



Garmouth Flooding Review Spring 2021



Prepare by: Will Burnish

Date: June 2021

CONSULTANCY

Consultancy Manager: Debbie Halliday B.Sc. M.Sc. C.Eng. M.I.C.E.

Environmental Services

PO Box 6760

ELGIN

IV30 9BX

Contents

Garmouth Flooding Review	3
1. Introduction	3
2. Roles and Responsibilities in Flooding	3
3. Background	4
4. Current Moray Council Policy	9
5. Potential Mitigation	9
5.1. FRM Act Section 59 Clearance and Repair Schedule (including routine maintenance)	9
5.2. Routine Maintenance by Landowners	9
5.3. Potential Structural Works.....	10
6. Possible Funding Options.....	13
7. Moray Council Actions	13
8. Conclusion	15

Garmouth Flooding Review

1. Introduction

Garmouth is a small rural settlement located in Moray approximately 10 miles east of Elgin. Garmouth consists of approximately 220 households and 500 people and is located on the west bank of the River Spey just 1km inland from Spey Bay. Garmouth is surrounded by agricultural land, except to the east where Garmouth Golf Course separates the village from the River Spey. The Golf Course Club House and the village sewage treatment works are located on the golf course east of the village. The southern extent of the village is defined by the dismantled railway line that runs in an east - west direction and spans the River Spey. Ross House, at Queenshaugh, is a single isolated property located south of the dismantled railway line.

Garmouth is located at the downstream end of the River Spey Catchment. The River Spey is a major watercourse and ranks 7th in the UK in terms of estimated peak flow, 8th in terms of mean annual discharge and 9th in terms of catchment area (2988km²). The vast majority of Garmouth is elevated above the River Spey's natural floodplain. However, a small number of properties located at the north east end of the village are located at a lower elevation on the edge of the River Spey's floodplain. Garmouth's close proximity to the River Spey means it has suffered from repeated flooding. There are approximately 10 properties that are currently at risk of flooding in Garmouth.

Return Period (years)	Residential Properties	Non Residential Properties and Utilities
1	2	0
5	6	3
10	6	3
25	6	4
50	6	4
100	6	4
200	6	4

Table 1: Properties at Risk (Garmouth Flood Alleviation Scheme Pre-Feasibility Study Report 2007)

The number of properties at risk has not changed since the feasibility study was undertaken in 2007, however, the frequency of flooding has increased. The Garmouth Flood Alleviation Scheme Pre-Feasibility Study Report 2007 can be found in Appendix B.

2. Roles and Responsibilities in Flooding

A number of statutory bodies and stakeholders have responsibilities with regard to flood risk. A list of the key stakeholders, with details of their role and responsibilities, with regard to flood management is provided below.

Landowner – Organisations and individuals are responsible for protecting their property from flooding. Help and advice on how to protect their property can be obtained from the following organisations.

1. SEPA
2. Moray Council
3. Scottish Flood Forum.

4. Scottish Water

Moray Council - Moray Council is responsible for delivering actions identified in the Local Flood Risk Management Strategies and Plans. The Strategies and Plans are developed and delivered over a six year cycle in partnership with other authorities. Garmouth is in the Findhorn, Nairn and Speyside Local Plan District, for which Moray Council is the Lead Local Authority. During severe flooding, Moray Council works with the emergency services and coordinates shelter for people evacuated from their homes.

SEPA - SEPA is Scotland's national flood forecasting, flood warning and strategic flood risk management authority. SEPA is responsible for publishing Scotland's Flood Risk Management Strategies and working with other authorities, including Moray Council on developing Local Flood Risk Management Plans. SEPA has developed and operates Floodline, which provides live flooding information and advice on flooding 24 hours a day, seven days a week. People who live in flood risk areas can sign up to Floodline to receive alerts and warnings when flooding is predicted to happen in their area.

Crown Estate Scotland - As a landowner, the Crown Estate Scotland is responsible for protecting its property against flood risk. As with other landowners it must not undertake action which could increase flood risk.

