CASE STUDY

Reposition or alter river embankments to create a natural floodplain

Project Summary

Title: Elgin Flood Alleviation Scheme
Location: Elgin, Moray, Scotland
Technique: Construction of set back embankments; flood plain lowering
Cost of technique: ~~£~~£~~£~~£
Overall cost of scheme: ~~£~~£~~£~~£~~£~~
Benefits: ~~£~~£~~£~~£~~£~~
Dates: 2012 - 2014

Mitigation Measure(s)

Reposition or alter river embankments to create a natural floodplain
Replace flood walls with earth banks
Allow the river to flood its floodplain
Preserve and improve water's edge and bank side habitats
Retain and improve existing water's edge and bankside habitats in modified watercourses
Use green engineering techniques instead of hard bank protection

How it was delivered

Delivered by: Scottish Government (Flood Prevention) and Moray Council
Partners: Moray Council, Royal HaskoningDHV, Morrison Construction and EC Harris

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The project has provided protection to Elgin from a 1 in 200 year flood event through the recreation of flood plains through the city, removing numerous constrictions to flow, setting back embankments from the river channel, creating a flood relief channel and diverting two burns

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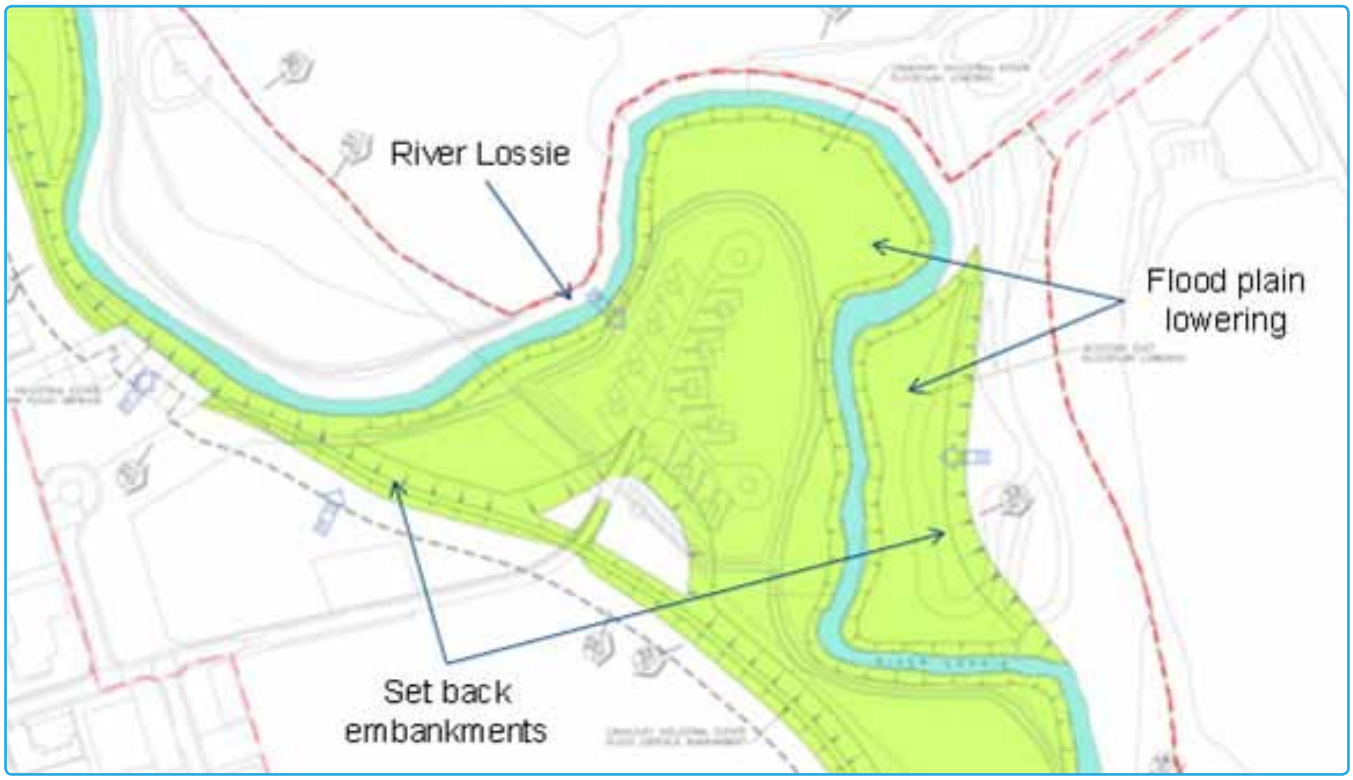
Background and issues

