



POWER STATION FUEL LINE

Options Appraisal

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SHG Airport Directorate on behalf of Airport Project Team

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Interpretation

Airport Development Ordinance: An ordinance to facilitate the design, construction and operation of an airport in St. Helena, and for purposes connected therewith or incidental thereto

Airport Development Area - The parcels of land and other areas described in the Schedule are designated as Airport Development Areas (Rupert's Valley: Parcel Nos. 25, 31, 32, 33, 35, 36, 46, 47, 54, 57, 63, 75, 76, 77 and 79)

Environmental Statement (ES) – Faber Maunsell/AECOM 2008 Detailed Environmental Assessment

Background

Governor-in-Council granted development consent for the St Helena Airport Project and Supporting Infrastructure in September 2008. This included provision for fuel systems in Rupert's Valley.

The development planned in Rupert's in relation to fuel systems is set out in sections 4.35 – 4.43 of the Airport Project Planning Statement (2008) and includes:

- A Bulk Fuel Installation (BFI) in Upper Rupert's (commonly referred to as the Permanent BFI);
- Retention of some of the existing fuel facilities at Rupert's Bay;
- A new floating pipeline system (i.e. the ship to shore transfer arrangement for fuel);
- A new land-based pipeline arrangement (i.e. the fuel transfer arrangement from the Bayside to the Permanent BFI and from the Permanent BFI to the Power Station);
- Decommissioning of the existing fuel facilities that will no longer be required.

The existing fuel systems cater only to ground fuels i.e. petrol (Gasoline) and diesel (Gasoil). The planned development will provide upgraded fuel facilities that will also handle aviation fuel (Jet A1).

This document relates solely to a section of the pipeline arrangement from the Permanent BFI to the PowerStation.

The original proposed arrangement was set out in reference design 5098141-CI-01-1300 an extract of which is shown in Figure 1.

During the course of the design process under the design and build contract, a number of factors have been considered and it is the view of the Airport Project Team (Basil Read, PMU, SHG) that the design should be updated.

Request for Development Consent

Development consent is therefore sought to amend the original development consent granted for the Airport project in respect of the relocation of a section of the fuel pipeline to the Power Station. From the Permanent BFI the pipeline follows the same route as the two fuel transfer pipelines from the Bayside to the Permanent BFI and makes use of the same pipe supports. This request relates to the section of the pipeline between the route of the two fuel transfer pipelines and the Power Station.

Development consent is sought under Section 8 of the Airport Development Ordinance (2006). The Ordinance makes provision that anything done in a designated 'Airport Development Area' with the consent of the Governor-in-Council is to be treated as done with development permission under the Land Planning and Development Control Ordinance.

Fuel Line to the PowerStation

Section 14 of the Airport Design Build, Operate and Handback contract covers the construction of a Bulk Fuel Installation in Upper Rupert's for the storage and distribution of Gasoil, Gasoline and Jet A1 Fuel. The contract specifies that the fuel supply to the PowerStation must be gravity fed. The purpose of this method of supply being to reduce the risk of failure of supply to critical infrastructure, and to reduce operating and maintenance costs.

The contract also states (Revised Section 14, Page 19) that all connecting pipe-work shall be located above ground or in a service duct to permit inspection and maintenance.

The reference design drawing provided for this aspect of the works shows this pipeline to the Power Station running across the front of the Old Gaol site. From here it is unclear as a line is included to the existing BFI Office with a small line also to the Power Station. A fuel line to the existing BFI Office is not required therefore for the purpose of this document the Tender Route referred to is the line shown in red on Figure 1 below.

The Old Gaol site is a recognised heritage feature, designed by Colonel Joshua Jebb and built in late 1855. It was occupied until 1867 when it was gutted by a fire and abandoned.