Spey Fishery Board - The Spey Fishery Board is responsible for providing fisheries protection, ensuring fish passage over obstructions to migration, and protecting juvenile fish and spawning redds.

Scottish Water - Scottish Water is responsible for foul drainage and the drainage of rainwater run-off from roofs and any paved ground surface from the boundary of properties. Scottish Water also works in partnership with other authorities in the development and delivery of the Flood Risk Management Strategies and Plans. Scottish Water is not responsible for private pipework or guttering within the property boundary.

The Scottish Government – The Scottish Government oversees the implementation of the Flood Risk Management (Scotland) Act 2009, which requires the publication of Flood Risk Management Strategies and Plans. Scottish Government is responsible for the prioritisation of works identified in the Strategies and Plans and the allocation of grant funding for these prioritised works. Scottish Ministers are responsible for setting the policy framework for how organisations collectively manage flooding in Scotland.

NatureScot – NatureScot has provided general and local advice in the development of the Flood Risk Management Strategies. Flooding is seen as a natural process that can maintain the features of interest at many designated sites, so NatureScot helps to ensure that any changes to patterns of flooding do not adversely affect the environment. NatureScot also provide advice on the impact of Flood Protection Schemes and other land use development on designated sites and species.

Scottish Flood Forum – The Scottish Flood Forum provides support for those who are affected by or are at risk of flooding. It provides flood advice, information, awareness, education and training to individuals and communities to help reduce the risk of flooding

3. Background

In response to a letter from Garmouth & Kingston Amenities Association dated 30th October 2020 and subsequent site visits and meetings with residents, Moray Council agreed to undertake the actions listed below:

1. Review existing topographical survey information between the River Spey and Garmouth Village, so that the flow mechanism can be understood for different flood levels. This action could take up to 6 months if additional survey data is required.
2. Review opportunities to reduce the interaction of the Black Burn and the River Spey until normal flood plains are active. This will take at least 6 months and can only be undertaken when the survey work is complete.
3. Review operational Flood Warning Level. It is hoped that this will be complete by Christmas. This is subject to receiving data from SEPA through a Formal Data Request.

This report is the output from item 2 above.

Over the last year significant erosion has continued just upstream of Ross House and the difference in alignment can be seen on photographs 1 and 2 below. The left hand bank has eroded by over 5m and the original access track to Ross House is now lost to the River Spey. The erosion, although significant, has not changed the flood risk profile within Garmouth.



Photo 1: Ross House 12/12/19



Photo 2: Ross House 3/3/21



Photo 2: Ross House 29/6/21

The erosion of the left hand bank of the River Spey has caused the bank level to drop, which allows flow from the river to enter the old Black Burn and flow towards the village at lower levels than before. This change in the flood mechanism has increased the frequency of flooding to properties in Garmouth. The depth of flooding has not increased, therefore, the number of properties at risk has not changed, only that these properties may flood more frequently. Appendix B shows the flood maps produced as part of the 2007 flood study. With the change in left hand bank position and greater understanding of climate and rainfall, the stated return periods at which the onset of flooding begins are likely to be less now.

Moray Council undertook a walk over inspection to understand the change in flood mechanism. The visit highlighted a number of issues, details of which are described below and shown in Figure 1:

1. **Point 1** – indicates the location of the erosion of the left hand bank of the River as described above. Historic maps show the Black Burn crosses Ross House access track at the point where the road runs parallel to the River Spey. The bank in this area is now lower by about 300mm for about 4m. This reduced level is enough to push a significant flow along the old burn line (there is a clear depression on the Aerial Image and 3D Survey Data and on the ground) towards the east bridge, where the burn exits the culvert under the field. See photos 1 and 2, Appendix A.
2. **Point 2** - debris is artificially raising the water level, causing it to over top the east bank and run down towards the east bridge. This was evident on the ground as seen in Photo 3, Appendix A.
3. **Point 3** - there has been a significant build-up of debris on the trash screen under the bridge. This debris is restricting flow and pushing water over to the west along the western edge of the golf course between the burn and fairways, which was evident in a number of locations. See Photo 6, Appendix A.
4. **Point 5** - there is a large build-up of sediment, which is restricting the flow of water out of the burn and in high flows will cause the burn to back up. See photo 8, Appendix A.

