APPENDIX V – Public Engagement Material and Feedback Report

APPENDIX U – Public Engagement Material and Feedback Report

Community Engagement Posters

Community drop-in sessions - 2pm-8pm, 1st & 8th September 2016

Introduction

Welcome to this community drop-in session. The aim of the drop-in session is to provide you with further information on:

- The risk of flooding in Comrie.
- The Council's proposals for a flood scheme.
- Work to raise awareness of flooding and to help the local community to become more prepared and resilient to deal with flooding in the future.
- Other action being taken on flood risk.

This display outlines the latest proposals. Please feel free to ask questions. Comment forms are also available to allow you to record your views. Your views are important to us and will help us decide how to take our proposals forward.

Figure 1: Flooding along Dalginross Street (1927).

Figure 2: Flooding from the Water of Ruchill (Camp Road, November 2012).

Flood History

Comrie has suffered historically from repeated flooding. There are records of flooding in Comrie as far back as 1927 (Figure 1). The most recent significant flood events occurred in January 1993, February 1997, December 2006 and in August and November 2012 (Figure 2).

The main flood risk comes from the Water of Ruchill, the River Earn and the River Lednock.

Following the flood events on the Water of Ruchill in 2012, the Council implemented flood protection works to reduce the risk of this happening again (figure 3). However, it is estimated that approximately 290 businesses and residential properties are still considered to be at risk of flooding.

Figure 3: Flood protection works on the Water of Ruchill (2013).

Flood Scheme

In order to address this, the Council engaged consulting engineers, Mouchel, to develop proposals to manage the risk of flooding from the three main watercourses in the area. Mouchel have considered a wide range of potential options for managing the risk of flooding at Comrie and have recommended a preferred option to the Council. However before we take this forward, the Council is keen to discuss this with the community.

The following display boards will present and summarise the work we have completed for the Scheme to date and will outline our next steps.

PERTH & KINROSS COUNCIL
The Environment Service

mouchel
building great relationships

Comrie Flood Protection Scheme | Community drop-in sessions | Board 2

Flood Scheme Investigations

The recent flood scheme investigations have involved a thorough and comprehensive exercise with many components:

Data Gathering and Analysis

The Council, the local community and SEPA have continued to provide records of previous flooding.

Topographical Survey

Further property threshold and ground levels has been gathered to improve and refine the hydraulic model for all three watercourses.

Design Flows

The river flows have been checked and are based on the most up to date recorded gauge data (where available) and national guidance. The flows have been independently agreed by SEPA.

Hydraulic Modelling

The hydraulic river model has been extended further upstream on all three watercourses and downstream beyond the town. The model has been used to determine the current level of flood risk and the required height, extent and type of potential flood defences, including upstream flood storage. The model has been verified by comparing the results with historic flood events.

Option Testing

A number of flood risk management options have been tested in the river model. The results have been analysed to determine if each option is feasible or not and the potential impact on flood risk elsewhere.

Economic Appraisal

The outline costs and predicted benefits offered over time by each of the options has been assessed (cost benefit analysis). The cost of the scheme must not exceed the benefits, i.e. the benefit/cost ratio must be greater than 1.0.

Preliminary Ground Investigation

A preliminary ground investigation was carried out to determine the ground conditions, the likelihood of groundwater seepage and to assess the stability of any proposed flood defences.

Drainage Surveys

The drainage systems in the area have been surveyed. This will be used to determine the impact of a potential scheme on surface water drainage in the future.

Utility Services

Information has been collected to assess the potential need for, and cost of, protecting or diverting utility services.

Environmental Assessment

A desk study was carried out to identify any issues for consideration in the options assessment process and in preparation for a future Environmental Impact Assessment during the development of the flood scheme.

Land Ownership

Land owners have been identified so that the Council can consult and liaise with them directly during the future development of the flood scheme.

Level of Flood Protection

Flooding is a natural phenomenon which can never be entirely prevented. Even a flood scheme can only protect up to a certain standard and there will always be a residual risk, should a greater flood occur.

The flood scheme investigations considered various forms of flood defences to protect the area up to the 1 in 200 year flood event (the flood that has a 0.5% chance of occurring in any one year).

This does not mean that the 1 in 200 year flood can only happen every 200 years - flooding can happen at any time. It represents the statistical chance of a flood of a particular size happening within a certain time.

Mouchel's investigations used the peak flows in Table 1, which were agreed with SEPA and are based on recorded data (where available):

Flood Event	Chance of Flood Occurring in any given year	River Earn (m^3/s)	Water of Ruchill (m^3/s)	River Lednock (m^3/s)
1 in 10 year	10%	105	214	78
1 in 25 year	4%	128	240	96
1 in 75 year	1.3%	160	272	121
1 in 100 year	1%	170	282	127
1 in 200 year	0.5%	196	303	145

Table 1: Design Flows for Watercourses

Table 2 shows how these values compare to the 5 highest flows recorded since 1993.

Flood Event	Chance of Flood Occurring in any given year	River Earn (m^3/s)	Water of Ruchill (m^3/s)	River Lednock (m^3/s)
Jan 1993	10-20%	65	228	-
Feb 1997	10-20%	63	229	-
Dec 2006	30-40%	64	189	-
Aug 2012	30-40%	55.5	198.5	-
Nov 2012	30-40%	67.3	191.7	-

Table 2: Historical Flood Events

The standard of protection for the scheme has been assessed considering a number of factors including:

- The height, extent and 'buildability' of the proposed flood defences
- The environmental impact of the scheme
- Climate change impacts and safety factor impacts ('Freeboard')
- The estimated costs of the design, construction, maintenance and safe operation of the proposed scheme

In addition to the 1 in 200 year peak flood levels, the proposed flood defences must also include 'freeboard' which provides a factor of safety to the design and accounts for the uncertainty within the hydraulic modelling, the type of flood defence and also the localised effects of water turbulence.

Recent Government guidance suggests increasing the peak design river flows by 20% to allow for future climate change. This has been fully considered in as part of the investigations noted above. For the proposed flood scheme, it was not feasible to incorporate this, in addition to the 1 in 200 year level of protection, due to the excessive heights of the proposed defences that would be required and the associated visual impact and 'buildability' issues.

The aim of the proposed scheme at Comrie is to protect the area against a 1 in 200 year flood event (the flood that has a 0.5% chance of occurring in any one year) with an addition for 'freeboard'.

Comrie Flood Protection Scheme | Community drop-in sessions | Board 3

Flood Risk Management Options

A series of flood risk management options have been considered to see if they would be suitable as part of a potential Scheme. All options have been assessed from a hydraulic, technical, environmental and economic viewpoint. Some of the options have also been assessed in combination to determine if this could provide an improved solution when compared to one option in isolation. The options which have been tested in the hydraulic model, are as follows:

Option 1 - Dredging (Figure 4)

The benefits of removing river bed material have been assessed. The depth of material that would have to be dredged to protect the village from flooding has been determined for the Ruchill, Earn and Lednock.

Option 2 - Walls and Embankments (Figure 5)

This option includes the provision of walls and embankments along the Ruchill, Earn and Lednock river corridors. The heights of the defences are determined by predicted flood levels, local ground levels and calculated freeboard (an allowance for uncertainty and also a safety factor).

Option 3, 4 & 5 - Upstream Storage of Flood Water (Figure 6)

These options consider the potential to provide upstream flood storage reservoirs on the Ruchill, Earn and Lednock catchments. Each river is assessed individually to determine the volume of flood water that would need to be temporarily stored upstream to reduce flooding further downstream.

Details of these options are presented on the following display boards.

Figure 4: Water of Ruchill Sediment Removal.

Figure 5: Typical Flood Protection Wall (North Muirton, Perth).

Figure 6: Lednock Dam, Glen Lednock.

Option 1 - Dredging

Option Overview

Dredging is the process of removing material from the bed and banks of a river channel to increase its flow capacity. The flood risk management benefits of removing the material have been considered and the depth and extent of dredging required to suitably protect the village from flooding have been calculated for the Water of Ruchill, River Earn and River Lednock.

Assessment & Results

Dredging the river bed by a depth of one metre for a total of approximately 2.5km would reduce flood water levels by the following amounts in a 1 in 200 year flood:

Watercourse	Average water level reduction (1 in 200 year flood)
Water of Ruchill	190mm
River Earn	200mm
River Lednock	60mm

Table 3: Average reduction in flood water level for 1m reduction in the river bed level.

This means that removing 1m of river bed material from the river reaches indicated in figure 7, would not prevent flooding for the 1 in 200 year event. Therefore, further measures would be required in addition to with the dredging to make it a viable option.

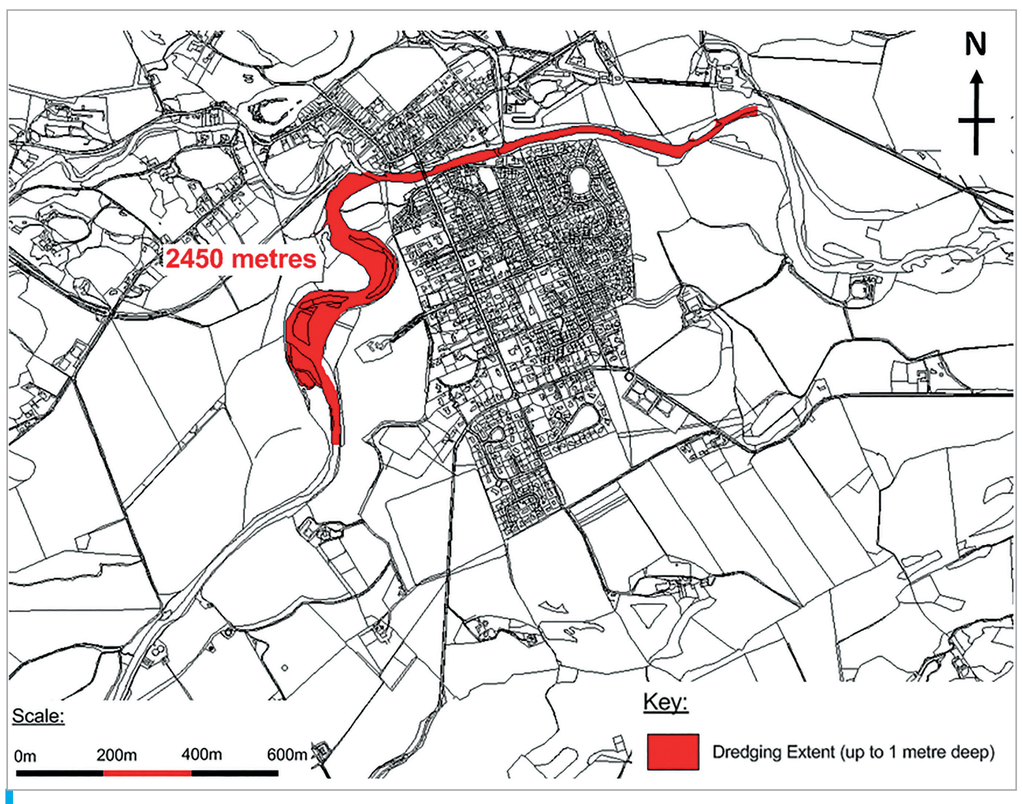


Figure 7: The considered extent of dredging the river bed by 1m.

Option Assessment

Following further testing it was determined that the river beds would need to be reduced by an average of approximately 5m along large extents of the watercourses, in order to protect Comrie from a 1 in 200 year flood. This is indicated in figure 8. This dredging would need to be conducted initially but also maintained at regular intervals in order to maintain the reduction in bed level due to the constant deposits of new sediment from upstream.

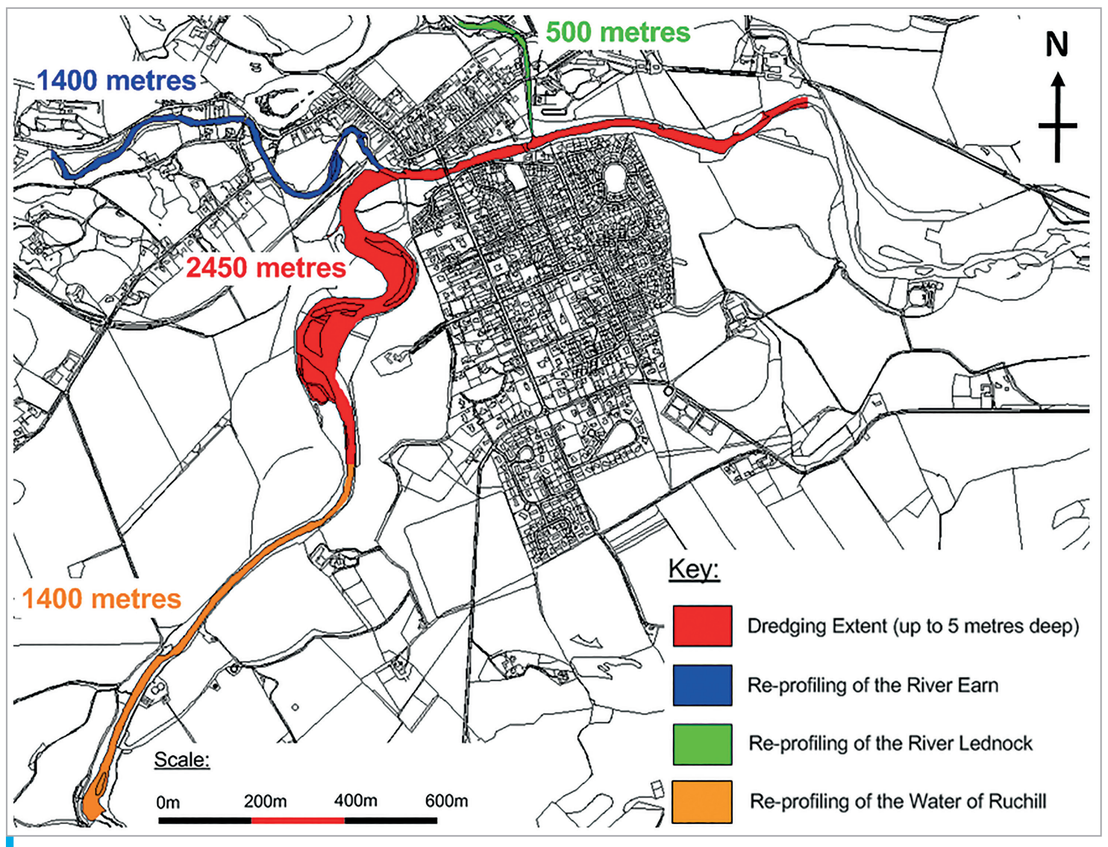


Figure 8: The extent of dredging required to manage the risk of flooding during the 1 in 200 year event.

