REPORT NO 1410/04

ANGUS COUNCIL

INFRASTRUCTURE SERVICES COMMITTEE

25 NOVEMBER 2004

BRECHIN FLOOD PREVENTION SCHEME - UPDATE

REPORT BY THE DIRECTOR OF ROADS

ABSTRACT
This report provides an update to Committee on the progress achieved in developing a flood prevention scheme for Brechin and in particular the outcome of a workshop with consultees and stakeholders when the results of the option appraisal were presented. The Committee is asked to approve the promotion by the council (under the terms of the Flood Prevention (Scotland) Act 1961) of the option for defences along the north bank of the River Esk in Brechin as the preferred flood prevention scheme. The committee is also asked to remit the Director of Roads to prepare details of this scheme taking into account the issues raised at the workshop and to begin consultations with parties likely to be affected by the preferred option.

1 RECOMMENDATION

1.1 It is recommended that the Committee agree:-

(i) to approve the promotion of a flood prevention scheme for Brechin under the terms of the Flood Prevention (Scotland) Act 1961 on the basis of “Option 3” as detailed in the Options Appraisal Report of October 2004, that is defences along the north bank of the River South Esk in Brechin either with or without demountable barriers;

(ii) to note that the preferred Option, although providing protection to properties at risk from a 1 in 200 year flood event, may give rise to some concern regarding aesthetics, loss of amenity, and a change in the character of River Street;

(iii) to note that there are a number of issues and concerns expressed by Consultees to be considered in developing the full proposals for the scheme;

(iv) to note that there is still no firm commitment from Scottish Water to upgrade their wastewater treatment and discharge infrastructure in Brechin to protect against a 1 in 200 year flood in the same timescale as that proposed for the Flood Prevention Scheme;

(v) to note that the overall cost of Option 3 is estimated to be in the order of £4.8m;

(vi) to note that the Scottish Executive has recently confirmed that grant aid for Flood Prevention Schemes is to be increased to 80% (previously 40%). The
The net cost to Angus Council will therefore be in the order of £1.350m allowing for 20% of the anticipated out-turn works costs and including grant ineligible internal staffing costs. Provision for this expenditure has been made in the Roads Department’s financial plan with the construction phase programmed for 2006/7 and 2007/8;

(vii) to remit the Director of Roads to prepare details and undertake a full environmental assessment for this preferred option with a view to obtaining planning permission (per a Notice of Intention to Develop) and submitting an application for a Flood Prevention Scheme to the Scottish Executive; and to begin consultation on the preferred scheme with landowners, residents and the local community in Brechin;

(viii) to remit the Director of Roads to report back to this committee at key stages in the development of the scheme: the procedure for the Notice of Intention to Develop (NID), promotion of Flood Prevention Scheme, tendering, and award of contract;

(ix) to the Director of Roads extending the commissions of the external consultants undertaking the hydrological analysis and the environmental impact assessment in respect of this extra work;

(x) to note that the extra costs arising in consequence have been allowed for in the most recent revision to the Roads Department’s financial plan.

2 INTRODUCTION

2.1 The council has been considering proposals to prevent flooding in Brechin with a view to promoting a Flood Prevention Scheme under the terms of the appropriate legislation. Two major workshops have been held with statutory consultees and interested stakeholders. Discussions have also taken place with representatives of the Scottish Executive, who will make recommendations to Ministers on approval of the details of the scheme and the level of grant which may be awarded. The workshops were held in December 2003 and March 2004 and were attended by local councillors and by representatives from Statutory Consultees (Scottish Natural Heritage, Scottish Water and Scottish Environmental Protection Agency), the Community Council and other interested parties. These workshops followed an initial public consultation exercise regarding the need for a flood prevention scheme. The workshops reviewed the need for the project and the initial proposals for the scheme. From the responses and advice received it became apparent that a fuller examination of generic options for the scheme would be required to satisfy the legislative requirements in particular those of the Town and County Planning Acts. It was also apparent that such an appraisal would be required to meet the emerging regulations for licensing under the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act) which are expected to come into force prior to the scheme being implemented.
3 DETAILS

3.1 Therefore the project team was remitted to undertake a comprehensive examination of three generic options identified through the consultation process: -

- Attenuation just upstream of Brechin between Stannochy and Finavon
- A flood relief channel to the south of Brechin
- Defences along the north bank of the River Esk in Brechin

3.2 The results of the examination are contained in the Brechin Flood Prevention Scheme Option Appraisal Report dated October 2004. The draft contents of this report were discussed at a third workshop in September 2004 and at a briefing meeting with Councillors whose wards include part of the catchment of the River South Esk before being finalised by the project team.