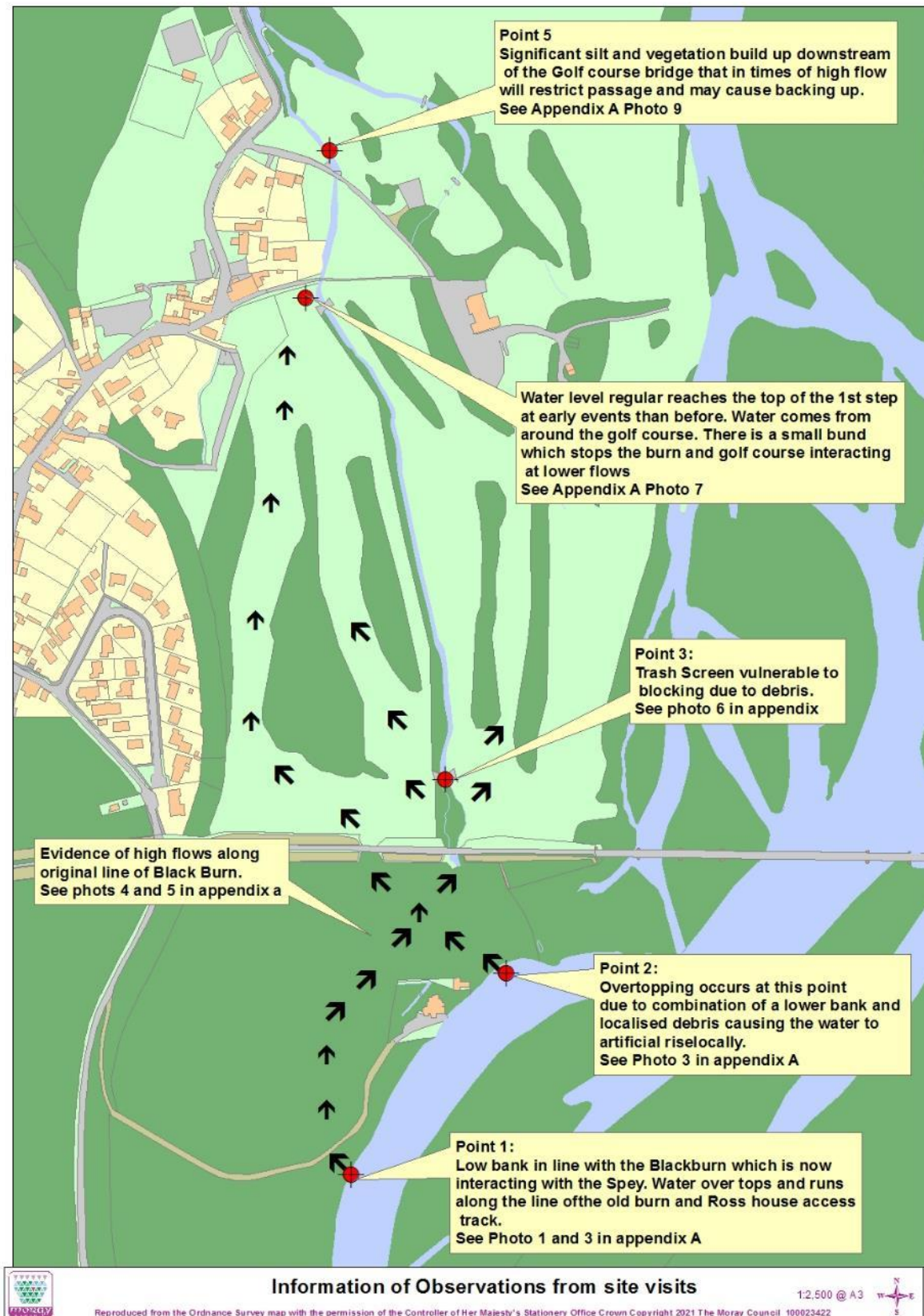


Figure 1: Map of Flood routing through Garmouth

Figure 2 shows the output from the 3D Survey Data, which clearly shows the flood route. It also highlights potential areas where further interaction with the River Spey and the low lying areas could occur.

