
Project:	Project Sun - Phase I		
Our reference:	400602-MMD-00-XX-TN-C-0001		
Prepared by:	Nicolas Choveau	Date:	26 January 2023
Approved by:	Phil Roberts	Checked by:	Natalie Lewis
Subject:	Southampton Airport - high-pressure gas pipeline crossing		

1 Introduction

Southampton International Airport Ltd (SIAL) has commissioned Mott MacDonald to develop the design of a 164m-long paved extension to the northern end of the existing runway at Southampton Airport. The design is now substantially complete, and SIAL has appointed a Contractor with the aim to start on site in April 2023.

This extension to the existing runway will require modification of ancillary infrastructure within, outside and including the current airfield security fence. The airfield security fence, which currently runs parallel to the gas pipeline on the south side, will be realigned to run on the northern side of the gas pipeline for a 190m segment, requiring the fence-line to cross the gas pipeline in two locations.

The airport maintenance track, which currently crosses the gas pipeline, will be realigned to cross further to the east.

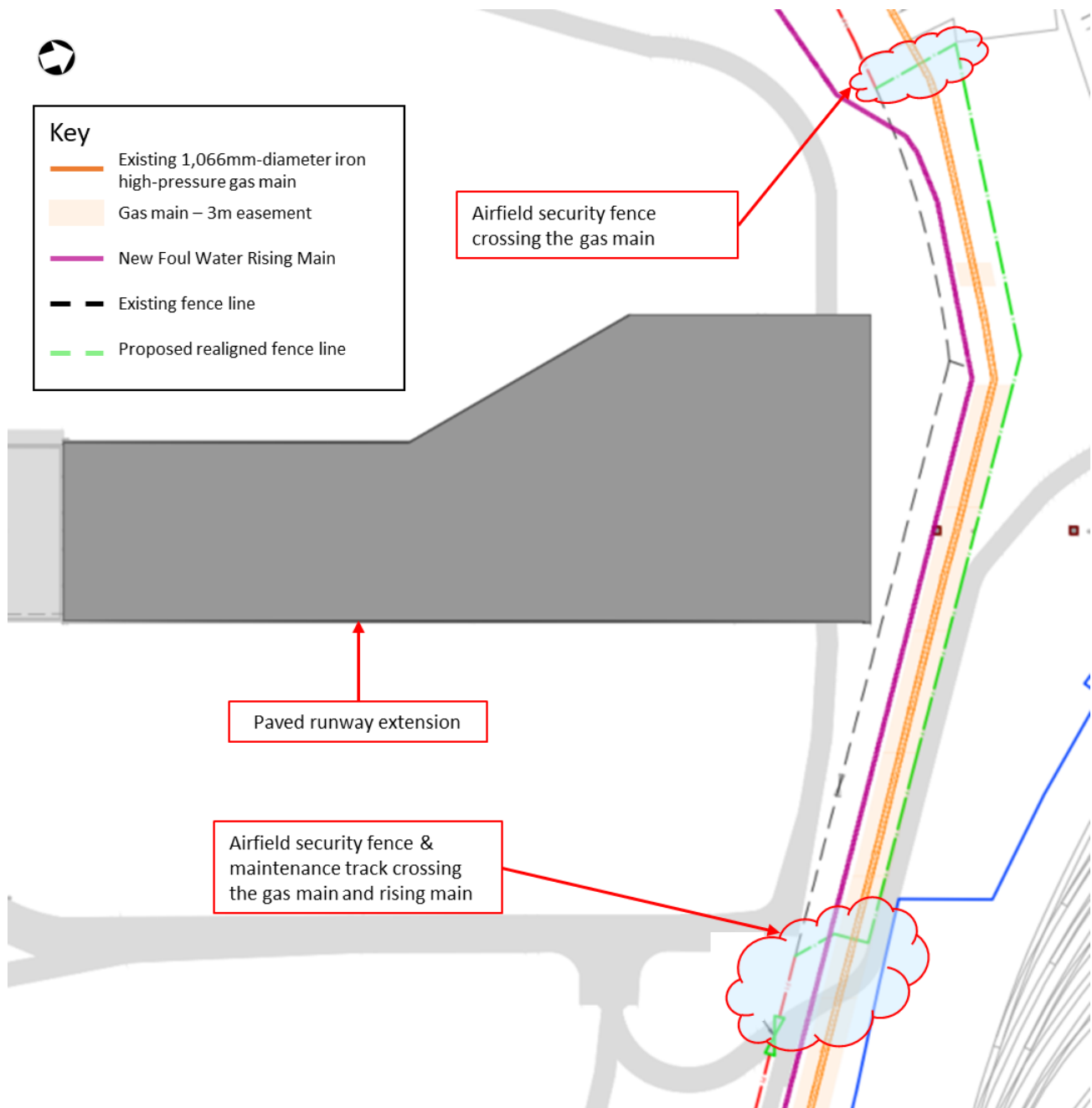
These crossings are indicated in Figure 1.1 on the following page.

