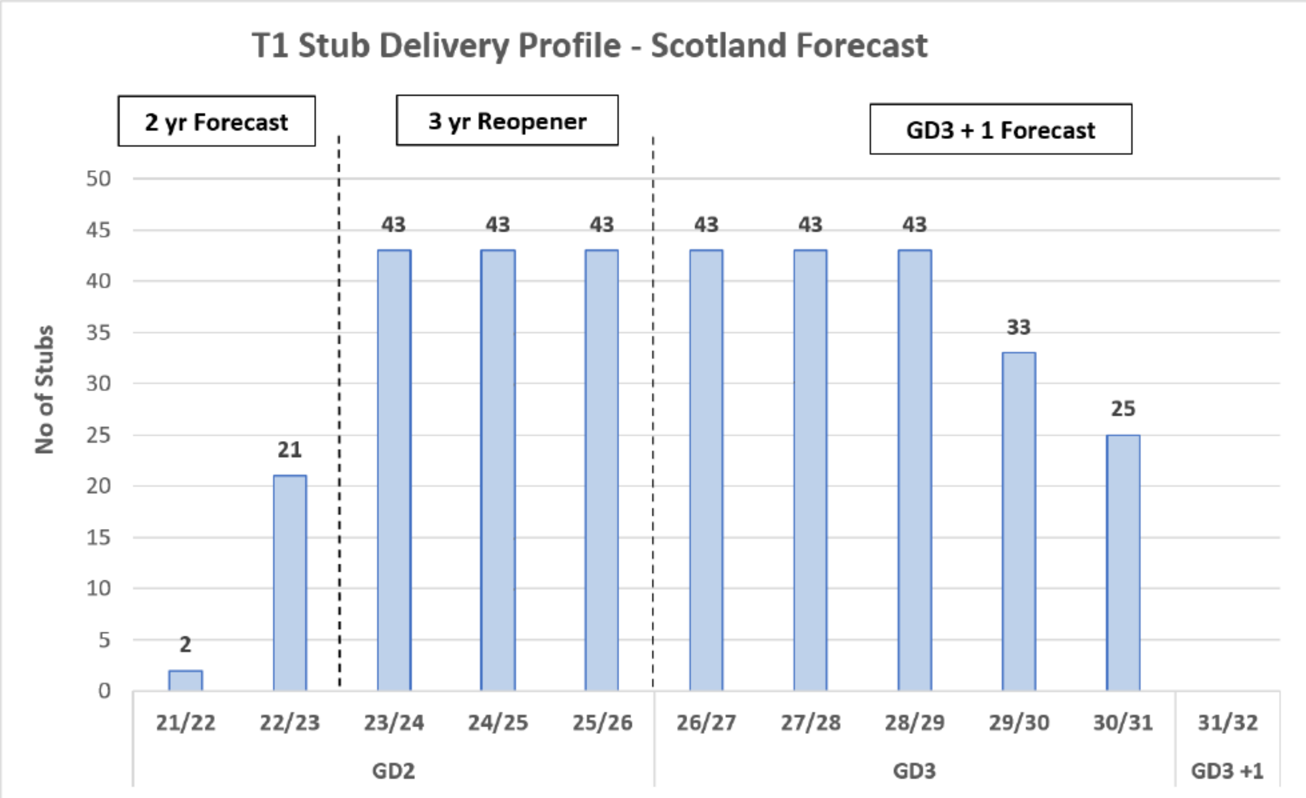
Figure 13 Work projection Southern



2.15.2. Scotland Network workload projection

Our proposed delivery profile for the Scotland Network is reflective of the confidence we have in delivering higher volumes. We are therefore proposing as part of this re-opener for the remaining 3 years of GD2 that a volume of 129 stubs (c.43 per annum) is applied with the remainder being delivered in the next price control. (Figure 14)

Figure 14 Work projection Scotland



3. Projected Spend Profile

Tables 11 and 12 below provides our projected spend profile for the remaining 3 years of GD2 based upon a modest programme of work that matches our run-rate and contractor constraints.

[redacted] [redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

[redacted] [redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

4. Delivery Option Selection

4.1. Comparison of Viable Options

Earlier in the document we had identified a number of contracting options. In addition to this we could seek to delay the workload into the next price control.

1. Use our direct labour teams and employ a specialist contractor when required.
2. Offer out to tender within a 'Major works' contract a category for stub end replacement.
3. Deploy our existing Tier 1 framework contractors.
4. Offer out to tender a 'turnkey' contract where the full financial risk is with the contractor.
5. Utilise our Dynamic Purchasing system (DPS).
6. Delay programme until the next regulatory period

To be able to assess which option is best, we have set out the positives and negatives of each approach before selecting our preferred solution.