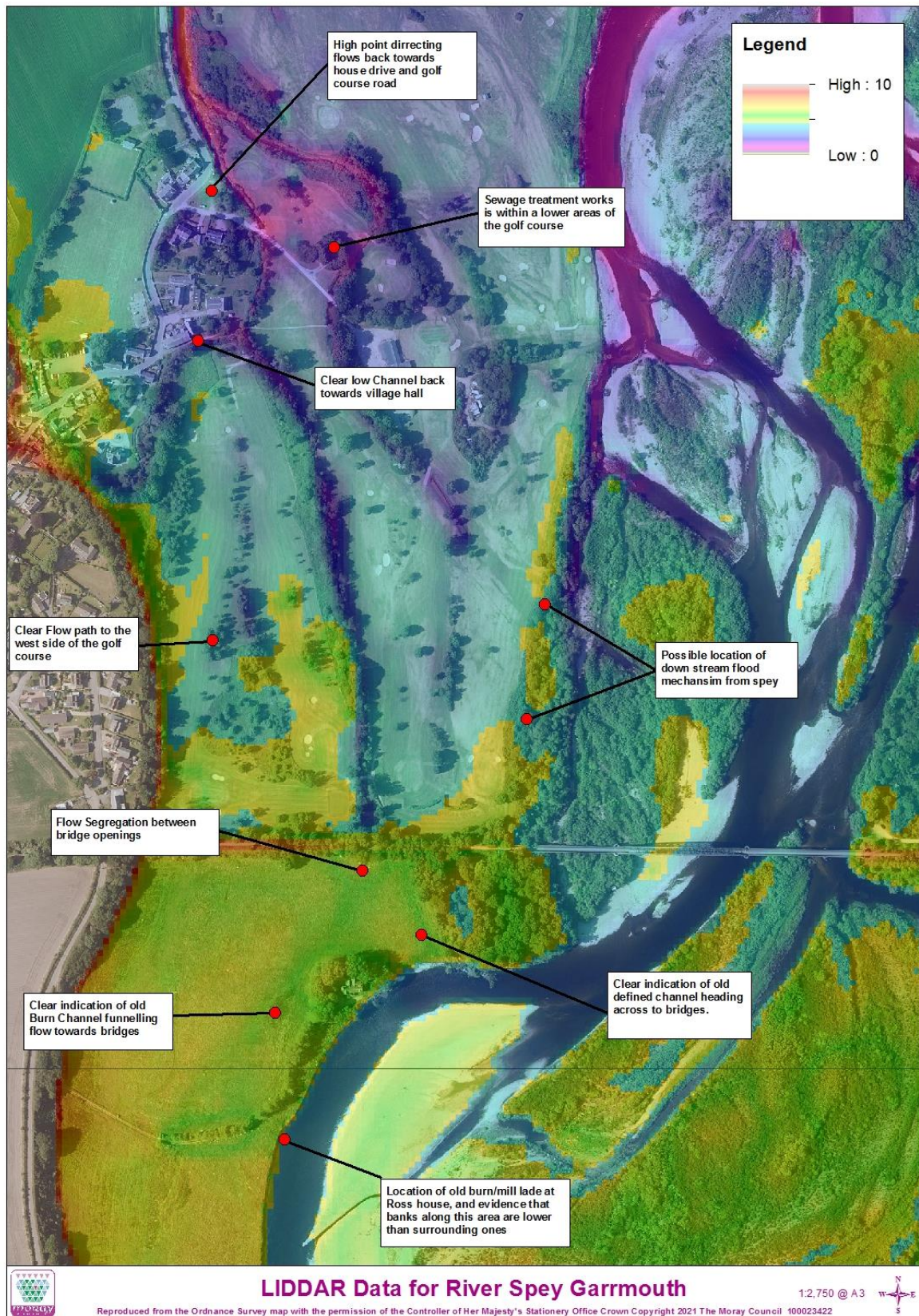


Figure 2: Map of 3d Data of Garmouth

4. Current Moray Council Policy

Moray Councils Policy, with regard to undertaking flood mitigation works, is to deliver only those schemes which have been identified in the Local Flood Risk Management Plans.