Option Cost and Benefits

It is estimated that an initial dredging operation for the Water of Ruchill, River Earn and River Lednock to a depth of 5 metres would cost **£34.9 million.** It is also estimated that interim operations would also be required to maintain river bed levels costing approximately **£0.95 million** every 5 years.

Advantages

- Would eliminate the need for any defences through the village for the 1 in 200 year event.
- Dredged material could be used in other applications.

Disadvantages

- Significant depths of dredging (approximately 5 m) would be required to alleviate flooding for the 1 in 200 year flood event. It is not feasible to dredge a river channel to this depth.
- This level of dredging required would create river instability and cause river banks and structures to collapse.
- The Bridge of Ross, Dalginross and Lednock bridges would all be severely undermined by such a dredging operation and would likely need to be replaced.
- The removal of river bed and bank material to the required 5 metres would mean that all bankside and channel vegetation would be removed. This would have a negative impact on the local landscape and also on local ecology.
- The noise and disruption caused by the removal and disposal of the required volume of material would likely be unacceptable to the local community.
- Restriction on the disposal of river material and the likely volumes would make this option impracticable.
- Very significant adverse environmental impacts would result if this option was implemented.

The dredging option has therefore been discounted as a viable Flood Risk Management Option for the Comrie and Dalginross Flood Protection Scheme on technical and environmental grounds discussed above.

Option 2 – Walls and Embankments

Option Overview

This option involves the provision of new walls and embankments along the Water of Ruchill, River Earn and River Lednock river corridors. The heights of the required defences are determined by predicted flood levels, local ground levels and calculated freeboard (an allowance for uncertainty / safety factor). The images in figure 9 and 10 show the typical construction of these types of defences.

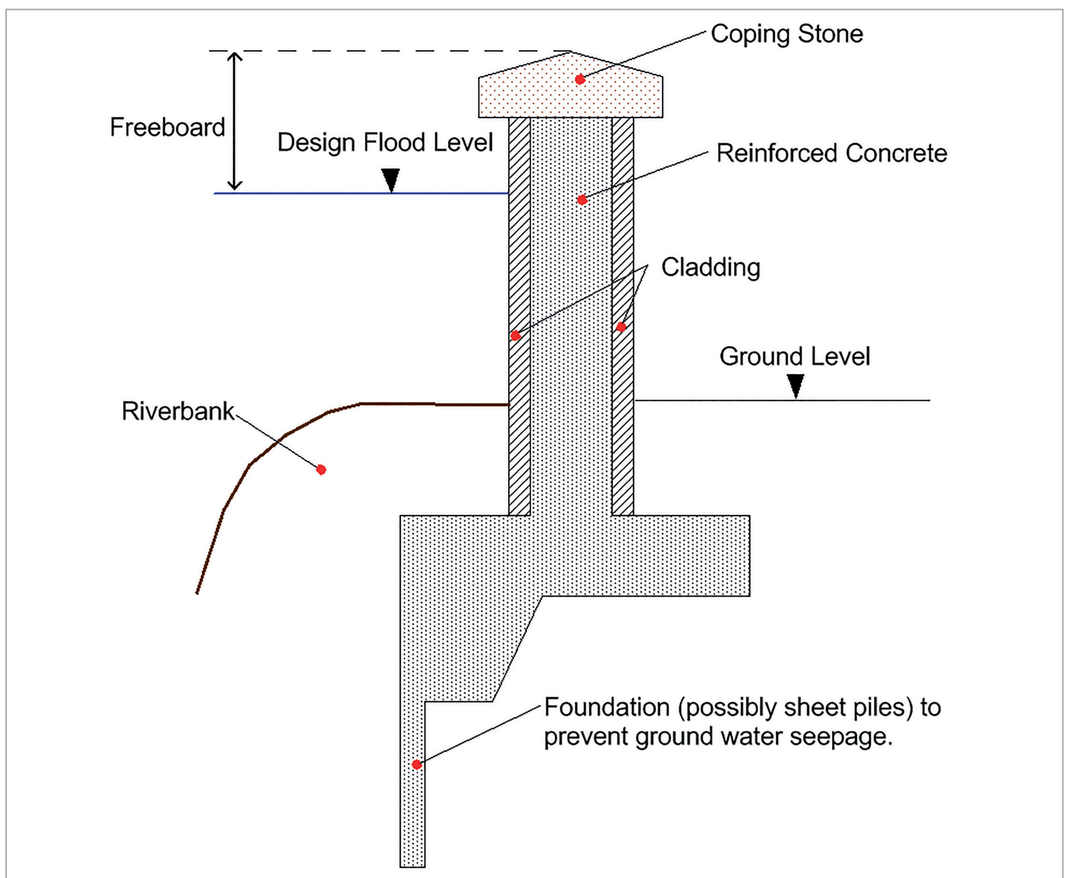


Figure 9: Typical Flood Wall Detail.

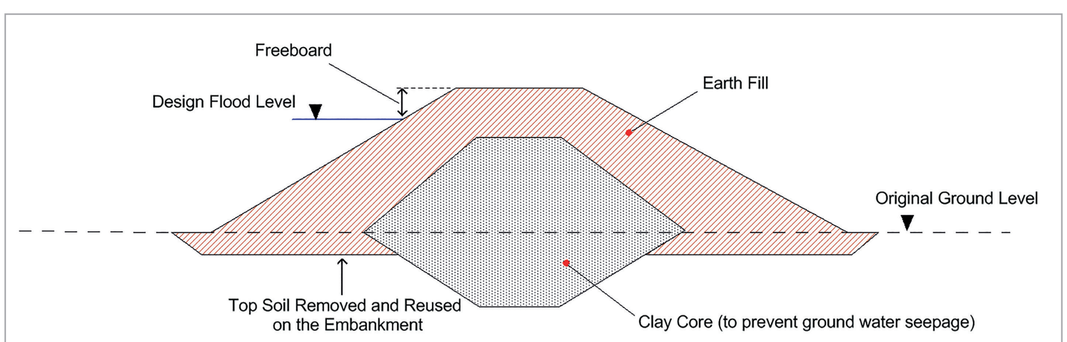


Figure 10: Typical Flood Embankment Detail.

Option Assessment

A flood scheme built to a 1 in 200 years standard of protection would require walls and embankments varying in height from 0.25m to 1.5m, with a maximum of 2.2m in localised areas. Flood embankments and walls can be built to these heights and the construction and design methods are well understood. These types of defences are therefore technically viable.

Option Cost and Benefits

The estimated cost of this option, which would include 1km of embankments and 3km of walls, built to the 1 in 200 year standard of protection is **£24.5 million**. The overall calculated benefit/cost ratio for this option is **2.0.**

The flood defences must also include flood gates so that access can be maintained. An initial plan of the proposed defences is shown in figure 11.

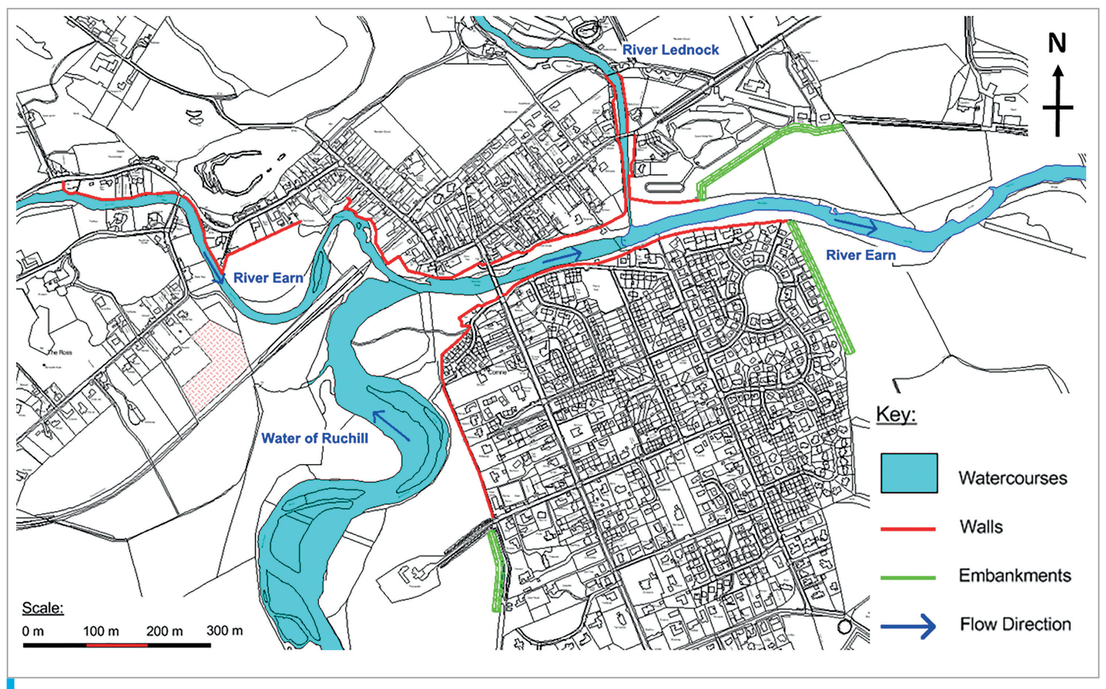


Figure 11: Indicative locations of flood walls and embankments.

Advantages

- Simple and familiar forms of construction.
- Simple design.
- Provides a 1 in 200 year standard of flood protection.
- No potential hazard from new large storage areas located upstream.
- Environmental impacts will be much less when compared with other options.
- Has a benefit cost ratio greater than 1.0

Disadvantages

- Possible negative visual impact to the village and residents in some locations, which would need to be mitigated.
- Extent of defences in the village could be significant.
- Access will have to be modified in some locations.

This option is therefore technically and economically viable and could provide an effective solution to manage the risk of flooding.

Option 3 – Upstream Flood Storage

Option Overview

This option involves the construction of flood storage dams upstream of Comrie on the Water of Ruchill and the River Earn. Sufficient water would have to be stored upstream during a 1 in 200 year flood, to ensure that there would be no flooding downstream in Comrie. The upstream topography around the watercourses was a factor in determining the required size and potential locations of these storage areas.

Option Assessment

From analysis undertaken in the hydraulic model it became quickly apparent that providing flood storage on the upper reaches of only one of the three rivers would not sufficiently reduce the risk of flooding. Therefore the option of providing upstream flood storage on just one river was discounted.

Our investigations then looked at the potential benefits of combining storage options together. Storage on both the River Earn and Water of Ruchill provided the 1 in 200 year standard of protection to Comrie without the need for any new flood defences to be built in the village. The required dimensions of the earth dams on the River Earn and Water of Ruchill needed to protect the village are indicated in figures 12 and 13 below.

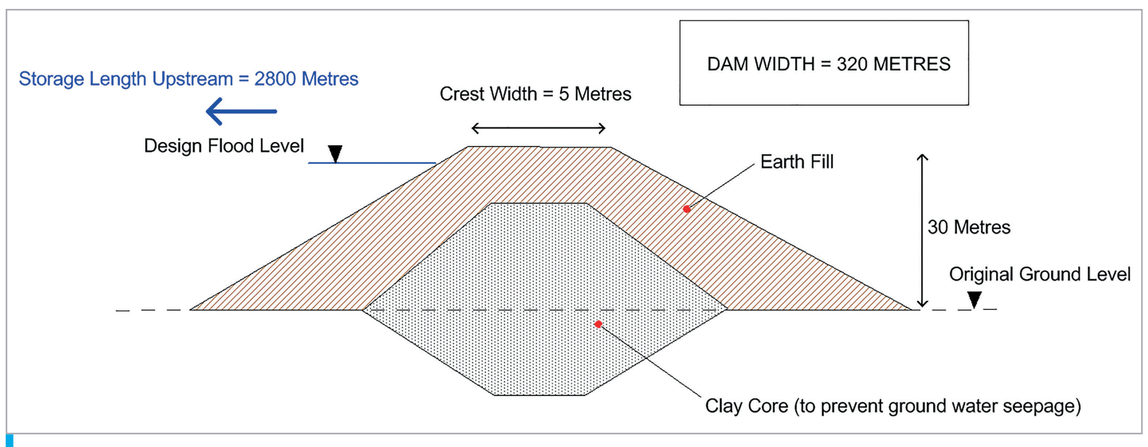


Figure 12: Cross section shows required dimensions of an earth dam on the Water of Ruchill.

