Item: 6

Development and Infrastructure Committee: 6 June 2023.

Churchill Barrier No 1 – Road Pavement Reconstruction.

Report by Corporate Director for Neighbourhood Services and Infrastructure.

1. Purpose of Report

To consider a Stage 1 Capital Project Appraisal in respect of road pavement reconstruction of the A961 at Churchill Barrier No 1.

2. Recommendations

The Committee is invited to note:

2.1.

That concerns over the deterioration of the road surface at Churchill Barrier No 1 have been raised by members of the public and residents of the linked south isles over a number of years.

2.2.

That defects, in the form of longitudinal cracking and surface undulations, have been observed over recent years and various investigations have been undertaken to establish a cause for these.

2.3.

That, in 2019 and as a result of concerns regarding the safety of motorists, particularly motorcyclists travelling over Churchill Barrier No 1, an advisory 40mph speed limit was introduced for all traffic.

2.4.

That immediate priority works have been identified, including repairs to the worst areas of surface cracking and undulations on Churchill Barrier No 1, at an estimated cost of £35,000, which are planned to be undertaken in the current financial year, being funded from the Roads Revenue Maintenance Programme.

2.5.

The Stage 1 Capital Project Appraisal in respect of proposed road pavement reconstruction at Churchill Barrier No 1, attached as Appendix 1 to this report, which recommends that Do Something Options 2 and 3 be progress to a detailed Stage 2 Capital Project Appraisal.

2.6.

That, should the project be approved for progression through the Capital Project Appraisal process, a sum of £45,000 is required to develop the Stage 2 Capital Project Appraisal, which can be met from the budgetary provision, previously agreed by the Capital Programme and Asset Management Sub-group in November 2021.

It is recommended:

2.7.

That, as an exception to the Capital Project Appraisal process, in order to address longstanding road safety concerns, the Corporate Director for Neighbourhood Services and Infrastructure should submit, to the Policy and Resources Committee, a Stage 2 Capital Project Appraisal in respect of proposed road pavement reconstruction at Churchill Barrier No 1.

3. Background

3.1.

Churchill Barrier No 1 is one of four causeways that link the islands of Lambsholm, Glimps Holm, Burray and South Ronaldsay to mainland Orkney. As such, the route provides a vital lifeline link to schools, the hospital and other services located on Mainland to communities and residents of the linked South Isles.

3.2.

In 1987, the carriageway was raised and widened with the casting of an additional concrete edge beam, and safety barriers were added. In 2000, the barrier was resurfaced.

3.3.

Defects in the form of longitudinal cracking have been observed over recent years and since 2017 various investigations have been undertaken to understand the reason for the failures. Additionally, concerns have been highlighted over surface undulations which represents a particular risk to motorcyclists. For this reason, a 40mph advisory speed limit was put in place for all motorists in 2019.

3.4.

In July 2019, ground penetrating radar surveys undertaken longitudinally along both lanes showed the presence of surface defects on Barrier No 1, but also highlighted shadows indicating potential voids deeper in the barrier construction. This data was deemed to be inconclusive without further intrusive investigations to establish the nature and extent of any voiding.

3.5.

In November 2021, following a report to the Capital Planning and Asset Management Sub-group, funding of £100,000 was allocated from the Capital Project Appraisal Fund towards further investigations and design work to identify the root cause of

pavement defects at Barrier No 1 and also potential solutions. To date £50,294 has been spent on these works, leaving a balance of £49,706 available within the project budget to progress the Stage 2 Capital Project Appraisal for the proposed pavement reconstruction works at Churchill Barrier No 1.

4. Consultants' Report

4.1.

In August 2022, following a competitive procurement process conducted under the Scotland Excel Framework for Engineering Consultancy services, Mott MacDonald were appointed to provide specialist pavement engineering support and advice.

4.2.

The brief provided to Mott MacDonald was to take a forensic approach to reviewing all previous surveys and reports, including historical information around the barriers' construction and previous improvements, as well as the widening and raising of the road undertaken in the 1980's. The scope of the commission specifically included:

- Review all existing data, including previous investigations, surveys and reports.
- Prepare a Pavement Condition Assessment Report.
- Review existing construction details.
- Prepare a report identifying the root cause(s) of existing defects.
- Prepare costed options for repair.

4.3.

In January 2023, following a review of existing data, additional intrusive investigations were carried out in the form of four trial pits (two on the northbound lane and two on the southbound lane) including two locations specified by Mott MacDonald where voiding was potentially present.