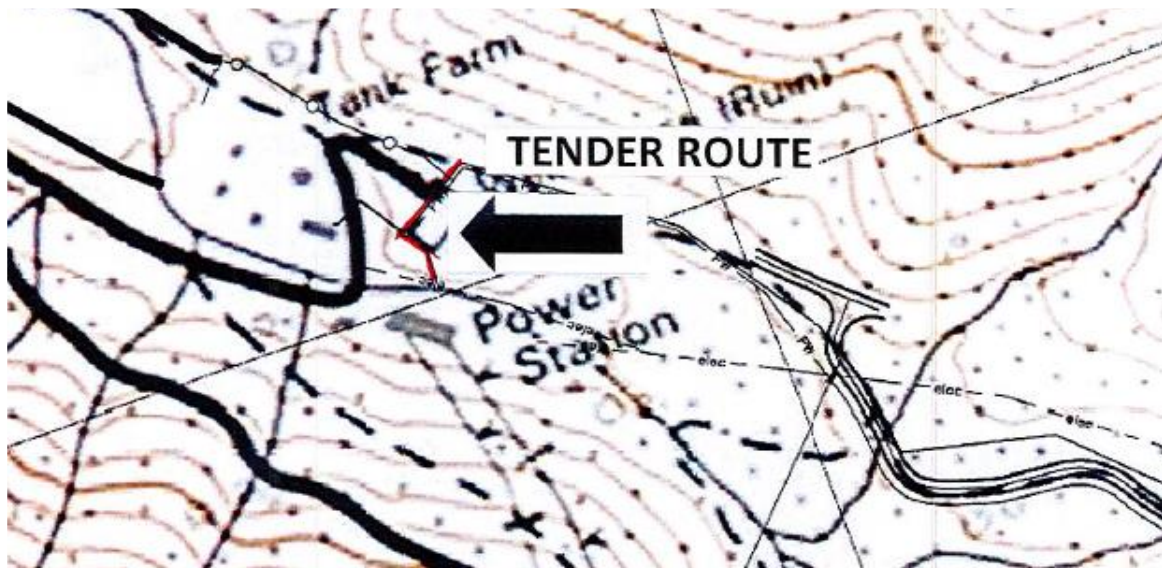


FIGURE 1: EXTRACT FROM 2008 REFERENCE DRAWING



FIGURE 2: OLD GAOL SITE- TENDER ROUTE

The area in question is in the vicinity of a known burial site as illustrated in Figure 3 below. The Power Station is located within this burial site and therefore all pipeline routes will pass through a section of the site.

