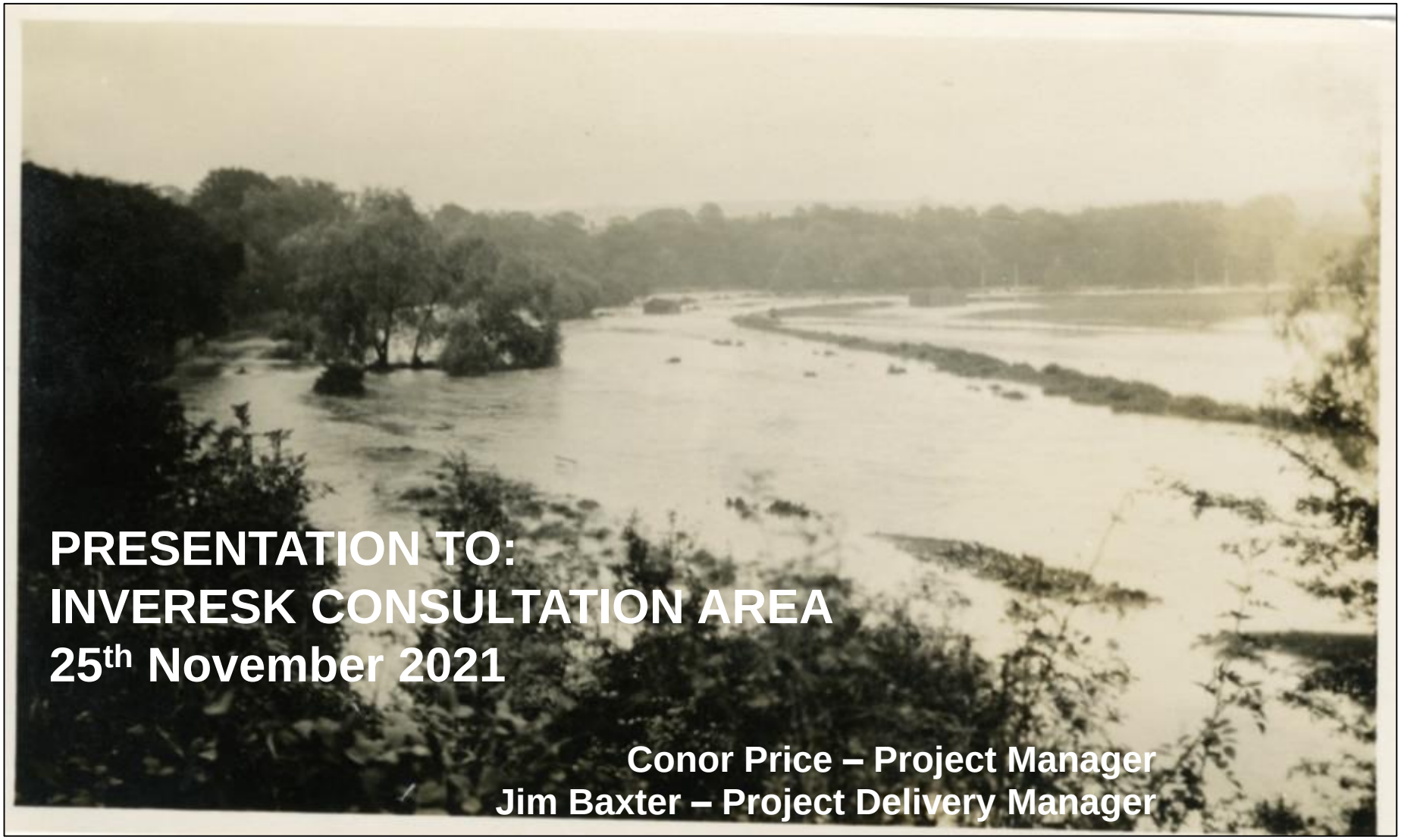
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Flood Protection



PRESENTATION TO:
INVERESK CONSULTATION AREA
25th November 2021

Conor Price – Project Manager
Jim Baxter – Project Delivery Manager

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CPE CONSULTANCY
Turner & Townsend

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Approach to Meeting:

1. PRESENTATION TO SET-UP EVENING / DISCUSSION

2. QUESTION & ANSWER SESSION

3. WORKING FORUM FOCUSED ON INVERESK AREA

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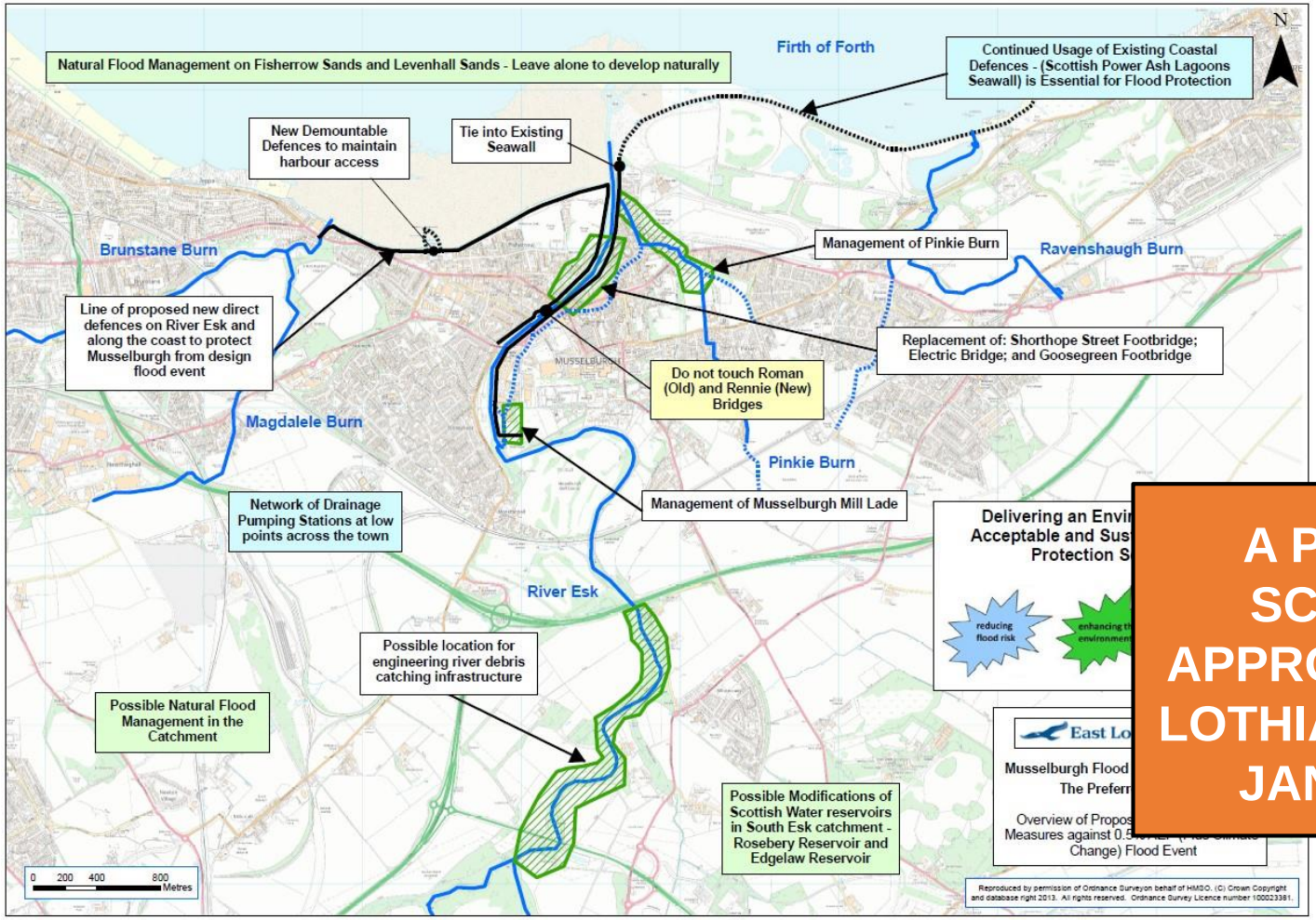
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The Preferred Scheme:



A PREFERRED SCHEME WAS APPROVED BY EAST LOTHIAN COUNCIL IN JANAURY 2021

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High-level update on Scheme:

THE TOWN HAS A MAJOR FLOOD RISK

WE DO NOT HAVE A DESIGN DEVELOPED – WE ARE CONSULTING ALL AUTUMN SO WE CAN BEGIN THE DESIGN

THE 'PREFERRED SCHEME' IS A CONCEPT – IT IS NOT FIXED – IT IS EVOLVING AND WILL CONTINUE TO DO SO

THE TOWN MUST HAVE NEW PHYSICAL BARRIERS - NFM CANNOT REMOVE THE FLOOD RISK

WE DID NOT PROCEED WITH THE DESIGN DURING LOCKDOWN → COULD NOT CONSULT

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Consulting on the Outline Design (CP)