In 2007 Moray Council undertook a study into the feasibility of providing a flood protection scheme for Garmouth. The findings of this study are that given the limited number of properties at risk and the costs associated with constructing a flood protection scheme, it is not economically feasible to construct a flood scheme for Garmouth. This position has been monitored since 2007 but as there has been no significant change in flood risk, no action to provide a scheme for Garmouth has been included in the Flood Risk Management Plans.

The current actions for Garmouth in the Local Flood Risk Management Plan are:-

- Community flood action groups
- Maintain flood warning
- Awareness raising
- Emergency plans/response
- Strategic mapping and modelling
- Flood forecasting
- Self help
- Maintenance
- Planning policies

Further detail on the actions is provided in the Findhorn, Nairn and Speyside Local Flood Risk Management Plan, which can be found in section 2.5 and Pages 31 -35 covering Spey Bay (Potentially Vulnerable Area 05/04) (<http://www.moray.gov.uk/downloads/file105636.pdf>)

5. Potential Mitigation

5.1. FRM Act Section 59 Clearance and Repair Schedule (including routine maintenance)

Moray Council has a responsibility to undertake works on the Clearance and Repair Schedule under Section 59 of the Flood Risk Management (Scotland) Act 2009 (the Act). The Clearance and Repair Schedule is the output from Moray Council's inspection regime, which is carried out under Section 18 of the Act. The Clearance and Repair Schedule is a programme of works required to alleviate flood risk. Moray Council adds an item to the Clearance and Repair Schedule, where a body of water gives rise to such a risk and Moray Council considers that clearance and repair works would substantially reduce that risk. The type of works that would be included are:-

- removing obstructions from a body of water;
- removing things that are at significant risk of becoming such obstructions; and
- repairing artificial structures which form part of the bed or banks of a body of water.

Further information on clearance and repair can be found here.

<https://www.gov.scot/publications/flood-risk-management-scotland-act-2009-guidance-duties-local-authority/pages/8/>

5.2. Routine Maintenance by Landowners

Routine maintenance is a key function in reducing the potential flood risk within any flood prone area. Garmouth has a number of areas where routine maintenance is key to ensure that the risk of flooding is not increased. These tasks are listed below.

- Quarterly clearance and post event clearance of the Trash Screen at the Golf Club.

- Quarterly clearance in and around the old bridge structure along the golf course.
- Quarterly clearance of Golf Course Access Bridge.
- Yearly channel vegetation clearance along Black Burn through the Golf Club including 50m down stream of Access Bridge.
- Removal of trees effecting flows in the River Spey in and around Ross House.

The tasks highlighted above are tasks which landowners should undertake to reduce the impacts of flooding.

5.3. Potential Structural Works

As stated in section 4 there are currently no actions within the current Flood Risk Management Plan to undertake any flood protection works at Garmouth, therefore, there is no funding available from either Scottish Government or Moray Council to deliver the solutions identified below.

Moray Council officers have identified six high level solutions that could be applied to the area around Garmouth. Applying these solutions could reduce the flood frequency to 2007 levels but would not reduce the overall flood risk. These solutions are high level and have been based on available data listed below and engineering judgement.

- Observed flood events.
- Pre flood event site visits.
- Engineer judgement.
- Assessment of LIDAR/ Aerial and geographical data.
- 2007 Flood Study.

To assess the impact of flooding during various return periods and provide details of the design required to protect property during these events would require the construction of a mathematical flood model. To construct a flood model of the River Spey for the Garmouth area would cost in excess of £100,000.