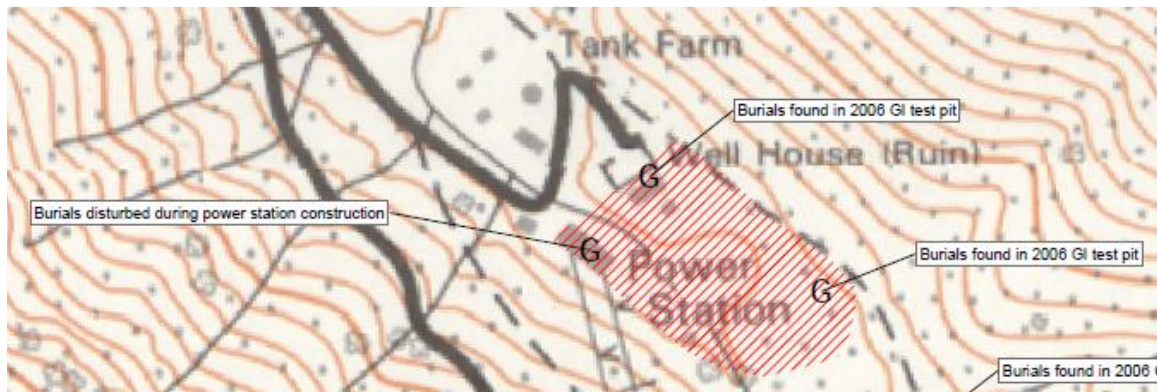


FIGURE 3: EXTRACT FROM ES ENVIRONMENTAL STATEMENT FIGURE 11.8 KNOWN BURIAL LOCATIONS

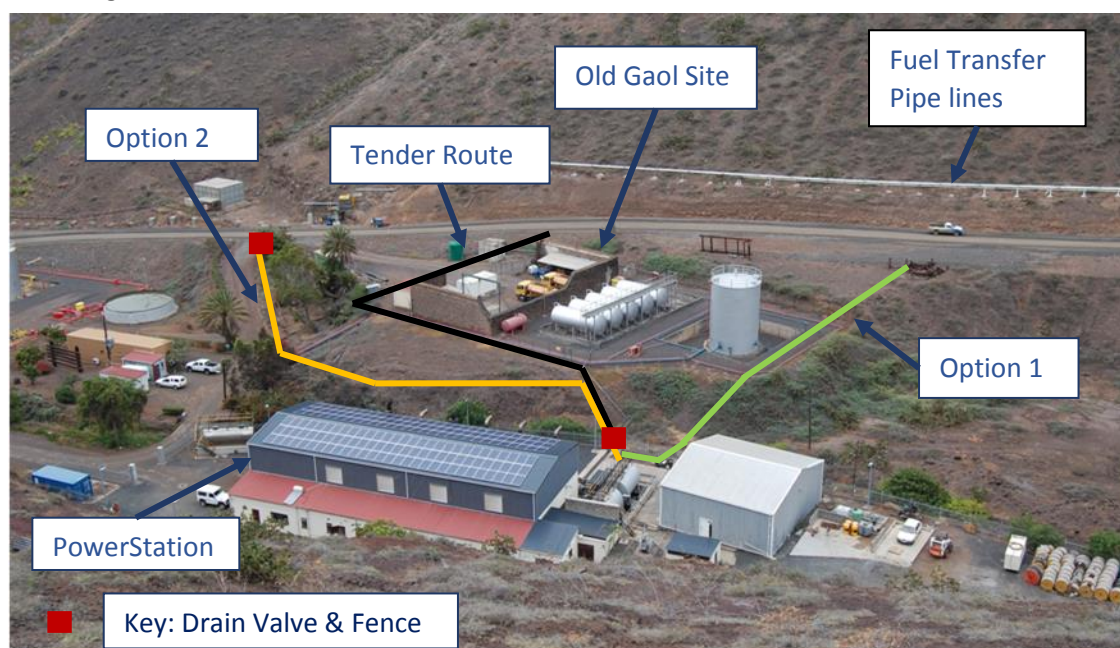
To enable continued access to the Old Gaol site it would be necessary for the pipeline along this section to be installed in a service duct which would therefore require excavation as well as continued access for inspection and maintenance through this sensitive area.

During the detailed design process, in order to minimise the environmental impact from excavating in a sensitive area and to provide the optimal technical route a number of route options have been explored.

Route Options

These are referred to as follows and are depicted in Figure 4 below:

- **Option 1:** This route runs above ground along the existing fuel storage platform behind the 'Old Gaol'
- **Option 2:** This route ties in with the existing road access between the Airport Access Road, BFI Site and PowerStation
- **Option 3 (Tender Route):** This is the route depicted in the tender documentation and runs along the front of the 'Old Gaol'



• FIGURE 4: ROUTE OPTIONS

Option 1

The proposed route for Option 1 runs through the known burial ground however it passes through the area that was excavated in 2008 and then borders the existing fuel storage area before connecting with the Power Station.

The designers XPE recommend this route at the base of the existing storage area however to minimise the risk of disturbing remains it is proposed that the route is located at the top of the mound and within the existing fuel storage boundary.

Due to the development of this area there should be minimal risk of disturbing remains. However it is proposed that to further mitigate this risk the pipeline is installed above-ground in order to minimise the environmental impact through excavation works.

It is estimated that fifteen plinths will be required to carry the pipe line. These plinths have been designed to sit on the surface and where minor excavation works are required for levelling purposes this will be done by hand in accordance with CEMP protocol. Details of the plinths are shown on Figure 5 below.