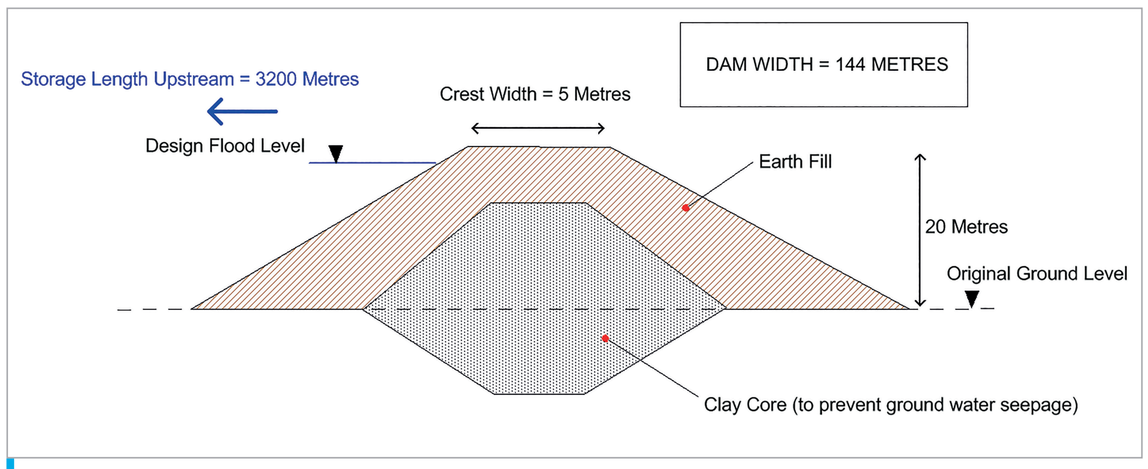


Figure 13: Cross section shows required dimensions of an earth dam on the River Earn.

For comparison, the existing Glen Lednock reservoir dam is approximately 40 m in height and 275 m wide. A plan indicating the proposed location of these two storage areas is shown in figure 14.

Earth dams have been used to cost the upstream storage option, but based on a more detailed assessment, it is possible that concrete dams would be a more preferable solution as they would require less land take. However a concrete dam is likely to be more expensive to construct and would result in a lower benefit/cost ratio for this option.

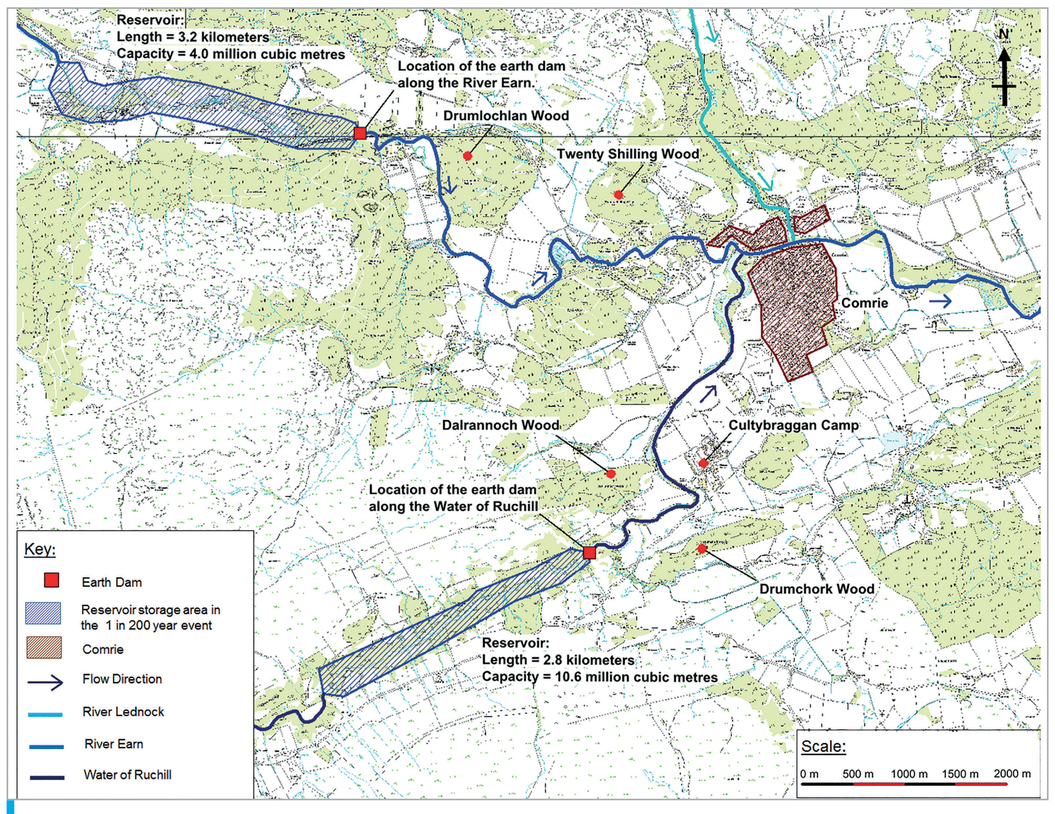


Figure 14: Approximate location of the River Earn and Water of Ruchill storage areas.

Option Cost and Benefits

The estimated total cost of this option is **£69.3 million**. The overall calculated benefit/cost ratio for this option is **0.69.**

Advantages

- The defences would provide an effective flood defence for up to the 1 in 200 year flood event without the need for new defences being constructed in the village.
- This would enable enhanced biodiversity through habitat and wetland creation.

Disadvantages:

- There would be major environmental impacts resulting from dam construction which would impact ancient woodland and farm land.
- The option would require significant land take to construct the dams resulting in large compensation for land owners. This is likely to be unacceptable to the land owners concerned.
- Agreement would be required with multiple stakeholders in order to implement this option which would be very challenging.
- The cost for this option is estimated to be very high, with a benefit cost ratio of less than 1.0.

For the reasons discussed above, this option is therefore not considered to be feasible and been discounted.

Option 4 – Flood Walls, Embankments and Flood Storage (Water of Ruchill)

Option Overview

This option entails a combination of Option 2, flood embankments and walls, as well as the provision of upstream storage, as described in Option 3, for the Water of Ruchill. This option was tested to see if the provision of upstream storage could reduce the height of required flood defences in Comrie. This would lessen the environmental and aesthetic impact of the flood defences as well as potentially reducing the construction cost.

Option Assessment

Analysis of the hydraulic model shows that the flood defence heights required to provide a 1 in 200 year standard of flood protection to Comrie, when used in combination with flood storage on the Water of Ruchill, will vary from 0.5 m to 1.6 m high. See figure 15 below for the proposed locations of defences in Comrie.

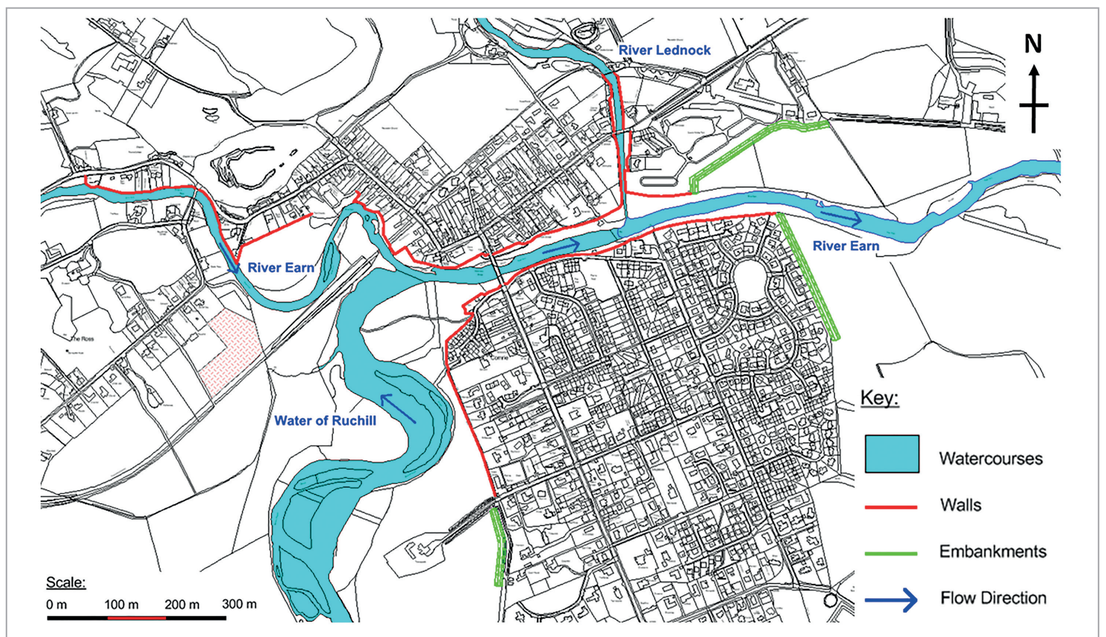


Figure 15: Locations of proposed flood defences around Comrie for Option 4.

The required dimensions of the earth dam that would be required on the Water of Ruchill are shown on figure 16 below.

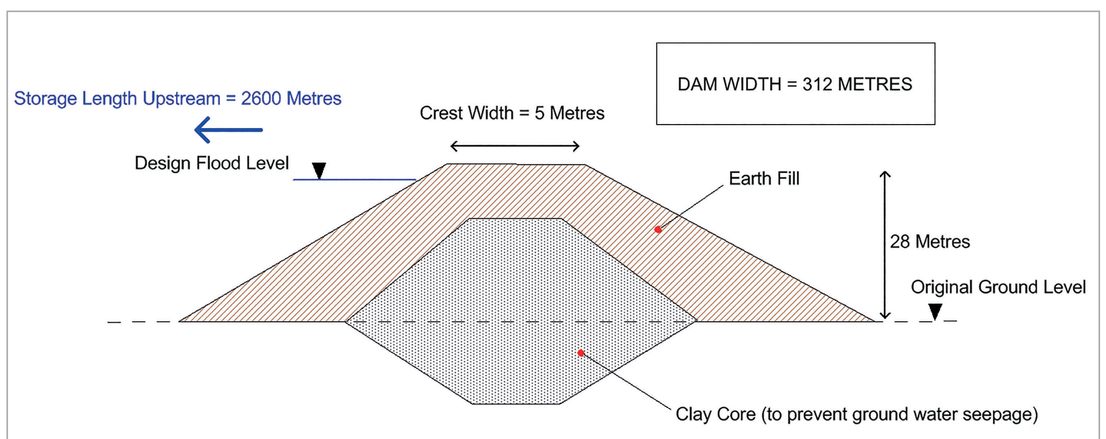


Figure 16: Cross section showing dimensions of an earth dam on the Water of Ruchill.

For comparison, the Glen Lednock reservoir dam is approximately 40 m in height and 275 m wide. A plan indicating the locations of the storage area is shown in figure 17.

An earth dam has been used to cost the upstream storage option, but based on a more detailed assessment, it is possible that a concrete dam would be a more preferable solution as this would require less land take. However a concrete dam is likely to be more expensive to construct and would result in a lower benefit/cost ratio for this option.

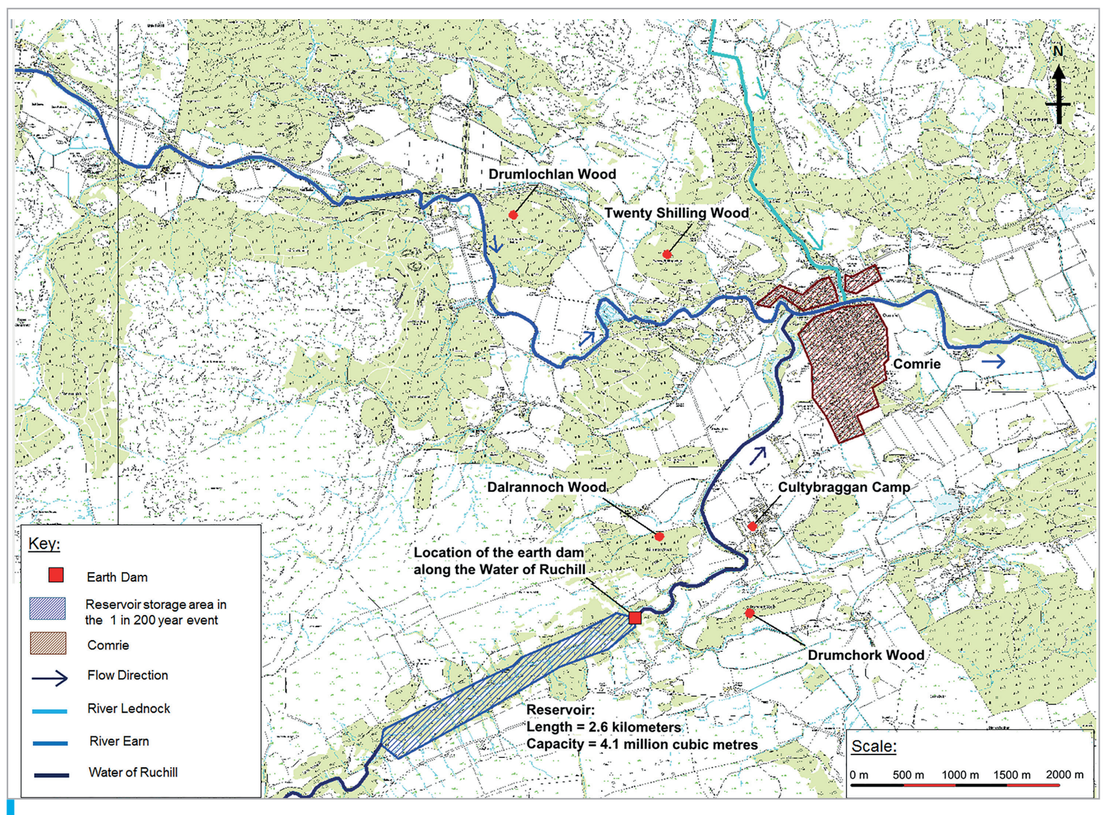


Figure 17: Approximate location of the Water of Ruchill storage area.

