Appendix F – Blended Flood Event Map

East Lothian Council

Musselburgh Flood Protection Scheme
Hydraulic Model A Flood Map

BLPUs Affected
0.5% AEP Blended
Fluvial and Coastal Flood Event
(Plus Climate Change)

N

Firth of Forth

Fisherrow Sands

Magdalene Burn

Musselburgh Mill Lade

Ravenshaugh Burn

Pinkie Burn

River Esk

Stoneybank Burn

Stoneybank Culvert

2514 No. Basic Land Property Units (BLPUs) Affected

0 250 500 Metres

Appendix G – Key Infrastructure Impact

Musselburgh Flood Protection Scheme

Flood Risk Vulnerable Assets

SW Esk WWPS

SW Eastfield WWPS

The Brunton

East Lothian Outdoor Learning Service

St Annes Care Home

Levenhall Care Home

Police Scotland

Bus Depot

Eskmills Business Park

SGN Gas Governor

Legend

- Bridges
- A Roads
- B Roads
- 1 in 200 plus CC Flood Event (Fluvial and Tidal)
- Loretto School (Nursery, PS & SS)
- ELC Primary Schools
- ELC Secondary School

0 55110 220 330 440 Meters

Appendix H – Preferred Scheme Executive Summary

Musselburgh Flood Protection Scheme

Preferred Scheme Report

MFPS-JEC-S3-XXX-XXX-RE-Z-0002 | version 1.0

January 2020

East Lothian Council

Musselburgh Flood Protection Scheme

Project No:	701909
Document Title:	Preferred Scheme Report
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Version	Date	Description	By	Review	Approved
0.1	Nov 2019	Draft for Client review	Various	KN	SV
1.0	Jan 2020	Executive Summary update to prepare for cabinet report	Various	KN	SV

JACOBS

Contents

JACOBS

Executive Summary

The purpose of this report is to summarise the appraisal process and the recommended preferred options which could be implemented to form the Musselburgh Flood Protection Scheme (the Scheme).

An option appraisal strategy was developed for the Scheme which involved a series of workshops attended by key project team members as well as wider stakeholders, where appropriate, to develop the long and shortlists of options, using Scottish Government and Scottish Environment Protection Agency (SEPA) guidance.

The options were developed in accordance with the aspiration to achieve a 0.5% AEP + CC standard of protection against fluvial, coastal and surface water flooding. A sophisticated fluvial and coastal hydraulic model was developed which enabled combinations of river and sea levels to be modelled and corresponding flood risk to be determined and mapped. This approach has been generally accepted by SEPA.

The options were assessed against a range of factors, including technical feasibility, economics, impact on environment, health and safety risks, impacts on social and stakeholders. A range of workshops and technical meetings were held throughout the option appraisal process, to ensure all interested parties had an opportunity to comment on the proposals and input to the relevant decision making. A spreadsheet based tool was developed which applied a RAG (Red, Amber, Green) analysis to these factors, allowing the long list to be readily appraised and unsuitable or unfeasible options rejected in an auditable and easy to understand manner.

All options which were shortlisted were then subject to a greater degree of assessment, including a full economic analysis using industry standard methodologies. The outputs from this assessment, combined with testing combinations of options in the hydraulic model (to develop a range of Scenarios), determined the preferred Scheme components.

The preferred Scheme consists of a combination of direct defences, pumping stations and bridge removal and replacement in Musselburgh town centre, combined with an upper catchment debris trap and adaption of two Scottish Water reservoirs to store greater volumes of water during a flood event, all to provide protection against the fluvial, coastal and surface water 0.5% AEP + CC events.

This is known as Scenario D and is the only economically viable scenario which, subject to more detailed hydraulic modelling and option testing during Stage 4, offers the potential to neutralise the increase in flood levels at structures through the town centre caused by the presence of direct defences. This scenario ensures that there is negligible impact on the Roman and Rennie Bridges and reduces flood levels through the town centre to visually acceptable levels.

The estimated construction cost of Scenario D (including service diversions) is £36.5 million and generates a Benefit Cost Ratio of 1.08. These values have been assessed in accordance with current Scottish Government economic guidance and using up to date construction rates from tender returns from similar recent projects.