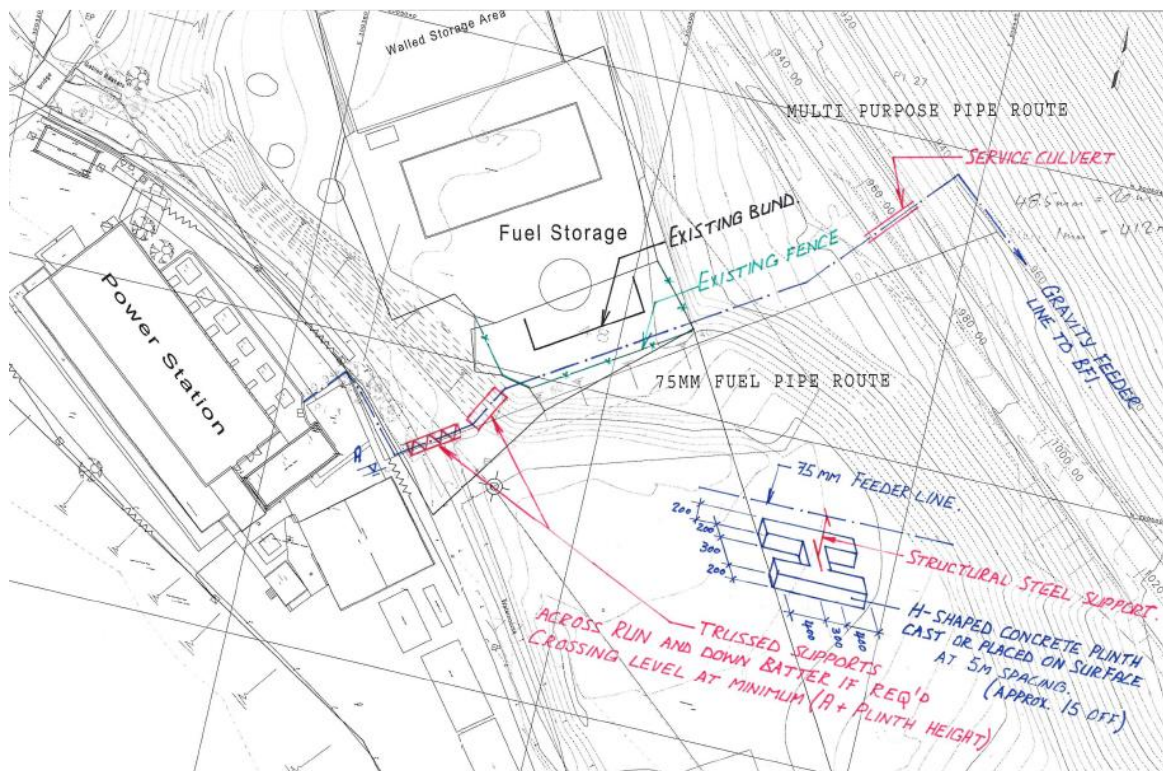


FIGURE 5: ROUTE OPTION 1 – PLINTH DETAILS

From a technical perspective this route is the shortest of all the options, and as a result friction is reduced and the flow rate is optimal. There are no low points and therefore no additional drains or pumps are needed.



FIGURE 6: ROUTE OPTION 1

Option 2

The first section of this route lies outside of the known burial grounds. The route travels along the airport access road crossing the road access to the Old Gaol site and travels back up along the run to tie in with the Power Station. This route extends the pipeline by 145meters and due to the difference in heights it will require a drain point below ground level immediately after the road crossing culvert and a drain point where the pipe meets the run. At each of these drain points there will need to be a below ground sump and a 3x3m fence and locked gate arrangement to protect the valves from being tampered with.

From the culvert the pipeline will run on plinths and travel along the Run for some length and if a leak were to occur there is a greater risk of contamination.



FIGURE 7: ROUTE OPTION 2

Due to the added drain points and length this is the least preferred option from a technical perspective as it also has higher friction, a reduced flow rate and will require additional maintenance.

