Forres (River Findhorn & Pilmuir) Flood Alleviation Scheme
Recommendation Report

The Moray Council

31st October 2006
Final Report
9R6782
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Forres (River Findhorn & Pilmuir) Flood Alleviation Scheme
Recommendation Report

1 BACKGROUND

1.1 Purpose of this Report

This report sets out the background to the River Findhorn Flood Alleviation Scheme. It identifies a preferred scheme, highlights the key issues associated with this option, outlines a way forward and presents a recommendation for adoption by the Environmental Services Committee.

1.2 Introduction

The River Findhorn has a catchment area of 790 square kilometres that extends from the Monadhliath Mountains to Findhorn Bay. The downstream section of the river lies within Moray, passing by the town of Forres, which has a population of approximately 9000. The other significant source of flood water to inundate the western side of Forres is from the local Pilmuir catchment, which lies to the south west of the town.

The options presented in the Appraisal Report allow an agreement of principles regarding future flood defence to Forres from the River Findhorn and local Pilmuir catchment. A preferred scheme has been set out in this report, subject to findings from the next phase of the investigation, e.g. ground investigation, landowner consultation, etc., which may warrant amendment to the scheme.

The scheme details need to be developed and can only be fully validated subject to:

- Acceptance of this recommendation,
- further consultation with the stakeholders, e.g. Transport Scotland and Network Rail
- consultation with the landowners, and local residents, and
- information gained from further necessary studies, e.g. ground investigation, hydro geological study of the Pilmuir catchment, location and extent of any contaminated land, etc.

1.3 Legislation, Policies and Plans

The Water Environment and Water Services (Scotland) Act 2003 (WEWS) places a duty on Local Authorities, and others, to promote sustainable flood management. It incorporates the EU Water Framework Directive (WFD) into Scots Law. Any flood alleviation strategy for the River Findhorn will need to demonstrate the sustainability of the proposals against the overall objective of the WFD, which is that all watercourses should achieve ‘good ecological status’. There is also a myriad of other legislation, policies and guidance of relevance to any works that must be met, including but not limited to:

- The Flood Prevention (Scotland) Act 1961
- The Water Environment (Controlled Activities) Regulations 2005 (CAR)
- The Environmental Impact Assessment (Scotland) Regulations 1999
The Moray Development Plan produced by The Moray Council contains structure and local policies to inform and assist in the delivery of development objectives over a 10 to 15 year period.

- Local Plan Designations
- Scottish Planning Policy 7
- Planning Advice Note 69

The following sections demonstrate the need for flood alleviation measures in Forres. The very nature and special character of the environment and the various legislation and policies present a challenge in delivering a scheme. By evaluating and ranking the performance of each of the options, against criteria previously developed for this scheme, an indication of the impacts of each option can be gained and the key issues identified.

This achieves the following objectives:

1. To allow the impacts and benefits associated with the options to be reflected in the appraisal;
2. To differentiate between options; and
3. To determine which of the options provides the best environmentally acceptable, technically robust, economically viable and sustainable solution

1.4 The Problem

The River Findhorn has a long documented history of flooding the Forres area with at least 16 major flood events in the last 300 years. The largest event recorded is the 1829 'Muckle Spate' where the flooded area was estimated to cover 20 square miles. The river caused serious flooding of Forres 1956 and 1970. The historic data and hydraulic modelling undertaken demonstrate the level of flood risk.

In addition to the problem posed by the River Findhorn, the area of Pilmuir in Forres is affected by flooding from the local catchment. The sub-catchments that lead into Pilmuir introduce flooding in three ways, which are independent of flooding from the River Findhorn.

- Overland flow is exacerbated by the poor capacity of the existing urban drainage network and saturated ground conditions which develop after periods of extended heavy rainfall.
- The Burn of Mosset, which is the outfall for runoff from the Pilmuir catchment, could potentially cause backing up of the existing drainage system.
- Groundwater egress has been reported in some isolated low-lying areas of the catchment.

This flood alleviation scheme aims to mitigate the effects of flooding from both the River Findhorn and Pilmuir catchments.