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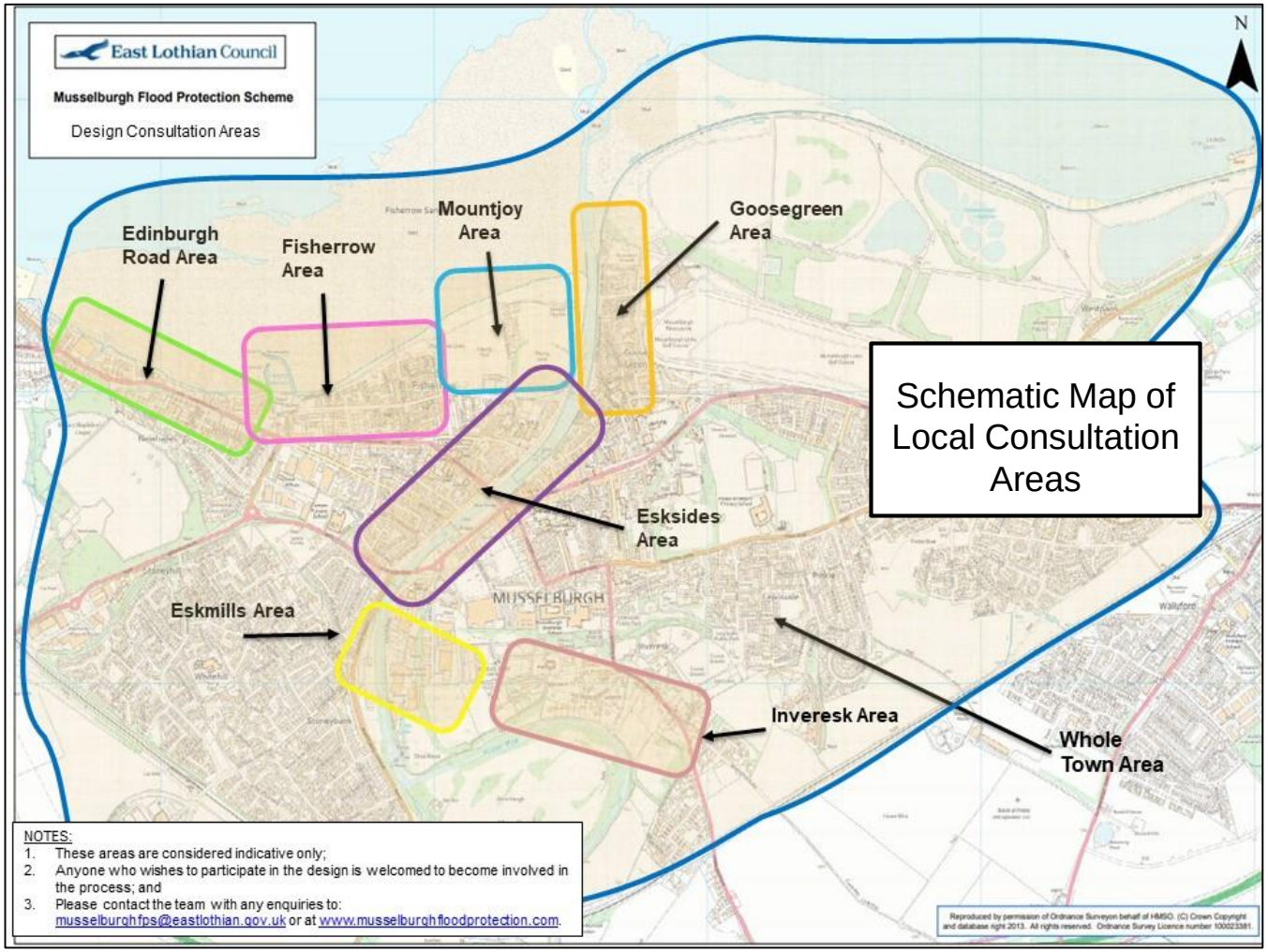
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Approach to Local Area Consultation:



Schematic Map of Local Consultation Areas

Tonight is all about Area 7 – Inveresk

East Lothian Council · Jacobs · CPE Consultancy · Turner & Townsend

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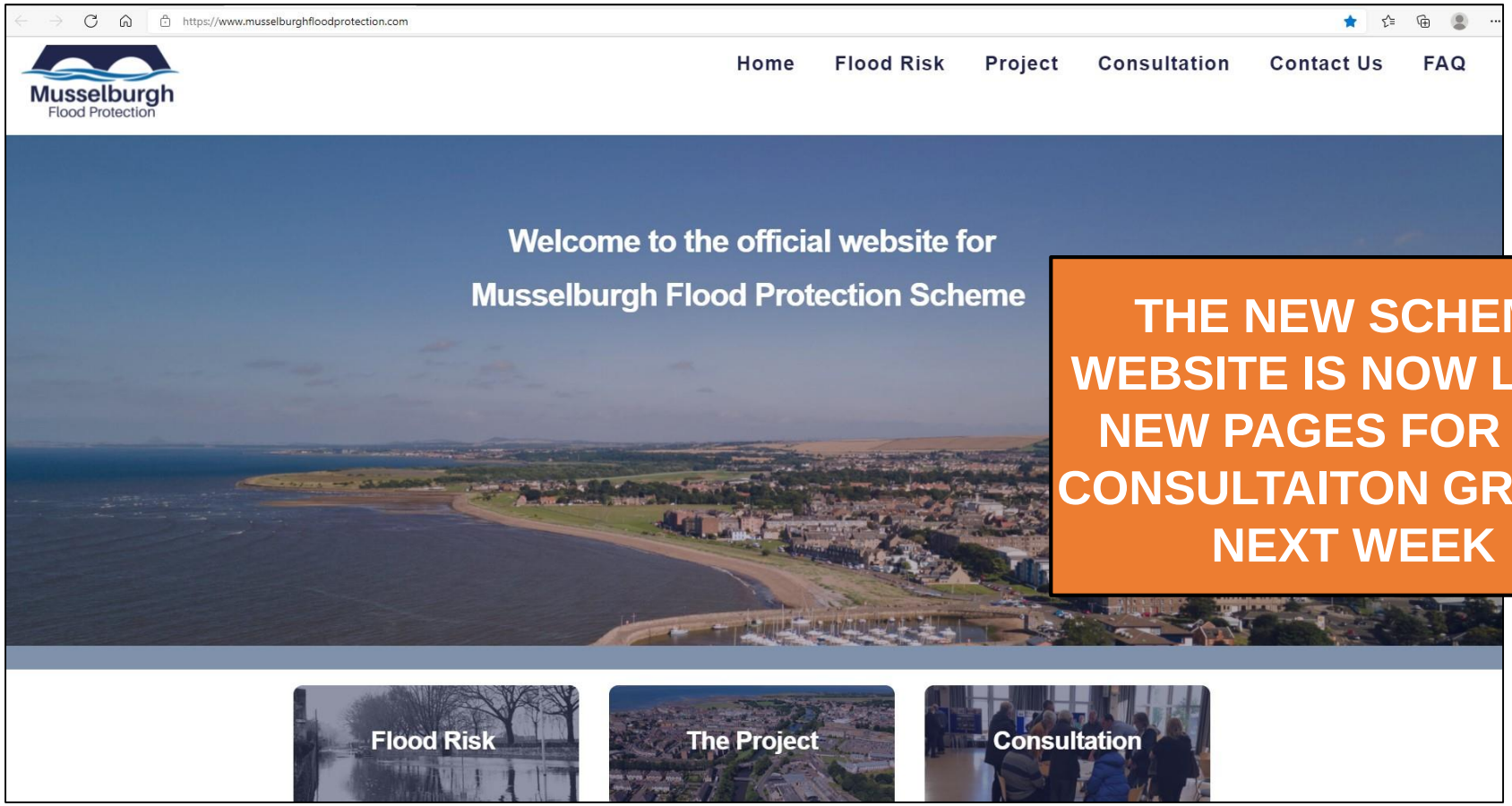
Update on Local Area Consultation:

Local Area:	No. of Properties:	Letters Delivered to Door:	Doorway Discussions:	Attendance at Meeting No. 1:	Attendance at Meeting No. 1 (percentage):
Edinburgh Road	75	68	19	7	9.3%
Mountjoy Terrace	22	22	12	11	50%
Fisherrow	323	305	88	24	7.4%
Goosegreen	267	254	103	8	2.9%
Esksides	286	260	93	27	9.5%
Eskmills	170	130	43	4	2.4%
Inveresk	50	24	15	TBC	TBC
TOTAL	**1,193**	**1,063**	**373**	**81**	**6.79%**

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Update on Scheme Website:



THE NEW SCHEME WEBSITE IS NOW LIVE – NEW PAGES FOR THE CONSULTAITON GROUPS NEXT WEEK

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Update on Scheme Newsletter:



THE NEW SCHEME NEWSLETTER IS BEING PREPARED JUST NOW – ISSUE IN EARLY 2022

DELVIERED BY ROYAL MAIL TO ALL LETTERBOXES IN MUSSELBURGH

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Overview of flood risk (CP)