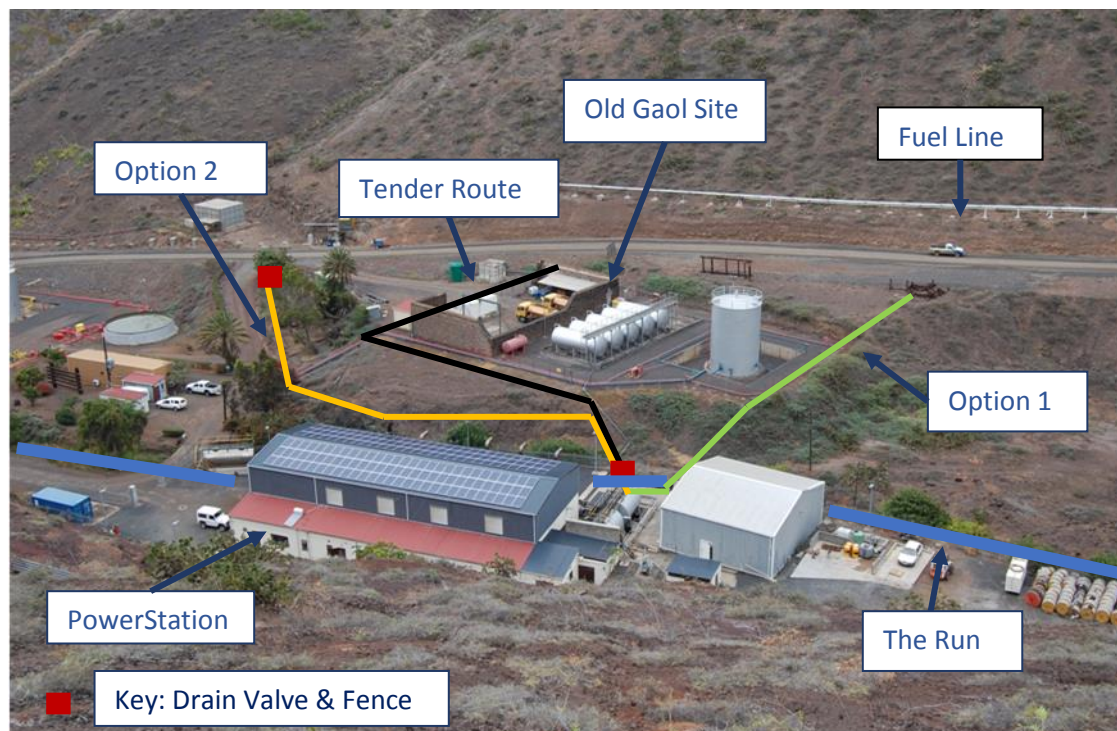


FIGURE 8: ROUTE OPTIONS

Whilst travelling along an existing track this pipeline will transverse through an area that could be rehabilitated and therefore segregates the two areas.

Option Three - The Tender Route

The Tender Route as shown in Figure 4 in black will cut across the front of the Old Gaol, a listed historical structure. In order not to restrict access to the building and the area behind it which is currently used for fuel storage intrusive ground works would need to be undertaken for the installation of the pipework. .

This will be the only section of pipe in the system that is installed below ground level except for the road crossings and would need to have measures to allow access to inspect and maintain the pipework.

Whilst shown to be outside of the known burial area, (Figure 2) due to the proximity to the burial site there is still a risk of disturbing remains. The excavation will require the removal of a section of cobble stone paving

The pipeline will segregate the plot.

Option 4

The option of running the pipeline down to the temporary fuel facility below the mid valley site before crossing the valley and connecting back up to the Power Station was explored however is not feasible due to the location of existing electrical services. A fuel pipeline cannot be located within

15.24m of an electrical service. Gravity feeding is not an option with this proposal. The increased installation and long term maintenance costs are also factors that count against this option.