1.5 The River Findhorn Flood Alleviation Strategy

The strategy looked at the Findhorn and Pilmuir catchments separately. The development of a River Findhorn flood alleviation strategy involved both consultation and investigation. It took into account extreme flow estimation, climate change analysis, modelling of the watercourse and flood mechanisms, production of flood risk maps, preliminary geomorphological studies, initial investigation of flood

Information gathered at the public consultations was used to help determine the town’s flood history, calibrate and verify the hydraulic modelling and flood risk mapping work, and to help develop flood alleviation options. In addition a Value Management Workshop (February 2003) was held to help generate ideas for solving the flooding problem in Forres. This was attended by Moray Council representatives, statutory consultees and members of the local community. These ideas have helped to inform the direction of the scheme and the appraisal criteria for The River Findhorn Flood Alleviation Strategy.

Following this consultation process, the River Findhorn Pre-feasibility Report investigated possible options for the River Findhorn FAS and as part of this process discounted a number of options, specifically;

- Afforestation;
- Natural wetlands;
- Flood storage;
- Channel diversion;
- Temporary and/or demountable defences;

The options that remained were developed into a preferred strategy as set out in MFAG 231 (Forres (River Findhorn) Flood Alleviation Scheme Strategy Recommendation Report), and agreed by the Environmental Services Committee on 23 February 2005. This provided a minimum flood defence standard of 1 in 100 year return period meeting the Scottish Executive grant eligibility criterion. The strategy recommendation was that a River Findhorn Flood Alleviation Scheme would include the following;

- Flood embankments on both sides of the River Findhorn, set back where possible, to prevent inundation of the town of Forres and surrounding communities.
- Infrastructure changes - Works may be required to the A96 trunk road, Inverness to Aberdeen railway line and at Greshop Industrial Estate to allow the river to utilise more of its natural floodplain during extreme events.
- Improved flood warning.
- Scheme maintenance to ensure optimal performance and long term structural integrity.

Scheme options were developed following the agreed strategy and presented at an Option Appraisal Workshop held in June 2006. The workshop was attended by team members and a number of representatives from stakeholder groups including SNH and Network Rail. The results of this workshop are recorded in River Findhorn Option Appraisal Workshop Report (MFAG 360), and information and ideas from this workshop have been used to revise the options presented in this Appraisal.

In parallel with the work undertaken on the River Findhorn FAS, a similar process of consultation and investigation was undertaken to consider a scheme to relieve groundwater and overland flooding in the Pilmuir area of Forres. This resulted in the production of MFAG359 Pilmuir FAS Economic Appraisal Report which demonstrated that there was only an economically viable scheme if it was implemented in combination with a flood defence scheme from the River Findhorn, as many of the properties are vulnerable to flooding from the River Findhorn. Should
a FAS not be pursued from the River Findhorn, then any flood alleviation works undertaken against rainfall in the local Pilmuir catchment, would be overwhelmed by flooding from the Findhorn. Combination therefore, with a River Findhorn FAS was considered to offer the only viable and sustainable option, together with potential financial opportunities through economies of scale. Therefore, the Pilmuir FAS Economic Appraisal recommended that the Pilmuir and River Findhorn FAS's should be combined to provide a single comprehensive FAS for flooding from the west of Forres. This was accepted by the Council at their Environmental Services Committee meeting on 16 August 2006.

2 PURPOSE OF APPRAISAL REPORT

The purpose of the Appraisal Report, from which this report has been distilled, is to record the appraisal of the potential flood alleviation options for implementing The River Findhorn Flood Alleviation Scheme Strategy and to document the recommendation of a preferred scheme to be taken forward for further stakeholder and landowner consultation and development in the Design Stage 1 phase of the scheme.

3 PREFERRED SCHEME

Following analysis of the options for implementing The River Findhorn Flood Alleviation Scheme Strategy, the preferred scheme, which optimises the key objectives and provides a consistent standard of flood protection of at least 1 in 100 years for Forres is,

- Set back defences, to Forres and all local communities, where possible;
- Raise A96 over a length of some 400m;
- Drainage channels from Pilmuir; and,
- Flood warning review.