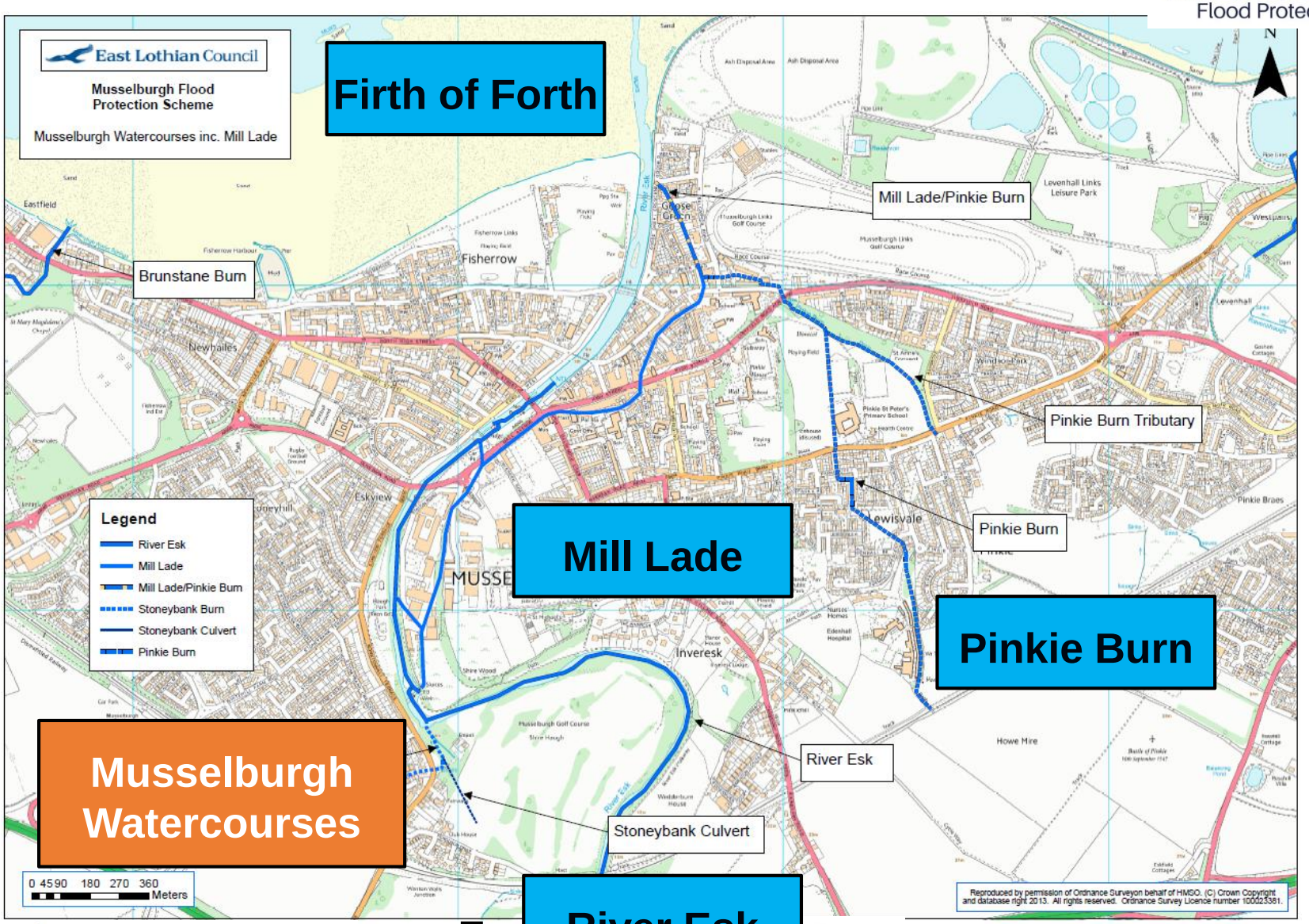
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How do we define a flood risk?:

- It is a statistical concept through which we state the probability of a flood of a certain magnitude at any given time
- **The key event from a planning perspective (i.e. Within SPP) is the 0.5% AEP (Annual Event Probability) Flood Event - known as the 1 in 200 Years Flood Event**
- This DOES NOT mean it will happen once every 200 years: it could happen today and again next week or not for 500 years

Musselburgh had a 0.5% AEP flood event in 1948

- Climate Change adds an allowance to river flows and sea level to account for changes happening due to predicted climate change

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MUSSELBURGH FLOOD PROTECTION SCHE

A History of Flooding

Exhibition Board from Public Exhibition No. 1 in July 2019 at The Brunton









24th July 1888: pluvial flooding, several shops in the High Street flooded

12th Feb 1894: Beuccleugh House in Fisherrow flooded to 0.45m, rail track submerged

11th August 1901: pluvial flooding of shops in High Street, New Street and Millhill

17th August 1920: River Esk flooded fields; one tier of iron bridge knocked down by a tree

13th August 1948: Worst event on record. River Esk flooded Shorthope Street, Millhill, James Street, Eskside East & Eskside West. Many houses flooded to two feet

6th October 1990: Flooding from River Esk after debris retained water at structures

4th January 2014: Cycle path and Eskside West flooded

1888 — 2014

Sept 1891: River Esk flooded the Paper Mills and other factories, as well as nearby houses

July 1897: pluvial flooding, High Street and Shorthope Streets flooded

October 1907: pluvial flooding on High Street and Newbigging to 0.6m. Streets and railway flooded near Newhails Station

Sept 1927: River Esk flooded Shirehaugh and other areas upstream. Footbridge at Shirehaugh swept away.

14th August 1966: Major flooding of Eskside West, Eskside East, Shorthope Street & Millhill

7th July 2012: Fields along River Esk flooded to depth of 2-3m









All historic images provided courtesy of John Gray Centre, Haddington

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East Lothian Council Jacobs CPE CONSULTANCY Turner & Townsend

MUSSELBURGH FLOOD PROTECTION SCH

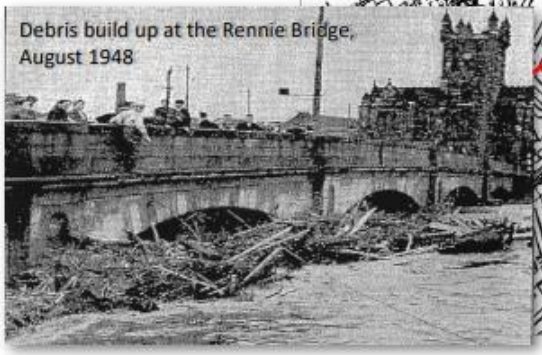
August 1948 Flood Event

Exhibition Board from Public Exhibition No. 1 in July 2019 at The Brunton



New Street looking towards Fisherrow, August 1948





Debris build up at the Rennie Bridge, August 1948

- Level markers on the properties at Eskmills from the flood event have allowed the event to be analysed using modern techniques
- Peak level of 7.37m aOD at Eskmills was recorded - calculated to be the equivalent of the 0.5% AEP (1 in 200 year) event
- Historical town mapping overlain with the calculated 1948 flood event shows the probable extent of flooding

Rennie Bridge image provided as extract from local history publication, author unknown, all other historic images provided courtesy of John Gray Centre, Haddington

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Flood Protection

Overview of Flood Risk Modelling:

1. The Scheme has developed two separate hydraulic models – one of the sea and one of the river;
2. These models use actual river flow and sea level data issued to us by SEPA from their network of gauging stations;
3. The model is calibrated against historic events (where possible) to verify the accuracy of its outputs;
4. Climate change is accounted for as a percentage increase in river flow, and as a change in sea level;
5. Climate change data / projections were last updated by UKCP18 in December 2018;
6. The whole process of determining the Scheme's Hydrology and thereafter the approach to Hydraulic Modelling was advanced in partnership with SEPA's Flood Modelling Team in Perth;

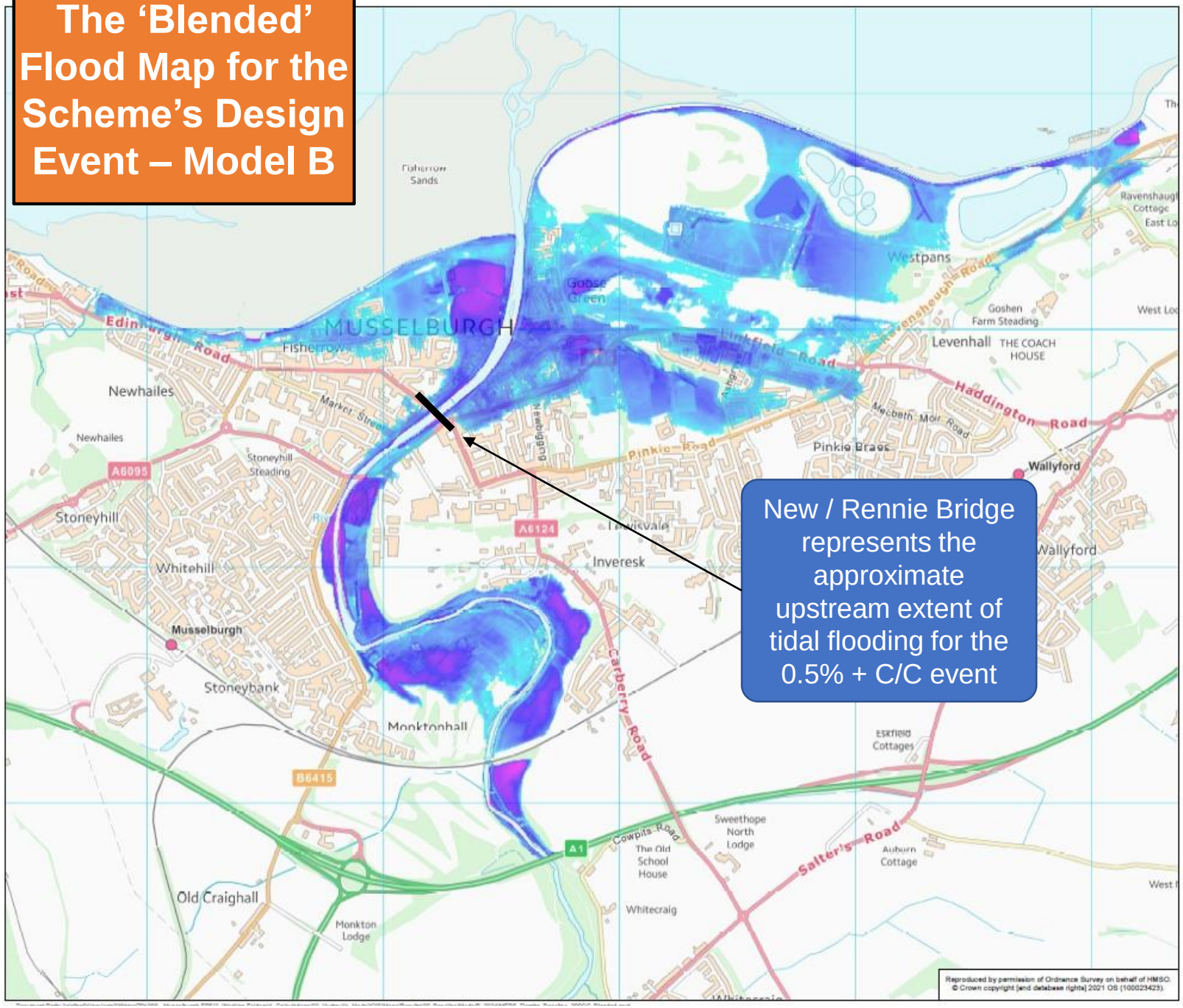
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Flood Protection