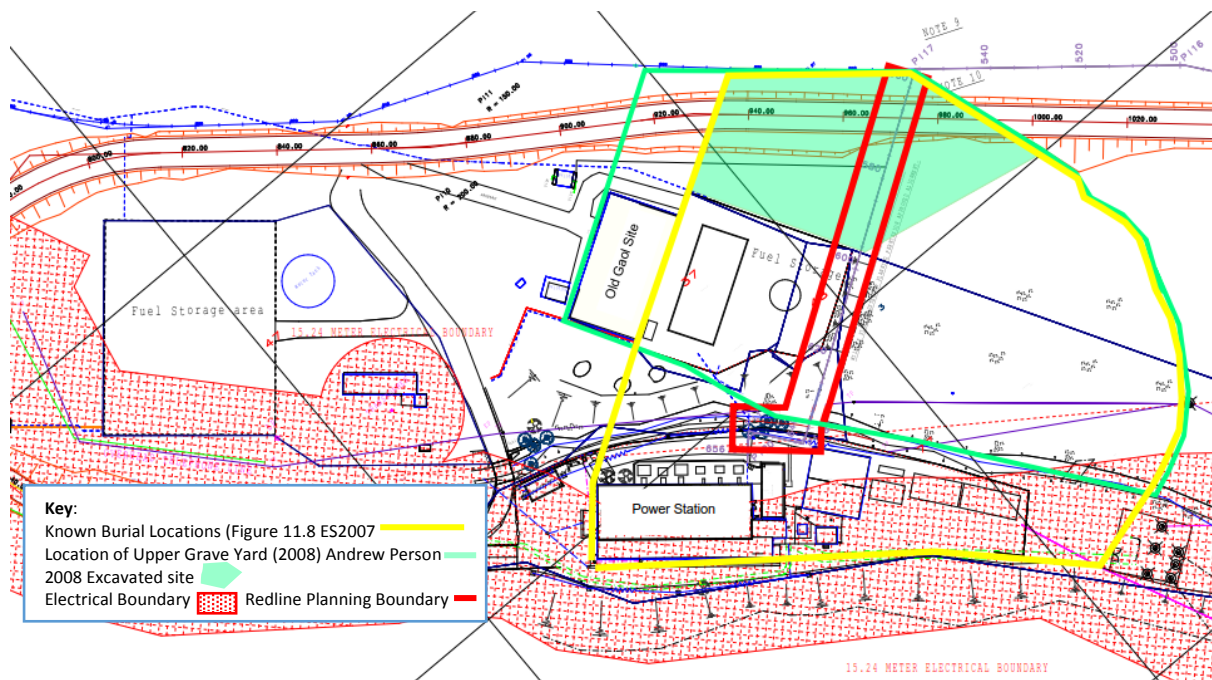


FIGURE 9: ELECTRICAL BOUNDARY

Option 5

Using a fuel tanker to transport fuel from the Permanent BFI to the Power Station. This was discussed as an option but will impose a high operating cost and also capital costs at Connect Saint Helena. . Whilst this is considered a backup in case of unavailability of the pipeline, if this option was adopted, then there would be no backup if the road tanker broke down.

Environmental Impact Assessment

A number of site walkovers have been carried out engaging Heritage, National Trust, Environmental Management Division, Connect Saint Helena, Planning Department, Penspen and Solomon & Company in the options appraisal.

So far, the options appraisal has explored technical aspects of the design. All five options are technically feasible, with varying degrees of complexity and cost involved.

The next stage in developing the options appraisal was to assess alongside the technical merits of each option, the environmental considerations so that there is a joined up options appraisal from a technical, environmental and financial perspective.

The environmental considerations were originally assessed under the Environmental Statement (2008 Vol. 2 chapter 11). The key considerations in this location as identified by the earlier studies were heritage/archaeological.

This has led to further assessment of archaeological factors. A weighted assessment was conducted by the contractor and the results are shown in the table overleaf.

Archaeological Impact Assessment for Proposed Routes

Proposed Routes	Archaeological Impact	Mitigation in design and Construction	Residual impact/ risk
<p>Option 1 (Technically Preferred Route) Pipe from the new BFI on the same supports as the other pipes, culvert under the road, and then on supports alongside the fence of the existing mid-valley diesel storage area and down to the power station</p>	<ul style="list-style-type: none"> • A-B traverses through area cleared of burials in 2008 in anticipation for the haul road; due to the slope, pins would have to be used on this section • B-D traverses on cut to fill platform; level area, should not require pins for plinths • D-E crosses the water course, burials unlikely but possible, pins required due to slope • A-E through a Known Burial Ground 	<ul style="list-style-type: none"> • Watching Brief to be implemented • Watching Brief to be in place; No excavation/ ground intrusive works • Watching Brief to be in place; No excavation; route to follow crossing of existing pipe as far as practically possible • Route cuts through a known burial ground, therefore permission for use other than burial is required by ENRC and the Governor as per the Burials Ordinance. 	<ul style="list-style-type: none"> • (-) Any accidental uncovering of any remains can cause serious delays to construction • (-) Permanent Structure through a Heritage Site

