

**ABERDEEN
CITY AND
SHIRE**

*Strategic Development
Planning Authority*

Proposed Strategic Development Plan 2020

Strategic Flood Risk Assessment

August 2018

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1. Introduction

- 1.1 This Strategic Flood Risk Assessment has been prepared by the Aberdeen City and Shire Strategic Development Planning Authority (SDPA) on behalf of Aberdeen City Council and Aberdeenshire Council. The Assessment covers the local authority areas of Aberdeen City and Aberdeenshire, except that part of Aberdeenshire which is within the Cairngorms National Park. The area covered by this Assessment is referred to throughout as the 'City Region'.
- 1.2 The Aberdeen City and Shire SDPA prepares a Strategic Development Plan (SDP) which guides the location and quantity of future development and informs the production of the Aberdeen and Aberdeenshire Local Development Plans.
- 1.3 The City Region's vulnerability to flooding has been extensively assessed at both a regional and local level over recent years. This document is a high-level Strategic Flood Risk Assessment undertaken by the SDPA's Officer Team in conjunction with Aberdeen City Council and Aberdeenshire Council's Flood Risk Management Teams. It has been undertaken to support the next Strategic Development Plan for the City Region, which is expected to be approved in 2020.
- 1.4 The Strategic Flood Risk Assessment is a strategic overview of flood risk across the City Region. It combines the collection, synthesis and presentation of existing and derivable information on flood risk.
- 1.5 The Strategic Flood Risk Assessment process is designed to inform the development planning process and to reduce flood risk by considering and avoiding areas at risk of significant flooding.
- 1.6 At the time of writing, both the Aberdeen City Council and Aberdeenshire Council Local Development Plan Teams are currently undertaking Strategic Flood Risk Assessments to accompany their respective Main Issues Reports. The two Council's Main Issues Reports should be published for public consultation in early 2019. It is in this context that this Strategic Flood Risk Assessment has been developed.

2. Policy and Legislative Context for Regional Flood Risk Planning

- 2.1. Scottish Planning Policy 2014 (para 256) states that Development Plans should prevent development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere.
- 2.2. Scottish Planning Policy goes on to state that Strategic Development Plans should (para 261) address any significant cross boundary flooding issues.
- 2.3. Consideration is given to the probability of flooding from all sources and associated risks involved when preparing Development Plans. Strategic Flood Risk Assessment is used to inform choices about the location of development and policies for flood risk management.
- 2.4. The Flood Risk Management (Scotland) Act 2009 provides a strategic framework for considering appropriate mechanisms to manage flood risk. Flood Risk Management Strategies for the City Region have been developed to reduce the devastating and costly impact of flooding and coordinate the efforts of all organisations that tackle flooding.
- 2.5. Flood Risk Management Strategies set out the short to long term ambition for flood risk management in Scotland. The strategies state the objectives for tackling floods in high risk areas. Actions that will then deliver these objectives are described and prioritised in six-year planning cycles. In the Local Flood Risk Management Plans, the decisions are based on the best evidence available on the causes and consequences of flooding.
- 2.6. The North East Local Plan District Local Flood Risk Management Plan for the cycle 2016- 2022 ([can be read here](#)) was published by Aberdeenshire Council on behalf of a partnership comprising three local authorities: Aberdeenshire Council, Aberdeen City Council and The Moray Council together with the Scottish Environmental Protection Agency (SEPA) and the following Responsible Authorities: Scottish Water; Forestry Commission Scotland and the Cairngorms National Park Authority. It identified twenty-three areas as potentially vulnerable to flood risk across the Management Plan area. These areas have been designated as Potentially Vulnerable Areas (PVAs), and represent areas where significant flood risk exists now or is likely to occur in the future.
- 2.7. The Plan proposes actions to avoid and reduce the risk of flooding through preparing and protecting communities within the Potentially Vulnerable Areas and the Management Plan District. The Management Plan's actions include local authority-led flood protection schemes, flood protection studies, surface water management plans and natural flood management studies. The Management Plan is the guiding document for SEPA, local authorities and Scottish Water to fulfil their statutory obligations under the Flood Risk Management (Scotland) Act 2009. Additionally, there are three

PVAs within Aberdeenshire Council area which are included in the Tay Estuary and Montrose Basin Management Plan District.

- 2.8. Work is currently being undertaken on the next flood risk management planning cycle for 2022 – 2028. The Scottish Environmental Protection Agency's consultation on Potentially Vulnerable Areas for Flood Risk Management in Scotland closed on the 31 July 2018 ([read here](#)). Scottish Ministers will formally designate Potentially Vulnerable Areas in December 2018 through the second National Flood Risk Assessment.