The historic city of Elgin is subject to flooding from both the River Lossie and the Tyock Burn, which has affected approximately 600 residential properties and 120 commercial properties. Development on the floodplain and the construction of embankments adjacent to the river has resulted in a number of constraints to natural flooding in the area, disconnecting the river from the floodplain and reducing its ability to cope with flood events.

The flood alleviation scheme aimed to provide 1 in 200 year flood protection for the City of Elgin, considerably reducing the flood risk to people and properties. This was achieved by creating more space for the online storage of flood waters, by reconnecting the river with the natural floodplain, ground lowering and setting back embankments as far as possible within the urban setting of Elgin. This means that water can be safely stored without affecting nearby assets and infrastructure.



Example design of the Elgin Flood Alleviation Scheme. This section indicates the floodplain lowering and set back embankments used around the Moycroft and Chanonry section of the River Lossie. The full scheme involved modification to 1.5km of the River Lossie, Tyock Burn and Linkwood Burn.

Step-by-step

The development of the scheme can be divided into 4 main stages:

Identification and Assessment of Options: 25 options were assessed and three viable options were identified. A range of studies were undertaken including geomorphological walk over surveys to characterise the functionality of the river, hydraulic modelling, geotechnical investigations; ecological surveys and contaminated land investigations. These studies provided the information required to make a detailed assessment of the three options and identify the preferred option.

Outline Design: Using the information obtained in the assessment stage, additional hydraulic modelling, and more detailed geomorphological assessments and ecological surveys, the design team (comprising of environmental scientists and engineers) identified the optimum locations for the set back of embankments and floodplain lowering, and determined the necessary dimensions to achieve the required standard of protection. Details of a flood relief channel and flood walls in areas where embankments could not be set back from development were also included at this stage. The outputs were then used to produce drawings to support a planning application.

Detailed design: During the detailed design stage of the project, the outline design was developed to produce drawings which were suitable for construction. Details about the types of embankment cores and toe drainage were included in the final design and drawings as were details of wall reinforcement. In addition, details relating to site compound layout and finalised access routes were detailed.

Construction: The construction stage of this project (April 2012 – March 2015) will involve:

- The creation of over 5 km of set back embankments (completed 2012).
- The creation of 21 hectares of lowered floodplain.
- The creation of 1.5 km of new watercourse, the creation of a 300 m flood relief channel and the realignment of a 180 m stretch of the River Lossie.
- The construction of three new clear span bridges.
- The demolition of a small number of residential properties, commercial properties and four bridges. These obstacles provided significant constraints to the operation of the flood alleviation scheme, and in the case of the residential properties had been constructed without planning permission.

(1) Existing flood embankment to be breached, with set back embankment constructed behind; (2) Flood plain to be lowered behind embankment shown here, with set back embankments constructed and buildings removed; (3) Bridge to be removed.

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Benefits

- Alleviation of flooding in Elgin.
- Recreation of a naturally functioning floodplain which is connected to the river.
- Creation of wet meadow habitats.
- Creation of riparian wet woodland.
- Waste minimisation – material from flood plain lowering used for construction of embankment.
- Increased amenity value of the water's edge for the public.
- Contribution towards maintenance of the water body's good ecological status.

New flood alleviation measures at Elgin after construction

Lessons Learnt

When creating set back embankments, a key requirement is to balance the construction programme with the seeding programme so that seeds are sown as soon as the embankments are completed and in a time that is right for the seed to germinate. Failing to factor this into the initial planning can lead to a failure of the seeding programme, requiring reseeding at a later date, and delaying the date at which the embankments regain their amenity / landscape value.

Site selection is important when identifying which areas can set back embankments. Negative press was generated when an illegal traveller's site (constructed without planning permission) was demolished to make space for the new floodplain.

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