3.3 The full Options Appraisal Report is available in the Members’ lounge but a summary has been prepared and is included in this report as Appendix 1.

3.4 The conclusion reached in the report is that the third generic option (Option 3) for defences along the north bank of the River Esk in Brechin represents the most technically practicable, cost effective and environmentally sound method of protecting Brechin from flooding and that this option should be promoted as the preferred option for the formal Flood Prevention Scheme.

3.5 Whilst the Flood Prevention Scheme is likely to be generally well received, there may be some concern regarding aesthetics, loss of amenity, and change in the character of River Street. The aesthetic impact of the scheme will however be mitigated as much as possible by high quality design, elevated footway levels, viewing platforms, etc. There will also be a reduction in public open space available and inevitably residents and businesses will be affected during the construction work.

3.6 There are also a number of issues and concerns highlighted by consultees at the workshop which have to be considered in developing the full scheme, including:-

- The need to pursue a combination of full height and demountable barriers and to assess the degree of risk that the Council, the residents and businesses are prepared to take in the long-term operation of the scheme.

- The need to introduce sustainable flood management techniques wherever possible both as mitigation measures and as enhancement measures. This is emerging as a fundamental component of any flood prevention scheme and is one of the recommendations made to the Scottish Executive by the National Technical Advisory Group (NTAG) on Flooding.

- The need to consider the scheme in relation to the new Water Environment and Water Services (Scotland) Act 2003 and associated Controlled Activities Regulations which are due to be enacted in Spring 2006 and which embody the pan-European Water Framework Directive which emphasises catchment level intervention and river basin management practices.
• The need to consider the council’s new statutory duty to promote biodiversity and habitat creation.

• The need to consider the flexibility of the scheme and the ability to introduce design enhancements in the future in terms of responding to the effects of climate change.

• The need to consider changes of land management, change of land occupation, change of land designations, both in the initial implementation phase but also throughout the operational life of the scheme and to have policies for these occurrences. For example initial selective relocation followed by gradual relocation of people and business out of the areas at risk from flooding.

• The need to deal with flows from the combined foul and surface water systems including the waste water treatment plant which discharge into the River Esk in Brechin. These will require to be upgraded to protect against sewer flooding up to and including the 1 in 200 year flood event. There is still no firm commitment from Scottish Water that they will be in a position to undertake this upgrade in the same timescale as that proposed for the Flood Prevention Scheme. There are several watercourses which also act as storm water overflows for the sewer system which will also have to dealt with. The share of the costs of dealing with these watercourses will be the subject of negotiations with Scottish Water as will the need to ensure that the Scottish Water upgrades are undertaken at times consistent with and appropriate to the prospective scheme.

3.7 The timetable for implementing the scheme has been adjusted in consideration of comments from Consultees to reflect the approvals process. The anticipated timetable is:-

<table>
<thead>
<tr>
<th>Action</th>
<th>Provisional Timescale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning application under Notice of Intention to Develop procedure</td>
<td>August 2005</td>
</tr>
<tr>
<td>Promotion and approval of Flood Prevention Scheme</td>
<td>December 2005</td>
</tr>
<tr>
<td>Licensing by SEPA under the WEWS Act and associated regulations</td>
<td>July 2006</td>
</tr>
<tr>
<td>Tender invitation</td>
<td>August 2006</td>
</tr>
<tr>
<td>Contract award and start on site</td>
<td>October 2006</td>
</tr>
<tr>
<td>Completion</td>
<td>September 2008</td>
</tr>
</tbody>
</table>

This timetable may require to be extended if objections to the scheme are received.
4 FINANCIAL IMPLICATIONS

4.1 The overall cost of Option 3 given in the option appraisal report is in the order of £3.7m. However at this stage these costs may vary subject to fuller design and development of the scheme. The scheme in the option report did not include elements to address the sustainable flood management issues raised by consultees, these may add to the costs. No allowances have been made for any share of the costs of dealing with surface watercourses which are still subject to discussions with Scottish Water. At this stage it is recommended that a general risk adjustment allowance of 30% should be added to the estimate to give a budget estimate of £4.8m for the scheme in total.

4.2 The Scottish Executive has recently confirmed that Grant Aid for Flood Prevention Schemes is to be increased to 80%. Subject to ratification by the Scottish Executive of the level of grant the net cost to Angus Council would be in the order of £1.350m including internal staff costs (which are not grant eligible).