4.4.

In March 2023 the Pavement Assessment Report submitted by Mott MacDonald concluded that the pavement defects evident at Barrier No 1 are attributable to the construction and movement of the barrier. In particular, the problems identified in the road surface are not entirely new and the evidence is that very similar problems to those present have been seen in the past and that there are multiple inter-related factors contributing to road pavement failures that reoccur over time. These include how the barrier was constructed, the quality of materials that were used and the impact of tidal and wave action on the barrier.

4.5.

The way the barriers were constructed means it is a 'flexible' structure and the pavement defects, particularly the cracking, that are being observed are a function of the barriers' natural behaviour. This behaviour can be expected to continue and will exhibit itself as pavement defects again in the future. However, with better construction of the upper pavement layers and sub-base, it is expected that these

defects will be more manageable in the future. The expectation is that the pavement is likely to crack again but this should be manageable through general crack sealing.

4.6.

The undulations that have been occurring are driven by poor quality sub-base materials. These are not expected to reoccur if a remedial option that involves replacing the current sub-base with a compliant Type 1 material is chosen.

4.7.

The Pavement Assessment Report identifies a number of treatment options that include do minimum, do something and also recommended immediate priority works.

4.8.

The immediate priority works identified include repairs to the worst areas of surface cracking and surface undulations where there is a particular risk to vulnerable road users (motorcycles). This includes a 50mm surfacing inlay over the full width of the northbound lane over a length of approximately 150m. The cost of this work is estimated to be £35,000 based on other similar works and is planned for the current financial year, to be funded from the Roads Revenue Maintenance Programme.

5. Options Appraisal

5.1. Do Minimum

This option is intended to address safety issues by only treating the worst cracking and any failed patches/pothole type failures. The treatment would not be eligible for capital funding and would need to be revenue funded and therefore built into the annual Roads Revenue Maintenance Programme for 2024/25.

5.2. Do Something

There are a number of options, which are summarised below, with the depth of reconstruction of existing pavement layers increasing along with estimated costs for each option.

Option 1A.	This option includes the replacement of the existing asphalt with a nominal 150mm asphalt Inlay (without an asphalt reinforcing grid).
Option 1B.	This option includes the replacement of the existing asphalt with a nominal 150mm asphalt Inlay (with an asphalt reinforcing grid).
Option 2.	This option includes the replacement of the existing asphalt with a nominal 150mm asphalt Inlay with an asphalt reinforcing grid and replacement of the existing sub-base material.
Option 3.	This option includes the replacement of the existing asphalt with a nominal 150mm asphalt Inlay with an asphalt reinforcing grid and replacement of the existing sub-base and old tar bound material.

Option 4.	This option includes the replacement of the existing asphalt with a nominal 150mm asphalt Inlay with an asphalt reinforcing grid and replacement of the existing sub-base and old tar bound material with new sub-base being wrapped in geotextile.

5.3. Recommended Treatment Option

When selecting the most suitable option, the following considerations have been made:

- Pavement structure.
- Anticipated service life.
- Duration of works.
- Dealing with tar bound material (hazardous waste).
- Estimated cost.

5.4.

The estimated cost of each option together with an estimated duration (number of night-time shifts) is provided below.

Option.	Estimated Duration (No. of Shifts).	Estimated Construction Cost (incl. contingency).
Do minimum.	5.	£120,000.
Do something – Option 1A.	16.	£920,000.
Do something – Option 1B.	24.	£1,050,000.
Do something – Option 2.	32.	£1,275,000.
Do something – Option 3.	65.	£2,285,000.
Do something – Option 4.	72.	£2,920,000.

5.5.

The difference between Option 2 and Option 3 is the removal of the old tar bound material below the existing sub-base. The additional risk and cost associated with the removal and replacement of the tar bound material is difficult to justify. Option 2 provides an anticipated 20 year life at just over half the estimated cost of Option 3. The risk in adopting Option 2 is that the area of worst condition, where excessive voiding was observed, may still require substantial maintenance treatment during its anticipated service life. All options other than the Do Minimum will include filling voids under the pavement as they are uncovered during the works.

5.6.

Accordingly, it is proposed to progress treatment options Do Something Option 2 and Option 3 to Stage 2 of the Capital Project Appraisal process.

