Item: 22

Policy and Resources Committee: 27 November 2018.

Replacement Heating Plant at Smiddybrae House.

Joint Report by Chief Officer/Executive Director, Orkney Health and Care, and Executive Director of Development and Infrastructure.

1. Purpose of Report

To consider the Stage 2 Capital Project Appraisal in respect of the replacement heating plant at Smiddybrae House.

2. Recommendations

The Committee is invited to note:

2.1.

That the existing borehole field for the ground source heat pump installation at Smiddybrae House is exhausted.

2.2.

That the existing heating plant at Smiddybrae House is also approaching the end of its useful life.

2.3.

That, as part of the design development for a replacement ground source heat pump installation at Smiddybrae House, a thermal conductivity test was undertaken and it was discovered that the thermal capacity of the ground in the area is lower than expected and a larger borehole field is required.

2.4.

The opportunity to obtain Renewable Heat Incentive (RHI) for a project to replace the ground source heating plant at Smiddybrae House.

2.5.

That the capital cost of the project to replace the ground source heating plant at Smiddybrae House, amounting to £801,300, will be funded from the General Fund Capital Improvement Programme over financial years 2018/19 to 2020/21.

2.6.

That, whilst the replacement ground source heating plant at Smiddybrae House will not create a new capital asset, the Capital Project Appraisal process is being followed to ensure appropriate governance is in place regarding significant expenditure, estimated at £801,300.

2.7.

The Stage 2 Capital Project Appraisal, attached as Appendix 1 to this report, in respect of the project to install boreholes and a new ground source heating plant at Smiddybrae House.

It is recommended:

2.8.

That the project to install boreholes and a new ground source heating plant at Smiddybrae House be approved at an overall project cost of £801,300.

3. Introduction

3.1.

On 1 February 2018, the Asset Management Sub-committee considered proposed three-year detailed Revenue Repairs and Maintenance and Capital Improvement Programmes for the period 2018 to 2021.

3.2.

The Sub-committee subsequently recommended that the Capital Improvement Programme for 2018 to 2019, to be funded from the allocation of £1,351,400 per annum within the current approved capital programme, be approved, together with provisional programmes for 2019 to 2020 and 2020 to 2021.

3.3.

Within the approved programmes, was a project to replace the boreholes at Smiddybrae House.

4. Proposed Project

4.1.

This project is to provide an upgrade to the Ground Source Heating System within Smiddybrae House. The original installation was undertaken with the construction of the building in 2004, however it has been discovered that the existing borehole field is insufficient for the long term needs of the facility and indeed has become exhausted. This has caused frost heave within the garden areas and an expense of over £35,000 to remediate.

4.2.

Initially it was thought that some further boreholes would be required to supplement the existing borehole field and the budget estimate was based on this with a further 15 bore holes at 125 metres deep included.

4.3.

As part of the design development a thermal conductivity test was undertaken and it was discovered that the thermal capacity of the rock in the area was significantly less than original estimated. Therefore, a new bore hole field, comprising 42 boreholes 125 metres deep, is required.

4.4.

Additionally, the existing heat pumps are now nearing the end of their useful life being some 14 years old. This has led to a redesign of the heating plant for the facility with a view to extending the life of the borehole field and the heating plant.

4.5.

An added benefit of replacing all the borehole field and providing new equipment means an application for the Government Renewable Heat Incentive (RHI) would be available. As shown in the Stage 2 Capital Project Appraisal, attached to this report, should an application to the Renewable Heat Incentive be successful, the payback is within 8 years and there is an immediate reduction in revenue costs once the new equipment is operational.

5. Corporate Governance

This report relates to the Council complying with its financial processes and procedures and therefore does not directly support and contribute to improved outcomes for communities as outlined in the Council Plan and the Local Outcomes Improvement Plan.

6. Financial Implications

6.1.

Expenditure on the replacement ground source heating plant at Smiddybrae House will not create a new capital asset. However, as this project will see a significant level of expenditure incurred on a current asset, it is considered appropriate to progress with this project by following the Capital Project Appraisal process.

6.2.

A Stage 2 Capital Project Appraisal is attached at Appendix 1 to this report with an estimated cost of £801,300 which is to be funded from the Capital Improvement Programme over the financial years 2018/19 to 2020/21.