Overview of Flood Risk Modelling:

7. The project team has undertaken significant and detailed land surveying (topographic survey) so that we have a Digital Terrain Model (DTM) of the ground – this now sits within the Hydraulic Model;
8. When the model is run to simulate any flood event the output can be provided as a Flood Map that shows the areas of inundation / flooding on that map.
9. During the Option Appraisal Process – we termed the Hydraulic Model as ‘Model A’;
10. We are now using a refined ‘Model B’ – this is not yet formally approved as SEPA suffered a cyber attack in December 2020 and have not been able to assist us in its final review;
11. Model B has fully absorbed to ‘new’ UKCP18 data and advice / guidelines on its usage.

The ‘Blended’ Flood Map for the Scheme’s Design Event – Model B





KEY

Water Depth (m)

Value

High : 3

Low : 0

Client: East Lothian Council

East Lothian Council

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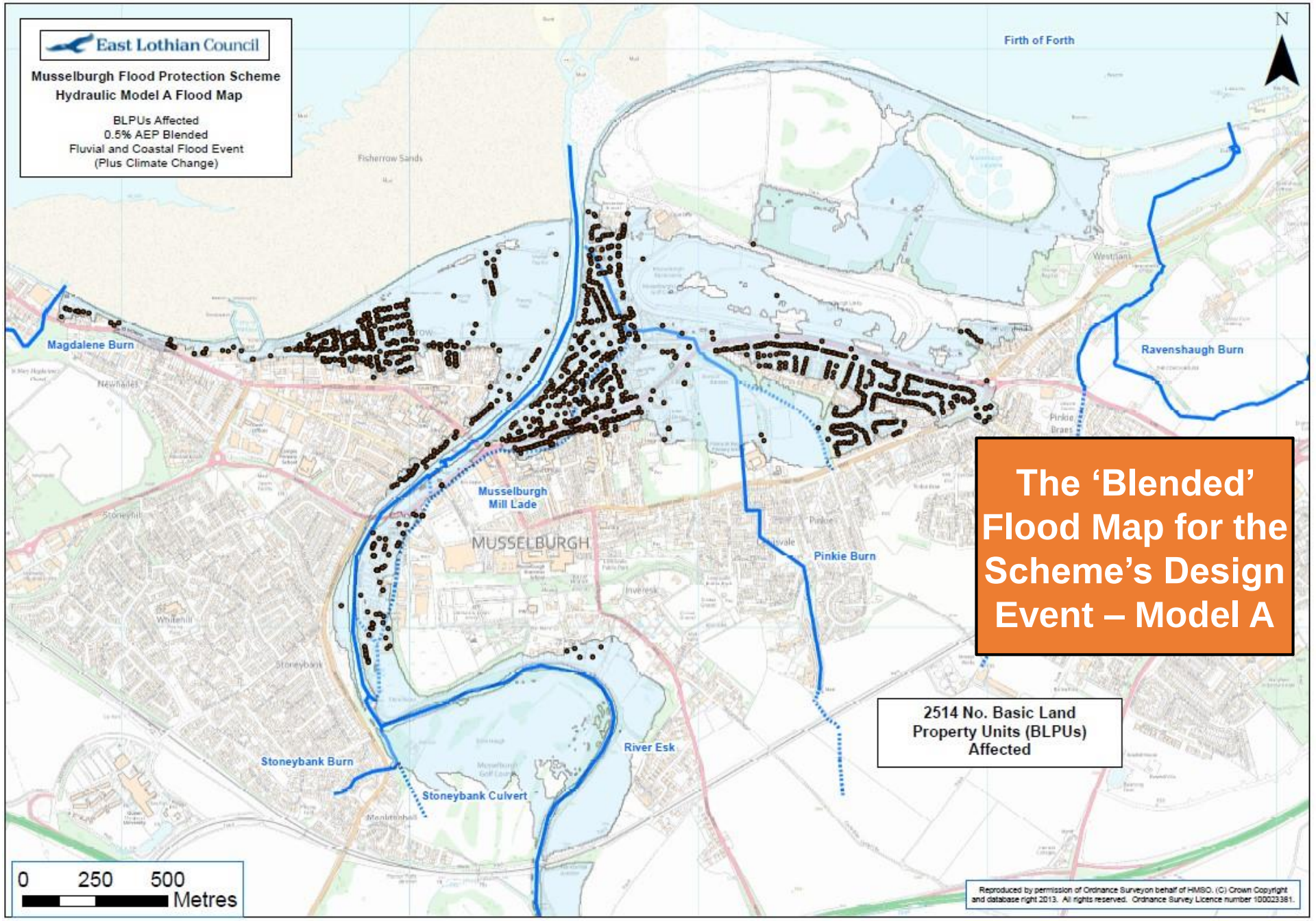
Project: Musselburgh Flood Protection Scheme

Drawing: Baseline Scenario - Blended Flood Maps Fluvial 0.5% AEP+CC; Tidal 0.5%

Drawn By : EM	Date: 23/09/2021
Checked By : GL	Date: 23/09/2021
Approved By : JB	Date: 23/09/2021
Drawing No. :	Revision 1

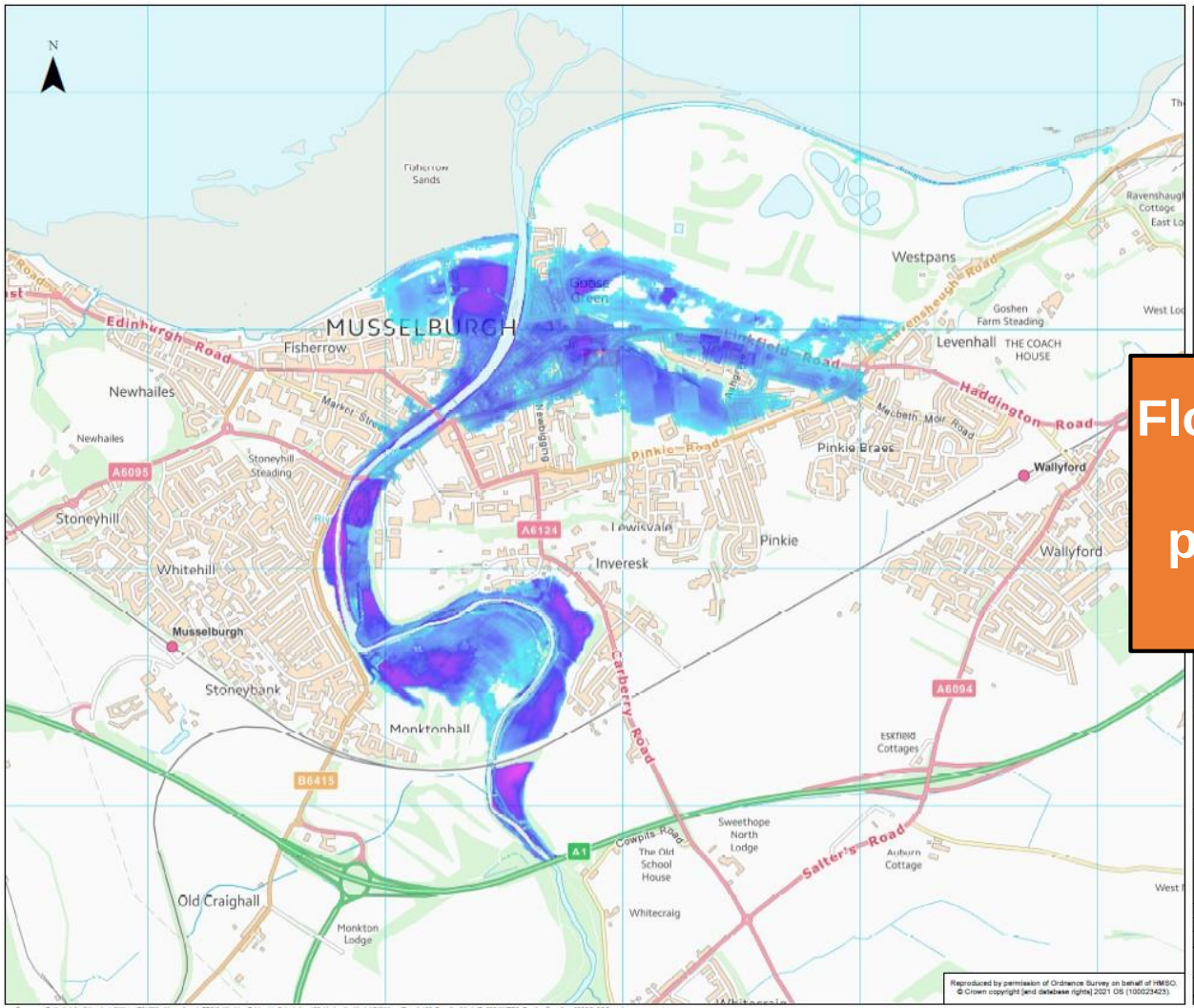
Drawing Scale : 1:15,000

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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
Ravenshaugh Burn
Musselburgh
Mill Lade
MUSSELBURGH
Pinkie Burn
River Esk
Stoneybank Burn
Stoneybank Culvert
The 'Blended' Flood Map for the Scheme's Design Event – Model A
2514 No. Basic Land Property Units (BLPUs) Affected
0 250 500
Metres
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Fluvial flood risk – At Inveresk Area:





KEY

Water Depth (m)

Value

High : 3

Low : 0

Flooding from the River Esk can and has previously inundated parts of Inveresk

Client: East Lothian Council

East Lothian Council

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Project: Musselburgh Flood Protection Scheme

Drawing: Baseline Scenario
Fluvial 0.5% AEP+CC; Tidal 50%

Drawn By : EM	Date: 23/09/2021
Checked By : GL	Date: 23/09/2021
Approved By : JB	Date: 23/09/2021
Drawing No.:	Revision: 1

Drawing Scale : 1:15,000

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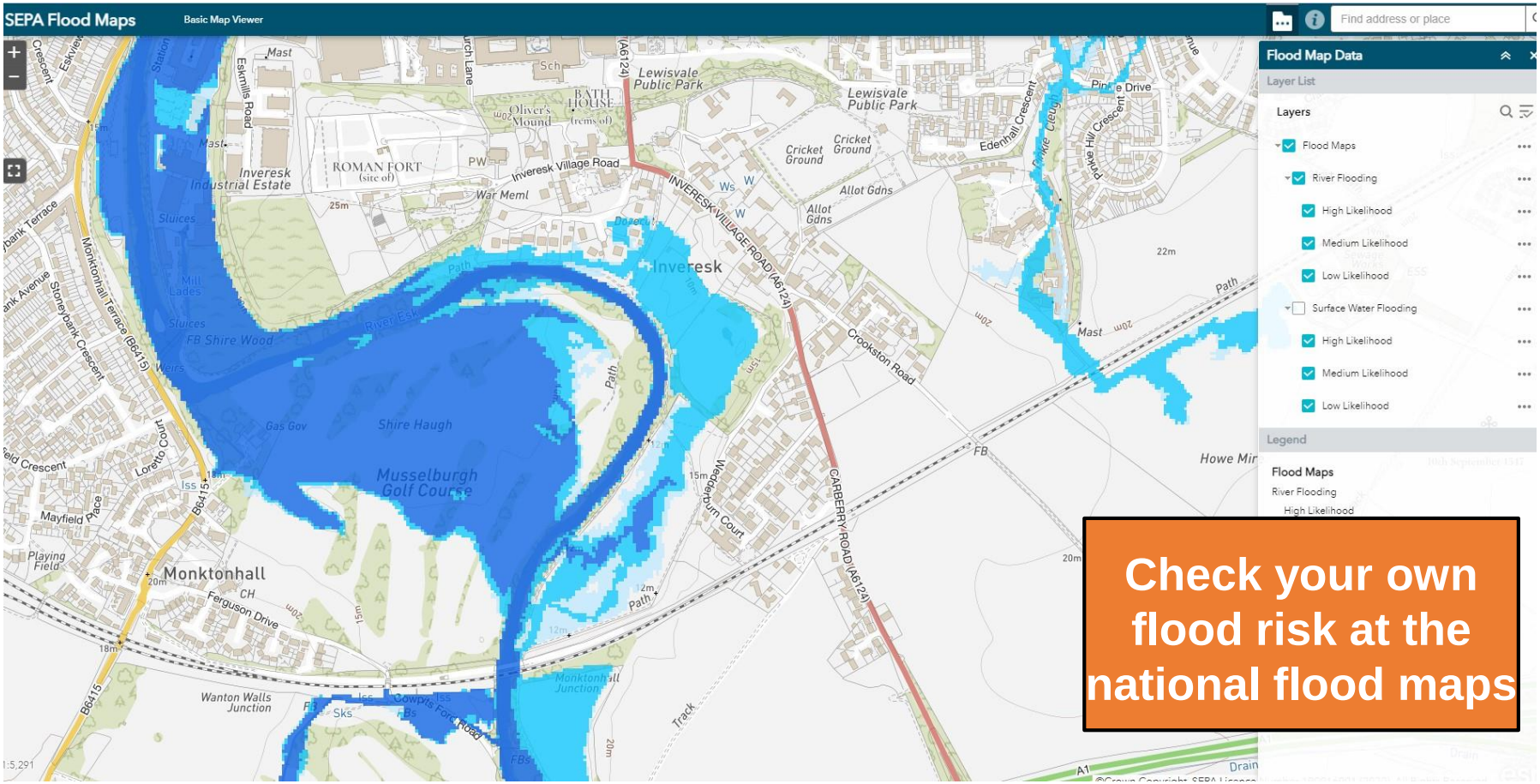
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Fluvial flood risk – At Inveresk Area:



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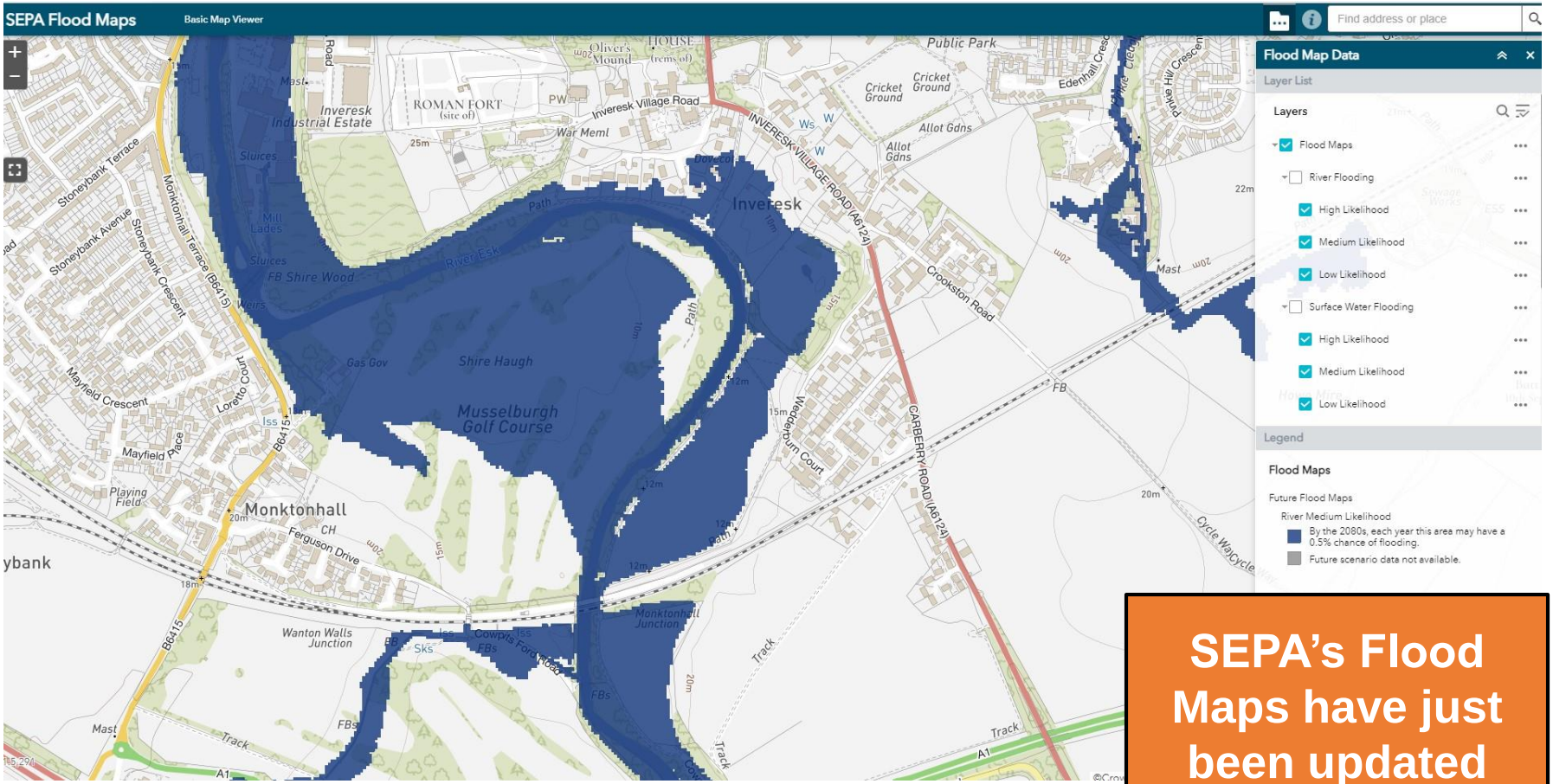
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Fluvial flood risk – At Inveresk Area:



SEPA's Flood Maps have just been updated

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Advancing a flood scheme (CP)