Proposed Routes	Archaeological Impact	Mitigation in design and Construction	Residual impact/ risk
Option 2: pipe from the new BFI on the same supports as the other pipes, culvert under the road, buried near the Old Gaol following the junction along the road to the power station	<ul style="list-style-type: none"> The last section of pipeline crosses the water course, burials are unlikely but possible, pins will be required. 	<ul style="list-style-type: none"> Part of the route cuts through a known burial ground, therefore permission for use other than burial is required by ENRC and the Governor as per the Burials Ordinance. 	<ul style="list-style-type: none"> (-) Permanent Structure through a Heritage Site (-) Any accidental uncovering of any remains can cause serious delays to construction
Option 3-Tender Route: pipe from the new BFI on the same supports as the other pipes, culvert under the road, buried in front of the Old Gaol, and then on supports round the existing mid-valley diesel storage area and down to the power station	<ul style="list-style-type: none"> Based on revised 2008 map by Andrew Pearson, the location of the Upper Graveyard extends to include the Old Prison Ruin and the area to the north of it (blue stippled line) Cobble stone pavements linked to the Liberated Africans are present along the entrance of the Old Prison Ruin 	<ul style="list-style-type: none"> Watching Brief to be in place; Limited excavation/ground intrusive works Archaeological excavation and recording of cobble stone pavements, restoration/ replication/ compensation of destroyed sections 	<ul style="list-style-type: none"> (-) Permanent Structure through a Heritage Site (-) Any accidental uncovering of any remains can cause serious delays to construction (-) Damage to listed heritage feature

Figure 10 below shows the recorded burial grounds and the area that was excavated in 2008.