4.3 There is provision for a part of this expenditure in the recently submitted draft Roads Department Financial Plan 2004/2008 as shown below:-

<table>
<thead>
<tr>
<th></th>
<th>Estimated Total Cost £000</th>
<th>Spend to 31/03/04 £000</th>
<th>Projected 2004/05 £000</th>
<th>Estimate 2005/06 £000</th>
<th>Estimate 2006/07 £000</th>
<th>Estimate 2007/08 £000</th>
<th>Estimate 2008/09 £000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cost</td>
<td>4,800</td>
<td>183</td>
<td>190</td>
<td>103</td>
<td>1,550</td>
<td>2,704</td>
<td>70</td>
</tr>
<tr>
<td>Scottish Executive Grant</td>
<td>(3,450)</td>
<td>(29)</td>
<td>(1,250)</td>
<td>(2,114)</td>
<td>(57)</td>
<td>(57)</td>
<td>(57)</td>
</tr>
<tr>
<td>Net Cost to Angus Council</td>
<td>1,350</td>
<td>183</td>
<td>190</td>
<td>74</td>
<td>300</td>
<td>590</td>
<td>13</td>
</tr>
</tbody>
</table>

4.4 The cost of undertaking the option appraisal and further design works on the elements required to meet the requirements in respect of sustainable flood management are expected to add to the cost of work by consultants in the preparation of the scheme in 2004/05 and 2005/06. The Committee is asked to agree to the Director of Roads extending the commissions of the external consultants undertaking the hydrological analysis and the environmental impact assessment in respect of this extra work involved in the Option Appraisal report and in the next stages of design.

4.5 The allowances to meet these increases have already been made in the Roads Department’s Financial Plan. The cost of external consultants is recoverable at the same rate of grant as other costs of the scheme once a Flood Prevention Scheme has been approved.

5 HUMAN RIGHTS IMPLICATIONS

5.1 The primary purpose of the Flood Prevention Scheme is to protect people and property from the adverse impacts of flooding. This directly meets the spirit of the European Charter on Human Rights.
6 CONSULTATION

6.1 The Chief Executive, the Director of Law and Administration, the Director of Finance and the Director of Planning and Transport have been consulted in the preparation of this report.

7 CONCLUSION

7.1 The result of the findings in the Option Appraisal Report of October 2004 is a clear consensus that Generic Option 3 - Defences along the north bank of the River South Esk in Brechin-represents the most favourable proposal and that the Council should now progress this option as the preferred proposal for the Flood Prevention Scheme at Brechin, taking into account issues and concerns highlighted by consultees.

R W McNeil
DIRECTOR OF ROADS

NOTE:

The following background papers, as defined by Section 50D of the Local Government (Scotland) Act 1973 (other than any containing confidential or exempt information), were relied on to any material extent in preparing this Report:-

Options Appraisal Report – October 2004
GMG/SG
5 November 2004
REPORTS brechin flood.prev
ANGUS COUNCIL
BRECHIN FLOOD ALLEVIATION SCHEME
OPTION APPRAISAL REPORT:
EXECUTIVE SUMMARY
FINAL REPORT
October 2004

Prepared by
FABER MAUNSELL
On behalf of
Angus Council
Executive Summary

1 INTRODUCTION

The River South Esk is located in East Scotland and drains the south-eastern flank of the Grampians. The catchment area draining to Brechin is approximately 488km² (HR Wallingford, March 2004). Much of the course of the river passes through sparsely populated arable and pastoral land, including the reach upstream of Stannochy Bridge. The River South Esk flows through the city of Brechin, a historic market town which has many features of historic and landscape interest, including the designed landscape and historic garden associated with Brechin Castle.

The river is designated as a candidate Special Area of Conservation (cSAC) and therefore is an internationally important area for nature conservation, in particular salmon and freshwater pearl mussel. The river flows into the Montrose Basin, which is also a site of national and local importance being designated as a Site of Special Scientific Interest (SSSI) and a Local Nature Reserve.

There has been a history of flooding of the River South Esk in the city of Brechin which affects residential and industrial properties together with public and private leisure facilities. The last major event in the winter of 2002 resulted in extensive flooding and temporary evacuation of some residents.

Option Appraisal Report

The objective of the Option Appraisal Report was to review the potential options for a Flood Prevention Scheme for Brechin capable of protecting the city of Brechin from flooding based on a 1 in 200 year flood event, and to recommend the most practicable cost effective and environmentally sound option.

The Need For The Project

The area particularly affected by flooding in Brechin is River Street and the adjacent industrial area in East Mill Road, on the northern bank of the river.