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Figure 1.1: Proposed infrastructure crossing the Gas Pipeline



Source: Mott MacDonald, 400602-MMD-00-XX-DR-C-0044-Fence Alteration Layout

This note aims to provide further detail regarding the anticipated infrastructure to be installed across the gas pipeline, including anticipated loading and frequency of trafficking on the maintenance track, to support acceptance of the proposed design by Scotia Gas Network (SGN).

Although some design requirements have been shared with Mott MacDonald for crossing of gas pipelines, it is noted that the information currently available does not provide sufficient information to confirm the requirements for additional protection over the pipeline.

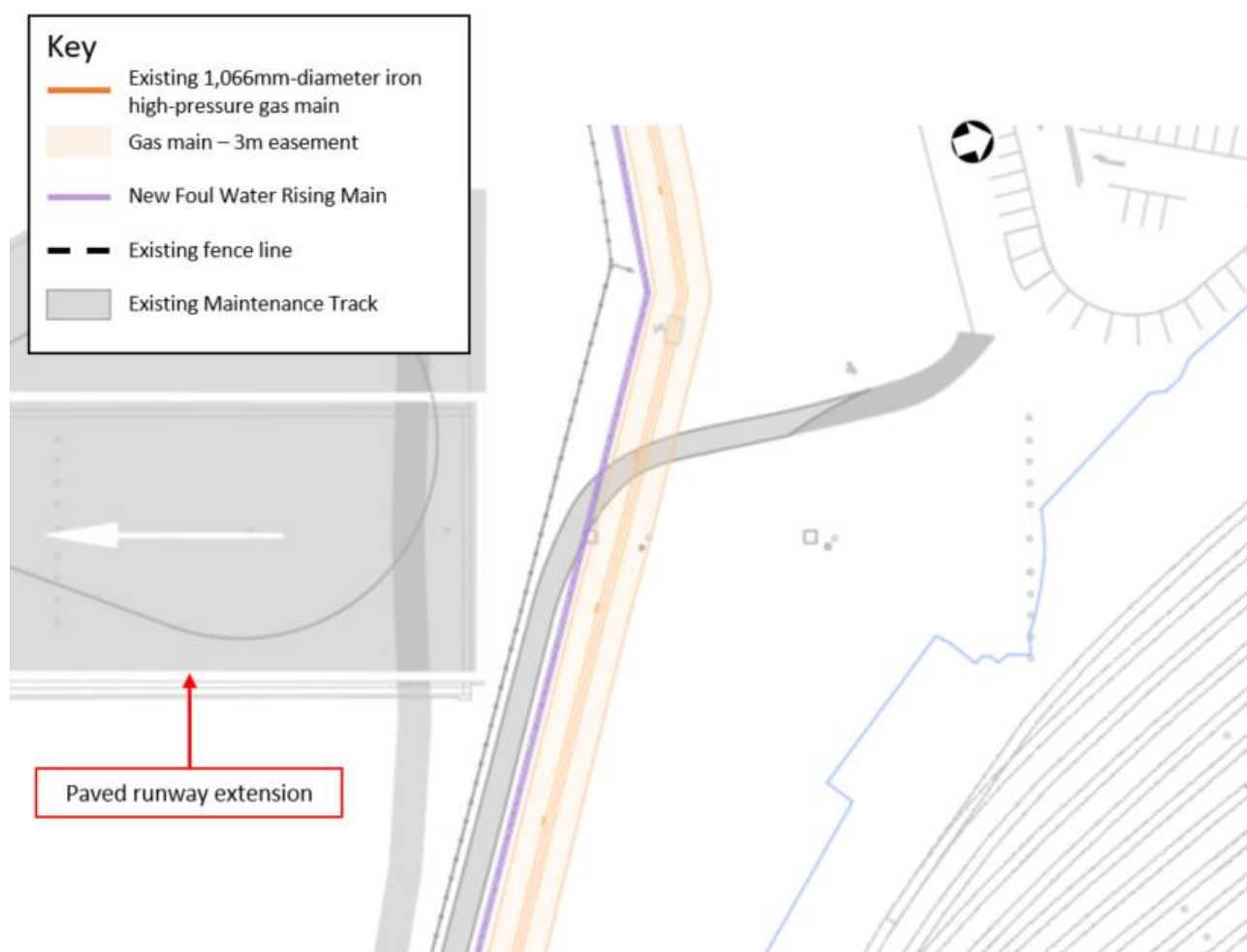
Whilst this note aims to provide sufficient information to SGN to assess and approve the proposed works in the vicinity of their asset, SIAL will continue to engage and consult SGN throughout the project during any works within the easement to ensure the gas pipeline is protected and agreed working practices are followed.