Further consultation with landholders, stakeholders and the public, together with the acquisition of further data through ground investigation, groundwater studies, contaminated land investigations etc. is required to confirm the preferred scheme. The preferred scheme is summarised below.

3.1 Set Back Defences; Raise A96; Drainage Channels from Pilmuir; and Flood Warning Review

This option follows the principle of set back defences from the current line of defences where practicable. This includes the use of earth embankments, flood walls, works to the A96, river training works, drainage channels and a flood water storage area and pumped outfall for the Pilmuir area (see drawing 9R6782/OP/006).

Embankment A will run for some 750m from Mundole around the western and northern sides of the community of Red Craig. Flood waters escaping the river are diverted around Red Craig and onto the flood plain.

Embankment B runs approximately north-south across the floodplain to the west of the Scheduled Ancient Monument (SAM) site for approximately 700 metres (see also Section 5.1). Open channels may run behind and in front of the embankments, where necessary, to act as drains to temporarily store any small quantities of flood water seepage through the embankments and allow drainage of the floodplain.
following an event greater than the 1 in 100 year design standard. Culverts or similar will be required to drain floodwater from the floodplain back into the Findhorn River.

The A96 would be raised over a length of some 400m to maintain continuity of the flood defence level. These works will avoid covering any area of the SAM that the current A96 does not already cover.

Flood Wall/Embankment C runs from the A96 to the railway embankment. It will consist of a 200m long flood wall behind the garden centre building together with earth embankments to the north and south of it.

Embankment D is to defend the Broom of Moy and will either follow the existing embankment alignment on the left bank of the river from the railway embankment or run around the west side of the village, subject to the consultation and investigations set out in Section 3 above.

Embankment E, some 300m in length, will protect the properties at the northern end of the Mains of Moy.

Embankment F will run from the railway embankment to the north of the Greshop Industrial Estate, for approximately 950m, principally along the line of an existing embankment forming the western edge of woodland, to the west of Greshop House and into the high ground at the refuse transfer station. An alternative alignment for consideration at Design Stage 1 is further set back to the south and east of Waterford farm.

River training/management works, probably taking the form of renewal and enhancement of existing bank revetments, will be necessary within the river channel on the outside of the bends upstream of the railway bridge, near Red Craig and adjacent to the Broom of Moy. Other river channel works will be the regular removal of existing scrub vegetation on the left hand bank adjacent to and under the railway bridge and the management of the bed level to the entrance of the high flow channel to the north east of the Mains of Moy.

For the Pilmuir Catchment, as indicated in Pilmuir Economic Evaluation of Options (MFAG 359) the preferred option identified is the construction of a 1300m long drainage channel(s) across the Pilmuir catchment redirecting overland and potentially some groundwater flows towards the River Findhorn. The channel starts south of Pilmuir near Ferry Road, and runs across the catchment towards the River Findhorn with box culverts under existing roads and the Pilmuir Sports ground. A secondary channel runs east from the sports field. A 4 hectare water storage area, to the south of the A96 and to the east of the SAM site, in combination with a pumping station allows discharge to the River Findhorn should its water level be too high to allow a gravity discharge.

4 BENEFITS AND COSTS

The economic damage to Forres from flooding from the Findhorn and local Pilmuir catchments is considerable. For a 1:100 year standard of defence, over a 100 year scheme life with climate change allowances made until 2080, the tangible benefits realised will be some £58.19million of which £4.21million comes from the Pilmuir element.

A cost estimate for the preferred scheme is shown in the Table below:
Table 1 Estimated Cost to Construction of Preferred Scheme (Option 3A)