Studies into the flooding problems were commenced in 1982 and have continued to date. The studies have focussed on determining flood levels and developing proposals for alleviation. An assessment of flood levels has been for a 1 in 200 year event and the effects of climate change. The following documents present the findings of surveys and studies that have been undertaken as part of the Flood Alleviation Scheme and support the appraisal of options:

- Brechin flood alleviation scheme – Hydrological assessment Report EX4911 Rev 0.0 December 2003, HR Wallingford Ltd;
- Brechin flood alleviation scheme – Hydraulic modelling and morphological modelling final report Rev 1.0 EX4924 March 2004, HR Wallingford Ltd
A 1 in 100 year flood event would have a very severe impact upon the properties situated within the North bank floodplain and it is assessed that over 150 dwellings and 10 businesses would be affected. If such an event were to occur it would involve the evacuation of in excess of 200 members of the public. The flood during November 2002 was evaluated as being between a 1 in 25 and a 1 in 35 year flood. It has been calculated that the lowest doorway threshold level would be breached by a 1 in 17 year flood event and above this, flooding would impact upon properties on the North bank flood plains in Brechin.
2 FLOOD ALLEVIATION SCHEME OPTIONS

Three viable options which would be practicable in protecting the city of Brechin during a 1 in 200 year flood event have been identified as follows:

1. Use of flood storage directly upstream of Brechin;
2. Flood relief channel located to the south of the River South Esk;
3. Defences along the north bank of the River South Esk in Brechin; with or without demountable barriers;

The three generic options 1, 2 and 3 have a number of sub options which have been examined during the option appraisal study. A brief summary of each is given in the following Table 1.
<table>
<thead>
<tr>
<th>Description</th>
<th>Capital</th>
<th>Annual Maintenance Costs</th>
<th>Operational Costs</th>
<th>Major Overhaul</th>
<th>Value of Benefits</th>
<th>Cost/ Benefit Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Full attenuation just upstream of Brechin between Stannochy and Finavon behind a 15m high earth dam with storage capacity of 9.2 million cubic metres</td>
<td>£8.9m</td>
<td>£150,000 p.a.</td>
<td>£20,000 p.a.</td>
<td>£1.24m Every 20 years</td>
<td>£12.3m</td>
<td>0.8</td>
</tr>
<tr>
<td>1.2 Partial attenuation just upstream of Brechin between Stannochy and Finavon behind a 12m high earth dam with storage capacity of 4 million cubic metres in association with 1.1m high defences on the north bank in Brechin</td>
<td>£11.1m</td>
<td>£150,000 p.a.</td>
<td>£25,000 p.a.</td>
<td>£1.24m Every 20 years</td>
<td>£12.3m</td>
<td>0.42</td>
</tr>
<tr>
<td>2.1 Flood relief channel to the south of Brechin in which the channel remains wet with continuous flow in normal conditions but which has sufficient extra capacity to divert peak flood flows around Brechin</td>
<td>£16.5m</td>
<td>£155,000 p.a.</td>
<td>£20,000 p.a.</td>
<td>£0.75m Every 20 years</td>
<td>£12.3m</td>
<td>0.55</td>
</tr>
<tr>
<td>2.2 Flood relief channel to the south of Brechin in which the channel retains standing water with little flow in normal conditions but which has sufficient extra capacity to divert peak flood flows around Brechin</td>
<td>£16.7m</td>
<td>£155,000 p.a.</td>
<td>£20,000 p.a.</td>
<td>£0.75m Every 20 years</td>
<td>£12.3m</td>
<td>0.54</td>
</tr>
<tr>
<td>2.3 Flood relief channel to the south of Brechin in which the channel is dry in normal conditions but which has sufficient capacity to divert peak flood flows around Brechin</td>
<td>£16.5m</td>
<td>£155,000 p.a.</td>
<td>£20,000 p.a.</td>
<td>£0.75m Every 20 years</td>
<td>£12.3m</td>
<td>0.55</td>
</tr>
<tr>
<td>3.1 Permanent Full Height Defences comprising walls and embankments along the north bank of the River South Esk in Brechin</td>
<td>£3.7m</td>
<td>£155,000 p.a.</td>
<td>£20,000 p.a.</td>
<td>£0.01m Every 25 years</td>
<td>£7</td>
<td>2.47</td>
</tr>
<tr>
<td>3.2 Sections of Permanent Full Height Defences comprising walls and embankment together with sections of demountable barriers in River Street, along the north bank of the River South Esk in Brechin</td>
<td>£3.65m</td>
<td>£155,000 p.a.</td>
<td>£20,000 p.a.</td>
<td>£0.04m Every 25 years</td>
<td>£7</td>
<td>2.30</td>
</tr>
</tbody>
</table>
3 EVOLVING LEGISLATION AND GUIDANCE - IMPLICATIONS FOR BRECHIN FLOOD PREVENTION SCHEME


The River South Esk has been classified as being “at risk” of not meeting WFD requirements to achieve good ecological status by 2015. This is due to land use changes which have resulted in an increase in water abstraction from the river.