Option Cost and Benefits

The estimated cost of this option is **£64.5 million**. The overall calculated benefit/cost ratio for this option is **0.75**.

Advantages

- Reduces the required heights of defences through the village along the Water of Ruchill for the 1 in 200 year event (reduction of up to 0.6 metres in some locations when compared to Option 2)
- Reduced visual impact for some residents.
- Enhanced biodiversity through habitat/wetland creation.

Disadvantages:

- Very large environmental impacts for creating these storage areas.
- Large amounts of land take will be required resulting in which may also lead to large compensation claims.
- Cost is likely to be very high and the benefit cost ratio is calculated to be less than 1.0.
- Negative visual impact to the surrounding area due to new dam structure upstream on the Water of Ruchill.
- There is a residual hazard to the community from the large upstream storage areas.

For the reasons discussed above, this option is not considered to be feasible and has therefore been discounted.

Option 5 – Flood Walls, Embankments and Flood Storage (River Earn)

Option Overview

This option entails a combination of Option 2, flood embankments and walls, as well as the provision of upstream storage, as described in Option 3, for the River Earn. This option was tested to see if the provision of upstream storage could reduce the height of required flood defences in Comrie. This would lessen the environmental and aesthetic impact of the flood defences as well as potentially reducing their construction cost.

Option Assessment

Analysis of the hydraulic model shows that the flood defence heights required to provide a 1 in 200 year standard of flood protection to Comrie, when used in combination with flood storage on the River Earn, will vary from 0.1 m to 1.5 m high. See figure 18 below for the proposed location of flood defences in Comrie.

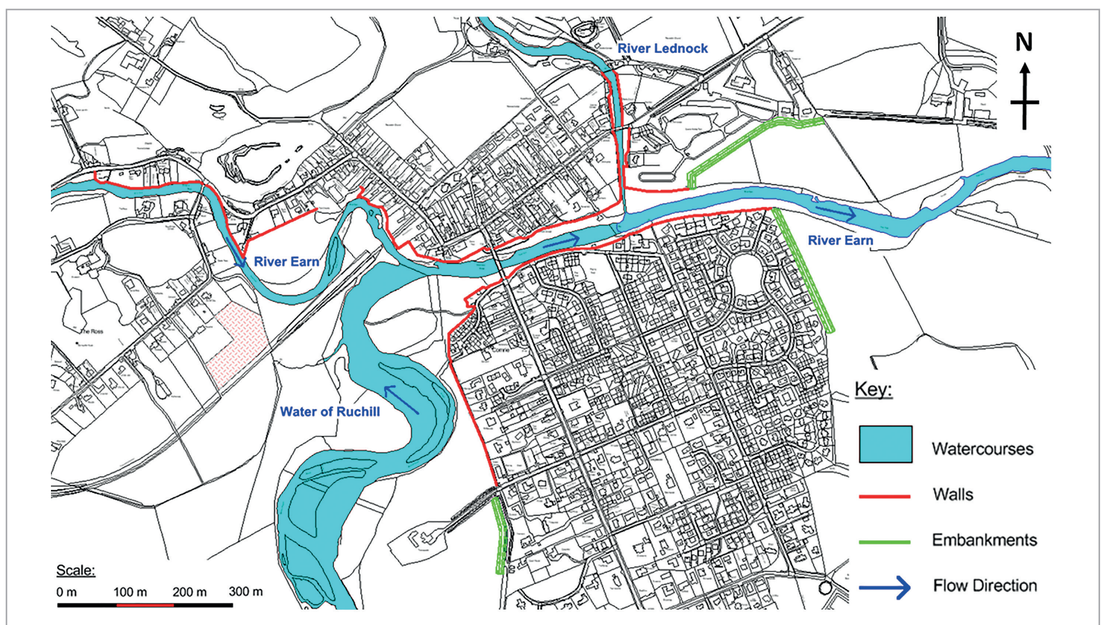


Figure 18: Locations of proposed flood defences around Comrie for Option 5.

The required dimensions of the earth dam that would be required on the River Earn are shown on figure 19 below.

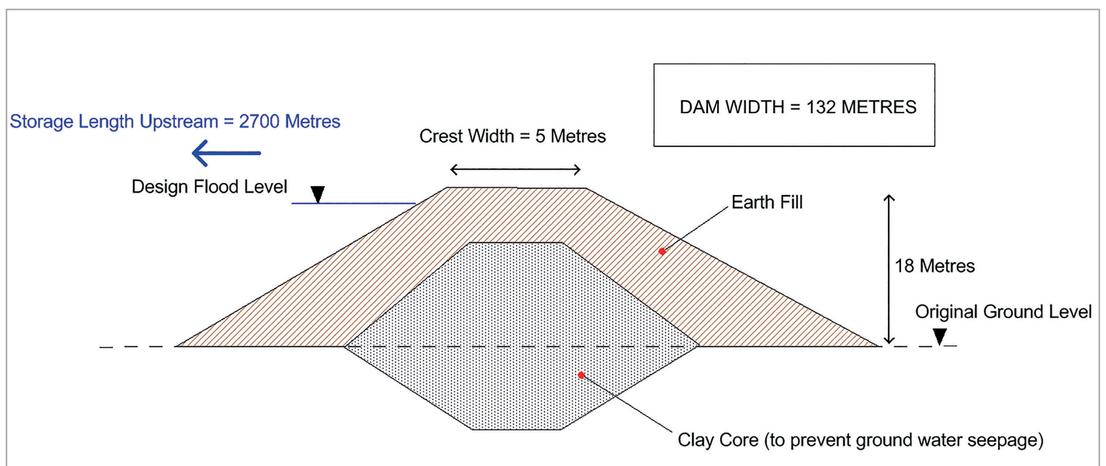


Figure 19: Cross section showing dimensions of an earth dam on the River Earn.

For comparison the Glen Lednock reservoir dam is approximately 40 m in height and 275 m wide. A plan indicating the location of the storage area is shown in figure 20.

An earth dam has been used to cost the upstream storage option, but based on a more detailed assessment, it is possible that a concrete dam would be a more preferable solution as this would require less land take. However a concrete dam is likely to be more expensive to construct and would result in a lower benefit/cost ratio for this option.

Figure 20: Approximate location of the River Earn storage area.

Option Cost and Benefits

The estimated cost of this option is **£48.8 million**. The overall calculated benefit/cost ratio for this scheme is **1.0**.

Advantages

- Reduces the required height of defences through the village along the Water of Ruchill for the 1 in 200 year event (reduction of up to 0.6 metres in some locations when compared to Option 2)
- Reduced visual impact for some residents.
- Enhanced biodiversity through habitat/wetland creation.

Disadvantages:

- Very large environmental impacts for creating these storage areas.
- Large amounts of land take will be required resulting in which may also lead to large compensation claims.
- Cost is likely to be very high and the benefit cost ratio is calculated to only be 1.0.
- Negative visual impact to the surrounding area due to new dam structure upstream on the River Earn.
- There is a residual hazard to the community from the large upstream storage areas.

For the reasons discussed above, this option is not considered to be feasible and has therefore been discounted.

Other Options Considered

A number of other potential options have also been assessed as part of the Scheme development process. These are options which could help reduce flood risk, in combination with the main options already presented but will not work as stand alone options. The options considered and tested within the hydraulic model are as follows.

Use of Existing Dams on Lochs Earn and Lednock (figure 21)

The use and control of the existing weir on the Loch Earn Dam was investigated to see if any changes in the management of the structure could increase available flood storage in Loch Earn. The weir which controls levels on Loch Earn cannot currently be altered to assist in managing the storage area in the event of a flood. Even if the level of the structure could be altered the dam is likely to only be able to provide a small amount of the storage required and reduction in water levels in Comrie. For these reasons this option is not considered to be feasible and has therefore been discounted.

The use and control of the Glen Lednock dam was also investigated in a similar manner. The use of the storage area in this way was explored with the reservoir owners, Scottish and Southern Energy and found to be impractical as it would directly conflict with its current use. Furthermore, it has been demonstrated from the hydraulic modelling exercise that the increase in storage along the River Lednock will have little impact on flood levels through the village. It is also unlikely that the dam could be emptied sufficiently in advance of a flood to manage flooding effectively. For these reasons, this option is not considered to be feasible and has therefore been discounted.

Removal of the Weir on the River Earn (figure 22)

The weir downstream of the Dalginross Bridge was removed from the hydraulic model in order to test its impact on flood water levels. Removing the weir only reduced the maximum 1 in 200 year flood levels by 110 - 280 mm immediately upstream of the weir, but had no wider benefits.

As the removal of the weir would result in only localised reductions in water levels but would also potentially have an adverse effect in terms of river stability and environmental impacts it has been discounted.

Raising of Dalginross Bridge (figure 23)

The effect of the bridge structure on channel flow and flood water levels was found to be very small. The raising of the bridge to above the maximum 1 in 200 year flood level only results in the water levels upstream of the bridge being reduced by 110mm. This option resulted in only a small localised reduction in water levels and the cost of raising the bridge would be high. The raising of the bridge is therefore not considered to be a viable option and has been discounted.

Increasing Local Floodplain Storage Capacity (figure 24)

The lowering of the Water of Ruchill floodplain was tested in the hydraulic model to see if it would have any positive impact on flood water levels . The lowering of the floodplain over a wide area by approximately 1 metre resulted in the reduction of the 1 in 200 year flood event water levels in the range of 30mm - 110 mm in Comrie. Floodplain lowering would therefore result in only a small reduction in water levels but a high level of disruption to agricultural land and would also require significant on-going maintenance. This option was considered in an earlier option assessment report in 2010, but for the reasons noted above this option is not considered to be feasible and has therefore been discounted.

Diversion Channel(s)

The construction of diversion channels to take excess flood water away from the flood risk areas in Comrie and Dalginross was considered during the early development of the Scheme. The diversion channel would have operated in flood conditions to divert flood water downstream away from Comrie. However, due to the local topography a diversion channel would not have provided any significant hydraulic benefits in reducing flood levels. This option would also be very expensive and require large amounts of land take while only providing small benefits. For the reasons noted above this option is not considered to be feasible and has therefore been discounted.

Property Relocation

The purchase and demolition/relocation of homes and properties was considered to see if this would be a viable option for Comrie.

Figure 21: Lednock Dam, Glen Lednock.

Figure 22: Weir on the River Earn located upstream of the Lednock Confluence.

Figure 23: Dalginross Bridge over the River Earn.

Figure 24: Land located next to the River Earn, downstream of Comrie.

This type of option is seen as an extreme measure and is only used where very small numbers of properties cannot be suitably protected by a viable flood protection scheme. As other options appear to be viable there is no need to progress with a widespread property relocation scheme and this option has therefore been discounted.

Natural Flood Management

Natural flood management is a term which covers many different small scale flood alleviation techniques applied at the catchment scale. They are often very small interventions to reduce the volume of water within a river system, to slow the flow of water and/or to increase temporary storage of flood water within a catchment. These techniques can include measures as diverse as increasing tree planting, introducing contour ploughing, reducing livestock densities, providing of in-stream barriers, creating pond and wetland areas etc.

The potential impact the application of these techniques could make has been estimated in the hydraulic model. Through the application of a variety of these techniques over the wider catchment a predicted decrease in the 1 in 200 year flood event water levels could be achieved in the range of 30 - 130 mm on the Water of Ruchill, 40 - 190 mm on the River Earn and 0 - 70 mm on the River Lednock. However, this option would require extensive work with upstream landowners and would not reduce flood levels sufficiently to work as an option in isolation. This option would also take a number of years to implement fully. The use of natural flood management as an option has therefore been discounted as part of this scheme.

Preferred Option - Option 2: Walls and Embankments

Option Overview

This option includes the provision of new walls and embankments along the Water of Ruchill, River Earn and River Lednock river corridors. The heights of the required defences vary from 0.25 metres to 1.5 metres and up to a maximum of 2.2 metres in some localised sections. The defence heights are determined by predicted flood levels, local ground levels and calculated freeboard (an allowance for uncertainty/safety factor).