6. Island Communities Impact

As the service being developed in terms of this report has been assessed as being unlikely to have an effect on an island community which is significantly different from its effect on other communities (including other island communities) in Orkney, a full Island Communities Impact Assessment has not been undertaken.

7. Links to Council Plan

7.1.

The proposals in this report support and contribute to improved outcomes for communities as outlined in the Council Plan strategic priority of Developing our infrastructure.

7.2.

The proposals in this report relate directly to Priority I1 Improve Isles Transport Links (review findings with regards to condition of barrier one, develop options for any actions to bring to Committee) of the Council Delivery Plan.

8. Links to Local Outcomes Improvement Plan

The proposals in this report support and contribute to improved outcomes for communities as outlined in the Local Outcomes Improvement Plan priority of Local Equality (transport connectivity in every community improved to the best standard achievable).

9. Financial Implications

9.1.

A Stage 1 Capital Project Appraisal is attached at Appendix 1 to this report with an overview of estimated costs to complete the Stage 2 Capital Project Appraisal phase.

9.2.

With £100,000 initially allocated from the Capital Project Appraisal Fund to develop this project beyond concept stage, £50,294 has been spent to date to develop an outline Stage 1 Capital Project Appraisal leaving a balance of £49,706 available within the project budget.

9.3.

The estimated cost of developing a detailed Stage 2 Capital Project Appraisal is £45,000 (£35,000 external fees and £10,000 internal fees) during financial year 2023/24. This cost will be met from the existing project budget allocated in November 2021.

9.4.

The estimated costs of road pavement reconstruction works at Churchill Barrier No 1 based on Do Something Options 2 and 3 is between £1.275 million and £2.285 million.

9.5.

Immediate priority works to address the worst areas of surface cracking and undulations at a cost of £35,000 funded from Roads Revenue Maintenance Programme 2023/24 will be carried out this summer from within existing revenue maintenance budgets.

10. Legal Aspects

The Council has a statutory duty to secure best value and development of a Stage 2 Capital Project Appraisal for the Churchill Barrier No 1 Road Pavement Reconstruction will support the Council in discharging this duty.

11. Contact Officers

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12. Appendix

Appendix 1: Stage 1 Capital Project Appraisal.

Stage 1 Capital Project Appraisal

Client Service: Neighbourhood Services and Infrastructure.

Project Name: Churchill Barrier No 1 – Road Pavement Reconstruction.

1. Background

The project is required to address long standing concerns over the current condition of the road surface at Churchill Barrier No 1. The Churchill barriers provide a vital transport link between the mainland of Orkney to the south isles of Lambsholm, Glimps Holm, Burray and South Ronaldsay. The barriers were last resurfaced in 2000 and road surface at all four barriers is now showing signs of deterioration which could be expected given the length of time since re-surfacing was last carried out. However, the road surface at Churchill Barrier No 1 is notably worse than the other three barriers.

Defects in the form of longitudinal cracking have been observed over recent years and since 2017, various investigations have been undertaken to understand the reason for the failures. Additionally, concerns have been highlighted over surface undulations which represents a particular risk to motorcyclists. For this reason, a 40mph advisory speed limit was put in place for all motorists in 2019.

In August 2022 the Council appointed Mott MacDonald to provide specialist pavement engineering advice specifically with a view to investigating road pavement defects at Barrier No 1.

The Pavement Assessment Report provided by Mott MacDonald (May 2023) identifies a number of treatment options that include do-minimum, do something and also recommended immediate priority works. These are summarised in Section 2 below.

2. Options

2.1 Immediate Priority Works

Immediate priority works include repairs to the worst areas of surface cracking and surface undulations where there is particular risk to vulnerable road users (motorcycles). This includes a 50mm surfacing inlay over the full width of the northbound lane over a length of approximately 150m.

2.2 Do Minimum

This option is intended to address safety issues by only treating the worst cracking and any failed patches/pothole type failures. The treatment comprises a series of Inlaid Crack Repairs (40mm deep and 150mm wide) using a Clause 711 Flexible grade material together with asphalt patching to areas of failed patching or pothole type failures that constitute a safety hazard to road users. The anticipated service life of this option is between one and three years. The function of this option is to keep the pavement in a safe condition until a time when more substantial treatments can be undertaken. These works can be undertaken during daytime or night-time lane closures.