Solution 1: Offset Flood Bund: This solution is to install an offset flood bund. The bund would follow the line of the Ross House access track before heading behind Ross House and towards the railway embankment, where it would terminate at the wall on the base of the railway embankment. The bund would be made up of a rock core and earth faces. The bund would be at a height of around 500mm and would be set at a level similar to the bank edge height based on the 2007 LIDAR data.

Advantages	Disadvantages
<ul style="list-style-type: none"> • This option returns the risk back to pre-2007 • Reduction in flood frequency • Ease of construction • Minimal environmental impact • Medium design life 	<ul style="list-style-type: none"> • High construction cost • Only returns risk level to around 2007 • Does not protect Garmouth from flooding, but would reduce the risk from lower return events between 1: 2 and 1:10 • Susceptible to erosion • Loss of farming land • Possible issue with regard to compliance with the Reservoirs Act

Estimated cost range for this solution is: - £300,000 to £400,000

Solution 2: Low Level Bunds at Railway Embankment: This solution is to place low level rock armour bunds within the bridge openings on the railway embankment. The height of the bunds would be set at around the same levels as the lowest point of the river bank on the 2007 LIDDAR Survey. This would mean that on the south side they would be around 500mm high and the north side about 1m with the invert of the bridge also filled in with rock armour.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Low cost solution • Easy to construct • Limited susceptibility to erosion, as rock will move and settle • No loss of existing flood plain • Reduce frequency of flooding but not extent • Minimal ecological risk • Medium term design life 	<ul style="list-style-type: none"> • Possible issue with regard to compliance with the Reservoirs Act • Only returns risk level to around 2007 • Does not protect Garmouth from flooding , but would reduce to the risk from lower return events between 1: 2 and 1:10 • Loss of access through bridges for vehicular traffic

Estimated cost range for this solution is: - £100,000 to £125,000

Solution 3: High Level Bund at Railway Embankment: This solution is to install a larger bund\wall within the bridge holes with an approx. height of 2m. The wall would be designed as a weir structure to allow a gradual increase of flow down the Black Burn, until the weir becomes inundated. The wall would be constructed of concrete and independent of the railway bridge. Scouring of the wall would be prevented by rock armour installed between the hard structure and with a rip-rap invert being created on both sides.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Provide a medium level of protect to Garmouth • Controlled discharge of water until high return periods are met • Reduction in the frequency of flooding • No loss of existing flood plain • Minimal ecological risk • Limited susceptibility to erosion, as rock will move and settle • Long design life 	<ul style="list-style-type: none"> • High cost solution • Difficult to construct due to the foundation required to hold water back • Medium solution to preventing flooding in Garmouth • May require further flood modelling to confirm no change elsewhere to flood risk • Possible issue with regard to compliance with the Reservoirs Act • Loss of access through bridges for vehicular traffic • Loss of public access through the bridge • Does not protect Garmouth from flooding , but would reduce to the risk from lower return events between 1: 2 and 1:10

Estimated cost range for this solution is: - £400,000 to £500,000

Solution 4: Low Level Wall at Spey Street Burn: This solution is to install a low level wall along the burn and parallel to the village hall, with a small rise at the footpath bridge over the burn. This would not remove flood risk from the rear of the properties but would reduce the number of times Spey Street is flooded and ensure continued emergency access. The wall could be constructed of brick and would be no higher than 300mm.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Low cost solution • Reduce the number of times Spey Street is closed • Long design life • Minimal ecological risk • Easy to construct 	<ul style="list-style-type: none"> • No defined level of protection for Garmouth • Consent of landowners would be required • Very low risk of increased flooding to rear of properties • Loss of floodplain (Spey Street)