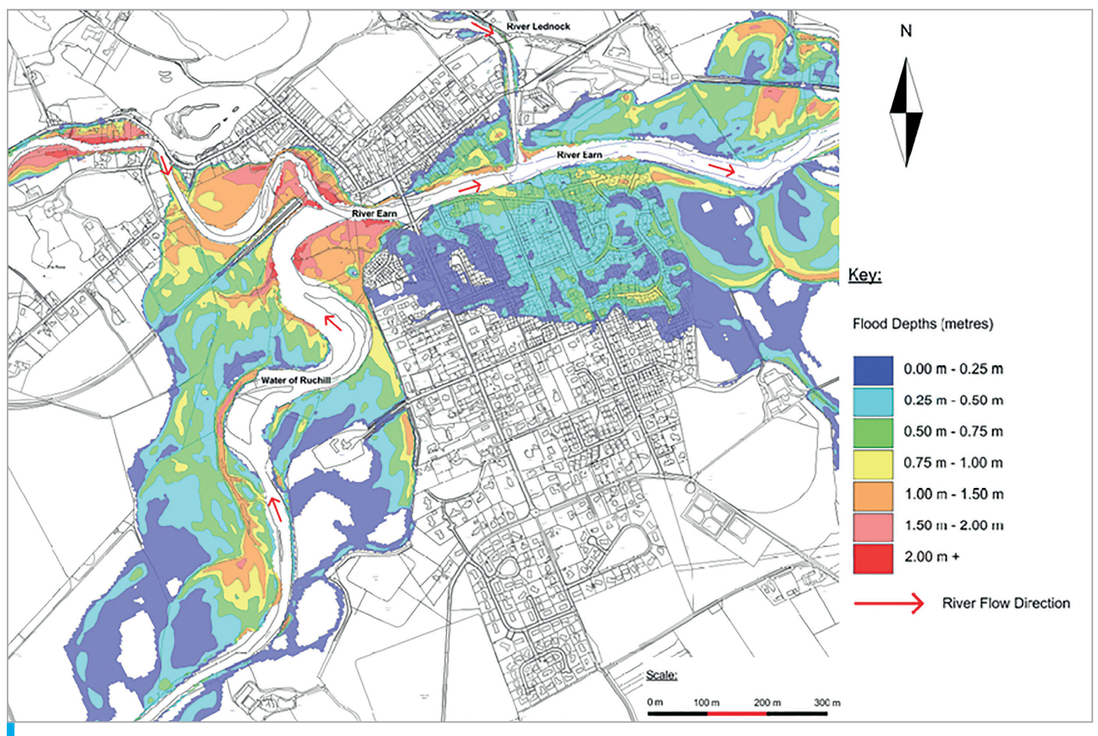


Figure 27: The undefended 1 in 200 year flood event

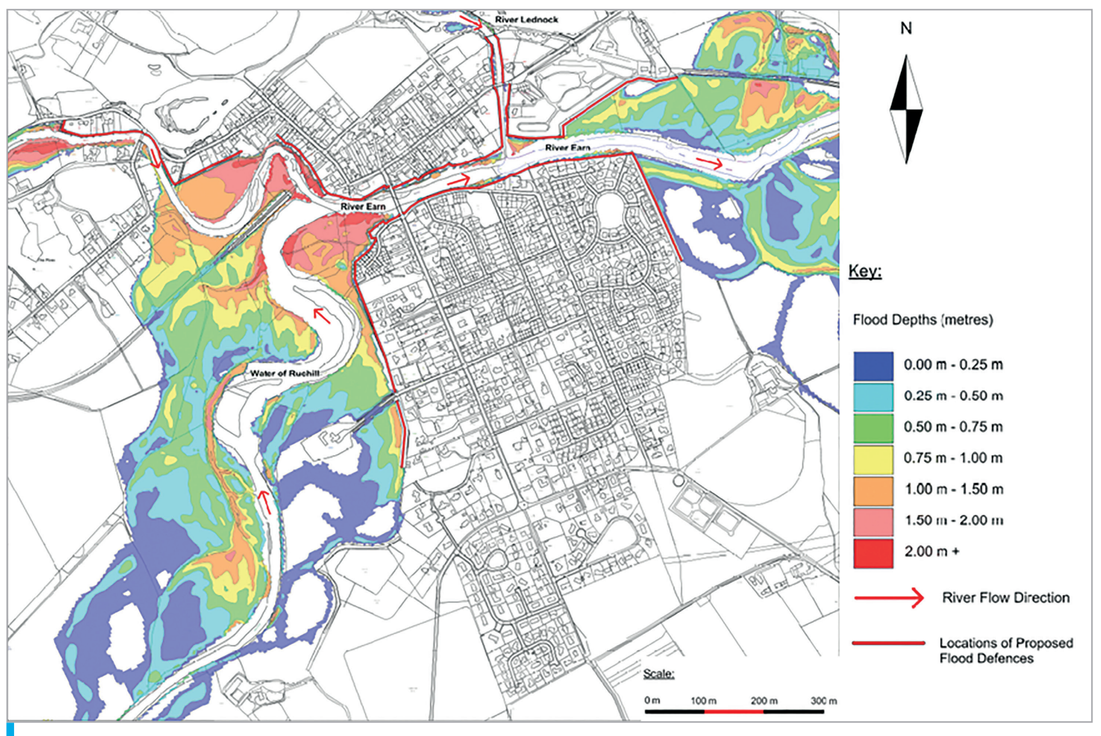


Figure 28: The 1 in 200 year flood event with the preferred option (option 2) implemented.

Selection of Option

The reasons for the recommendation of Option 2 as the preferred option are as follows:

- Walls and embankments are considered a feasible option and can reduce flood risk to Comrie for up to the 1 in 200 year flood event.
- Defences can be sympathetically constructed within the village using suitable finishing and landscaping.
- Access to the river and riverbank should be able to be maintained in some locations through the provision of flood gates and ramped accesses.
- Although some land take will be required, particularly during construction, the amount required will be much less than would be necessary for other options.
- Walls and Embankments provide the option with the highest benefit/cost ratio of 2.0.
- The total cost for the scheme is estimated to be £24.5 million.
- Operational and maintenance costs are also more manageable when compared to other options.
- Environmental impacts are likely to be small when compared to other options. Temporary construction impacts to the local environment will be able to be mitigated against through careful planning in the design and construction phases.
- A Scheme consisting of walls and embankments will be robust. Continual intervention will not be required to maintain the standard of protection (as would be the case with other options, particularly dredging).
- A climate change allowance has not been factored into the Scheme defence heights. This is because this would typically result in defence heights increasing by a further 600mm, which would mean the defences in Comrie would be too imposing. The 1 in 200 year standard of protection will provide a sufficiently high level of protection for the village without a further allowance for climate change.

PERTH & KINROSS COUNCIL
The Environment Service

mouchel
building great relationships

Comrie Flood Protection Scheme | Community drop-in sessions | Board 11

What Happens Next?

Community Feedback

Following this event, we will review your comments and seek to address any concerns or issues that you may raise. Your views will be recorded and will help inform the future development of the proposals for the Scheme. A response to your questions and comments will also be provided to the Community Council in due course.

Next Steps

The Councils consulting engineers will finalise and submit their report for the flood scheme. We will then report on the outcome of the consulting engineers report and these drop in sessions to the next available Environment Committee.

Outline Design

Work to develop the Scheme and to further refine the preferred option will commence in the current financial year.

- **Flood defences** – the defence heights, extents and the construction methodology will be confirmed;
- **Further Consultation** – all relevant stakeholders will be consulted to gauge their views on the Scheme as it develops;
- **Environmental work** – environmental surveys (Bats, Badgers, Trees.) and a full environmental assessment will be undertaken;
- **Further hydraulic modelling** - further detailed hydraulic modelling will be undertaken to confirm option defence levels to be used as part of the outline design;
- **Drainage** – analysis of the drainage network will be undertaken to determine the impact of a potential scheme on surface water drainage;
- **Services** – liaison with utility companies will be undertaken to determine how and where we will divert their services, if required;
- **Bridges** – the impact the Scheme may have on the relevant bridges will be assessed in order to determine if any work is needed to strengthen these structures;
- **Flood risk elsewhere** – the impact the scheme may have on flood risk in other locations will be assessed. If flood risk is found to increase in other locations because of the Scheme, mitigation measures will be proposed to address this.

Flood Risk Management (Scotland) Act and Funding

A flood scheme at Comrie has been included within the national priority list of flood schemes and forms part of the current Tay Flood Risk Management Strategy and Local Flood Risk Management Plan. The Council and the Scottish Government have agreed in principle to fund the Scheme for Comrie. Perth and Kinross Council will provide 20% towards the overall capital cost and the Scottish Government will contribute the remaining 80%, assuming that the Scheme remains economically viable.

Although funding is provisionally secured, it is important to note that implementation of a scheme is still likely to be some time away and is not yet certain, due to the need to secure statutory consents and other approvals.

The text box and indicative time line shown provide an overview of the work still required before a Scheme can be constructed for Comrie and Dalginross and an estimate of expected time scales.

For further information regarding the ongoing flood mitigation activities being carried out in the area, please refer to the power point presentation being shown.

INDICATIVE DATE/ TIME PERIOD	PHASE OF WORK	
Commence Winter 2016 /Spring 2017	Outline Design	• Statutory Stakeholders (including SEPA, SNH, Historic Scotland) • Landowners • Utility Companies • Wider Community • Other Council Departments (including Planning, Greenspace, Roads, Structures)
Commence Winter 2017 /Spring 2018	Further Consultation	
	Develop Flood Order	
Target Spring/ Summer 2018	Publish Scheme	This process can take anything from 3-6 months depending on whether any objections are received upon publication of the Scheme. Once the Scheme is confirmed the Council have the legal power to build it.
	Scheme Confirmed	
Approx 15 months	Detailed Design and Preparation of Contract Documents	
Minimum 4 month period	Tender Period	
Anticipated 18 months	Construction Phase	

Feedback and thank you

Thank you

We would like to thank you for your attendance and comments today. Community involvement is a key part of flood risk management and your views are appreciated.

Any comments or questions?

Please speak with a representative from Perth & Kinross Council or Mouchel. Please also take this opportunity to record your views by completing a comment form.

Do you have any further information?

To date we've received some very useful information from the local community and we would be very interested in any further photographs, maps and details of previous flooding events, including any witness accounts. All information helps to ensure we can develop the optimum solutions to flooding in Comrie.

Continued Community Involvement

We're committed to continuing your involvement with the scheme and will continue to keep you updated.

Contact Details

For further information on the proposals please contact:

Craig McQueen
Engineer (Flooding)
Structures and Flooding
Perth and Kinross Council
Pullar House
35 Kinnoull Street
Perth PH1 5GD

01738 477219

craigmcqueen@pkc.gov.uk

Paul Swift
Divisional Manager
Flooding & Drainage, Mouchel
Exchange Station
Tithebarn Street
Liverpool
Merseyside
L2 2QP

0151 600 5500

paul.swift@mouchel.com

Figure 29: Water of Ruchill

Figure 30: River Earn from Dalginross Bridge

River Lednock

River Earn

River Earn

The Ross

Comrie

Water of Ruchill

N

Key:

Flood Depths (metres)

- 0.00 m - 0.25 m
- 0.25 m - 0.50 m
- 0.50 m - 0.75 m
- 0.75 m - 1.00 m
- 1.00 m - 1.50 m
- 1.50 m - 2.00 m
- 2.00 m +

River Flow Direction

Scale:

0 m 100 m 200 m 300 m

PERTH & KINROSS COUNCIL
The Environment Service

mouchel
building great relationships

Comrie and Dalginross Flood Protection Scheme

Public Engagement Event

Date: September 2016

Current Scenario Event: 1 in 10 year flood event (10.0%)

River Lednock

River Earn

River Earn

The Ross

Comrie

Water of Ruchill

N

Notes:

The location of the defences shown is approximate and the precise alignment of the defences will have to be confirmed in the next phase of the project.

Key:

Flood Depths (metres)

- 0.00 m - 0.25 m
- 0.25 m - 0.50 m
- 0.50 m - 0.75 m
- 0.75 m - 1.00 m
- 1.00 m - 1.50 m
- 1.50 m - 2.00 m
- 2.00 m +

River Flow Direction

Locations of Proposed Flood Defences

Scale:

0 m — 100 m — 200 m — 300 m

PERTH & KINROSS COUNCIL
The Environment Service

mouchel
building great relationships

Comrie and Dalginross Flood Protection Scheme

Public Engagement Event

Date: September 2016

Defended Event (Option 2): 1 in 10 year flood event (10.0%)

River Lednock

River Earn

River Earn

The Ross

Comrie

Water of Ruchill

N

Key:

Flood Depths (metres)

- 0.00 m - 0.25 m
- 0.25 m - 0.50 m
- 0.50 m - 0.75 m
- 0.75 m - 1.00 m
- 1.00 m - 1.50 m
- 1.50 m - 2.00 m
- 2.00 m +

River Flow Direction

Scale:

0 m 100 m 200 m 300 m

PERTH & KINROSS COUNCIL
The Environment Service

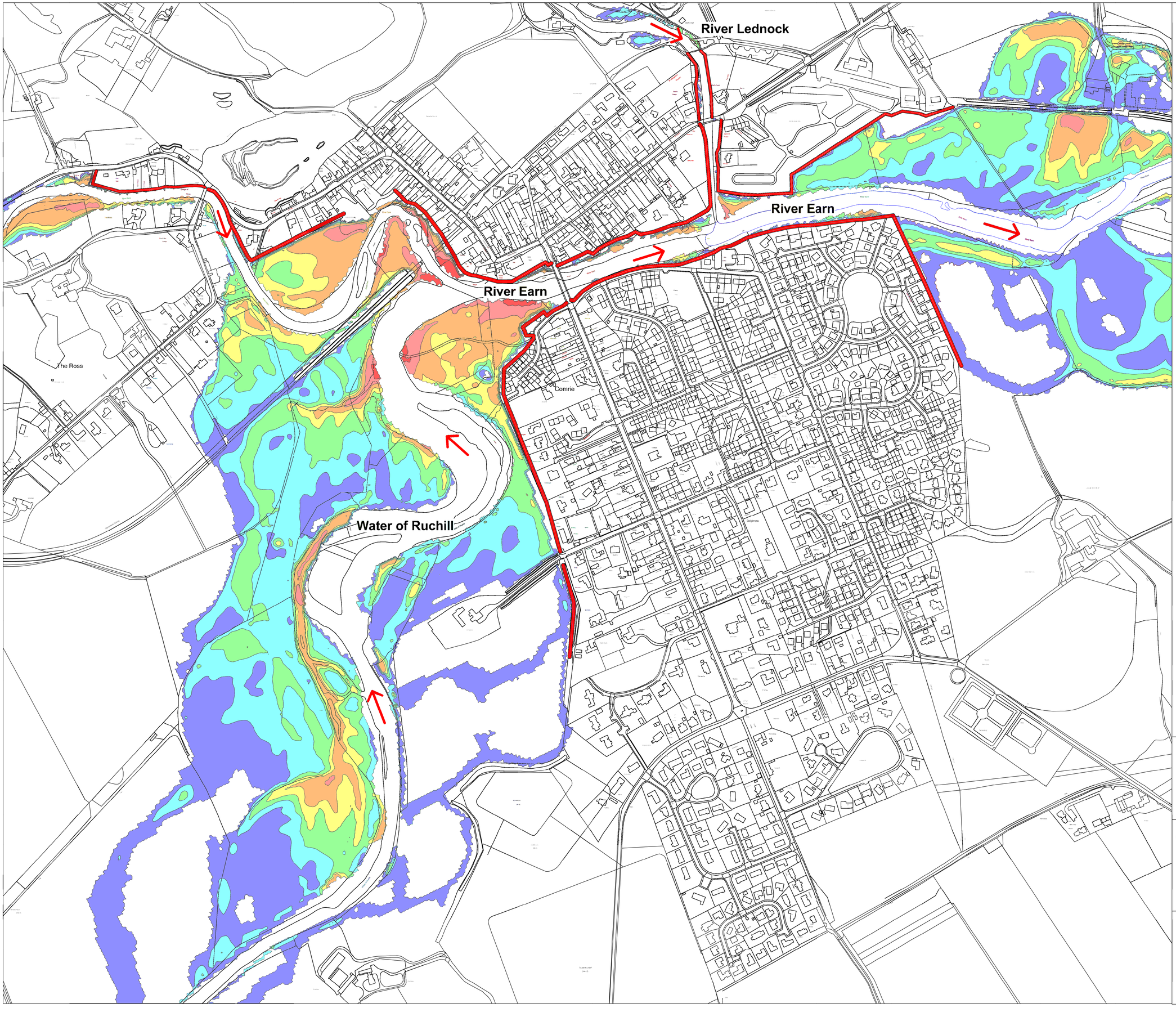
mouchel
building great relationships

Comrie and Dalginross Flood Protection Scheme

Public Engagement Event

Date: September 2016

Current Scenario Event: 1 in 50 year flood event (2.0%)



