KINTORE FLOOD STUDY

Aberdeenshire COUNCIL

1. Welcome & overview

The **Kintore Flood Study** has been carried out to understand the current and future flood risk in the area, and to identify practical options to help reduce that risk.

Flooding can cause a serious disruption to homes, businesses, infrastructure, and the environment. By studying how flooding happens in Kintore, we can make informed decisions about the most effective ways to manage and reduce flood risk.

Who is involved?

Binnies (part of RSK Group) on behalf of **Aberdeenshire Council** has completed a draft **Flood Study.**

We would appreciate your involvement in the development of this Flood Study as local knowledge and community feedback are an important part of this work.

What does the study cover?

- **How** and **why flooding** happens in Kintore
- How flood risk might evolve in the future due **climate change**
- **Possible measures** to manage and reduce the impacts of flooding
- **Recommendations** for next steps

What are the key objectives of the study?

- **Reduce the risk of flooding** to homes, business and main transport links from both surface water and watercourses
- **Prepare for climate change**, which is predicted to produce more intense and frequent rainfall events in the future
- Help to **protect watercourses** from pollution
- **Improve local green spaces**, habitats and biodiversity, contributing to enhanced placemaking
- **Enable economic development**

This Flood Study has been developed in consultation with key organisations such as **SEPA** and **Scottish Water** to define a strategy identifying the most appropriate and cost-effective opportunities to mitigate flood risk.

Where are we now?

We have completed the technical analysis and reviewed a range of possible flood risk management options. These panels share the results and our recommendations, and explains what happens next.

Figure 1. River Don at Kintore

binnies an RSK Group Company

2. Understanding flooding at Kintore

Kintore was affected by **significant localised flooding** in 2016, 2020 and 2022, and therefore has been identified as a **Potentially Vulnerable Area**, which makes it a national priority for flood risk management.

Main sources of flooding in Kintore

Flooding in Kintore can happen for different reasons. The Kintore Flood Study looks at how these causes interact and affects homes, businesses, infrastructure, and the surrounding environment.

- **River flooding** — When the River Don, Torry Burn, Tuach Burn or Loch Burn rises above their banks during periods of heavy and prolonged rainfall.
- **Surface water flooding** — When intense rainfall overwhelms the drainage system and water cannot flow away quickly enough.
- **Interaction between rivers and drainage** — When high river levels make it harder for surface water to drain away, causing water to back up in streets and low-laying areas.

Why flooding happens here

Kintore's location on the **River Don** means that it is exposed flooding during significant storm events. Certain parts of the village are also crossed by other watercourses (**Torry Burn, Tuach Burn and Loch Burn**) making them vulnerable when rainfall is heavy.

Climate change and future risk

The study also considers how climate change could affect flooding in the future. Higher rainfall intensity and more frequent extreme weather events may increase the **likelihood** and **severity** of flooding over time.

Under the **Flood Risk Management (Scotland) Act 2009**, Kintore was designated as a **Potentially Vulnerable Area** (PVA 02/06/13) due to river and surface water flooding within the **North East Local Plan District** (LPD 6).

Actions to manage flood risk are contained within the published Noth East Flood Risk Management Strategy, and this includes the requirement for a Flood Protection Study.

Further information at https://www2.sepa.org.uk/frmstrategies

River flows, return periods and probabilities

River flows are measured in **cubic metres per second** (m^3/s), and we often refer to the largest flow as the "**peak flow**".

To describe how **unusual** or **likely** a flood is, we use the terms "**return period**" and "**annual exceedance probability**" (AEP). These are simply ways of expressing the **chance** of a flood of a certain size happening in **any given year**.

For example: a 1 in 200-year flood (also called a 0.5% AEP event) means that the estimated peak flow at the River Don would be around $372m^3/s$. This does not mean such flood happens only once every 200 years. Instead, it means that in any single year, there is a 0.5% chance of a flood of that size (or larger) occurring.

Flooding is a natural process, and chance does not follow a strict calendar. It is entirely possible to experience two "1 in 200-year" floods within just a few years –or even within the same year.

In short: Return periods and AEP are statistical tools to describe how likely a flood is, not a prediction of when it will happen. Floods can occur at any time, and their frequency is based on probability, not fixed timelines.