After 2015 it is considered likely that a programme of measures will be imposed by a future River Basin Management Plan in order to bring back the river to good ecological status. In view of the above findings it is reasonable to assume these measures are likely to be focused on eliminating all future abstraction, and seek to find methods to decrease existing water abstractions.

The Water Environment (Controlled Activities) (Scotland) Regulations 2004

As a direct result of the above WFD legislation, in Spring 2006 the Controlled Activities Regulations will come into effect thereby requiring all Flood Prevention Schemes to be licensed by SEPA. At pre-application phase of the licence application, it will be required that Angus Council demonstrate the best practicable environmental approach is being used with regard to Brechin Flood Prevention Scheme. There is also a requirement placed upon local authorities to demonstrate sustainable flood management techniques are being used where practicable as part of the Flood Prevention Scheme. The definition of sustainable flood management has yet to be finalised by the Flooding National Technical Advisory Group (NTAG).

Examples of Sustainable Flood Management Techniques are provided below:

- Building breaches into existing small berms alongside fields - utilising sluice gates in the breaches to form semi-permanent wetlands
- "Buffer strips" to increase biodiversity alongside the river edge
- Land use changes - field drainage systems etc.
- De-culverting of nearby watercourses
- Enhancing nearby watercourses
- Artificial habitat features such as otter holts, wildlife ledges in culverts
- Creation of broad leaved woodlands

It is Angus Council’s intention to consider the above (and other) features in detail in conjunction with consultee and stakeholder consultation so as to enhance the preferred option(s). However, these considerations will be subject to the constraints of existing funding and legislation.

In summary, the Flood Prevention Scheme must ensure that there is no deterioration of ecological status if this is technically feasible; and has been shown not to incur disproportionate costs. Conversely, a derogation of the above requirement may be allowed if Angus Council can demonstrate that the alternatives are not technically feasible and/or would incur disproportionate costs.
Other Legislation

The Local Government in Scotland Act 2003

The above act states that:

“A local authority securing best value will be able to demonstrate (amongst other requirements) a contribution to the achievement of sustainable development. Biodiversity is one indicator of sustainable development.” (extract from “Best Value And Biodiversity In Scotland: A Handbook Of Good Practice For Public Bodies” – Scottish Executive 2004)

Nature Conservation (Scotland) Bill (2005)

Part 1 of the above draft bill will require Angus Council to further biodiversity when undertaking construction projects, especially those of an environmentally sensitive nature.

4 OPTION APPRAISAL METHOD

The options have been compared on a like-for-like basis. A set of objectives were developed for the scheme together with a set of criteria with which to measure how well each proposal performs in delivering the objectives of the scheme. This is known as a Multi Criterion Evaluation (MCE). For Brechin FLOOD PREVENTION SCHEME the MCE is based on the following four categories: technical practicability; cost; effects on the water environment; and effects on the human/terrestrial environment.

The key success factor is to protect against the 1 in 200-year flood. Table 2 describes the underlying objectives used for comparison. This table also sets out the steps in the MCE process.

Table 2 Outline Method for Option Appraisal

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Identify a list of flood alleviation scheme OPTIONS capable of protecting the city of Brechin from flooding based on a 1 in 200 year flood event.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Define the indicative location, nature and extent of the ENGINEERING COMPONENTS for each option and describe the associated construction work and operational activities.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Assess TECHNICAL PRACTICABILITY in terms of the relative engineering risk (relative risk of failure of structures and relative risk during construction), relative risk of operational malfunction and risk of delays through planning approval process associated with each option.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Estimate the COSTS of construction and operation and derive the benefit value for each option.</td>
</tr>
<tr>
<td>Step 5</td>
<td>Carry out an ENVIRONMENTAL APPRAISAL of the options in accordance with good practice, considering adverse and beneficial effects on water quality, aquatic ecology, watercourse characteristics, terrestrial ecology, landscape and visual amenity, archaeology and heritage, agriculture and forestry, recreation and community.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Assess flood alleviation scheme options using a MULTI-CRITERION EVALUATION based on consideration of:</td>
</tr>
<tr>
<td></td>
<td>• Technical Practicability</td>
</tr>
<tr>
<td></td>
<td>• Costs</td>
</tr>
<tr>
<td></td>
<td>• Effects on the water environment</td>
</tr>
<tr>
<td></td>
<td>• Effects on the human/terrestrial environment</td>
</tr>
</tbody>
</table>