2 Maintenance Track

2.1 Existing Information

An unsurfaced maintenance access track currently runs east from the Airport's Long Stay Car Park, passing to the north of the runway. It is used occasionally by the Airport's contractor for maintenance purposes, with access controlled by a locked gate to prevent use by the public.

Figure 2.1: Existing maintenance track above the gas pipeline



Source: Mott MacDonald

No intrusive survey has been carried out on the track and its structure is unknown; however, it is understood that there is currently no specific protection measure in place (i.e. load-relief structure) at the point where it crosses the gas pipeline.

Where the track crosses the gas pipeline, it is understood from GPR surveys that the pipeline runs at a depth of c. 1.70m below ground level.

Further information provided by SGN indicates the following information:

Table 1: Gas pipeline - asset information

Item	Information
Name	P006 Lordswood to Purbrook
Pipe Diameter	1066.8mm
Pipe Wall Thickness	12,7mm
Pipe Grade	X56
Pipe MOP	26.2 barg
Estimated temperature of pipe at time of tie-in	15°C
Maximum Operating temperature (including future)	not required
Location of bends or tees relative to pipeline protection slab	none
Type of bend (forged?)	n/a
Radius of Bend	n/a
Angle of Bend	n/a
Are the pipe welds subject to the requirements of SGN/PR/P/18	Yes
Requirements for access to pipe in the event of an emergency arising	access required
Building Proximity Distance	3m

Source: SGN, P006 Lordswood to Purbrook Pipeline Data, June 2020

It is understood that SGN carries out their own load assessments to determine the requirements for load protection above the gas pipeline and the information presented in the subsequent sections aims to provide SGN with sufficient information to validate the proposed design to confirm the conclusions within this technical note.

2.2 Anticipated Life of the Realigned Maintenance Track

As part of the Solent Freeport, the Airport has plans to develop land north-east of the runway in the near to medium-term, which would require the complete removal of the maintenance track outside the airfield security fence, rendering the track crossing of the gas pipeline redundant. It is therefore anticipated that the re-aligned track indicated in Figure 1.1 will remain in-situ for 24-36 months only.

As for all developments, uncertainty remains and it is possible that current expectations are not met, resulting in the re-aligned track remaining in-situ for a longer period of time.

2.3 Anticipated Traffic Loading

Trafficking of the re-aligned maintenance track will be limited to a discrete number of movement types, outlined below.

2.3.1 Airport Maintenance

Once re-aligned, there is no expectation that maintenance access traffic will fundamentally change compared to the existing situation. We have been advised by SIAL that the track is currently used predominantly by “4x4” vehicles for maintenance of the adjacent airport fence and landscaping.