Figure 2. Flooding at Castle View

Figure 3. Flooding at B977 road (Kintore)

3. Predicted flood risk

To understand Kintore's current and future flood risk, we used a **hydraulic model**. This computer-based tool simulates how water moves through the River Don, local burns, drainage network and overland during heavy rainfall and high river flows.

What the model tells us

- It predicts where flooding is most likely to occur, how deep the water could get, and how fast it might flow.
- It allows us to test different storm scenarios, including those that are more likely (e.g.: 1 in 10-year events) and those that are rarer but more severe (e.g.: 1 in 200-year events).
- It helps identify which areas are most at risk today and how this could change in the future.

Scenarios we tested

- **Present day** — representing the current situation without climate change.
- **Future climate change** — factoring in predicted increases in rainfall and river flows.

Why this matters

The model provides the evidence needed to explore possible flood management options. By understanding the extent and severity of flooding, we can focus efforts where they will have the greatest benefit.

Using a combination of the reported flood history; responses to the public questionnaire submitted in September 2024; and predicted flood outlines produced by the integrated catchment model, three flooding 'hotspots' were defined. These are shown on Figure 1 with the hotspots located at:

- HOTSPOT 1: **Northern Road**
- HOTSPOT 2: **Macallan Road**
- HOTSPOT 3: **Kingsfield Road**
- HOTSPOT 4: **Tumulus Way**

Flood maps

A number of flood maps representing maximum flooding extent and depth for a range of return periods were considered for the Flood Study. You can view these flood maps on the Council's consultation website: **www.KintoreFloodStudy.info**