7. Legal Aspects

Section 95 of the Local Government (Scotland) Act 1973 requires he Council to make arrangements for the proper administration of its financial affairs. As part of this the Council is expected to have regard to economy, efficiency and effectiveness in its use of resources.

8. Contact Officers

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9. Appendix

Appendix 1: Stage 2 Capital Project Appraisal.

Appendix 1.

Project Appraisal – Stage 2

Capital Programme:	General Fund.
Client Service:	Orkney Health and Care.
Project Name:	Replacement Heating Plant – Smiddybrae House

1. Background

The project is to provide an upgrade to the ground source heating system (GSHP) within Smiddybrae House. The original installation was the first operational GSHP for the Council in 2004 and it has been discovered that the borehole field was insufficient to meet the long-term heating demands of the building. Over time the borehole field has become exhausted, and caused the ground to freeze, with frost heave to the paths and an expense of over £35,000 to remediate. The heat pumps are unable to extract energy efficiently from the ground, as a result the heating and hot water load has gradually migrated to the backup oil boiler system.

Initially at the budgeting stage it was anticipated that 15 additional boreholes would suffice.

A thermal conductivity test was carried out on one of the existing boreholes which allowed an accurate assessment of the ground heating capacity to be assessed. The test revealed the thermal capacity of the rock in the Dounby area was significantly less than was originally estimated. Using this data, a new bore hole field comprising of 42No 125m deep boreholes would be required. In order to secure Renewable Heat Incentive (RHI) the grant administrators have confirmed that utilising the existing bores would not be permitted.

The existing heat pumps although operational are now 14 years old. The anticipated life of the heat pump is 15 years (Chartered Institute of Building Services Engineers, CIBSE Guide M) so it would be prudent to look at replacement heat pumps at this time. It can also be demonstrated that, by taking advantage of the RHI, and making a capital injection now, paybacks are as detailed below. By installing new heat pumps, an application can be made to the Government RHI scheme, which will provide ongoing revenue support to the project in the form of quarterly payments based on the energy generated by the plant.

At present the building is operating on the oil boilers originally installed as part of the heat pump scheme. An enabling works package was carried out over the summer of 2018 to ensure the capacity of both oil boilers were available to the heating and hot water loads, which was not originally possible under the heat pump scheme. This modified system will provide a reliable backstop until replacement plant is installed.

The design of heat pump installations has developed over time since the original scheme was installed. The use of buffer vessels to improve system efficiency is now standard and as a result the space requirement for plant increases. In order to enable the new heating system to be fully installed and commissioned without impacting on the operation of the

care facility, it will be necessary to build a new heat pump plant room. A design for the plantroom and the associated modifications to the existing heating and hot water systems has been developed and form part of the cost plan.

The project costs can be broken down as follows:

Item	Cost	Programme
Installation of boreholes	£245,350	Q4 FY 2018/19
Ground collector works	£97,550	Q4 FY 2018/19
Construction of plantroom	£114,600	Q1 FY 2019/20
Installation of new plant	£328,000	Q2 FY 2019/20
Removal of redundant plant	£15,800	Q1 FY 2020/21
Expenditure FY2018/19	£342,900	
Expenditure FY2019/20	£442,600	
Expenditure FY2020/21	£15,800	
Total Project Cost	£801,300	

The project team require the necessary governance to continue to develop and deliver this project. Funding is available in the General Fund Capital Improvement Programme budget if the works are undertaken over 2/3 financial years.

2. Options Available

This proposal is based on a Ground Source heat pump which was selected after also considering the cost of ownership of Air Source heat pumps and Oil boilers over a lifetime of 30 years.

Although the capital cost of the GSHP system is greater than both ASHP and oil boilers the reduced operating cost and income from RHI reduce the overall cost of ownership and result in a payback within 8 years. The GSHP option will deliver reduced revenue costs from day one.

The ground collector is based on a 20 year lifetime, however the pipework in the collector has a lifetime of over 50 years so may still be serviceable far beyond the initial design life.

3. Land Purchase Requirement

The full borehole field can be accommodated within the site boundary utilising the area to the south of Smiddybrae House.

Although this space was originally set aside for the construction of sheltered accommodation, the scheme design has been developed to ensure all boreholes, pipework and manifolds are positioned such that it will be possible to construct 8 housing units without adversely impacting the ground loop system or any potential future sheltered housing development.