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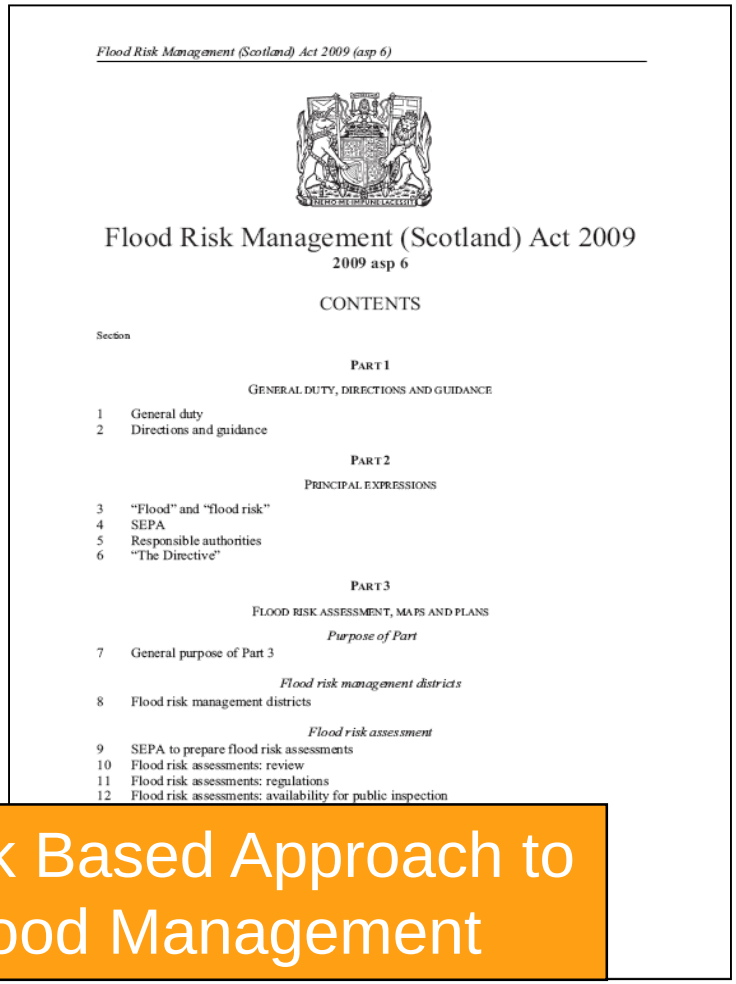
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The Legislation and a FPS:

- This (new) Act superseded the (old) Flood Prevention (Scotland) Act 1961
- Maps out how flood risk will be managed in Scotland and who will be responsible for managing that risk
- New approach – i.e. professionally manage: not just bigger walls
- Major projects to reduce flood risk are delivered through a 'flood protection scheme'
- Formal approval under FRM with DPP



Flood Risk Management (Scotland) Act 2009 (asp 6)

Flood Risk Management (Scotland) Act 2009
2009 asp 6

CONTENTS

Section

PART 1
GENERAL DUTY, DIRECTIONS AND GUIDANCE
1 General duty
2 Directions and guidance

PART 2
PRINCIPAL EXPRESSIONS
3 "Flood" and "flood risk"
4 SEPA
5 Responsible authorities
6 "The Directive"

PART 3
FLOOD RISK ASSESSMENT, MAPS AND PLANS
Purpose of Part
7 General purpose of Part 3
Flood risk management districts
8 Flood risk management districts
Flood risk assessment
9 SEPA to prepare flood risk assessments
10 Flood risk assessments: review
11 Flood risk assessments: regulations
12 Flood risk assessments: availability for public inspection

Ethos of Act: Catchment & Risk Based Approach to Sustainable & Natural Flood Management

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Schematic Timeline of FPS development:

Set-up project & define the problem

Work out the options & formal OAP

Surveys & Gather information

Decide on Preferred Scheme

Formal Consultation – PE No. 1

Achieve Scheme Approval

Carry out Outline Design through a consultative framework

Tender for construction

Formal Consultation – PE No. 2

Carry out Detailed Design and prepare contracts

BEGIN CONSTRUCTION

The Scottish Government
Riaghaltas na h-Alba

Scottish Water



MUSSELBURGH & INVERESK COMMUNITY COUNCIL

SEPA
Scottish Environment Protection Agency

NatureScot
Scotland's Nature Agency
Buidheann Nàdair na h-Alba

MUSSELBURGH RACECOURSE
SINCE 1816



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Background to the Scheme (CP)

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Where has this Scheme come from:

1. There is a history of flooding to Musselburgh;
2. Climate change projections make the situation much worse;
3. The new Flood Risk Management (Scotland) Act 2009 put in place a national approach to managing flood risk;
4. From this the Local Flood Risk Management Plans were developed and approved;
5. The Forth LFRMP records a specific action of a flood protection scheme for Musselburgh;
6. The SEPA and the Scottish Government then confirmed the Scheme as a priority via its Cycle 1 Flood Protection Scheme Programme – 42 No. FPS's across Scotland;
7. The Council → Project Team have been advancing it since 2016;
8. A Preferred Scheme was confirmed by East Lothian Council in January 2020.

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Timescales for delivery (CP)

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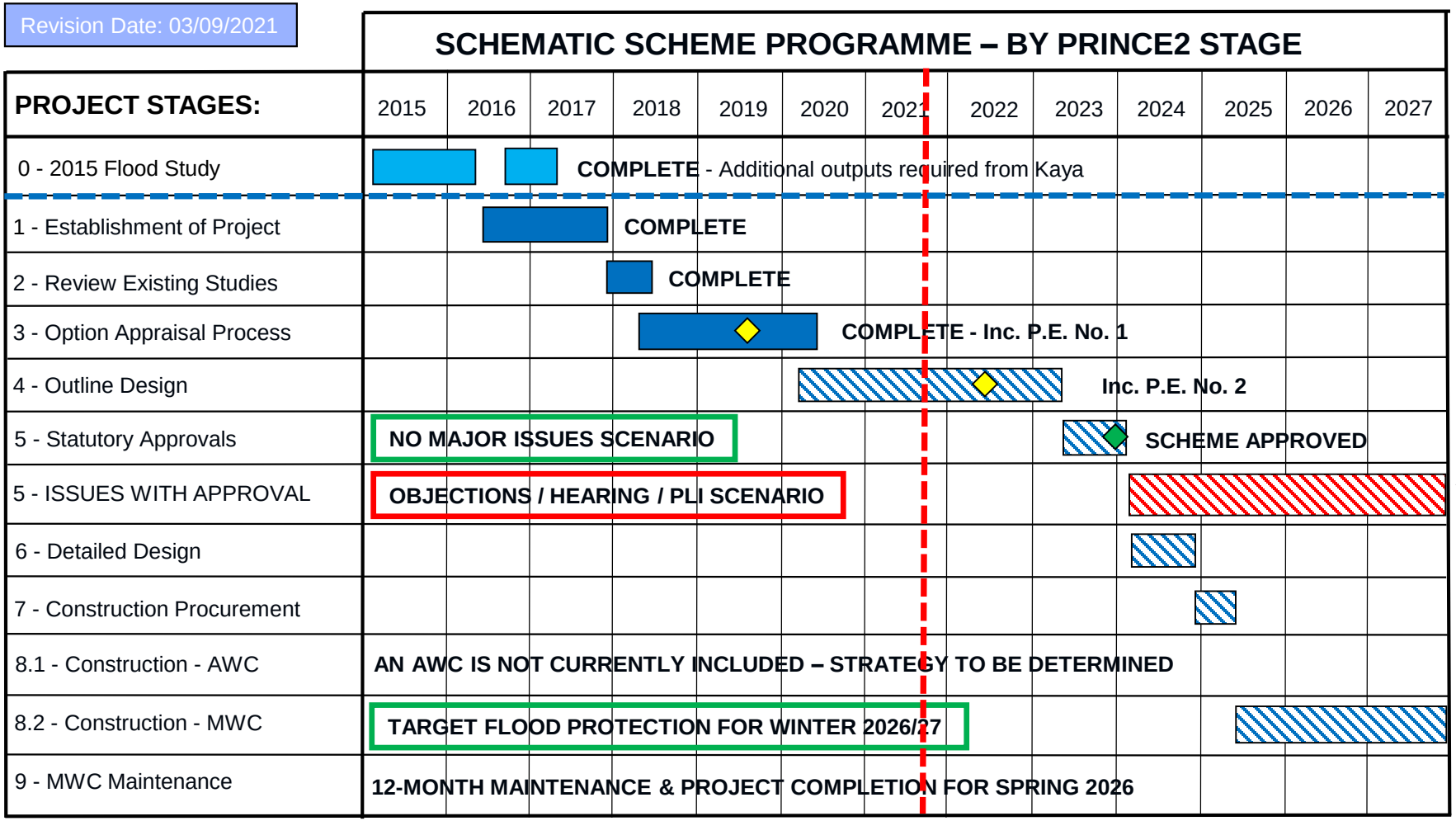
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What is the likely delivery timetable:

Revision Date: 03/09/2021



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What are the next steps:

Assume by spring 2022

1. Local Area Consultation Meetings;
2. Meetings with Key Stakeholders;
3. Major updates to Scheme Website before end 2021;
4. Develop first edition of new Scheme Newsletter;
5. Continue work of Working Groups with Regulatory Officers;
6. Finalise the Hydrology and Hydraulic Model with SEPA;
7. Produce formal outputs from the approved Hydraulic Model;
8. Begin Outline Design;
9. Continue cycle of design → consultations → design etc.;
10. Present the draft Outline Design to public for consultation – review and comment by anyone who wishes to view / participate.