Sets of criteria were derived for the four objectives listed in Step 6 in Table 2 above. The criteria were used to compare the characteristics of each scheme. Where sufficient information was available the assessment used quantitative data, where information was not so plentiful it was necessary to use professional judgement.
5 SUMMARY OF OPTION APPRAISAL FINDINGS

Summary of Values

A detailed assessment of each of the sub-options listed in Table 1 against the criteria derived for each objective is presented in the Option Appraisal Report. In terms of the environmental criteria, the assessment was made for effects during the construction and operational phases.

The approach and MCE methodology used to compare the options and the findings of the assessment were discussed at a workshop held on the 23rd September 2004, involving the statutory Consultees, stakeholders, and other interested parties. The purpose of the Workshop was to invite comment regarding the options and the method of appraising the options, to enable the report to be finalised and the scheme to progress with comments and views of all parties having been considered. The response to the draft report was favourable and it was considered that fundamentally the method and findings of the option appraisal study was sound.

The final values from the detailed appraisal of options are presented in Table 3 below. The values used are:

- H = High adverse
- M = Medium adverse
- L = Low adverse
- N = negligible

Table 3 Summary of Assessed Values for all Options
<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>1.1</th>
<th>1.2</th>
<th>2.1</th>
<th>2.2</th>
<th>2.3</th>
<th>3.1</th>
<th>3.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNICAL PRACTIBILITY</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability and Impact of Failure of structures</td>
<td></td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Relative Risk during Construction</td>
<td></td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>L</td>
<td>L</td>
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<tr>
<td>Relative Risk of Operational Malfunction</td>
<td></td>
<td>M</td>
<td>M</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>Relative Risk of Delayed Planning Approvals</td>
<td></td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>L</td>
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<tr>
<td>Inflexibility</td>
<td></td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>M</td>
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<td>L</td>
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<tr>
<td>Impacts on Infrastructure</td>
<td></td>
<td>L</td>
<td>M</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>M</td>
<td>M</td>
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<tr>
<td>COST</td>
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<td>Capital</td>
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<tr>
<td>Annual Maintenance Operational</td>
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<td>H</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>L</td>
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<tr>
<td>Benefits</td>
<td></td>
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<td>L</td>
<td>L</td>
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<td>M</td>
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<tr>
<td>WATER ENVIRONMENT</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>Construction Effects</td>
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Comparison of Assessed Values

A brief summary of the main effects of the options being considered follows. The purpose of this section is to identify the main issues which have arisen from the option appraisal process. Further details can be found by referring to the full option appraisal report.

Technical Practicability

All the attenuation and flood relief channel options incorporate large dam/intake structures which pose a greater consequence due to structural failure when taken in comparison with the proposed flood alleviation barriers at Brechin. The probability of failure would be less for these large structures, and this has been taken into account in the above ratings.

Relatively high risks of operational malfunction are considered with the flood relief channel (options 2.1, 2.2 and 2.3). This is due to the relatively untried history of such structures, compared to the other options with the exception of option 3.2. Option 3.2 would have demountable barriers which would require a lengthy time to activate, hence a high risk of operational malfunction has been applied.

The large dam/intake structures which would be required for the attenuation and flood relief channel options are relatively complex engineering schemes in comparison to the proposed walls/embankments along the North bank at Brechin. This is reflected in the higher risks allocated to these options for the planning, construction, and flexibility aspects of the schemes in comparison to the proposed flood defences at Brechin.

Existing supply mains and services would remain relatively unaffected by all the options with the exception of the proposed walls/embankments at Brechin. Here, existing water gas and telephone services at River Street would be affected by the construction of a wall. This has been reflected in the risk allocated for this option under impact upon infrastructure.

Costs and Benefits

With regards to costs, the three main components of a cost/benefit factor have been broken down for analysis in the above option appraisal. With regard to capital costs, the flood relief channel scores poorly as having the highest capital cost for all three main options due to the large dam structures required. The attenuation options score poorly as having the highest operational and maintenance costs, mainly due to the large major overhaul costs associated with these options. The North bank defences at Brechin score poorly for benefits in comparison to the other options for two reasons:

- Attenuation would benefit all areas prone to flooding downstream of Brechin – the walls/embankments would only benefit Brechin alone
- The majority of engineering scheme components constructed in the flood relief channel and attenuation options would be designed for a longer life, and would therefore afford protection for a longer period than would be the case for the walls/embankments at the North bank in Brechin.
**Water Environment**

**Construction Effects**

The highest adverse effects on watercourse characteristics (channel, banks, flows etc), water quality and aquatic ecology would be likely to occur as a result of the construction of the dam and sluice structure associated Options 1.1 and 1.2. The construction works would involve a diversion of the main river channel for a temporary period which would affect river habitats and water quality.