<table>
<thead>
<tr>
<th></th>
<th>£ million</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Cost</strong></td>
<td></td>
</tr>
<tr>
<td>Work items</td>
<td>£12.32</td>
</tr>
<tr>
<td>General &amp; Preliminaries (27.5%)</td>
<td>£3.39</td>
</tr>
<tr>
<td><strong>Total Construction Cost (TCC)</strong></td>
<td>£15.71</td>
</tr>
<tr>
<td><strong>Non-construction Cost</strong></td>
<td></td>
</tr>
<tr>
<td>Professional Fees and Investigations (15% of TCC *)</td>
<td>£2.36</td>
</tr>
<tr>
<td>PV Operation and Maintenance Cost over 100 years (5% of TCC)</td>
<td>£0.78</td>
</tr>
<tr>
<td>PV Operation and Maintenance Cost (Pumps) over 100 years</td>
<td>£0.20</td>
</tr>
<tr>
<td><strong>Total Non Construction Costs (TNCC)</strong></td>
<td>£3.34</td>
</tr>
<tr>
<td>Optimism Bias (60% of TCC + TNCC)</td>
<td>£11.43</td>
</tr>
<tr>
<td><strong>Total PV Scheme Costs</strong></td>
<td>£30.48</td>
</tr>
</tbody>
</table>

* The above estimate includes costs to date.
A cost risk analysis has been undertaken for the preferred scheme. Currently the best estimate of cost for the preferred scheme is £26.55 million with an estimated cost range of £22.7m – £30.4m taking into account all uncertainties and opportunities. In accordance with the Scottish Executive’s guidance the 95% confidence level estimate (£30.4m) has been used in assessing the costs utilised in the economic analysis.

Using the upper boundary cost figure this gives a **scheme benefit cost ratio of 1.9**.

5 **KEY ISSUES**

The key issues that have been identified for the preferred scheme are discussed below:

5.1 **Greshop Farm Scheduled Ancient Monument Site**

An archaeological site designated as being of national importance within the study area is Greshop Farm Scheduled Ancient Monument (SAM) located to the south of the A96 and to the west of Pilmuir, within the agricultural fields. This site is protected under the Ancient Monuments and Archaeological Areas Act 1979. The SAM site extends over the footprint of part of the A96 which was realigned prior to the 1979 Act being fully implemented. Road construction works would have damaged the archaeological interests.

Consultation with both Historic Scotland and the Aberdeenshire Council Archaeological Services has confirmed that it would be unlikely that Scheduled Ancient Monument Consent would be granted for a scheme that would seek to damage this monument which is considered to be of national importance. The
The preferred scheme requires works on the A96 as it passes through the SAM and to land to the north of the existing A96 although there is some potential for works to be required in the grass verge to the south of the A96 within the SAM. Due to previous excavations within the northern section of the SAM site, it is considered that the works proposed would have minimal additional impacts on the archaeological interests of this site. This option will protect the SAM site from flooding in the future. Ongoing consultation with Historic Scotland and Aberdeenshire Council Archaeological Services is required to ensure that the scheme develops without significant impacts on the SAM thereby ensuring Scheduled Ancient Monument Consent is granted.

5.2 Rail and Road Infrastructure

The A96 trunk road and the Inverness to Aberdeen railway line both bisect the River Findhorn’s floodplain. The preferred scheme requires raising of the A96 by approximately 2.5 metres to ensure the continuity of flood defence, whilst allowing the River Findhorn to utilise the flood plain. Works to the A96 will require consultation and consent from the Transport Scotland. Works to the railway line would require consultation and consent from Network Rail.

5.3 Planning, Development and Business Interests

The scheme impinges on agricultural land but this has been minimised. It protects land use within existing commercial business areas such as Greshop Industrial Estate and residential areas of Pilmuir. Care will be taken to minimise any economic impact of a flood alleviation scheme through further consultation.

5.4 Investment Case

At this stage the appraisal indicates a sound investment case for flood alleviation at Forres. The cost estimate contains allowance for risk and uncertainty reflecting that a number of ground and other investigations are still to be carried out, and the scheme may need further changes. The cost – risk assessment undertaken as part of this appraisal includes significant allowance providing robustness to the economic justification.

5.5 Contaminated Land

The extent of sites of potentially contaminated land has now been identified. Based on data available the appraisal considers the relative effect of scheme options on potentially contaminated sites. All of the options have a similar potential for impacting on some of these sites. The consequence of the preferred scheme requiring land remediation may affect the benefit cost ratio if it exceeds the allowance made in the risk allowance included in the estimate.