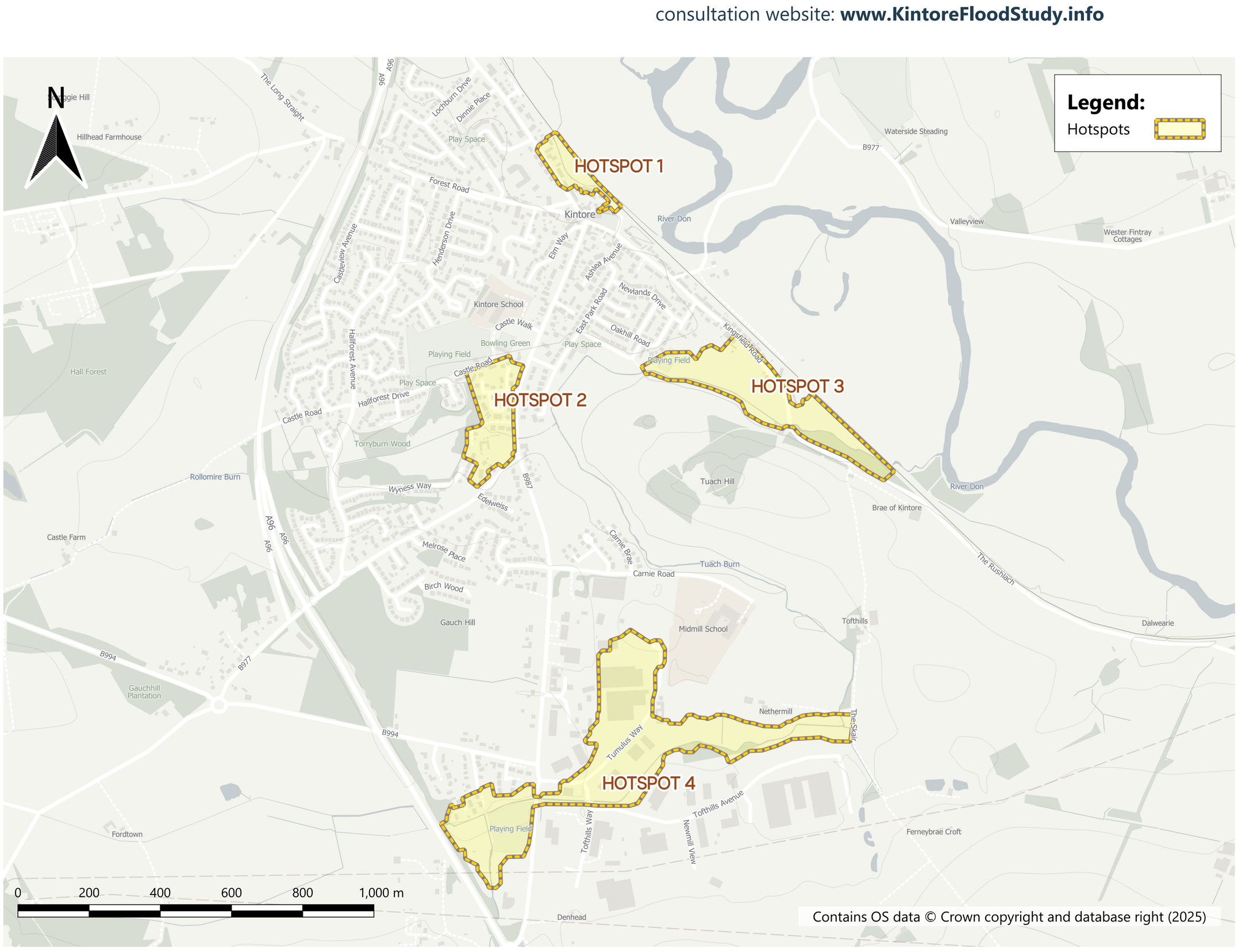

Figure 4. Flooding hotspots across Kintore

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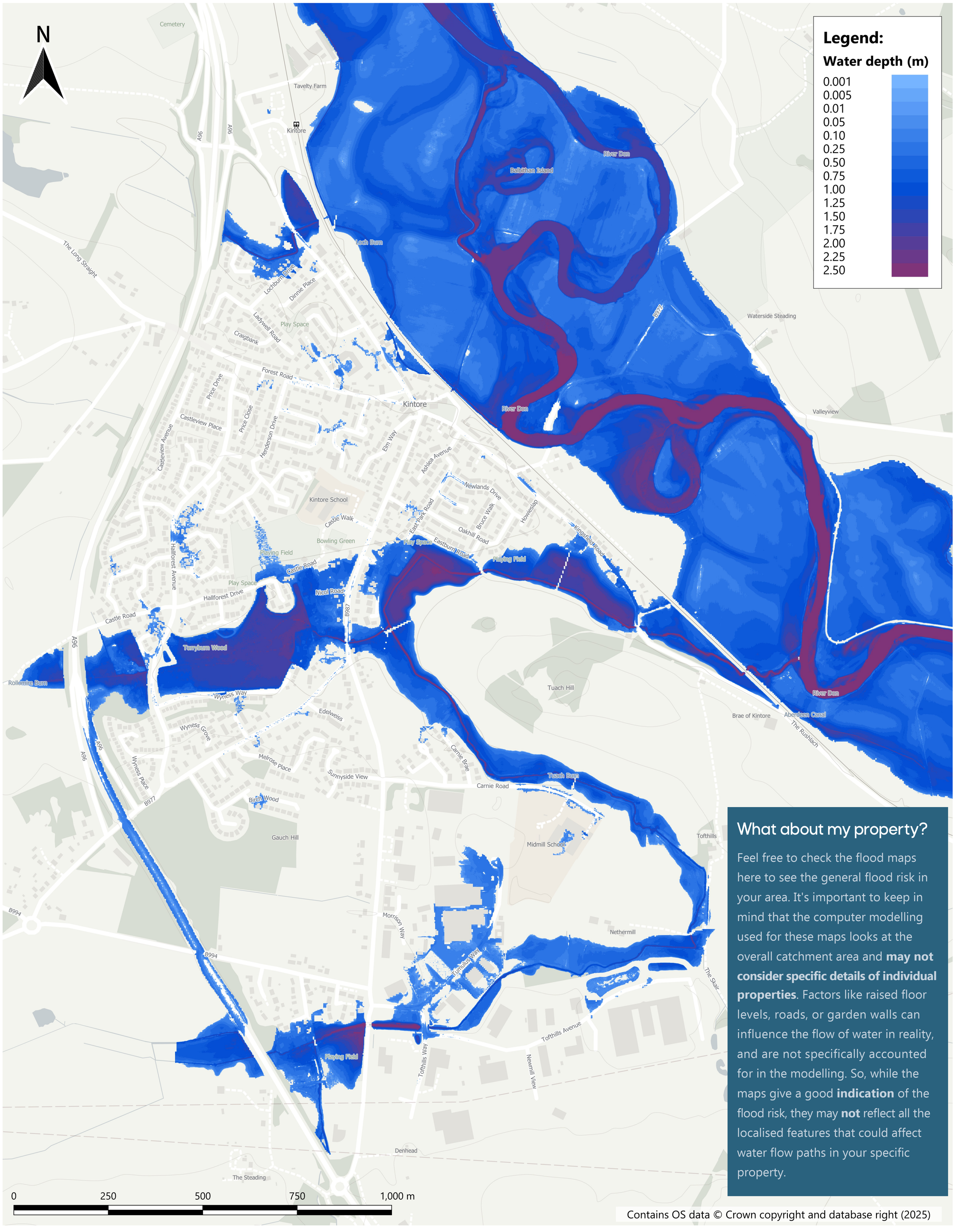
Flood map – 1 in 200-year return period 8-hour duration rainfall event