Given that the works associated with the construction of the defences along the north bank in Brechin (Options 3.1 and 3.2) should not affect the main watercourse channel directly, low adverse effects on watercourse characteristics would be likely to occur. In turn, this is likely to have a negligible adverse effect on water quality and overall aquatic ecology.

**Operational Effects**

Relatively, the highest adverse effects on watercourse characteristics would be likely to occur as a result of the operation of the upstream attenuation options (Options 1.1 and 1.2). In turn this is likely to have medium adverse effects on water quality and aquatic ecology. The main effects are likely to result from an increase in sediment (including gravels) deposited upstream of the structure and a reduction in sediment transportation to reaches downstream of the structure.

A high adverse effect on watercourse characteristics would also be likely with the flood relief channel with continuous flow during normal conditions (Option 2.1). This is due to the reduction in flow in the main river channel caused by diversion through the relief channel. In turn, this is likely to have high adverse effects on water quality and aquatic ecology.

The defences along the north bank in Brechin (Options 3.1 and 3.2) should not affect the main watercourse channel directly, low adverse effects on watercourse characteristics would be likely to occur resulting from small changes in sediment movement. In turn, this is likely to have a negligible adverse effect on water quality and overall aquatic ecology.

**Terrestrial and Human Environment**

**Construction Effects**

The highest adverse effects on terrestrial ecology would result from the construction of the flood relief channel (Options 2.1, 2.2 and 2.3). The effects would largely result from relatively higher level of disturbance to species and habitats in the vicinity. The channel would also cut through an area designated as ancient woodland.

During construction, high adverse effects on landscape and visual amenity would be likely to occur for most options. High adverse effects are due to large numbers of visual receptors (such as, residential properties) and effects on the Historic Garden and Designed Landscape associated with Brechin Castle.

High adverse effects on archaeology and heritage would occur during the construction of the upstream attenuation structure (Options 1.1 and 1.2). This is due to the higher number and
closer proximity of listed buildings and sites listed on the National Monuments Record compared to other options.

For the temporary period during construction, the effects on agriculture would be high adverse for all options except the defences along the north bank within Brechin (Options 3.1 and 3.2). Adverse effects would occur as a result of temporary and permanent loss of Grade 3 agricultural land and disruption to farming patterns. There would be negligible effects during the construction of Options 3.1 and 3.2.

Relatively, the effect during construction on recreation in the vicinity of the upstream attenuation area (options 1.1 and 1.2) would be high adverse. This is due to the temporary channel diversion and the likely duration of the works affecting both land and water based recreation for a long period.

The effects on the community for all options would be medium adverse with the exception of Option 1.1 which would be low adverse. With the exception of Option 1.1 all options could entail disturbance to the community within Brechin as a result of possible increases in noise, dust and changes to traffic movements. The area surrounding Option 1.1 is sparsely populated therefore the effects would be comparatively low adverse.

Operational Effects

The effects on terrestrial ecology during operation of the upstream attenuation option (options 1.1 and 1.2) would be medium adverse as a result of change in the flooding regime upstream and downstream of the structure.

During operation high adverse effects on landscape and visual amenity would be likely to occur for all options with the exception of those options entailing demountable defences along the north bank at Brechin, i.e. Options 3.2, which would be medium adverse. The inclusion of de-mountable barriers in Option 3.2 would reduce the adverse effect of the defences along the north bank in Brechin.

Similarly to construction, high adverse effects on archaeology and heritage would occur during the construction of the upstream attenuation structure (Options 1.1 and 1.2). The effects on agriculture would be high adverse for all options except the defences along the north bank within Brechin (Options 3.1 and 3.2). The effects on recreation for all options would be medium adverse. The adverse effects of the defences along the north bank in Brechin are likely to be low as the main river channel is less likely to be adversely affected. The effects on the community for all options would be low adverse with the exception of Option 3.1 and 3.2 which would be negligible.

6 CONCLUSION

A Draft of the Option Appraisal Report (September 2004) was issued to all members of the Stakeholder/Consultee group and was presented for consultation at a workshop held on 23 September 2004 for their endorsement. The draft report was also presented to Councillors representing the wards affected by the scheme and again comments were invited ahead of finalising the report.
The response to the draft report was favourable and it was considered that fundamentally the method and findings of the option appraisal study was sound.