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The Stages of the Scheme (JB)

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Project Stages

- Stage 1 – Establishment of the scheme
- Stage 2 – Review of existing studies
- Stage 3 – Option appraisal
  - Consult public on the need for flood protection
  - Work with statutory stakeholders to identify options
  - Assess feasibility and effectiveness of options
  - Selected options become a ‘preferred scheme’

COMPLETE

- Stage 4 – Outline design
  - Gather further information
  - Consult stakeholders on the preferred scheme
  - Develop an outline design
  - Assess the impact of the outline design on the environment
  - Refine the outline design to form a ‘Proposed Scheme’

IN PROGRESS

- Stage 5 – Statutory approvals
- Stage 6 – Detailed design
- Stage 7 – Procurement
- Stage 8 - Construction

SUBJECT TO APPROVAL

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Consultation (JB)

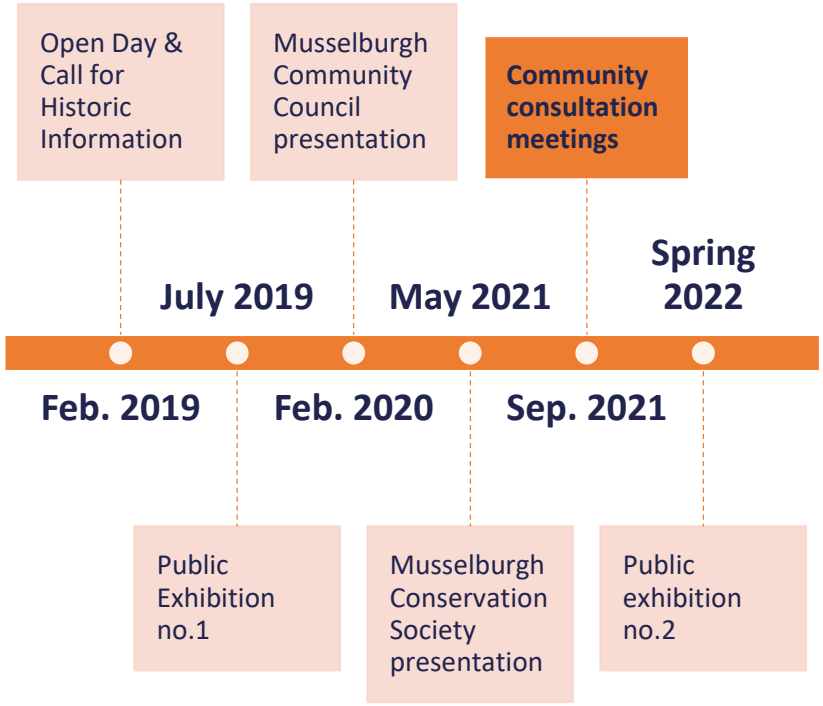
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Public Consultation





Consultation Feedback

Public exhibition no.1 was attended by 210 people, of which, 93 people completed the questionnaire. Their responses indicated the following themes were of importance:

- 94% of respondents were in favour of the scheme
- 47% commented on the potential visual impact of the scheme
- 23% commented on future access to the river and the coast
- 11% commented on consideration of upstream measures, including storage.

This feedback directly informed the option appraisal by the project team

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The Preferred Scheme (JB)

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The Option Appraisal Process

- The option appraisal was carried out by technical specialists and representatives of statutory bodies.
- 97 options were identified, 28 of which were considered further.
- The positive and negative impacts of each option were evaluated on a wide range of technical, environmental, social, economic, and health & safety criteria
- Some of the rejected options include: property abandonment, dredging, bypass channels, tidal barrages, breakwaters, new flood storage reservoirs, and weir demolition.

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The Preferred Scheme

- The terminology comes from: “Flood Risk Management (Scotland) Act 2009 – Flood Protection Schemes – Guidance for Local Authorities”.
- The preferred scheme is the preferred combination of options from the option appraisal process.
- The preferred scheme is not a design – it is a collection of concepts which, subject to further development, could collectively reduce the risk of flooding to Musselburgh from coastal, fluvial, pluvial and groundwater sources.
- We need engagement with the community and other stakeholders to develop the preferred scheme into a design which best meets the needs of the people of Musselburgh

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Flood Protection

The Preferred Scheme Components

1. **Attenuation** – Sustainable flood management, using Rosebery and Edgelaw reservoirs to store floodwater at the height of the storm and reduce the peak flow of water entering Musselburgh
2. **Debris management** – Sustainable flood management to intercept large woody debris to reduce the risk of blockage beneath bridges
3. **Conveyance improvement** – replace bridges at a higher level, above the flood to reduce restrictions to the flow of water
4. **Containment** – direct defences to contain the river and keep out the sea
5. **Urban drainage** – pumping stations to collect rainwater caught behind defences and return it to the river

None are effective on their own – their combined effect is required

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Attenuation

- The peak flow at the Esk gauging station is approximately 310m3/s (an Olympic swimming pool of water every 8 seconds).
- Attenuation at Roseberry and Edgelaw reservoirs would reduce this by approximately 25m3/s (8% of total flow)
- This results in lower flood defence heights required between Eskmills weir and Electric bridge



Debris Management

- Debris ‘trap’ proposed within Dalkeith Country Park
- This will intercept large woody debris to reduce risk of bridge blockage
- This results in lower flood defence heights required between Eskmills weir and Electric bridge



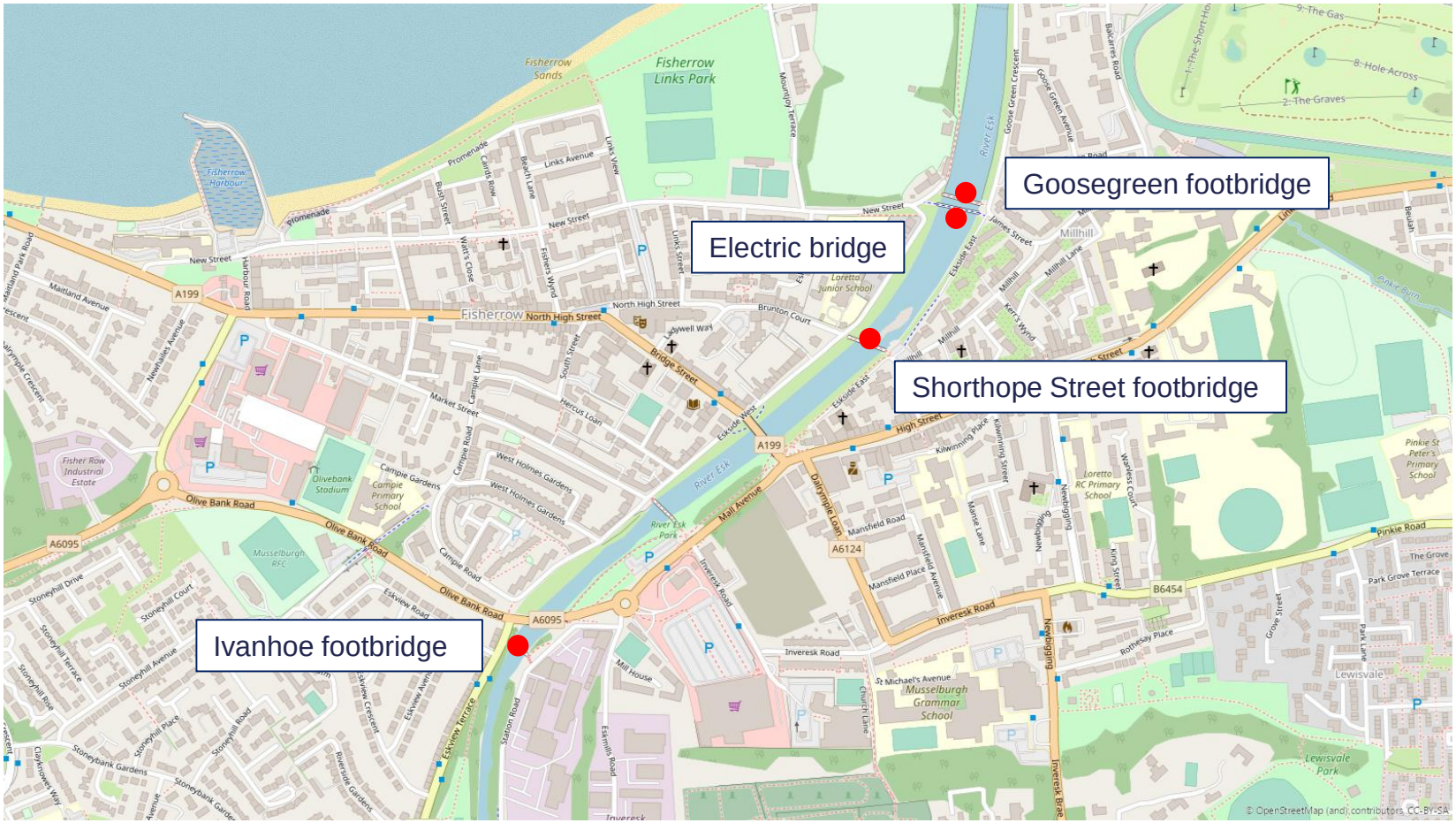
Debris at Rennie bridge on 29th October 2021



Morpeth Flood Alleviation Scheme (Photo courtesy of JBA Bentley)

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Replacement of Bridges



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Direct Defences



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The Outline Design – At Inveresk Area (JB)