N

Notes:

The location of the defences shown is approximate and the precise alignment of the defences will have to be confirmed in the next phase of the project.

Key:

Flood Depths (metres)

- 0.00 m - 0.25 m
- 0.25 m - 0.50 m
- 0.50 m - 0.75 m
- 0.75 m - 1.00 m
- 1.00 m - 1.50 m
- 1.50 m - 2.00 m
- 2.00 m +

River Flow Direction

Locations of Proposed Flood Defences

Scale:

0 m — 100 m — 200 m — 300 m

PERTH & KINROSS COUNCIL
The Environment Service

mouchel
building great relationships

Comrie and Dalginross Flood Protection Scheme

Public Engagement Event

Date: September 2016

Defended Event (Option 2): 1 in 50 year flood event (2.0%)

River Lednock

River Earn

River Earn

The Ross

Comrie

Water of Ruchill

N

Key:

Flood Depths (metres)

- 0.00 m - 0.25 m
- 0.25 m - 0.50 m
- 0.50 m - 0.75 m
- 0.75 m - 1.00 m
- 1.00 m - 1.50 m
- 1.50 m - 2.00 m
- 2.00 m +

River Flow Direction

Scale:

0 m 100 m 200 m 300 m

PERTH & KINROSS COUNCIL
The Environment Service

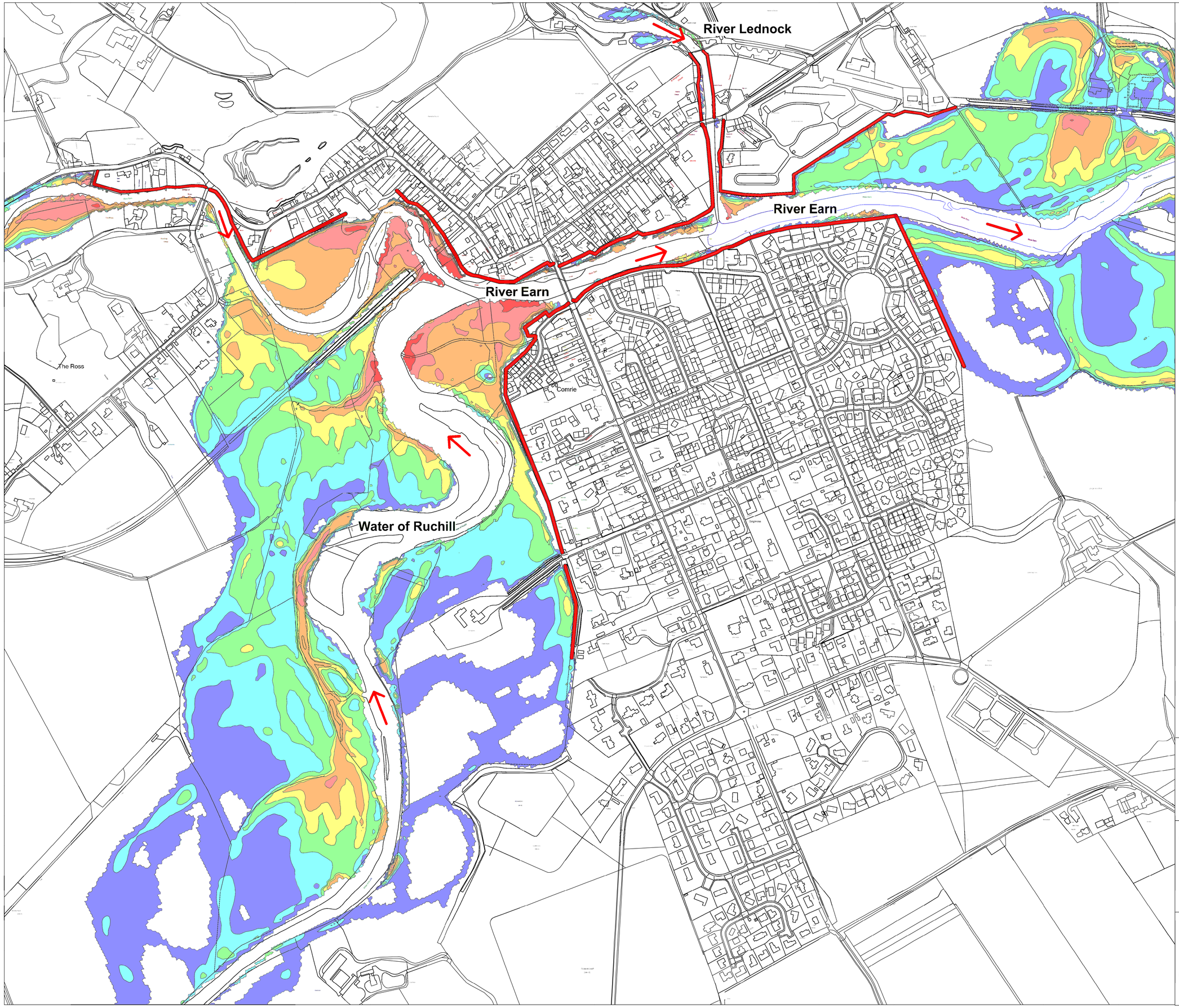
mouchel
building great relationships

Comrie and Dalginross Flood Protection Scheme

Public Engagement Event

Date: September 2016

Current Scenario Event: 1 in 100 year flood event (1.0%)



N

Notes:

The location of the defences shown is approximate and the precise alignment of the defences will have to be confirmed in the next phase of the project.

Key:

Flood Depths (metres)

- 0.00 m - 0.25 m
- 0.25 m - 0.50 m
- 0.50 m - 0.75 m
- 0.75 m - 1.00 m
- 1.00 m - 1.50 m
- 1.50 m - 2.00 m
- 2.00 m +

River Flow Direction

Locations of Proposed Flood Defences

Scale:

0 m — 100 m — 200 m — 300 m

PERTH & KINROSS COUNCIL
The Environment Service

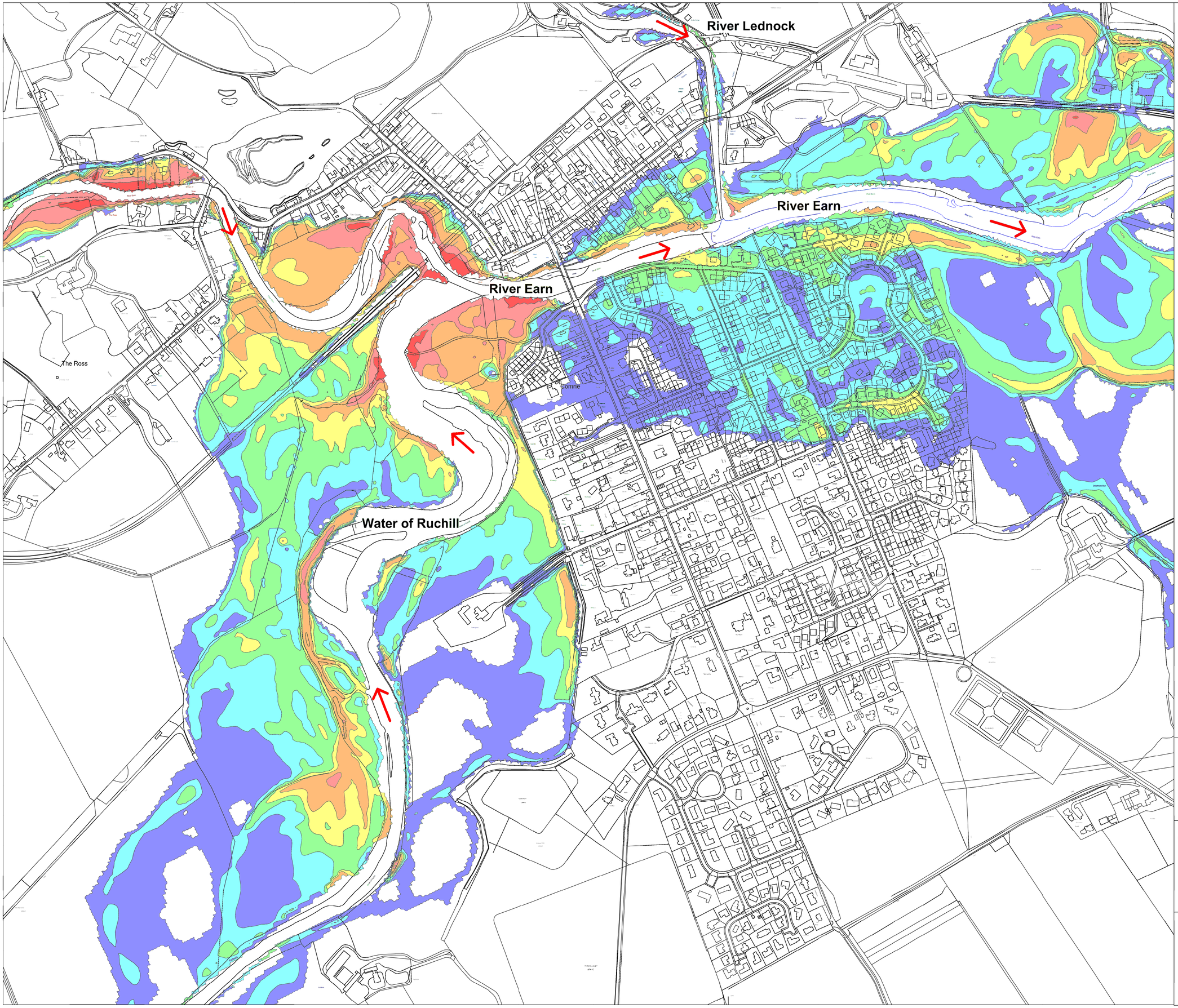
mouchel
building great relationships

Comrie and Dalginross Flood Protection Scheme

Public Engagement Event

Date: September 2016

Defended Event (Option 2): 1 in 100 year flood event (1.0%)



N

Key:

Flood Depths (metres)

- 0.00 m - 0.25 m
- 0.25 m - 0.50 m
- 0.50 m - 0.75 m
- 0.75 m - 1.00 m
- 1.00 m - 1.50 m
- 1.50 m - 2.00 m
- 2.00 m +

River Flow Direction

Scale:

0 m — 100 m — 200 m — 300 m

PERTH & KINROSS COUNCIL
The Environment Service

mouchel
building great relationships

Comrie and Dalginross Flood Protection Scheme

Public Engagement Event

Date: September 2016

Current Scenario Event: 1 in 200 year flood event (0.5%)

River Lednock

River Earn

River Earn

The Ross

Comrie

Water of Ruchill

N

Notes:

The location of the defences shown is approximate and the precise alignment of the defences will have to be confirmed in the next phase of the project.

Key:

Flood Depths (metres)

- 0.00 m - 0.25 m
- 0.25 m - 0.50 m
- 0.50 m - 0.75 m
- 0.75 m - 1.00 m
- 1.00 m - 1.50 m
- 1.50 m - 2.00 m
- 2.00 m +

River Flow Direction

Locations of Proposed Flood Defences

Scale:

0 m 100 m 200 m 300 m

PERTH & KINROSS COUNCIL
The Environment Service

mouchel
building great relationships

Comrie and Dalginross Flood Protection Scheme

Public Engagement Event

Date: September 2016

Defended Event (Option 2): 1 in 200 year flood event (0.5%)

Community Drop-in Sessions Summary of Questions & Answers

Perth and Kinross Council Environment Service
Comrie Flood Protection Scheme - Community Drop-in Sessions
Summary of Questions & Answers

Introduction

Perth and Kinross Council held community drop-in sessions in Comrie Community Centre from 2-8pm on 1 and 8 September 2016. The aim of the drop-in sessions was to consult with the local community on:

- The risk of flooding in Comrie.
- The Council's proposals for a flood scheme.
- Work to raise awareness of flooding and to help the local community to become more prepared and resilient to deal with flooding in the future.
- Other action being taken on flood risk.