In response to comments received a number of changes were made to Option Appraisal Report and these are reflected in this final version which should meet the aspirations of all parties.

This Option Appraisal Report presents a comparison of the options on a consistent basis across the objectives of the flood defence scheme for Brechin. The process clearly demonstrates that the most favourable proposal is: -

**Generic Option 3 - Defences along the north bank of the River South Esk in Brechin**

At present this generic option encompasses two sub-options as follows:

- Full Height Flood Defences at Brechin North
- Full Height Flood Defences at Brechin North Bank - with demountable barriers along River Street

The Council will progress the preferred option for the Flood Prevention Scheme at Brechin through the next stages of design and environmental impact assessment. The views of stakeholders and statutory consultancies will continue to be sought and the consultation will be widened to encompass landowners and residents in and around Brechin.

**Issues For Consideration In Development Of The Proposed Scheme**

A number of issues were raised by Consultees in the preparation of this report, which have been emphasised in the written responses. These issues should be considered in the development of the preferred option:

- The need to pursue a combination of full height and demountable barriers and assess the degree of risk that the Council, the residents and businesses are prepared take in the long-term operation of the scheme.
- The need to introduce sustainable flood management techniques wherever possible both as mitigation measures and as enhancement measures. This recognises emerging national policy that such techniques are a fundamental component of any flood scheme.
- The new Water Environment and Water Services (Scotland) Act which places an emphasis on catchment level intervention and river basin management practices.
- The need to consider the Council’s new statutory duty to promote biodiversity and habitat creation
- The need to consider the flexibility of the scheme and to introduce policies for the future in terms of responding to the effects of climate change.
- The need to consider changes of land management, change of land occupation, change of land designations, both in the initial implementation
phase but also throughout the operational life of the scheme and to have policies for these occurrences.

- The need to deal with combined foul and surface water systems including the need to upgrade the wastewater pumping station so as to protect against sewer flooding up to and including the 1 in 200 year flood event. There are also several watercourses which include storm water overflows from the sewer system. How the costs of dealing with these sewers and watercourses will be met is to be the subject of negotiations with Scottish Water.

7 RECOMMENDATIONS

A report on the option appraisal study is due to be made to the Infrastructure Services Committee of Angus Council in November 2004 with recommendations on how to progress the preferred option for the Flood Prevention Scheme at Brechin through the next stages of design and environmental impact assessment. Widening the consultation undertaken to date with stakeholders and statutory Consultees to include landowners and residents in and around Brechin will also have to be considered by the Committee.

The recommendations of the report to the Infrastructure Services Committee should include: -

(i) The Council should now progress generic Option 3 (Defences along the North Bank of the River South Esk in Brechin - with or without Demountable Barriers) as the preferred proposal for the Flood Prevention Scheme at Brechin. Detailed design proposals should be prepared and a full environmental impact assessment undertaken, with a view to submitting a planning application and flood prevention scheme in Autumn 2005;

(ii) to note that the preferred Option (generic Option 3), although providing protection to properties at risk from a 1 in 200 year flood event, will reduce the amenity value and visual appeal of the current open aspect and river-side attractions of River Street, Brechin (road-level footway edged by iron railings atop a river bank entainment wall). The aesthetic impact of the scheme will however be mitigated as far as possible by high quality design, elevated footway levels, viewing platforms, etc;

(iii) to note that it is anticipated that although the Flood Prevention Scheme is likely to be generally well received, there may be some criticism and concern regarding aesthetics, loss of amenity, and change in the character of River Street;

(iv) to extend consultation to landowners, residents and the local community in Brechin;

(v) to note that there is still no firm commitment from Scottish Water that it will upgrade its wastewater treatment and discharge infrastructure in Brechin to protect against a 1 in 200 year flood in the same timescale as the proposed Flood Prevention Scheme;
(vi) to note that the overall cost of Option 3 given in the option appraisal report is in the order of £3.7m. This cost is subject to fuller design and development of the scheme to encompass the issues raised in Recommendation (ii) above and to discussions with Scottish Water on how the costs of dealing with surface watercourses will be shared. At this stage a general contingencies allowance of 30% should be added to give a budget estimate of £4.8m for the scheme. The Scottish Executive has recently confirmed that Grant Aid for Flood Prevention Schemes is to be increased to 80%. The net cost to Angus Council will therefore be in the order of £0.900m excluding internal staff costs and £1.350m including internal staff costs. Provision for this expenditure should be made in the Roads Department’s Financial Plan with the construction phase programmed over 2006/7 and 2007/8.