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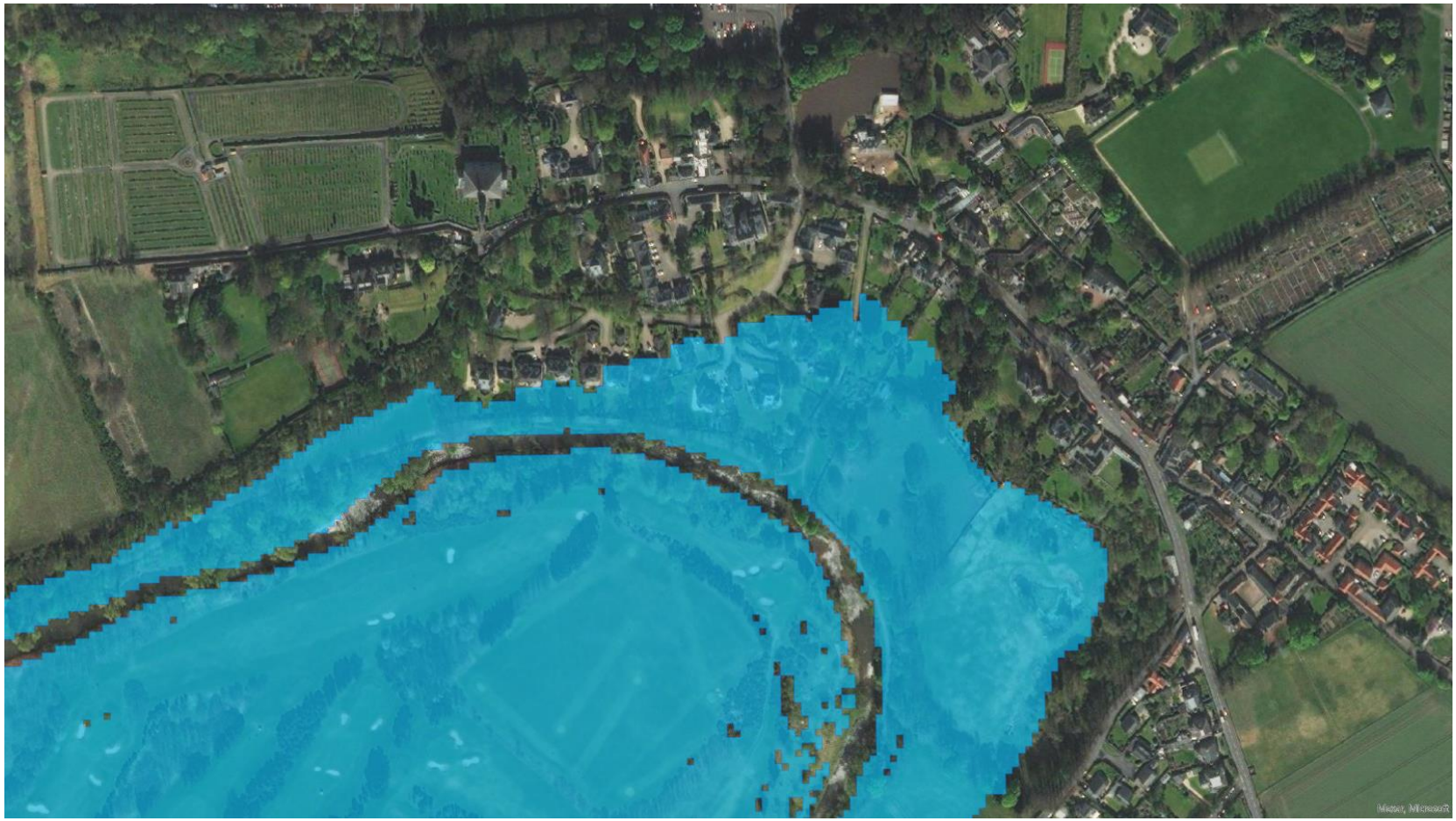
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Stage 4 – Outline Design

- Collect further information
- Consult stakeholders on the preferred scheme
- Develop an outline design
- Assess the impact of the outline design on the environment
- Refine the outline design to form a ‘Proposed Scheme’

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Inveresk flood risk from 0.5%AEP+CC fluvial event



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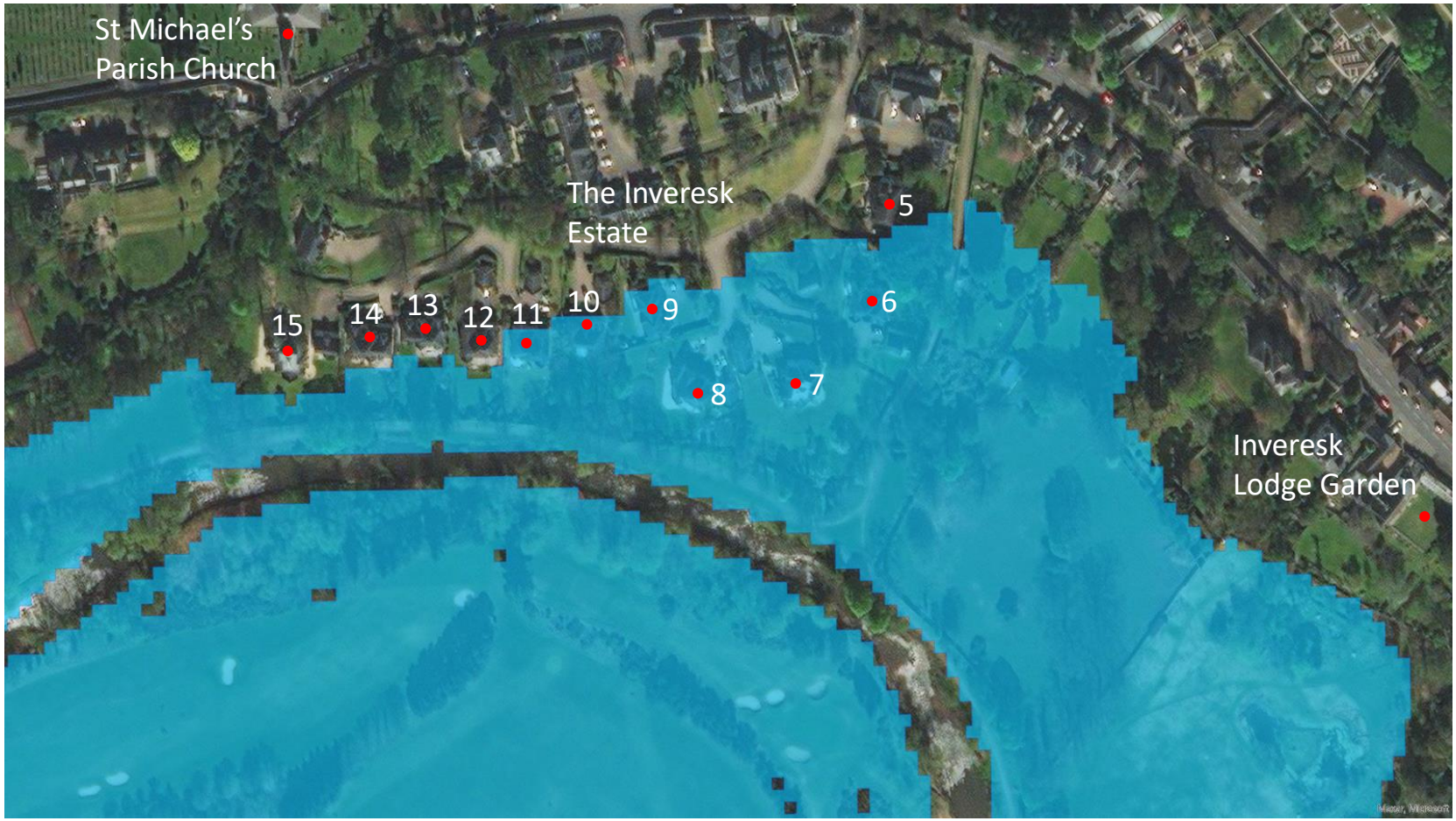
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Inveresk flood risk from 0.5%AEP+CC fluvial event



Inveresk flood risk from 0.5%AEP+CC fluvial event

	Level in metres above ordnance datum (maOD)*			
Property	Threshold Level	Baseline water level (without Scheme)	Water level with Scheme in place	Height above threshold
6 The Inveresk Estate	11.57	11.817	11.769	+0.199
7 The Inveresk Estate	11.47	11.757	11.713	+0.243
8 The Inveresk Estate	11.58	11.544	11.516	-0.064
9 The Inveresk Estate	11.42	11.401	11.357	-0.063
10 The Inveresk Estate	11.43	11.222	11.155	-0.275
11 The Inveresk Estate	11.57	11.194	11.143	-0.427
12 The Inveresk Estate	11.71	-	-	
13 The Inveresk Estate	11.9	-	-	
14 The Inveresk Estate	11.97	-	-	
15 The Inveresk Estate	13.17	-	-	

Inveresk flood risk from 0.5%AEP+CC fluvial event

- The onset of property flooding in Inveresk is only at the 0.5%AEP+CC fluvial event (i.e. the properties are not at risk from more likely, less extreme events)
- Whereas Eskmills Business Park is at risk from the 20%AEP+CC fluvial event and Mountjoy Terrace is at risk from the 50%AEP+CC coastal event

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Thank you for listening to our presentation

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FOLLOWED BY QUESTIONS & ANSWERS SESSION

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FOLLOWED BY OPEN DISCUSSION / BRAINSTORMING SESSION

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