This report collates the questions received during the drop-in sessions and provides the Council's response to those questions.

The event was well attended and the Council would like to thank those residents who took the time to attend and provide comment.

Flood Scheme Proposals

The Council has engaged consulting engineers, Mouchel, to develop proposals to manage the risk of flooding from the Water of Ruchill, the River Earn and the River Lednock. Mouchel have considered a wide range of potential options for managing the risk of flooding at Comrie and have recommended a preferred option to the Council. However before taking this forward, the Council was keen to consult with the community.

The following main options have been considered as part of the flood scheme investigations:

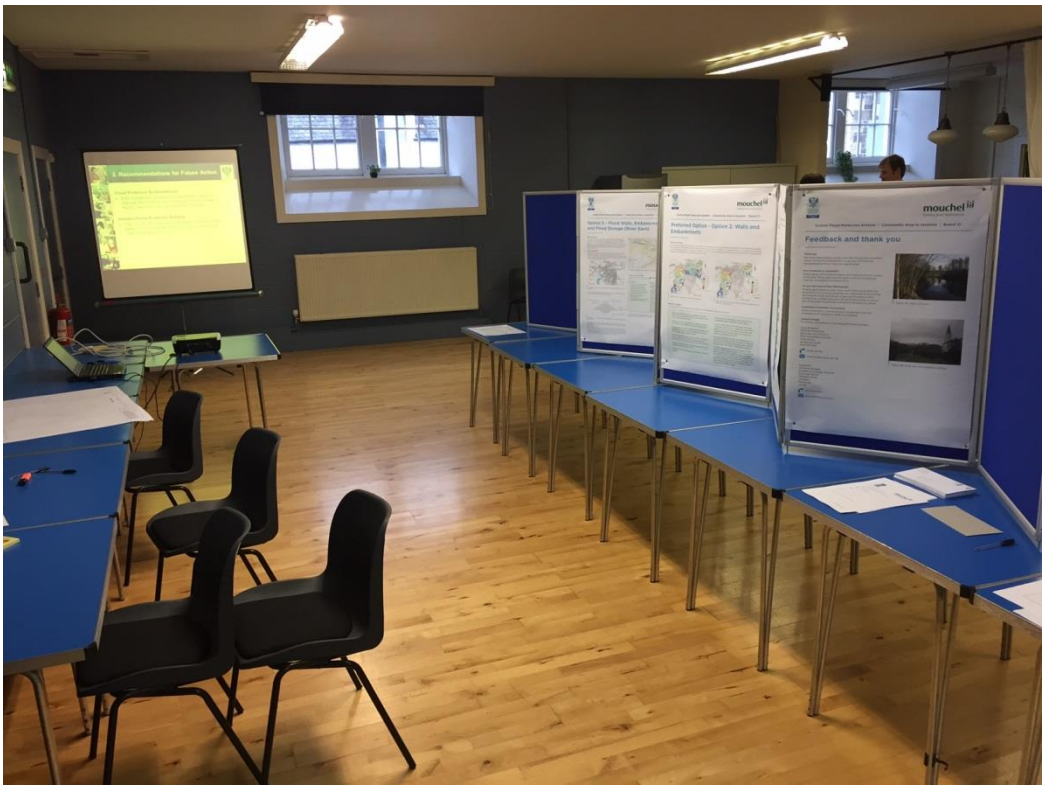
Option 1 – Dredging
Option 2 – Walls and Embankments
Option 3 – Upstream Flood Storage
Option 4 – Flood Walls, Embankments and Flood Storage (Water of Ruchill)
Option 5 – Flood Walls, Embankments and Flood Storage (River Earn)

Option 2 – Walls and Embankments – was put forward at the drop in sessions as the preferred option.

Drop In Sessions

The drop in sessions involved a central display, a slide show on a projector and a series of plans of the scheme options located on tables around the room. A letter had been distributed to the community in advance outlining the options considered and inviting residents to attend the drop in sessions.

The event was very well attended by the local community demonstrating a high level of interest in the flood scheme proposals. An estimated 120-150 people attended the drop in sessions over the two days. Representatives from the Council and Mouchel attended to provide information and answer questions.



Displays at Drop in Sessions

All members of the community who attended where encouraged to complete a comment form to express their views and opinions or to ask any questions on the Council's proposals. These forms were either completed on the day and handed to the Council or Mouchel, or were completed after the event and returned to the Council. Blank maps were also made available to allow consultees to make comments and mark on any information they had on flood extents, etc.

The public consultation materials can still be viewed on the Council's web site at http://www.pkc.gov.uk/comriefloodscheme and also on the Comrie Community Council website at http://www.comrie.org.uk/.

Community Response

In general, the impression received from the drop-in sessions was that the local community where in favour of the preferred option (Option 2 – Walls and Embankments).

24 comment forms were returned to the Council. The majority of the responses also indicate general approval for the preferred option.

The attendees raised a number of questions on their completed forms and these are listed in the Annex below along with the Council's response. The questions have been grouped into the following three general themes: -

(A) Flood scheme development and timescales;
(B) Maintenance;
(C) Resilience and self-help.

Those submitting forms have not been named for confidentiality reasons.

This report will be distributed to members of the community.

Conclusion

Perth & Kinross Council was satisfied with the outcome of the drop-in sessions. The sessions confirmed that the local community are generally in favour of the preferred option put forward by the Council's consulting engineers, Mouchel.

The Council has therefore instructed Mouchel to finalise their report on this phase of the flood scheme investigations and will move forward to develop the preferred option in more detail.

The Council will carry out further consultation with the community as the scheme proposals are developed.

For further information on the proposals please contact:

Craig McQueen
Engineer (Flooding)
Structures and Flooding
Perth and Kinross Council
Pullar House
35 Kinnoull Street
Perth PH1 5GD
Tel 01738 477219
Email craigmcqueen@pkc.gov.uk

Paul Swift
Divisional Manager
Flooding & Drainage
Mouchel
Exchange Station
Tithebarn Street
Liverpool L2 2QP
Tel 0151 600 5500
Email paul.swift@mouchel .com

Website: www.pkc.gov.uk/comriefloodscheme

Annex - Questions & Answers

(A) Flood Scheme Development and Timescales

Question 1 – Can anything be done to reduce the estimated timescale for implementation of the flood defences?

The flood scheme has a high priority within the national priority list of flood schemes and the Council's local flood risk management plan. Although funding is provisionally secured, it is also important to note that the implementation of a scheme is still likely to be some time away and is not yet certain, due to the need to secure statutory consents and other approvals.

The development of such a large civil engineering project takes a good deal of time, as indicated on the displays at the drop-in sessions. A lot of work remains to be done on the planning and design of the scheme; securing statutory approval; tendering and the construction works. In the first instance the design of the preferred option put forward at the drop in sessions needs to be developed further as described below:

- **Develop outline design** – the flood defence heights, extents and the construction methodology for the Scheme will be developed further;
- **Environmental work** – environmental surveys (bats, badgers, trees, etc) and an environmental assessment will be undertaken;
- **Further hydraulic modelling** - further detailed hydraulic modelling will be undertaken to confirm flood defence levels and the impact the scheme may have on flood risk in other locations. If flood risk is found to increase in other locations then mitigation measures will be proposed to address this.
- **Drainage** – analysis of the drainage network will be undertaken to determine the impact of a potential scheme on surface water drainage;
- **Services** – liaison with utility companies will be undertaken to determine how and where we will divert their services (electricity, mains water, etc.), if required;
- **Bridges** – the impact the scheme may have on the relevant bridges will be assessed in order to determine if any work is needed to strengthen or alter these structures;
- **River behaviour assessment** – the hydraulic modelling, together with further river surveys, will be used to assess the nature of sediment movement and the potential for erosion within the rivers. Further works to mitigate these issues may still be required as part of the proposed scheme.
- **Further consultation** – the community and all relevant stakeholders will be consulted and their views will inform the development of the proposals.

Following further consultation and refinement, the Council will formally publish the flood scheme under the Flood Risk Management (Scotland) Act. At this stage any person who may have an interest (including local residents and landowners) will have the opportunity to object to the scheme. Such objections can take time to resolve, but the Council will seek to minimise these through early consultation.

Once the Scheme is approved (or 'confirmed') the Council will have the legal power to build it and will be able to proceed with securing the remaining consents, the detailed design, tendering and construction.

It is essential that the final scheme will be safe, functional and readily buildable by the selected civil engineering contractor.

In summary, due to the large number of issues to be considered; the extensive consultation required; the complexity of the engineering work and the statutory requirements, it is unlikely that the estimated programme for delivery can be reduced significantly.

Question 2 - How high will the proposed defences be?

The walls and embankments will vary in height from 0.25 metres to 1.5 metres and up to a maximum of 2.2 metres in some localised sections. The defence heights are determined by predicted flood levels, local ground levels and calculated freeboard (an allowance for uncertainty/safety factor).

The required height of the flood defences will be reviewed and refined during the design of the scheme and we will provide greater detail on this thereafter. The flood defences heights will be subject to further consultation with the community.

Question 3 – Will consideration be given to measures in the upper catchment that may reduce the risk of flooding at Comrie (these measures are generally termed "Natural Flood Management")?

Natural flood management (NFM) typically involves slowing or storing flood water in the upper catchment to reduce peak flows in areas downstream. These techniques can include measures as diverse as increasing tree planting, introducing contour ploughing, reducing livestock densities, provision of in-stream barriers, creating pond and wetland areas etc. The works are therefore normally of a small scale and low cost however a large number of separate sites and actions are often required to see any perceptible difference in flood flows in the lower catchment. This is true even in small catchments and the effect of NFM on the scale of large catchments during extreme events is still untested.

As part of the initial option assessment for the flood scheme, the potential impact that the application of these techniques could make was estimated from the hydraulic model. They were found not to reduce flood levels sufficiently for large flood events. As the Council is aiming to manage flood risk from 3 large rivers up to the 1 in 200 year flood event event NFM measures have been screened out and are not considered to be a viable option as part of the proposed flood scheme.

Question 4 – Will the location and appearance of any finished work be sympathetic to its surrounding environment?

The Council will seek to minimise the impact of the scheme on the surrounding environment. Further consultation with the community, SEPA, SNH, Historic Scotland and other relevant stakeholders will be carried out to inform the development of the scheme. This issue will be considered as part of the environmental assessment for the flood scheme.

Having decided that flood walls and embankments form part of the preferred option, the Council and our consultants will investigate the alignment and visual appearance and of these proposed structures in more detail. Often it is appropriate to clad or treat a wall surface in some way to integrate it into the local surroundings. The use of sympathetic landscaping will also be considered.

More detail will become available as the scheme progresses and more information will be made available to the community throughout the design process.

In the meantime please be assured any selected finishes will be required to be in keeping with the local area, and that the defences will be incorporated into the local landscape as much as possible.

Question 5 – Could the final proposals address measures to 'sweep' the outlet of the River Lednock into the flow of the River Earn at the junction of the two rivers?

The preferred proposal for flood walls and embankments allows for the flow regime at the confluence of the River Earn and the River Lednock. The flood defences at the Comrie Holiday Park are set back from the River Earn to allow more space for the rivers in higher flow conditions.

The preferred proposal is designed to work with the natural alignment of the River Lednock. Permanently re-directing the channel of the River Lednock at its confluence with the Earn would require major engineering works which would effectively work against the river and would therefore have to be maintained at considerable cost in the future. It is also unclear what additional benefits such work would deliver when compared to the proposed arrangements.

There are therefore no current plans to introduce a 'sweep' at the outlet of the River Lednock. .

Question 6 – Will the scheme address the required upgrade to drainage in the Monument Road area?

There is a short watercourse system which flows down the edges of Monument Road before entering into a pipe at the Car Park for Deil's Cauldron. The watercourse is culverted from here towards the River Earn via Dundas Street.

Flooding has occurred from this watercourse on Monument Road due to the limited capacity of the pipe inlets at the car park. The Council has carried out works to alleviate this situation by providing an alternative overflow route, with an improved

headwall and a new screen arrangement. This overflow will reduce the amount of water which flows down Monument Road towards the road junction and adjacent property in times of heavy rain.

The route, form of construction and current condition of the culvert are not fully known south of the entrance to the drive of Comrie House. The culvert passes through various sections of private ground before it outfalls to the River Earn. The relevant landowners in this area have a responsibility for the culvert where it passes through their property and may have more information on their title deeds.

It is considered that the preferred option for the flood scheme will have a negligible impact on the culvert or the watercourse. The bulk of the flood defence works will be remote from the assumed line of the drain and therefore there are no plans to upgrade or replace the drain as part of the flood scheme. However, where the proposed flood defences cross the culvert then measures may be required to maintain the integrity of the outfall to the River Earn and even to prevent backflow in times of flood.

Question 7 – Will the scheme take in to account the risk of water being passed downstream and/or backing up in Comrie and possibly causing damage to downstream and/or upstream properties? Will the risk of flooding be transferred to downstream or upstream locations?

A number of residents noted their concern that a flood scheme will either cause a constriction on the river channels causing flood water to back up or will pass more flood water downstream, thereby increasing flood risk to property in these areas.

The Council acknowledges these concerns and has engaged experienced consulting engineers to carry out detailed river modelling to examine these impacts in detail.

The proposed flood defences will reduce the available floodplain area available to the rivers. This will ensure that flood water that would previously have entered the town and flooded property will in future be contained by the flood defences. However the new flood walls and embankments will be raised to a sufficient level and create additional storage within the restricted river channel to allow for this containment localised raising of water levels through the reaches of the Scheme.