Option 1 - Use our direct labour teams and employ a specialist contractor when required
Positives:

- Our existing direct labour teams have the competence to deliver the bulk of this workload
- Would naturally align repairs on stubs and remediation such that stubs are not visited twice

Negatives:

- Our direct labour teams are fully deployed on emergency and repair activities, workload on stubs could introduce conflicting priorities
- Direct labour teams may be re-deployed mid-completion to undertake higher priority work leaving open excavations in sensitive road locations (junctions and main roads) and therefore may overrun notice periods and incur additional charges
- Competence to work on larger diameter mains is limited and if intervention requirements change, due to the issues outlined above, then the team may need to re-instate without completing the work. The work would then have to be re-programmed to be completed by a competent team resulting in the need to re-excavate the location and could additionally require a new notice.

Option 2 - Offer out to tender within a 'Major works' contract a category for stub end replacement.

Positives

- Allows us to agree rates up front, which will fix costs and provides certainty in delivery
- Removes competing workload from Tier 1 framework contracts
- Ensures that delivery will be met over a longer planning horizon
- Provides capacity to deal with additional stubs workload

Negatives:

- Will take time to setup new framework (New contracts are in progress for other workstreams)
- Training the additional contractor resource will take time
- Additional process will be needed to support repair functions should a stub pipe fail

Option 3 - Utilise our Tier 1 contract

Positives

- Allows us to agree rates up front, which will fix costs
- Ensures that delivery will be met over a longer planning horizon
- Capacity already exists to deal with stubs workload

Negatives:

- Could introduce a conflict in the delivery of our Tier 1 programme
- Additional process will be needed to support repair functions should a stub pipe fail

Option 4 - Offer out to tender a ‘turnkey’ contract where the full financial risk is with the contractor

Positives

- Removes the uncertainty in project delivery for customers
- Ensures that delivery will be met over a longer planning horizon

Negatives:

- Would likely come at a higher unit cost
- Due to low visibility of the type of work and mitigations required, it’s likely that contracts would build in an undue amount of risk-cost into the contract

Option 5 - Utilise our Dynamic Purchasing system (DPS)

Positives

- Is a highly flexible approach that could provide delivery solutions for complex jobs
- Allows for spare capacity in the market to be used

Negatives:

- Experience has shown that jobs would likely come at a higher unit cost
- Lack of visibility can cause issues when resourcing work
- Potential risk of non-delivery and would require careful management
- Likely to only be suitable for lower volumes of work

Option 6 - Do nothing – defer workload into future price controls, managing failures reactively

Positives

- Short term cost reduction
- Reduced burden on contracting market

Negatives:

- Potential higher number of failures leading to an increase in the number of repairs and short notice interventions
- Increase in failures may lead to incidents
- Increase in failures will cause disruption to road users and the public
- Iron mains programme will be put at risk of non-delivery due to excessive workloads in future price controls
- Skills in contractor market would not be maintained, developed, or fully utilised causing a potential shortage in the future
- Higher unit costs would likely be seen in the future as the market would be stressed due to excessive delivery timescales

There is an amount of work which will need to be completed as part of RIIO-GD2 regardless of any deferral of the programme which can be summarised as being either; replacement due to failures on stubs in the network or, management of stubs in line with our agreed management of pipe assets. An estimate of the volumes of this workload has been fed into our do-minimum option seen below.

4.2. Delivery Options Considered

4.2.1. Southern Delivery

In our Southern network we are experiencing constraints in the contractor market. The availability within our contracting resource is being created by the following challenges:

- Redistribution of our existing workforce to safety-critical operations, necessary for embedding fatigue requirements as a fundamental part of the new ways of working, including shift patterns, as a priority.)
- Falling levels of competency as a result of an aging workforce
- Increased market pressure from the competition of fibre telecommunications installation
- Very competitive labour market resulting in challenges in recruitment across SGN as a whole, expanding to the wider UK market.
- All of the above has been compounded by COVID recovery.
- Lack of long-term stability of workload

We've explored options in our Southern network using our current framework contracts because that was the most expedient way of mobilising this trial programme. However, they do not have the resource capacity or skill sets to increase remediation levels beyond the currently completed work. Any further delivery using this mechanism would result in a trade-off without Tier 1 programme, and therefore lead to a potential shortfall of workload at the end of the price control.

It is proposed that our delivery solution in our Southern Network during the last 3 years of RIIO-GD2, and into the next regulatory period, will be to seek to include this work within our major works contract. This contract will be comparable to the existing framework rates used for stub end replacement in our initial programme of works. This will allow us to achieve the levels of stub remediation required to complete this mandated programme by providing our contractors with the reassurance that this work type will exist going forward, so that they can commit to increasing the availability of resources and building the skill sets needed to complete this programme.

In addition to the proposal above, we will also employ our Dynamic Purchasing System as an option for stubs that have high complexities where contract rates do not or cannot be applied to an engineering project situation. The removal of these high-cost jobs will allow for a lower level of risk being needed as part of the agreement under the major works contract.

4.2.2. Scotland Delivery

Following a review of all the options and challenges above, and discussions with our contractors in the Scotland network, we are proposing to use our Tier 1 framework contractors and associated costs to delivery this programme of work. We believe that this solution for our Scotland network is the most appropriate delivery vehicle and de-risks delivery of this mandated workload.