2.3 Do Something – Option 1A

This option is intended to provide a new asphalt surface. However, the optimum service life of the surfacing will be reduced. The treatment comprises the replacement of the existing asphalt with a nominal 150mm asphalt Inlay (without an asphalt reinforcing grid). The anticipated service life of this option is five to ten years. However, it is anticipated that crack sealing and some patching would be required at some point during this period. This is a short to medium term option. It would be fairly easily implemented but it has limited value for money. These works can be undertaken during night-time lane closures.

2.4 Do Something – Option 1B

This option is intended to provide a new asphalt surface with the inclusion of an asphalt reinforcing grid to delay the formation of cracks within the asphalt layers. The treatment comprises the replacement of the existing asphalt with a nominal 150mm asphalt Inlay (with an asphalt reinforcing grid). The anticipated service life of this option is between ten and fifteen years. However, it is anticipated that crack sealing and some patching may be required at some point during this period. This is a short to medium term option with better value for money than Option 1A but still not matching the optimum service life of the surfacing. These works can be undertaken during night-time lane closures.

2.5 Do Something - Option 2

This option is intended to provide a new asphalt surface and replace the existing sub-base type material. The treatment comprises the replacement of the existing asphalt with a nominal 150mm asphalt Inlay (comprising DBM binder course and a High Stone Content HRA surface course with an asphalt reinforcing grid sandwiched in the binder course) and replacement of the existing sub-base type material with a Clause 803 sub-base material at a nominal layer thickness of 150mm. The anticipated service life of this option is anticipated to be up to twenty years. However, deeper localised treatment will be required in the area where excessive voiding was discovered to achieve this. This is a long-term treatment with a service life to match that of the surface course. These works can be undertaken during night-time lane closures. However, output per night will be limited and challenging as there is a requirement to overlap the asphalt reinforcing grid. There is a risk that, over the anticipated service life of up to twenty years, the area of settlement could continue to settle and require further deep treatment.

2.6 Do Something – Option 3

This option is intended to provide a new asphalt surface and replace the existing sub-base type material together with removal of the existing tar bound asphalt and replacement with sub-base on a geosynthetic membrane. The treatment comprises the replacement of the existing asphalt with a nominal 150mm asphalt Inlay (comprising DBM binder course and a High Stone Content HRA surface course with an asphalt reinforcing grid sandwiched in the binder course) and replacement of the existing sub-base type material with a Clause 803 sub-base material at a nominal layer thickness of 230mm on a geosynthetic membrane. The anticipated service life of this option is anticipated to be twenty years plus. However, deeper localised

treatment will be required in the area where excessive voiding was discovered to achieve this. These works can be undertaken during night-time lane closures. However, output per night will be even more limited and challenging.

2.7 Do Something – Option 4

This option is very similar to Do Something - Option 3. The difference is the treatment of the sub-base replacing the existing tar bound material. In this option, the replacement sub-base is wrapped in a geosynthetic membrane to create a 'mattress'. This is based on a geotechnical solution sometimes adopted for locations of very poor ground where some settlement is anticipated. Should the public utilities, located below the 'mattress' layer require renewal in the future, the integrity of the 'mattress' would be compromised.

2.8 Do Something – Option 5 (Deeper Treatments)

Consideration was given to undertaking deeper treatments than those shown in the options previously mentioned. In an ideal world a deeper treatment including replacement of the rock fill material with a better graded fill material would be undertaken. However, such a treatment would require the closure of the barrier and as the barrier is the only route for land vehicles between the islands, this is not a possibility.

3. Financial Implications

	Total.	**2023/24.**	**2024/25.**	**2025/26.**	**2026/27**	**2027/28.**
	£000.	**£000.**	**£000.**	**£000.**	**£000.**	**£000.**
Capital Expenditure. Design/preparation of CPA2. Reconstruction works.	45	45	 2,285			
Less: Anticipated Grants or Other Contributions.						
Net Capital Expenditure.			**2,285**			
Revenue Implications (immediate works).						
Financing/Loan Charges.			114	146	143	141

Estimated cost of detailed Stage 2 CPA.	45	45				

The estimated cost of developing a detailed Stage 2 Capital Project Appraisal is £45,000 (£35,000 external fees and £10,000 internal fees) during financial year 2023/24. This cost will be met from the existing capital project appraisal development budget allocated from the Capital Project Appraisal Fund in November 2021.

The estimated cost of pavement reconstruction works based on the costs for Option 2 and 3 is between £1.275m and £2.285m.

4. Policy Aspects

The proposals in this report support and contribute to improved outcomes for communities as outlined in the Council Plan strategic priority of **Developing our infrastructure**.