What about my property?

Feel free to check the flood maps here to see the general flood risk in your area. It's important to keep in mind that the computer modelling used for these maps looks at the overall catchment area and **may not consider specific details of individual properties**. Factors like raised floor levels, roads, or garden walls can influence the flow of water in reality, and are not specifically accounted for in the modelling. So, while the maps give a good **indication** of the flood risk, they may **not** reflect all the localised features that could affect water flow paths in your specific property.

Figure 5. Flood map 1:200-year, 8-hour duration storm

4. Flood risk management

To develop options for managing and, if possible, reducing flood risk in Kintore, we followed a series of steps.

1. Available information and a hydraulic model were used to identify the flooding issues within the catchment. These findings serve as a **baseline** for evaluating options to manage flood risk.

2. A **long-list** of measures was considered that could be taken to reduce or manage the flood risk. This was screened to remove measures that were clearly unfeasible, leaving an initial short list of potential actions.

3. We conducted a high-level scoring exercise to evaluate the options and produce a final **short-list** of those that are most feasible. This helped us eliminate measures that were not practical or viable for the situation.

4. We conducted a detailed **appraisal** of the final short-listed options using the hydraulic model. This involved evaluating their performance under different scenarios, considering their implementation requirements, compatibility with other policies and plans, and their potential to achieve the objectives of the Flood Study.

5. Based on the results of the appraisal, we selected **recommended options**. Factors such as effectiveness, affordability, environmental and social impacts were considered during the selection process.

Multi-criteria assessment

Options are evaluated against a range of criteria to determine their suitability, including **technical**, **environmental**, **social** and **economic** feasibility.

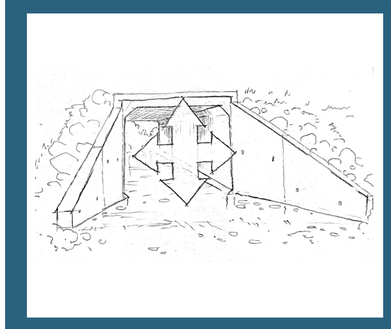
In managing flood risk Aberdeenshire Council is required to have regard to the economic impact of its actions. For an option to be considered viable, the costs must not exceed the benefits, i.e. the **benefit-cost ratio** (BCR) must be greater than 1.

What was considered in the long-list?

A range of different actions were considered when producing the long-list. Actions can be classified under the following the categories:

◀ Direct Defences

This group of measures includes construction of flood walls and embankments.



◀ Conveyance Improvements

Including channel modifications and culvert upgrades to increase flow capacity.

◀ Upstream Storage

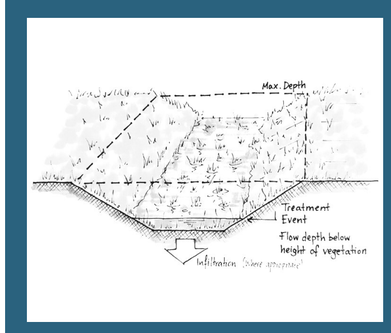
Measures to create new or upsize existing storage were considered.

◀ Natural Flood Management (NFM)

NFM techniques work with natural processes to manage flood risk, and work on the principle of slowing the flow down in the upper catchment.

◀ River Restoration

Within this group are included actions such as wetland creation, floodplain recovery or re-meandering.