Estimated cost range for this solution is: - £75,000 to £125,000

Solution 5: Adaption Plan: An Adaptation Plan could be developed in conjunction with Community Engagement. The Plan would consider the current and future flood risk to receptors and assets and consider how they can be modified to manage the flood risk. The Plan would use triggers based on climate change, rainfall data, sea level rise and erosion rates. When triggers are met, set actions would be undertaken.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Allows for long term financial planning • Gives clear points when action will be undertaken based on data • Not just a single body action • Long term solution to increasing problem • Manages climate change 	<ul style="list-style-type: none"> • No physical work at the start of the Plan • Will require continued finance to allow actions to be undertaken • Will not provide full protection to all flood events

Estimated cost range for this solution is: - £30, 0000 (mainly time with minimal works)

Solution 6: Natural Flood Management: This solution is to plant the field in certain locations with willow obtained from the East bank of the River Spey. In addition to planting willow, fallen trees will be buried in the field with the root balls exposed. The placement of willow and root balls should cause the river to deposited sediment in low lying areas and raise the land local creating a natural barrier to flooding. This solution being a natural one does not provide a defined level of protection. However, the level of protection will increase over time, by catching woody debris during floods, which form obstructions to flow and restrict the amount of water that can pass through the field and down in to Garmouth. This solution provides a longer term sustainable solution to the flooding issue:-

Advantages	Disadvantages
<ul style="list-style-type: none"> • Low cost solution • Positive environmental impact 	<ul style="list-style-type: none"> • No defined level of protection for Garmouth

<ul style="list-style-type: none"> • Easy to construct • Medium term design life • No loss of flood plain • Increased public access 	<ul style="list-style-type: none"> • Requires land owner agreement • Susceptible to erosion • Loss of farming land
---	---

Estimated cost range for this solution is: - £100,000 to £150,000

Solution 7: Localised Land Raising: This solution is locally in fill the low area of land where the current water flows during the lower water level events. The works would be infilled using clean natural locally won material. The initial edges of the fill will be protected with erosion matting. The fill will be see with native species and allowed to vegetate

Advantages	Disadvantages
<ul style="list-style-type: none"> • Low cost solution • Positive environmental impact • Easy to construct • Minimal loss of Flood plan • Easy to maintain 	<ul style="list-style-type: none"> • No defined level of protection for Garmouth • Requires land owner agreement • Susceptible to erosion • Loss of farming land • Short term design life due to erosion risk

Estimated cost range for this solution is: - £25,000 to £45,000

6. Possible Funding Options

As stated in Section 5.3, there is no statutory funding available to undertake flood protection works at Garmouth. However, alternative funding sources to undertake works at Garmouth, which the community could bid for, are provided below.

- Scottish Land Fund
<https://www.tnlcommunityfund.org.uk/funding/programmes/scottish-land-fund#section-2>
- People Post Code Lottery

7. Moray Council Actions

Listed below are the actions which Moray Council are proposing to take forward within the next Flood Risk Management Cycle from 2022 to 2028. The proposed strategies and plans will be published for public consultation on 26th July for 4 months:-

1. Creation of an Adaption Plan – Solution 7 will be developed to manage the changing dynamics of the River Spey due to climate change.
2. Manage Flood Warning System – Update and review on a yearly basis with SEPA to ensure current trigger levels are appropriate.
3. Quarterly inspection of the Black Burn and River Spey banks between Queenshaugh and Kingston. Where applicable add works to the Clearance and Repair Schedule.
4. Maintain Flood Warning Signs.
5. Where applicable ensure all works related to Garmouth and Kingston are completed from the Clearance and Repair Schedule.

8. Conclusion

The erosion of the left hand bank of the River Spey at Queenshaugh has increased the frequency of flooding at Garmouth. While the frequency of flooding has increased, the number of properties at risk has not. As such the economic case for providing a flood protection scheme at Garmouth is the same as it was in 2007, which is, it is not considered economically feasible to construct a flood protection scheme at Garmouth.

There are potential actions that could be taken to reduce the frequency of flooding to levels experienced in 2007 but as there is no statutory funding available for these works alternative funding would need to be obtained. Alternative sources of funding have been identified in Section 6 of this report.