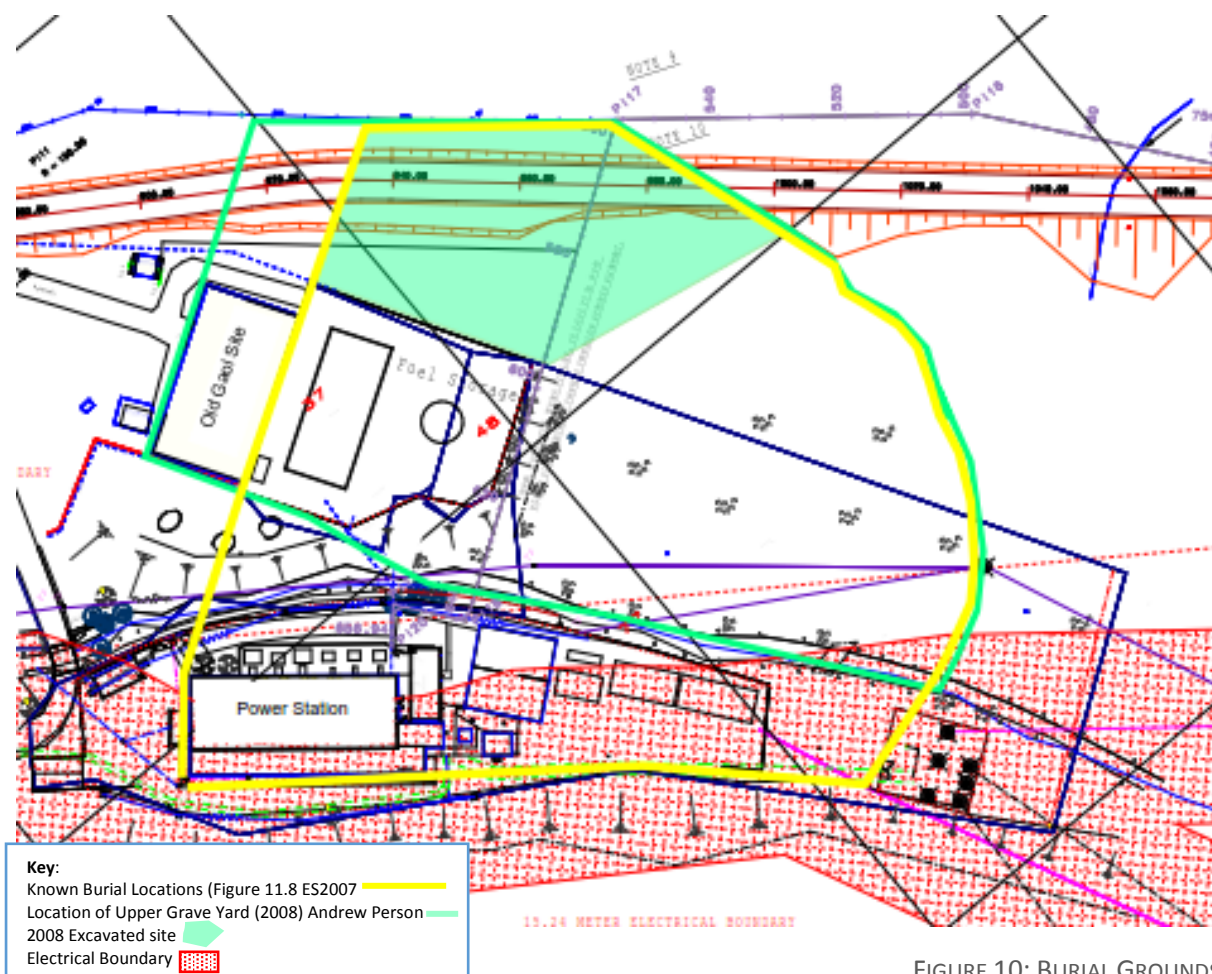


FIGURE 10: BURIAL GROUNDS

Summary of Findings

The table below summarises the evaluation criteria applied to each option. As discussed above, each option was appraised on Environmental, Health & Safety, Engineering and Economic criteria. Each Category was further detailed into sub-categories and ranked with the highest score associated with the highest impact.

Evaluation criteria	Option 1 (with mitigation implemented)	Option 2	Tender Option (Option 3)	Option 4	Option 5
ENVIRONMENTAL CRITERIA (5 = significant impact; 3 = moderate impact; 0 = no impact)					
Archaeology and heritage	3	1	5	1	0
Invertebrate habitat (Samphire)	1	1	1	2	0
Proximity to watercourses	1	1	1	3	0
Aesthetics	1	3	2	3	0
Planning permission (5=Planning Permission Required 0 = No Planning Permission Required)	5	5	5	5	0

Evaluation criteria	Option 1 (with mitigation implemented)	Option 2	Tender Option (Option 3)	Option 4	Option 5
HEALTH AND SAFETY (5 = high risk to public safety; 3 = medium risk; 1 = low risk)					
Risk to public (applicable work permits)	2	2	2	2	1
Traffic control (culvert and pipe construction)	2	2	2	2	0
ENGINEERING AND ECONOMIC CRITERIA (5 = significant cost/engineering risk; 3 = moderate cost/risk; 1 = low cost/risk)					
Route length	1	5	3	5	0
Number of road culverts needed	2	2	2	3	N/A
Number of new plinths needed	1	3	2	5	N/A
Potential for deadlegs	1	4	3	5	N/A
Number of pipeline bends	1	4	2	5	N/A
Amount of intrusive groundwork required	1	2	3	5	N/A
Operating cost	1	3	2	5	5
Total score	23	38	35	51	6

From the above table Option 4 has the highest impact overall particularly from the engineering and economic perspective due to the length of the pipeline, the levels and the proximity to the existing electrical network which would have to be removed.

Option 5, transporting the fuel in fuel tankers has the lowest impact from the criteria given. However it should be noted that on average nine trips would have to be made per week delivering 5,000 litres per trip and each trip would take an hour which attributes to the operating costs. Costs involved in upgrading infrastructure at Connect for this to be a permanent arrangement have not been factored in.

Options 2 and 3 are relatively close in terms of impact with Option 3 being favourable from the engineering and economic perspective.

Option 1 with the planned mitigation measures has a moderate impact overall with a low engineering and economic impact.

Recommendation

Based on the work undertaken it is recommended that the route of the Power Station fuel pipeline be amended to Option 1, this being the most technically efficient route and although it also travels through the known burial area it has the least environmental impact as it transverses through an area that has been previously developed. Due to the land contours there is a natural border and therefore the pipeline does not segregate any areas as it would in options 2, 3 & 4.