6 OPPORTUNITIES

6.1 Sustainable Flood Defence

The preferred scheme raises the existing flood defences to Forres to a 1 in 100-year standard. It incorporates the principle of ‘set-back’ flood defences allowing the River Findhorn to utilise its flood plain more fully, and recognises the geomorphologically
mobile nature of the river channel. It minimises the use of ‘hard’ defences wherever possible.

6.2 Planning and Development

This scheme presents opportunity to manage jointly flood risk and long term development of Forres. The provision of sustainable flood defences will aid the long term economic prospects of Forres and the surrounding area.

6.3 Access and Recreation

The scheme presents an opportunity to enhance access and recreation in and around the River Findhorn and Pilmuir areas. The provision of new flood embankments may provide some opportunity to improve existing and establish new footpath and cycle networks in the area. Access to and along the river could be improved for anglers, canoeists, walkers and cyclists as well as for maintenance operations.

7 NEXT STEPS

The principal steps in implementing a flood alleviation scheme for Forres, following acceptance of this report, are set down below.

7.1 Design Stage 1

Design Stage 1 will identify the nature and extent of all works required, and will produce general arrangement drawings with key dimensions which will be central to gaining the consents, approvals and agreements necessary. A cost estimate and implementation programme will be prepared in parallel with the next stage of the design.

In developing the outline design it will be necessary to:

- Submit Project Execution Plan and fee forecast to the Flood Alleviation Sub-Committee.
- consult further with those directly affected by the proposed scheme including landowners, residents and commercial property owners.
- undertake further investigations, including
  - ecological surveys,
  - ground investigation,
  - groundwater hydrology in the Pilmuir catchment,
  - contaminated land study,
  - sediment modelling and
  - topographic & services surveys.
- consult further with stakeholders to take forward opportunities and establish statutory and regulatory requirements for the design, construction and operation of the scheme.
- develop the design and identify environmental and amenity opportunities.
- Confirm validity of investment appraisal.
- Hold a public exhibition towards the end of the Design Stage 1.
- Produce Design Stage 1 Report.
- Present a report to the Environmental Services Committee with recommendations to proceed to FPO and Planning Application.
7.2 Obtaining a Flood Prevention Order and Planning Consent

Design Stage 1 will be taken forward to the Flood Prevention Order (FPO) gained from Scottish Executive, and planning consent from The Moray Council and/or Scottish Ministers. The steps needed to procure these consents are:

- To consult with the Scottish Executive to confirm requirements for the business case and obtain feedback on the proposals and funding;
- To further develop the business case through value engineering and risk management for submission to the Scottish Executive and key statutory consultees;
- To secure agreements with all significantly affected landowners and occupiers;
- To carry out an Environmental Impact Assessment (EIA) and prepare an Environmental Statement as part of the planning application; and,
- To comply with the Controlled Activities Regulations.

It is possible that one or more Public Local Inquiries (PLI's) may be necessary to gain a FPO and planning consent.

7.3 Detail Design and Target Setting

With all key consents in place, the outline design will be developed to construction stage, involving the preparation of design, construction drawings, specification, contract documentation and an Environmental Action Plan. All land and access agreements will be developed and finalised. Environmental consents identified in the EIA will be sought and Controlled Activities Regulations (CAR) application submitted to SEPA. Construction cost and programme targets will be set to administer the construction contract.

7.4 Construction and Commissioning

The scheme will be constructed in accordance the FPO, planning and other consents together with their associated conditions. On completion, the scheme will be commissioned and handed over to Moray Council to operate and maintain.

8 RECOMMENDATIONS

It is recommended that:

- Option 3A, set back defences to Forres and all local communities, where possible; raise the A96 over a length of some 400m; drainage channels from Pilmuir; and flood warning review, is taken forward as the preferred scheme to alleviate and manage the flood risk in Forres from the River Findhorn and Pilmuir Catchments;
- Consultation on the preferred scheme is undertaken with the following key parties: Scottish Executive, statutory consultees, landowners, residents and commercial property owners to progress investigations and development of the scheme;
- Negotiations with stakeholders and landowners are undertaken to establish land management agreements for the operation and maintenance of the scheme and to acquire land interests as necessary; and,
- Design Stage 1 proceeds.