4. Project Appraisal

	Criteria	Response
1.	Protects Existing Statutory Provision	The project will ensure the building is able to operate to meet statutory requirements in the provision of elderly care.
2.	Meets Corporate Priority / Community Planning Goal	This project contributes to the Enterprising Communities target of developing a vibrant carbon neutral economy. The use of renewable heating in the building estate takes the Council along this path.
3.	Protects Existing Assets	The existing heating plant in the building is at the end of its economic life and replacement of the plant will ensure the building continues to operate efficiently and cost effectively for the foreseeable future.
4.	Minimises Capital Cost	The proposed project is not the minimum capital cost option; however, the project assessment was based on different technologies and the cost of ownership over a 20 year period which shows the GSHP option to have the lowest cost of ownership (see attached graph).
5.	Maximises Investment from External Sources	No grant funding is available on this type of technology but revenue income from the Renewable Heat Incentive (RHI) will provide an income stream to the project.
6.	Beneficial Impact on Revenue Expenditure	The cost of operating a GSHP system is significantly lower than the equivalent oil heating plant, with a contribution to the revenue income from the RHI the revenue expenditure should show a reduction over the current oil costs.
7.	Linked to Other Council Provision	
(a)	Enhances Statutory Provision	This project does not have any impact on statutory provision.

	Criteria	Response
(b)	Protects or Enhances Discretionary Provision	The project contributes to the Council's Carbon Reduction Targets, the use of 100% GSHP as the heating source increases CO_2 savings over the original renewable energy scheme.
8.	Re-use of Derelict Land or Building	This project does not reuse any derelict land or buildings.
9.	Promote or Enhance Orkney's Environment	The proposed installation will improve the building's carbon footprint by eliminating the element of emissions associated with the oil boilers. The resizing of the ground loop will also improve the overall COP of the heat pump installation reducing the CO_2 emissions.
10.	Promote or Enhance Orkney's Heritage	This project has no impact on Orkney's Heritage.
11.	Economic Prosperity or Sustainable Communities	This project will have little impact on the economic prosperity of the community.
12.	Enhances Council operations or Improves Health and Safety	At present the building is served by an underground oil tank. If the tank leaks, a problem may not be obvious until considerable contamination has occurred. By transferring the heating to all heat pump, oil storage can be removed from site, thus eliminating the risk associated with the storage tank.

5. Financial Implications

A summary of the financial implications is detailed on the attached spreadsheets. The installation works could be spread over 3 years in total although the final strip out works could easily be pulled forward to reduce the programme to complete in FY 2019/20 if required.

The installation will be eligible for RHI payment and it is anticipated that these payments will be in the order of £35,000 per annum.

6. Risk Assessment

Risk	**Mitigation**
RHI payments not available	RHI scheme is still open to applications, no recent government announcements on the scheme so must assume it will continue to operate.

Risk	Mitigation
	Risk would be associated with technical aspects, however an application has recently been concluded and the main stumbling blocks identified.
Delay in realisation of ground loop contracts could force all cost into FY 2019/20	Ground loop works have been split into two components – bore holes and ground works. By splitting the works, this should ensure at least borehole work can be concluded within the programmed time.

7. Conclusion

The original GSHP installation at Smiddybrae House is no longer able to heat the building adequately. A temporary modification to the plant has been implemented to ensure the building has a robust and reliable heating system as a stop gap measure. This project proposes the installation of a new GSHP and borehole field to meet the heating and hot water demands of the building and help reduce the carbon footprint and operating cost of the facility.

8. Recommendations

The recommendation is that the project to install boreholes and a new ground source heating plant at Smiddybrae House be approved at an overall project cost of £801,300. Funding is available in the Capital R&M budget if the works are undertaken over three financial years, with the initial phase of the project commencing within this Financial Year.

9. Accountable Officer

Ian Rushbrook, D&I Capital Programme Manager, extension 2713.