The total number of movements by maintenance vehicles is anticipated to be around 20 per year (10 maintenance activities), with occasional movement of light truck (7.5T).

2.3.2 Construction Traffic

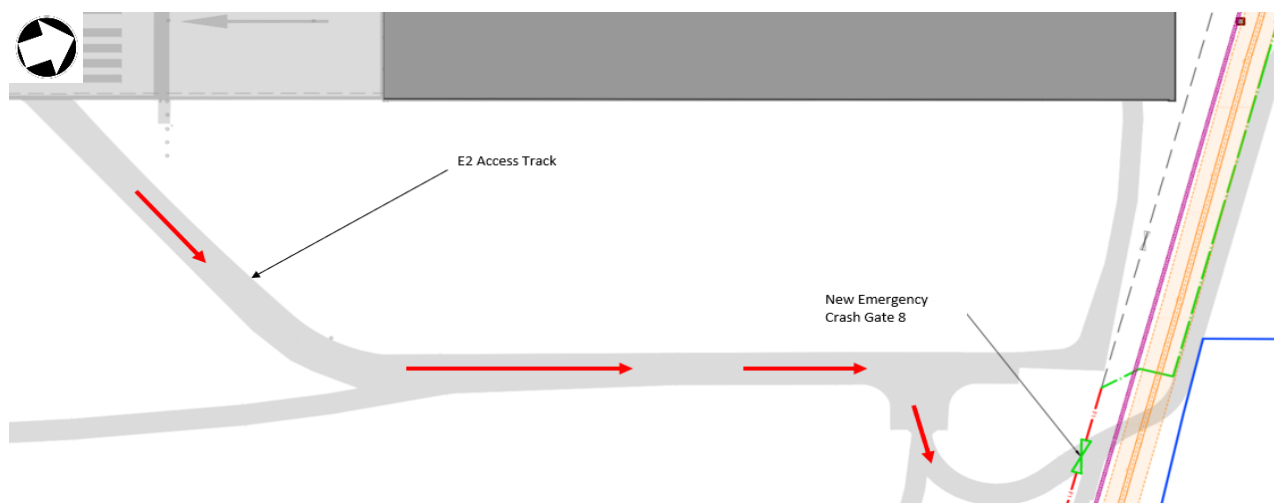
For the runway extension works, the contractor compound will be located west of the runway, near the existing fuel farm. Access to the project site will be via the existing airside road and therefore trafficking in the vicinity of the gas pipeline will be limited to the minimum necessary (i.e. for the realignment of the track itself and for the construction of the re-aligned security fence).

The total number of movements by construction vehicles on the track is currently unknown but expected to be limited and controlled, if required.

2.3.3 Emergency Vehicles

The existing Crash Gate 8 (CG8) located directly north of the runway will be relocated to the east, meaning that in the unlikely event of an Airport emergency north of the airfield security fence, the Airport’s fire fighting vehicles may access the incident site via the E2 access track and CG8, crossing the gas pipeline.

Figure 2.2: Emergency route for Fire Fighting vehicles



Source: Mott MacDonald, 400602-MMD-00-XX-DR-C-0044-Fence Alteration Layout.pdf & SIAL, Peri track access.docx

The Airport’s Fire Service confirmed that the track would not be used for training but only in the event of an actual emergency. The largest vehicle currently operated by the fire service is the Rosenbauer Panther¹, a 39,000kg, 3-axle Aircraft Rescue and Fire Fighting Vehicle.

The total number of movements by emergency vehicles over the life of the track is anticipated to be zero, however its use cannot be ruled out.

¹ https://www.rosenbauer.com/fileadmin/sharepoint/products/airportvehicles/panther/TEST_Datenbltter/DS_PANTHER6x6neu_A146_X2S0081_V2_en.pdf

2.4 Proposed Maintenance Track Design

2.4.1 Design Methodology

It is intended that the realigned maintenance track is unpaved at the crossing with the gas pipeline, as per the existing track.