The proposals in this report relate directly to **Priority I1 - Improve Isles Transport Links** and specifically the action to "review findings with regards to condition of barrier one, develop options for any actions to bring to Committee" of the Council Delivery Plan.

5. Statutory Responsibility

The Council has a statutory responsibility to ensure that it maintains its road infrastructure in a safe and useable condition, particularly those that are termed as lifeline routes such as the A961 Kirkwall to Burwick road.

6. Land Purchase Requirement

No land purchase is required for the project.

7. Impact on Local Business, Employment and the Economy

The Churchill Barriers provide the only road transport link between the Orkney mainland and the linked south isles of Lambsholm, Glimps Holm, Burray and South Ronaldsay and as such provide the only access for local residents of these islands travelling on a daily basis to and from work and also for accessing services and facilities that are located in Kirkwall and elsewhere on Mainland Orkney. This includes workers travelling to and from the Flotta oil terminal via the Houton ferry terminal. It also provides the only route for ferry passengers from mainland Scotland via the passenger only John O Groats to Burwick ferry as well as the crossing of the Ro-Ro ferry services between Gills Bay and St Margaret's Hope. Therefore, it is a vital transport link that is relied upon by many local businesses for goods and supplies.

The recent poor quality of the road surface has prompted concerns about the safety of motorists, particularly motorcyclists crossing Barrier No 1, and this has led to the introduction of an advisory 40mph speed limit being put in place. Resurfacing of the

barrier is now overdue with additional works to be carried out to the roads structure to mitigate the causes of the defects that are prevalent across Barrier No 1. Funding is required to develop a Stage 2 Capital Project Appraisal to ensure funding of major resurfacing and carriageway reconstruction works is available to allow this work to go ahead in financial year 2024/25.

It is further recommended that the immediate priority works outlined at 2.1 are carried out this current year eg 2023. The cost of this work is estimated to be approximately £35,000 (based on other similar works which will be undertaken during the current financial year) and will be funded from the Road Maintenance Renewal Programme 2023/24.

8. Risk Assessment

Risks from not progressing this work

The main risk if the project does not progress will be the continued deterioration of the road surface and the impacts that this would have on the communities, businesses and individuals that rely on the barriers as a lifeline route.

Postponing or delaying these works would likely mean that more extensive pavement reconstruction and treatments would be required. This would come with additional cost and also cause more significant disruption to those who rely on this route.

Risks from progressing this work

The main risks to progressing this work is that funding will need to be secured for significant pavement reconstruction works starting next year (likely summer 2024). At present construction prices are volatile and subject to inflationary increases, so prices have risen sharply even over the past 12 months. Whilst predictions are for inflation rates to begin to fall towards the end of 2023, prices are still likely to be increasing.

Other project risks are around the estimated time that the works will take to complete on site. The deeper that reconstruction work is necessary then this has an effect on the length of road that can be opened up at one time. The narrowness of the current road (which is not more than 5.5m between barriers on either side) means that it will not be possible to complete single lane working so it is assumed that most of the work will need to be carried out under full closures at night-time. This presents additional difficulties as each shift will need to incorporate time at the start and end to setup traffic management and also to ensure full re-instatement is carried out prior to re-opening to traffic at the end of each shift. Arrangements to allow emergency vehicles to travel through the works at short notice will also need to be factored into the contractor’s methods of working.

All other risks are those associated with significant construction works of this nature eg utilities, weather, unexpected ground conditions which have potential to increase cost and delay completion.

9. Recommendation

The recommendation is to progress Do something Options 2 and 3 to Stage 2 Capital Project Appraisal in addition to carrying out the Immediate Priority repairs, outlined at 2.1, to address the worst areas of surface cracking and surface undulations in this current financial year.

It is proposed to develop both Options 2 and 3 to allow the construction costs of each option to be examined in more detail and also to further review the likely construction methods and logistics of competing these works under night-time closures. These will be significant factors in the selection of a preferred option and therefore the prudent approach is to progress both and then make a recommendation when seeking approval of funding at Stage 2 Capital Project Appraisal.

The difference between Option 2 and Option 3 is the removal of the old tar bound material with significant cost and time associated with the removal and replacement of the tar bound material. Option 2 provides an anticipated twenty year life at just over half the estimated cost of Option 3. The risk in adopting Option 2 is that the area of worst condition, where excessive voiding was observed, may still require substantial maintenance treatment during its anticipated service life.