There is sufficient capacity within the contract to market in Scotland to undertake this additional workload within GD2 and into the next regulatory period. For stubs that have high complexities, and therefore situations where the current rates do not provide coverage, we will utilise our Dynamic Purchasing System as an to establish and implement the least cost delivery solution.

4.3. Options Cost Comparison

Table 13 below provides a cost comparison between:

- Our preferred option, Efficient delivery
- Deferring investment into future price controls and anticipating repair / remediation and completing stubs that have been found to have insignificant integrity

Table 13 Cost Comparisons

Option	Template	Cost Breakdown	Total Cost (£m)
Efficient Delivery Option	Southern	Unit cost (£k/Stub)	[redacted]
		No. of Stubs	200
		Total	[redacted]
	Scotland	Unit cost (£k/Stub)	[redacted]
		No. of Stubs	129
		Total (£m)	[redacted]
Option	**Network**	**Cost Breakdown**	**Total Cost (£m)**
Do Minimum Option	Southern	Unit cost (£k/Stub)	[redacted]
		No. of Stubs	28
		Total	[redacted]
	Scotland	Unit cost (£k/Stub)	[redacted]
		No. of Stubs	14
		Total (£m)	[redacted]

5. Preferred Option

5.1. Programme summary

Our preferred option in the Southern network is to continue a program that matches the contract market capacity in the Southern Network that delivers 200 stubs over 3 years. This will assure that delivery is met, and risk levels are managed.

Our preferred option in the Scotland network is to continue a program that matches the contract market capacity in the Scotland Network that delivers 129 stubs over 3 years. This will assure that delivery is met, and risk levels are managed.

6. Business Case Outline

6.1.1. Business Case Summary

We are mandated to replace our T1 mains by 2032, which Tier 1 stubs are included. These stubs are connected to mains that will not get replaced in the course of our Iron mains replacement programme. Therefore, the replacement of these stubs will only occur on failure which leads to societal disturbance and unplanned customer interruptions.

We have engaged an independent industry specialist to provide a risk-based analysis to provide suitable exemption lengths that delivers assurance on how we will continue to manage the risk of our Tier 1 Stubs in line with the Health and Safety Executive (HSE) iron mains risk reduction programme (IMRRP) and our Licence obligation. This paper proposes a volume of 200 stubs in our Southern network, and 129 stubs in our Scotland network for the remainder of GD2.

As part of our licence obligation, we would like to take this opportunity within the re-opener window to request funding of [redacted] in Southern and [redacted] in Scotland for the last two years of GD2 and to suggest a volume driver or mechanistic PCD that allows flexibility to the programme in light of the uncertainties mentioned within this document.

7. Glossary of Terms

Acronym	Description
CBA	Cost benefit analysis
CSEG	Customer and Stakeholder Engagement Group
DNV	Independent gas industry advisors and consultants
Eseal	Engineering Technique to insert a cast iron pipe with PE pipe
GIB	Gas in building
GSMR	Gas Safety (Management) Regulations
>=	Greater than or equal to
<=	Less Than or equal to
Km	Kilometres
IMRRP	Iron mains risk reduction programme
LP	Low Pressure
MRPS	Mains Replacement Risk Score
Parent Main	The main which a stub is connected from
PE	Polyethylene pipe
PRE	Public Reported Escape
PSR	Pipeline Safety Regulations 1996
RIIO-GD2	Price control period April 2021-26
RRP	Regulatory Reporting Pack
Sealback	Engineering Technique to insert a cast iron pipe with PE pipe
STUBt	Term used within the Ofgem price formula
SVI	[redacted] (see foot note 3)
Ti	Team Incorporated Ltd (see foot note 5)
T1	Tier 1 Iron mains
T2	Tier 2 Iron mains
T3	Tier 3 Iron mains

8. Appendix A

During the first two years of the current price control, we have intervened on 48 stubs across both networks utilising the most cost-effective engineering solution for each situation. Our key objective was to gain a understanding of the true costs of remediating these stubs and the market rates that can be used as a benchmark for future costs.

With an approach of a single stub being provided with a unique project code has allowed for costs specifically associated with each intervention and to be independently recorded through our core financing systems. This provided an extremely accurate method to capture and to analyse the costs incurred through a variety of remediations as discussed earlier in this document in s2.9. To underpin our cost capture each intervention has been completed by one of our contracting partners outside of their normal framework workload. To support this, separate applications for payment were submitted via our Contractor Invoice Payment System (CIPS) accompanied by appropriate additional supporting evidence.

In addition to these costs any additional invoices for specialist services, highway authority perimetry or traffic management were recorded and a standard uplift for materials applied, as these are centrally supplied and cannot be invoiced separately. Averaging of these costs across the 25 completed stubs in Southern and 23 completed stubs in Scotland gave unit costs of [redacted].

[redacted]

[redacted]