Based on the hydraulic modelling undertaken so far, the potential impacts out with the proposed defences and Scheme bounds are as below:

(i) just upstream of the proposed flood defences along the River Earn - flood levels would increase by up to 200mm in the 1 in 200 year flood event;
(ii) just downstream of the proposed flood defences along the River Earn - at Invermilton, flood levels would increase by 115mm in the 1 in 200 year flood event.

The impacts in other locations for the 1 in 200 year flood event are considered to be negligible.

At the upstream end of the scheme, the main constriction on the River Earn is the Bridge of Ross and the extent of the flood defences required in this area is limited. The total loss of floodplain in this area is therefore relatively small. The hydraulic modelling has been used to consider if any significant change in predicted flood levels will occur to properties in this location outwith the Scheme extents as a result of the proposed defences. This has not been found to be the case currently as any of the houses in this location are set well back from the bank and/or are elevated above the predicted flood levels. However, this will be looked at further and in more detail in the next stages of design.

It would not be acceptable for the Council to increase flood risk to neighbouring property without suitable mitigation. Where a change in predicted flood levels has the potential to impact on property, then the need for mitigation will be assessed and measures included within the flood scheme to ensure that their current standards of flood protection are maintained. The Council will consult with any landowners or residents who may potentially be affected if required though the next stages of the Scheme development.

Question 8 – Will communication continue with the local community to update us on the progress of the scheme and decisions being made?

We are committed to continuing the community involvement in the development of the flood scheme proposals and will continue to keep you updated on progress.

A dedicated webpage for the flood scheme has been set up on the Councils' web site at http://www.pkc.gov.uk/comriefloodscheme. The display materials used at the recent drop-in sessions can be viewed at this web page.

The Council will continue to update Comrie Community Council with information as and when it becomes available. The next full consultation with the community will be carried out before the outline design of the flood scheme is completed. Discussions with individual landowners and residents will continue in the meantime

In the meantime any questions you may have can be directed to Craig McQueen Engineer (Flooding), Perth and Kinross Council, Pullar House, 35 Kinnoull Street, Perth, PH1 5GD or craigmcqueen@pkc.gov.uk

Question 9 – Will the Scheme construction start upstream first?

The programme and phasing for the construction phase of the project will be confirmed once a contractor has been appointed.

The management of flood risk during construction will be considered as part of the detailed planning for the construction works.

Question 10 - Which river contributed most to the 2012 flooding? The Water of Ruchill, the River Earn or the River Lednock?

The Dalginross area of Comrie was severely affected by flooding on 27 August and 19 November 2012. During both of these events the Water of Ruchill was the main source of flooding and the highest contributor to the recorded river flows.

(B) Maintenance

Question 11 – Will regular review of the watercourse and subsequent protection be taken into account within the scheme's maintenance?

Under the Flood Risk Management (Scotland) Act, the Council has a duty to assess bodies of water and to carry out clearance and repair works where this will substantially reduce flood risk. The Council currently undertakes routine inspections of the bodies of water and flood defences in Comrie as follows:

- The Water of Ruchill, River Earn, River Lednock and Fey Burn are inspected every 3 months. Once per year a more detailed inspection is carried out on the Water of Ruchill to monitor any change in the river channel.

- The rock armour at Ruchilside and the Field of Refuge is also inspected every three months. The flood protection works along the western edge of Dalginross are inspected every year, with a structural inspection every five years.

The Council will also respond if any issues are reported in the intervening period between routine inspections. The Council has and will continue to carry out clearance and repair works as required.

The primary responsibility for avoiding or managing flooding risk remains with riparian landowners who are expected to maintain watercourses which pass over their land.

Once the new flood scheme is complete, the frequency of watercourse inspections will be reviewed. In most areas across Perth and Kinross, watercourses are inspected every 6 months or every year where a flood scheme has been constructed. At present, Comrie is currently monitored more frequently than this as there is a high risk of flooding but no flood scheme that protects the whole town.

The Council will inspect and maintain any new flood defences that are constructed as part of a flood scheme. This will be carried out in accordance with the recommendations of the scheme designers.

Question 12 - Are there actions, (e.g. tree planting, stabilizing banks, periodic dredging, other) to minimize / manage / validate the control of natural river fill as a key part of the final recommended flood protection scheme? What analysis / modelling has been included and validated regarding the source / timing and impact of aggregate / sediment / river debris build-up / movement over time and the wall and embankment recommendation?

Rivers change over time due to the natural processes of erosion and accretion. In particular the Water of Ruchill has changed its alignment over the years.

Natural flood management actions - such as tree planting - have been considered by Mouchel – please see our response to Question 3.

Where necessary, the Council has carried out works to raise and stabilise the river bank at Ruchilside (which was heavily eroded during the flooding of 2012) and at the Field of Refuge (in order to protect the existing flood defences).

With regard to dredging, the work done by Mouchel and put forward at the drop-in sessions confirms that a significant amount of material would also have to be removed from the Water of Ruchill to contain a flood event and deliver any significant reduction in flood risk. This is not considered to be a feasible or sustainable option; hence other options have also been considered to manage flood risk.

The modern approach to river management aims to minimise disturbance to the natural characteristics of rivers and to work with nature to reduce the risk of flooding.

The preferred option for a flood scheme involves the construction of flood walls and embankments. These flood defences will be set back from the river where possible and will therefore minimise any impact on the rivers.

Mouchel have already investigated flood risk and changes in river behaviour. Hydraulic modelling of the three watercourses in Comrie has been carried out based on survey data and river cross sections which have been re-surveyed in recent years. Work has also been carried out to study the river behaviour in the area (in particular river stability and likely future channel change). Much of this work will be based on a photographic record of the main watercourses in Comrie and the recorded changes over time. Further study, survey and modelling work will be carried out and this will continue to inform the development of the flood scheme

One of the key aims of this assessment will be to ensure that future changes in the river channel will not affect the integrity of the flood defences. Where this is likely to be an issue then the scheme proposals may include works to address this risk, e.g. mitigation/stabilisation works and/or enhanced monitoring. This work will inform the design of the flood scheme and its future maintenance.

Question 13 – Will consideration be taken for regular review of the pumping stations and will upgrading of the pumps be taken when necessary? How will they be maintained?

There are currently 5 pumping stations in Comrie which help the local sewer system operate effectively. Scottish Water is responsible for operating and maintaining the sewer system, including these pumping stations. The new flood scheme will be carefully designed and planned so as to ensure that there is no impact on this system.

Now that the preferred scheme option has been identified, further analysis of the drainage network will be undertaken to determine the impact of the potential scheme on surface water drainage. Suitable mitigation may be required such as new drainage pipes, storage, pumping stations etc.

Arrangements will be put in place by the Council to ensure that any new pumping stations are regularly inspected, serviced and maintained so as to remain operational during a flood event. The council already has similar arrangements in place for the pumping stations which form part of flood schemes in other areas.

Question 14 – Will dredging be used as an ongoing measure to manage flood risk on the Ruchill along with the management of fallen trees?

A river is contained entirely within its banks under normal flow conditions. Any flow in excess of the channel capacity will result in overtopping of the banks. The sight of water out of a river channel and on floodplains is therefore actually quite commonplace. However, this can be a concern if it impacts upon people or property located on the floodplain.

During a large flood event, the peak river flow is usually many times the bank full channel capacity and large volumes of water will spill out onto the floodplain. It is therefore not practical to dredge the river to the extent that it would confine such large flood flows within the channel only and to exclude flow from the wider floodplain.

For example, try to visualise the size of river channel which would have been required to contain the Water of Ruchill during the 2012 flood events. The channel would need to be enlarged to many times its natural size to prevent it spilling onto the floodplain.

Overall, the volumes of flood water are just too large for dredging to work effectively to manage flooding on rivers as large as those in Comrie. In addition, regular dredging would be required to maintain the enlarged channel and this would not be sustainable.

The results of the hydraulic modelling work carried out by Mouchel and put forward at the drop-in sessions confirms that a significant amount of material would have to be removed from the Water of Ruchill to contain a flood event and deliver any significant reduction in flood risk. Dredging has therefore been discounted and will not form part of the proposed flood scheme or the Council's approach to managing flood risk in the area.

Landowners are however free to apply for the appropriate permissions from SEPA should they wish to continue to extract river bed gravel on a commercial basis.

With regards to fallen trees, please see our response to Question 11. In reality the rivers at Comrie are large and fallen trees present little risk in terms of flooding. Only a significant build-up of trees would create an obstruction to river flow. The Dalginross Bridge is the only structure which could potentially trap timber and collect

debris in a manner to increase flood risk. However, there are no reports of any substantial build-ups of timber ever occurring on this bridge. The central span of the bridge (between the masonry piers) is approximately 26 m and this allows the predominant river flow to pass largely unimpeded. Fallen timber carried down by the river tends to continue past the bridge. However despite the nominal risk, the Council will continue to monitor the rivers and this bridge and will remove any large trees which become trapped on the bridge piers.

With regards to fallen timber in the river generally landowners are free to remove fallen trees from their sections of river channel should they wish. They do not need any relevant permissions to carry out this type of work.

Question 15 – Can you if confirm that the flap valves/outfalls from the roads drainage system which discharge into the River Earn are operating correctly?

The Council has checked these systems on several occasions and no issues were observed regarding the operation of the flap valves. The connected pipe networks are also in good condition.

As part of our on-going inspection regime in Comrie we will continue to check these flap valves on a regular basis and we will also undertake additional checks after any high-water events.

There are potential issues with these drainage outfalls as they are set low into the river bank and so the flap valves will close at an early stage when river levels are high. The roads drainage system will only discharge water to the river provided there is sufficient head of water within the pipe. If not then the flap valve will seal to prevent the flow of river water back-up up the pipe until the river level drops. This means that there is a limit to how much water can enter the drainage system from upstream before it begins to surcharge at the lowest road drains. This has occurred on several occasions now and does cause issues along the roads closest (and lowest) to the River Earn (Lochay Drive and Garry Place).

The Council intends to investigate this issue further as part of the flood scheme design. Further analysis of these outfalls and drainage systems will be undertaken to determine the impact of the proposed scheme on them. The Council will consult further with the community on this.

Question 16 – Is any maintenance planned for the existing defences along the western edge of Comrie prior to any Scheme being constructed?

A visual inspection of these flood defences is carried out annually and a structural survey is also undertaken every 5 years. Based on the findings and recommendations from these inspections, the Council will take action to maintain the defences as and when required. No maintenance works are currently planned for these flood defences.

Residents or landowners can report any issues in the intervening period.

It is likely that the existing flood defences in this area will require to be raised and/or refurbished as part of the proposed flood scheme. This part of the proposals will be developed further during the outline design of the scheme.

(C) Resilience and Self-Help

Question 17 – We are interested in protecting our own property in the meantime before the scheme is complete and are interested in flood defences for our home however they are expensive; can the council help with this?

As a householder or a business, you can install products to help protect your property from flooding. Flood products, such as flood gates for doors and air brick covers, are widely available and are designed to suit a variety of homes. A number of residents in Comrie have already installed such devices on their homes.

The Council would encourage you to look into the suitability of these products for your home and can provide advice on this; however we cannot provide financial assistance to residents for the purchase of these products.

The Scottish Flood Forum (Tel 01698 839021) can provide you with further independent advice on the selection of suitable products, and also on any related flood insurance matters.

Further information on property level flood protection products and flood insurance can also be found at the following:

www.pkc.gov.uk/plp
www.scottishfloodforum.org
www.floodre.co.uk

Question 18 - I asked for sandbags during the last high flow event but I never received them or they are always too late in arriving. Can you not just give me sandbags now?

Although the primary responsibility to protect property from flooding lies with the owner, the Council still endeavours to assist during flood events by supplying traditional sandbags to affected properties where possible, even though this is not a statutory responsibility. Sandbags are only provided if property is being flooded or is in imminent danger of being flooded. At the same time as endeavouring to supply sandbags, the Council may assist by attempting to divert the flow of water and by pumping flood water away from properties. However, the resources for these activities are limited and therefore assistance has to be prioritised.

As part of this prioritisation process, where flooding is imminent the Council will sometimes deliver a pallet (or several) of sandbags to a community and leave them for local residents to help themselves The Council has previously left pallets of

sandbags at the Fire Station on Strowan Road. Unfortunately the Council is not able to deliver sandbags to individual properties in a large town like Comrie.

The Scottish Fire and Resuce Service also holds floodsax (a modern lightweight version of traditional sandbags) at the Fire Station on Strowan Road.

If you know you are at flood risk, then the Council would suggest that you take steps in advance of any future flooding to ensure that you are as prepared as possible. Part of this may include purchasing your own sandbags and/or other suitable flood protection products for your home. Flood protection products can play an important role in improving the resilience of individual properties against flooding.

However, if you are in imminent danger of flooding and require sandbags urgently then please call 01738 625411 to request assistance.

Further information is available at www.pkc.gov.uk.

Question 19 – Will the 'early warning' system continue to be in place within Comrie?

SEPA are the national flood forecasting authority in Scotland. As part of this role they provide targeted local Flood Warnings for Comrie. This warning system will continue to be maintained and SEPA would advise all local residents who are at risk of flooding to sign up for the Floodline service to ensure they receive the appropriate warnings. The service is free and ensures that anyone who is registered within a target area will be sent a message by phone or text, advising when a Flood Warning or Flood Alert for their local area has been issued.

You can get more information, or sign up for the Floodline service, at http://www.floodlinescotland.org.uk/ or by phoning 0345 988 1188.