A conservative design has been developed based on the Giroud-Han design method which is widely used to determine the thicknesses of unreinforced and geosynthetic reinforced aggregate bases for unpaved roads over soft subgrade^{2,3}. *Secucalc*, a proprietary software provided by manufacturer Naue Geosynthetics was used to produce this design.

Two designs have been produced: with and without a geosynthetic reinforcement (“geogrid”).

2.4.2 Design Parameters

Ground conditions

Geotechnical investigations have been carried out in the vicinity of the maintenance track as part of the runway extension works and it has been determined that a CBR of 4% is appropriate to use across the site.

Design life

As a result of the uncertainty with regards the future development east of the airport, a design life of 10 years has been used.

Traffic loading

Due to the uncertainty related to trafficking by heavy vehicles (i.e. construction and emergency vehicles), two cases have been run:

Load Case 1:

- 3 standard axles per month for a light truck,
- 1,000 standard axles for construction traffic (conservative assumption),

Load Case 2:

- 1 fire truck per year with an assumed weight of 70,000kg (conservative use of software vehicle database).

For both load cases, a 1100kPa tyre pressure was used.

2.4.3 Output Design

The design developed based on the inputs mentioned in sections 2.4.1 and 2.4.2 shows that the traffic “Load Case 1” results in the most onerous design requirements. The proposed designs are hence based on this anticipated worst-case loading scenario, resulting in:

- With a geogrid: 200mm Type 1 granular base + geogrid (assumed to be Naue Secugrid 40/40).
- Without geogrid: 350mm Type 1 granular base

² Giroud, J. and Han, J-H. 2004a. Design method for geogrid reinforced unpaved roads. I – Development of design method. Vol. 130. No. 8. pp 775-786. Journal of Geotechnical and Geo-environmental Engineering. American Society of Civil Engineers.

³ Giroud, J. and Han, J-H. 2004b. Design method for geogrid reinforced unpaved roads. II – Calibration and applications. Vol. 130. No. 8. pp 787-797. Journal of Geotechnical and Geo-environmental Engineering. American Society of Civil Engineers.

Due to the constraints of the site and the availability of Type 1 material, the unreinforced design has been selected.

Given the depth of the gas pipeline, the low frequency of trafficking and the precedent of the existing, unpaved maintenance track crossing the gas pipeline, it is understood that no specific protection measures shall be required for the realigned maintenance track to cross the gas pipeline. This conclusion is subject to approval by SGN on the basis of their design requirements, not currently fully shared with SIAL.

3 Security Fence

3.1 Existing Information

GPR survey conducted as part of the runway extension design noted that the pipeline runs approximately 2.20m below ground level at the Western fence crossing, and approximately 1.80m below ground level at the Eastern fence crossing.

Trial pits carried out by Southern Water as part of the Rising Main relocation project have not been shared with Mott MacDonald.

3.2 Design Requirements

Airfields are highly secure environments and as such need to conform to stringent standards when it comes to the security fence. These standards are detailed in BS 1722: Part 10 and will require the installation of fence posts within the 3m easement of the gas pipeline owing to spatial constraints.

It is noted that information provided by SGN in June 2020 confirmed that construction within 3m of the gas pipeline would be possible, provided fence post foundations are at least 1.5m from the edge of the pipeline (either side) and are made of concrete. However, at the point of crossing this would result in a 4m spacing between two posts (1.5m easement, 1m pipeline, 1.5m easement) which would not meet the requirements of BS1722:10 (3m max spacing).

3.3 Proposed Design

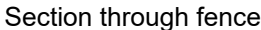
A typical detail is provided in Appendix A of this technical note.

At present, two solutions are anticipated for the foundations of the posts:

- Standard foundation for intermediate posts where required,
- Installation of a top and bottom rail with floating posts when these are located within 1.5m from the edge of the pipeline.

At the time of writing this technical note, the choice of fence supplier is yet to be finalised and therefore final design of the fence and foundations for the posts is not available however, both outline options are proposed to SGN for their assessment and approval.

A. Fencing - Typical Detail



INTERMEDIATE POST
SCALE 1:25



STRAINING POST
SCALE 1:25