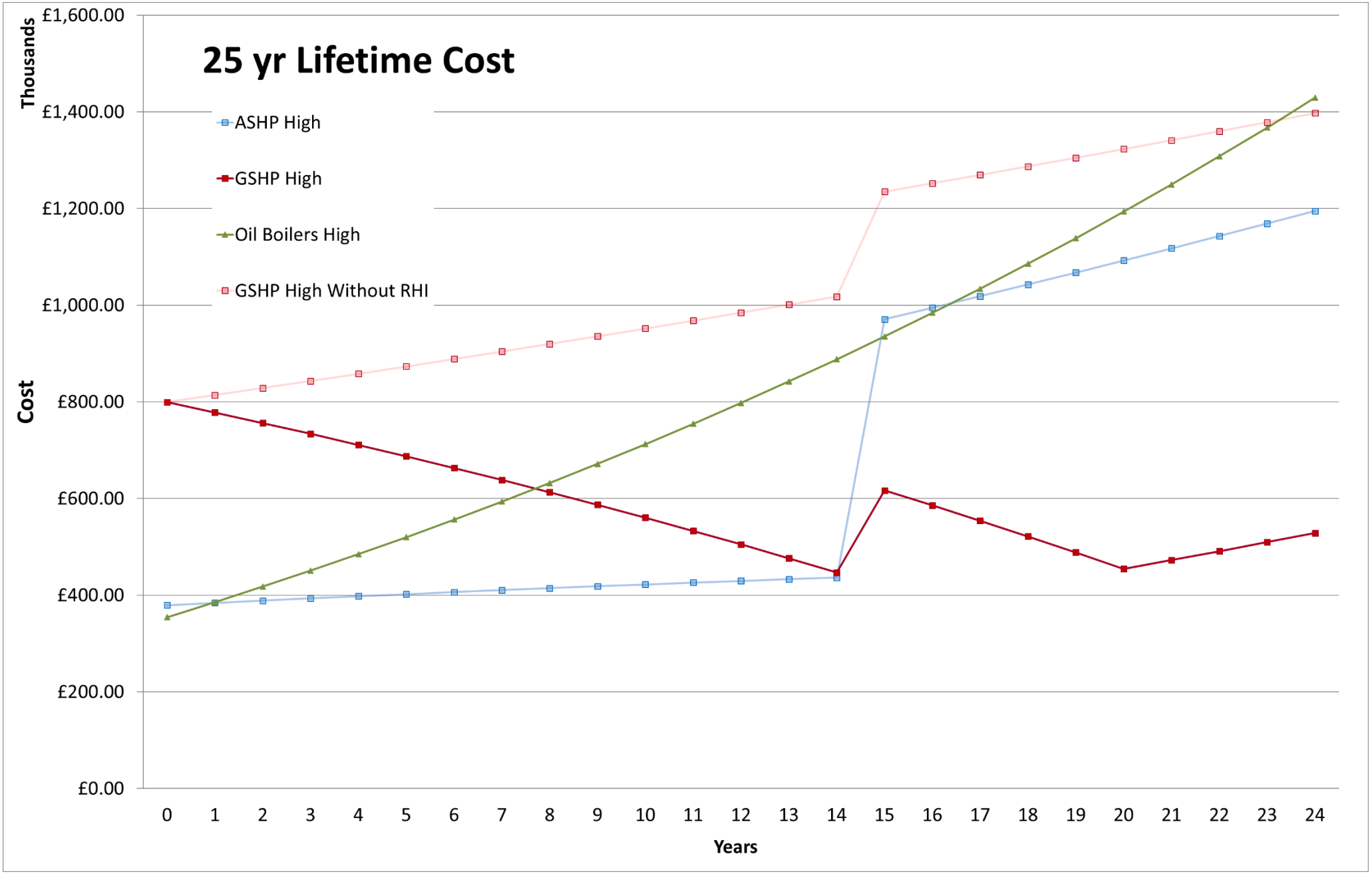
10. Annexes

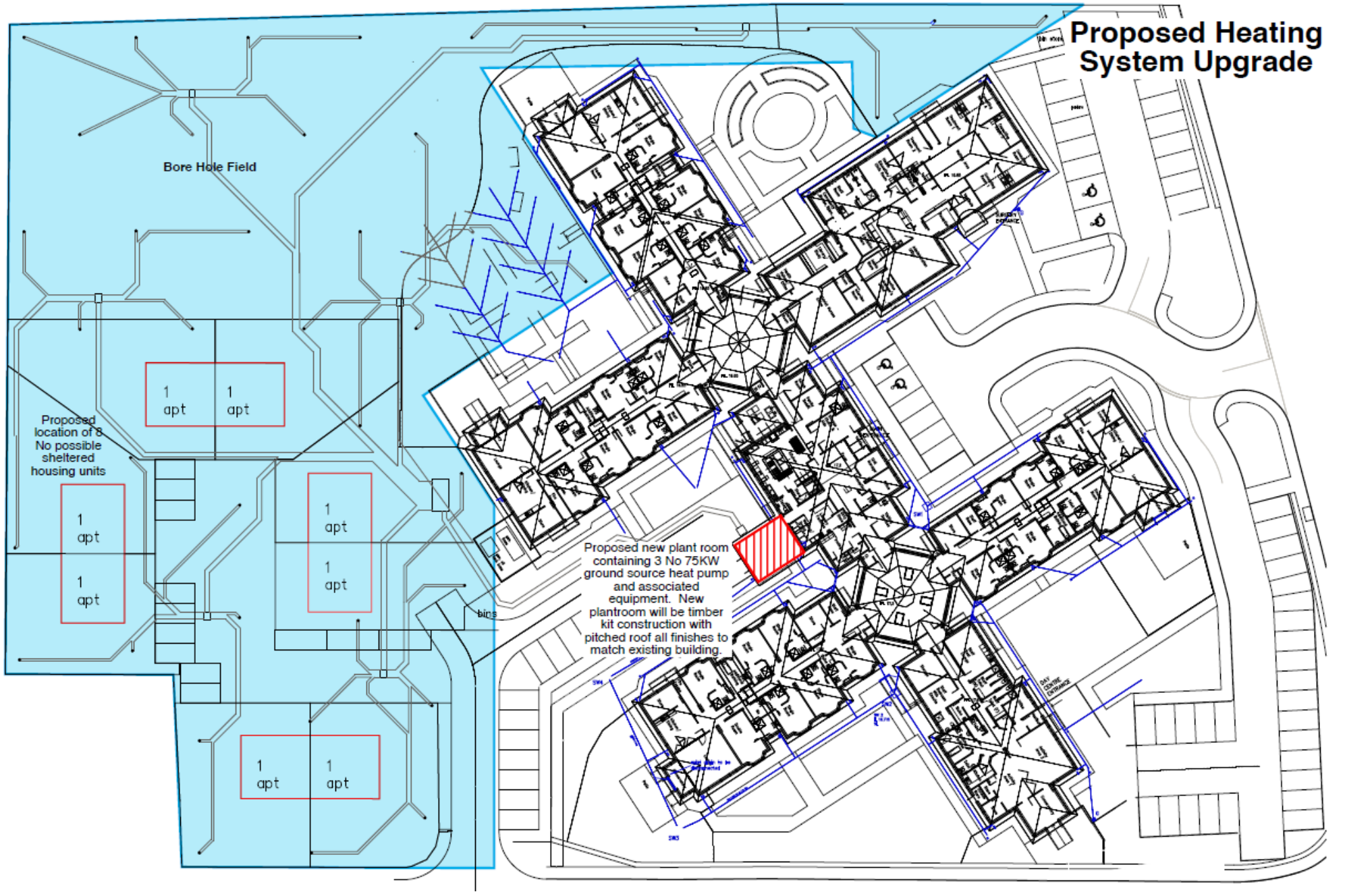
Annex 1 – 25 year Lifetime Cost graph

Annex 2 – Proposed Borehole Layout

Annex 3 – Capital Expenditure

Annex 4 – Revenue Budget


25 yr Lifetime Cost
Thousands
Cost
£1,600.00
£1,400.00
£1,200.00
£1,000.00
£800.00
£600.00
£400.00
£200.00
£0.00
ASHP High
GSHP High
Oil Boilers High
GSHP High Without RHI
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Years


Proposed Heating System Upgrade
Bore Hole Field
Proposed location of 8 No possible sheltered housing units
1 apt
1 apt
1 apt
1 apt
1 apt
1 apt
1 apt
1 apt
bins
Proposed new plant room containing 3 No 75KW ground source heat pump and associated equipment. New plantroom will be timber kit construction with pitched roof all finishes to match existing building.