◀ SuDS elements

Sustainable Drainage Systems (SuDS) are elements with innovative design to collect, store and treat overland flows. These aim to imitate the natural drainage processes. Examples are: Ponds, swales, green roofs or rain gardens.

◀ Non Structural Measures

These consist of policies, regulations and practices that aim to reduce the exposure and vulnerability of communities to flooding.

5. Short list of options

This is summary table of the shortlisted options considered in the flood study:

Option	Benefit-Cost Ratio (BCR)
Option 1 — Storage area at Kintore football pitch	0.0
Option 2 — Upstream storage area on Tuach Burn	0.6
Option 3 — Upstream storage area on Sheriff Burn	**2.4**
Option 4 — Flood walls along Tuach Burn	0.1
Option 5 — De-culverting section at Tumulus Way	0.9
Option 6 — Flood-relief channel at Tumulus Way	0.0
Option 7 — Upstream storage area on Torry Burn	-0.1
Option 8 — Wetland north of Tuach Hill	0.1
Option 9 — Flood wall at Macallan Road	**2.4**
Option 10 — Land reprofiling at Old Torryburn Hotel	0.3
Option 11 — Culvert replacement on Torry Burn	0.2
Option 12 — New surface water pipes and SuDS	0.0

Figure 6. Shortlisted options

OPTION 3. Upstream storage area on Sheriff Burn

The preferred option at the Sheriff Burn involves creating two separate flood storage areas to temporarily hold back water during high flows and reduce flood risk downstream in Kintore:

Upper storage area (further upstream):

- Formed by building a small earth embankment or flood bund across the Sheriff Burn.
- Water passes through a pipe with a special flow-control device, which slows the flow of water downstream.
- An overflow channel will be included to safely release excess water if levels rise too high.
- This area can store up to 8,500 cubic metres of water (about the size of three Olympic swimming pools).

Lower storage area (closer to the A96):

- Uses the existing culvert (water pipe under the road) with a new flow-control device added.
- An overflow across the farm track will allow water to spill safely when levels are high.
- This area con store up to 7,100 cubic metres of water (just under three Olympic swimming pools).

Together, these storage areas store and attenuate the flow of water in the Sheriff Burn, reducing flood risk in the urban area downstream.