If the Garmouth community is successful in obtaining the funding required to undertake works, Moray Council officers may be able to assist the community with advice on design, procurement and contract management of the works it would take forward.

Appendix A

Site Walkover Photos



Photo 1 showing Interaction between River Spey/Access Road and Black Burn



Photo 2 Showing flood water following line of Black Burn into field from access road



Photo 3 Showing debris which has artificial raised levels locally



Photo 4 Showing line of Black Burn and flatting of grass due to flood



Photo 5 Showing line of Black Burn and flatting of grass due to flood and over topping



Photo 6 Showing blocked Trash Screen.

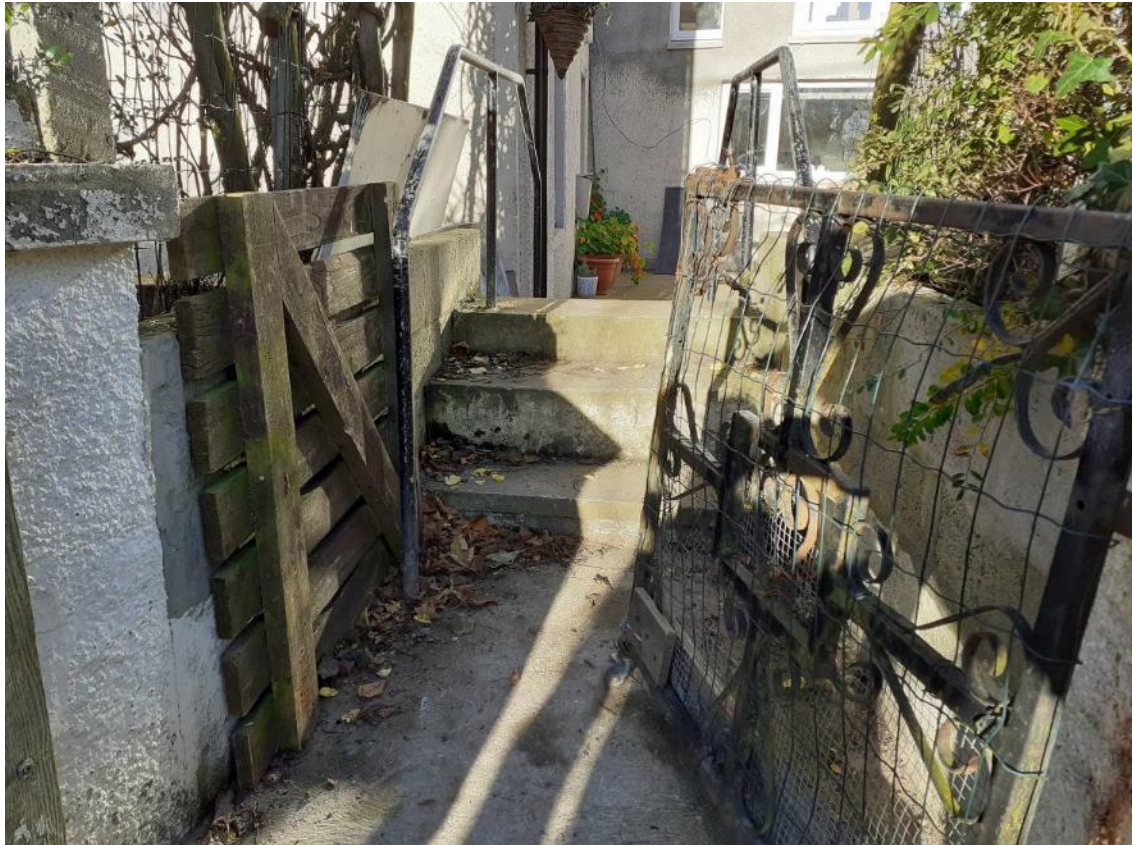


Photo 7 showing steps where flood level came up to tread of second step.



Photo 8 Showing heavy siltation

Appendix B

Garmouth Flood Alleviation Scheme Pre-Feasibility Study Report 2007

Appendix

Solution Drawings