Should Scenarios C or D prove to be undeliverable as a result of any technical, economic, hydraulic or stakeholder issue, the minimum combination of components would be those represented by Scenario B, which generally consists of direct defences, pumping stations and replacement of the Shorthope Street and Electric / Goose Green footbridges. Within Scenario B, careful analysis of the impacts on the Roman Bridge will require to be discussed with key stakeholders and a solution to incorporate the Rennie Bridge into the scheme will be required, along with consideration of the need to protect Cell 9 Inveresk Estate. The risk of objection due to unacceptably high direct defences is elevated compared to Scenario D, but Scenario B offers a more cost effective and economically beneficial solution, with an estimated construction cost estimate of £33.0 million and BCR of 1.18.

Further hydraulic modelling, ground investigation, topographic, ecological and structural surveys are required in advance of or during Stage 4 to fully determine the preferred Scheme Scenario.

Appendix J – Preferred Scheme Overview Maps

Natural Flood Management on Fisherrow Sands and Levenhall Sands - Leave alone to develop naturally

Firth of Forth

Continued Usage of Existing Coastal Defences - (Scottish Power Ash Lagoons Seawall) is Essential for Flood Protection

New Demountable Defences to maintain harbour access

Tie into Existing Seawall

Brunstane Burn

Management of Pinkie Burn

Ravenshaugh Burn

Line of proposed new direct defences on River Esk and along the coast to protect Musselburgh from design flood event

Replacement of: Shorthope Street Footbridge; Electric Bridge; and Goosegreen Footbridge

Do not touch Roman (Old) and Rennie (New) Bridges

Magdalele Burn

Pinkie Burn

Network of Drainage Pumping Stations at low points across the town

Management of Musselburgh Mill Lade

River Esk

Possible location for engineering river debris catching infrastructure

Possible Natural Flood Management in the Catchment

Possible Modifications of Scottish Water reservoirs in South Esk catchment - Rosebery Reservoir and Edgelaw Reservoir

Delivering an Environmnentally Acceptable and Sustainable Flood Protection Scheme

reducing flood risk

enhancing the environment

assisting communities

East Lothian Council

Musselburgh Flood Protection Scheme

The Preferred Scheme

Overview of Proposed Flood Protection Measures against 0.5% AEP (Plus Climate Change) Flood Event

0 200 400 800 Metres

East Lothian Council

Musselburgh Flood Protection Scheme
The Preferred Scheme

Detailed Overview of Proposed Flood Protection Measures against 0.5% AEP (Plus Climate Change) Flood Event

N

Natural Flood Management on Fisherrow Sands and Levenhall Sands - Leave alone to develop naturally

Firth of Forth

Continued Usage of Existing Coastal Defences (Scottish Power Ash Lagoons Seawall) is Essential for Flood Protection

Tie into Existing Sea Wall

Tie new Flood Wall into Magdalene Bridge

Tie into Existing Fisherrow Harbour

Works on Pinkie Burn culvert to ensure it is water-tight

Low Height Embankment and Ground Reshaping to contain any Flood Waters

No Impact on Rennie (New) Bridge Structure

New Demountable Defences to maintain harbour access

Replace Goosegreen Footbridge

Replace Electric Bridge

Replace Shorthope Street Footbridge

No Impact on Roman (Old) Bridge Structure

Network of Drainage Pumping Stations (PS) at low points across the town

Structural Work to Retain Existing Inveresk Weir

Culvert Mill Lade through Open Section and Close-Up Mill Lade Basin

Flow Control on Mill Lade Inlet

Brunstane Burn

Magdalele Burn

Pinkie Burn

Ravenshaugh Burn

River Esk

Fisherrow Sands

Musselburgh Lagoons

Fisherrow

Newhailes

Stoneyhill

Whitehill

MUSSELBURGH

Levenhall

Westpans

Wallyford

Monktonhall

0 100 200 400 Metres

Delivering an Environmnentally Acceptable and Sustainable Flood Protection Scheme

reducing flood risk

enhancing the environment

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