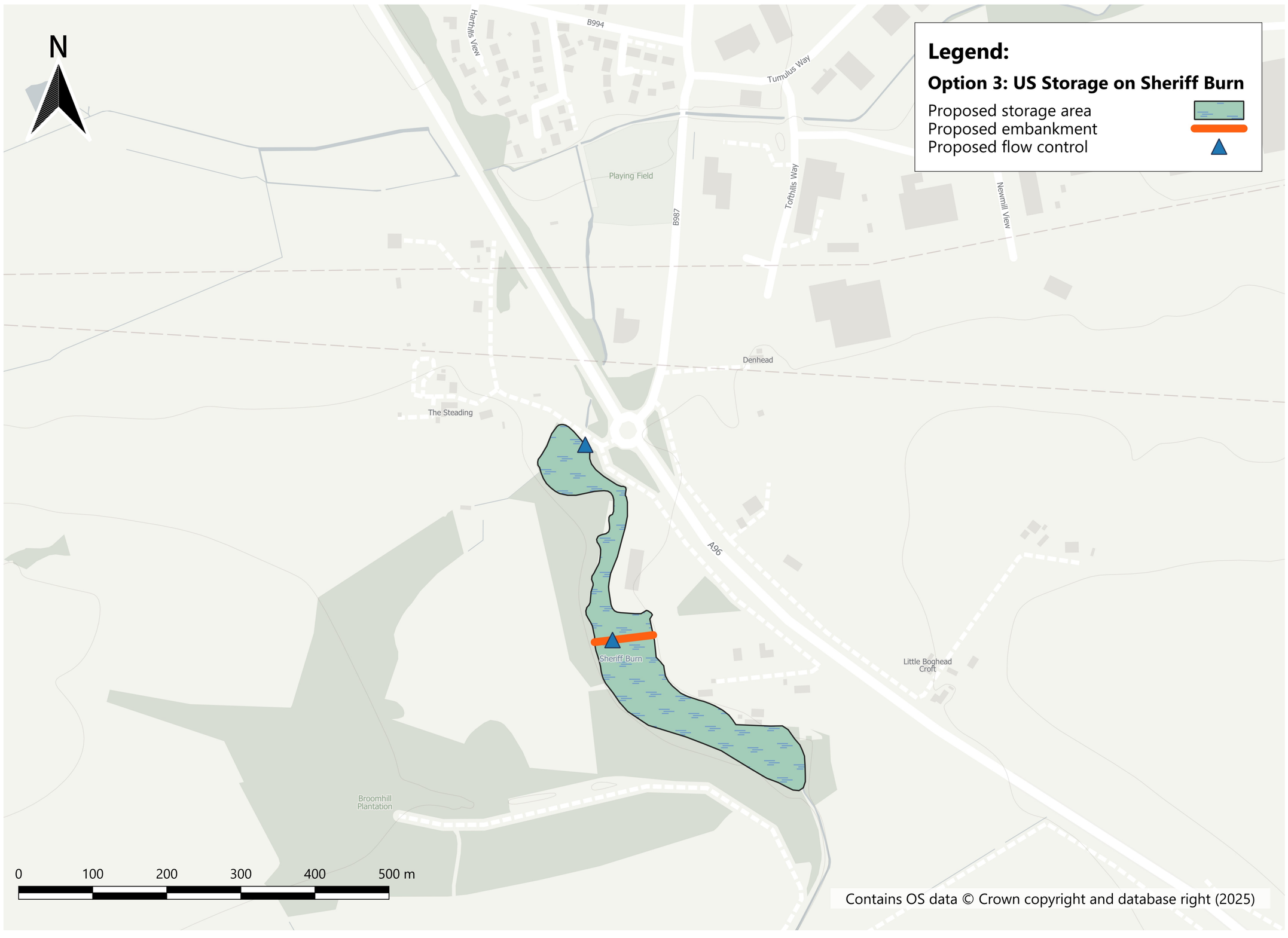


Figure 7. Option 3, upstream storage area on Sheriff Burn

OPTION 9. Flood wall at Macallan Road

At Macallan Road, the preferred option is to build a new flood wall about 250 metres long.

- The wall would be made from precast concrete blocks (such as LEGATO blocks), which can be built quickly, with less noise and dust, and mostly prepared off-site.
- The wall will be around 0.8m to 1.4m high (depending on ground level) and will provide protection for the properties located east of Torryburn Wood

Figure 8. Nicol Road

Figure 9. LEGATO block

Figure 10. Flood wall at Macalllan Road

6. Summary of the study findings & recommendations

The Kintore Flood Study has given us a much clearer understanding of the flood risks within the catchment. To achieve this, we collected and reviewed extensive data, carried out surveys, and developed a detailed integrated hydraulic model to improve the accuracy and reliability of the flood predictions. Now we have a clearer picture to make informed decisions to reduce the flood risk at Kintore.

We built a combined 1D-2D hydraulic model to assess study area. This model incorporates the watercourses, sewer network and overland flood flows, enabling us to understand how these systems interact. It also allowed us to estimate flood damages and evaluate the economic impacts of different mitigation options over a 100-year period.

From the twelve shortlisted options, two provide cost-effective flood mitigation and are recommended for implementation:

- **Option 3** involves the creation of an online storage area in Sheriff Burn, upstream Kintore (BCR = 2.4).
- **Option 9** involves the construction of a flood wall to protect properties in the area around Macallan Road (BCR = 2.4).

Option	Option 3	Option 9
Capital cost	£323,171	£342,338
Total estimated **cost** across a 100-year lifespan	£509,276	£487,368
Estimated **flood damages avoided** across a 100-year lifespan	£1,203,880	£1,145,725
Benefit-cost ratio	**2.4**	**2.4**
Multi-criteria assessment score	58%	44%

7. Feedback & next steps

We encourage any feedback on the proposals, and will seek to incorporate the views of the local community into the proposals where we can.

The Kintore Flood Study will then be updated and finalised.
The conclusions of the plan will then be reported to the relevant Committee. Thereafter, the Council will seek to secure funding and any relevant regulatory approvals to implement the recommendations of the report.

Contact details

For further information on the Kemnay Flood Study please contact:

Flooding Team

Aberdeenshire Council, Viewmount,
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Email: **flooding@aberdeenshire.gov.uk**

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 Aberdeenshire Council or Binnies.