STAGE 2 - CAPITAL PROJECT APPRAISAL
FINANCIAL ASSESSMENT OF ASSOCIATED CAPITAL EXPENDITURE IMPLICATIONS

Capital Programme: **Capital Improvement Programme**

Client Service: **Orkney Health and Care**

Project Name: **Replacement Heating Plant – Smiddybrae House**

		1	2	3	4	5		
CAPITAL COSTS	**Total £ 000**	**2018/19 £ 000**	**2019/20 £ 000**	**2020/21 £ 000**	**2021/22 £ 000**	**2022/23 £ 000**	**Onwards £ 000**	**Notes**
1. Initial Costs (at inflated prices)								
Land or Property Purchase	-	-	-	-	-	-	-	
Other Site Costs (including Fees)	-	-	-	-	-	-	-	
Construction or Improvements	696.8	298.2	384.9	13.7	-	-	-	
Information Technology Costs	-	-	-	-	-	-	-	
Plant, Vehicles & Equipment	-	-	-	-	-	-	-	
Professional Fees - Consultant	-	-	-	-	-	-	-	
- In-house	104.4	44.7	57.7	2.0	-	-	-	
Gross Capital Expenditure	801.2	342.9	442.6	15.7	-	-	-	
2. Initial Funding (at inflated prices)								
Government Grants	-	-	-	-	-	-	-	
Other Grants	-	-	-	-	-	-	-	
Other Financial Assistance	-	-	-	-	-	-	-	
Total Grants Receivable, etc.	-	-	-	-	-	-	-	
Net Capital Cost of Project	801.2	342.9	442.6	15.7	-	-	-	
Net Council Capital Expenditure	801.2	342.9	442.6	15.7	-	-	-	
Net Present Value	**778.7**	342.9	421.5	14.2	-	-	-	
Cost of Capital		5%	5%	5%	5%	5%	5%	
Year		0	1	2	3	4	5	

Notes - Additional narrative on main assumptions and support working papers
1
2
3
4
etc.

Annex 4

STAGE 2 - CAPITAL PROJECT APPRAISAL
FINANCIAL ASSESSMENT OF ASSOCIATED REVENUE BUDGET IMPLICATIONS

Capital Programme: **Capital Improvement Programme**

Client Service: **Orkney Health and Care**

Project Name: **Replacement Heating Plant – Smiddybrae House**

		1	2	3	4	5		
REVENUE COSTS / (SAVINGS)	**Total £ 000**	**2018/19 £ 000**	**2019/20 £ 000**	**2020/21 £ 000**	**2021/22 £ 000**	**2022/23 £ 000**	**Onwards £ 000**	**Notes**
1. Full Year Operating Costs (at inflated prices)								
Staff Costs	-	-	-	-	-	-	-	
Other Staff Costs (incl. recruitment, etc.)	-	-	-	-	-	-	-	
Property Costs	-	-	-	-	-	-	-	
Supplies and Services	-	-	-	-	-	-	-	
Transport, Vessel and Plant Costs	-	-	-	-	-	-	-	
Administration Costs	-	-	-	-	-	-	-	
Apportioned Costs	-	-	-	-	-	-	-	
Third Party Payments	-	-	-	-	-	-	-	
Finance and Loan Charges	-	-	-	-	-	-	-	
Miscellaneous Expenditure	-	-	-	-	-	-	-	
Gross Revenue Expenditure / (Saving)	-	-	-	-	-	-	-	
2. Operating Income (at inflated prices)								
Government Grants	-	-	-	-	-	-	-	
Other Grants	-	-	-	-	-	-	-	
Rents and Lettings	-	-	-	-	-	-	-	
Sales	-	-	-	-	-	-	-	
Fees and Charges	-	-	-	-	-	-	-	
Miscellaneous Income (RHI)	- 140	-	-	- 35	- 35	- 35	- 35	1
Gross Revenue Income	- 140	-	-	- 35	- 35	- 35	- 35	
Net Revenue Expenditure / (Saving) of Project	140	-	-	35	35	35	35	
Increase / (Reduction) in Revenue Costs	140	-	-	35	35	35	35	
Net Present Value	**33**	-	-	33	32	31	30	
Cost of Revenue		3%	3%	3%	3%	3%	3%	
Year		0	1	2	3	4	5	

Notes
1 Estimated RHI payment available should a successful application be made the Government RHI fund.
2
3
4