3. Strategic Development Plans and Flood Risk Management

- 3.1. In terms of the Flood Risk Management (Scotland) Act 2009, both Aberdeen City Council and Aberdeenshire Council must exercise their general functions with a view to reducing its overall flood risk.
- 3.2. Of most relevance to Strategic Development Planning Authorities is 'Section 1: General Duties' of the Act which require all Responsible Authorities (including local authorities) when exercising their flood risk related functions to manage flood risk in a sustainable way and to cooperate with all other Responsible Authorities. The SDPA is responsible for setting a regional spatial strategy for development planning, including the coordination and facilitation of transboundary spatial planning issues. It is in this context that the SDPA is best served to influence regional flood risk management, i.e. through the coordination of strategic development planning for the two Councils and encouraging the consideration and cooperation of transboundary flooding impacts on current and future development.
- 3.3. The 'Our Resources' Chapter of the Proposed Strategic Development Plan discusses Flooding, Water Supply and the Coast. Para 6.3 states:
 - *“Areas of Aberdeen and Aberdeenshire are already at risk from flooding and storm surges, but increased risk is expected due to changing and more unpredictable weather patterns, extreme weather events and rising sea levels. Development which avoids areas of flood risk and which improves surface water management will be important in adapting to climate change. Local Development Plans should consider ways to ensure new development can be appropriately “future-proofed” to take into account climate change effects relating to extreme weather. Both Councils will need to work together to deliver a coordinated approach to flood prevention”.*
- 3.4. Under the 'How to Meet The Targets' section of the Our Resources Chapter, point 3 states:
 - *“Local Development Plans should take due regard of the Strategic Flood Risk Assessment which accompanies this Plan and not identify sites for new development which are at an unacceptable risk from flooding. This may exclude brownfield sites which have appropriate flood prevention measures in place. Unacceptable risk will normally be more than a 1 in 200 (0.5%) chance of a flood happening in any year, although this will vary with the type of development being proposed”.*
- 3.5. As part of the Action Programme which accompanies the Proposed Strategic Development Plan, the SDPA notes a commitment to liaise with the Flood Risk Management and Local Development Plan Teams of both Councils and to support the development of Strategic Flood Risk Assessments for the next set of Local Development Plans.

- 3.6. Officers from the Strategic Development Planning Authority and both Councils Flood Risk Teams met and considered the Proposed Plan in the context of flood risk assessment. It was agreed that during the Local Development Plan preferred site assessments process a more detailed assessment of flood risk could be undertaken rather than at a City Regional scale.
- 3.7. Local Development Plan bid sites are assessed in detail in terms of flood risk and transboundary flooding issues which could occur between Aberdeenshire Council and Aberdeen City Council. Engagement with the Flood Risk Teams at an early stage of assessment has numerous benefits, including:
- Joint working between the Strategic Development Planning Authority, Local Development Plan and Flood Risk Management Teams;
 - Joint working between the Strategic Development Planning Authority and the two Councils;
 - Improved local and regional strategic development planning as flood protection is considered earlier in the development process and the scale of future development can be factored into flood protection projects.
 - Consideration of transboundary flooding issues as a result of joint working.

4. Sources of Information

4.1. The research for this Assessment is secondary and desk based. It has been prepared with reference to 'Strategic Flood Risk Assessment - Technical Guidance to Support Development Planning' 2015, a guidance document published by the Scottish Environmental Protection Agency. A number of potential sources of information on flood risk are suggested to aid the Assessment. Those considered most useful for the regional context are:

- The most recent SEPA Flood Extent Maps;
- SEPA National Flood Risk Assessment and the draft National Flood Risk Assessment;
- North East Flood Risk Management Plan;
- Previous Aberdeen City Council Biennial Reports on the prevention or mitigation of flooding in Aberdeen - the last Biennial Report was produced in 2009;
- Previous Aberdeenshire Council Biennial Reports on the prevention or mitigation of flooding in Aberdeenshire - the last Biennial Report was produced in 2009;
- Previous flood risk studies;
- GIS Layers including flood extents, watercourses and reservoirs, flooding incidents etc;
- Information on Flood Protection Schemes in Aberdeen City and Aberdeenshire.

Scottish Environmental Protection Agency Flood Maps

4.2. Key sources of evidence are the Flood Extent Maps produced by the Scottish Environmental Protection Agency, which show different levels of flood risk for rivers and the coast. Updated maps became available during 2018 and the high-level assessment of flood risk included in this Assessment is informed by these maps.

4.3. The SEPA Flood Maps have been produced following a consistent, nationally-applied methodology for catchment areas equal to or greater than 3 square kilometres (km²) using a Digital Terrain Model to define river corridors and low-lying coastal land. The maps are indicative and designed to be used as a strategic tool to assess flood risk at the community level and to support planning policy and flood risk

management in Scotland. SEPA Flood Maps¹ are also indicative because they are not able to consider the influence of any structures or flood protection schemes. For site specific flood risk assessment, further hydraulic modelling would be required on a local scale.

- 4.4. The SDPA operates at a City Region level. The Aberdeen City and Shire Structure Plan 2009 introduced a Spatial Strategy for the City Region which focuses new development along existing and planned transport infrastructure. The Strategic Development Plan 2014 carried this Spatial Strategy forward, as does the Proposed Strategic Development Plan 2020. Both the Structure Plan 2009 and the Strategic Development Plan 2014 undertook Strategic Flood Risk Assessments. The Spatial Strategy focuses development in four Strategic Growth Areas, which includes Aberdeen City, Aberdeen to Peterhead, Aberdeen to Huntly and Aberdeen to Laurencekirk with a focus on Regeneration Priority Areas along Aberdeenshire's northern coast.
- 4.5. The SEPA Flood Maps have been considered in terms of the Strategic Growth Areas, however given the scale of the area covered and the high level of the SDP's Spatial Strategy, the assessment of potential flooding is most accurately undertaken during the Bid Assessment process of the two Council's Local Development Plans. The SDPA can best direct flood risk planning by indicating the Strategic Growth Areas where allocations will be considered. The Strategic Development Plan sets the Housing Land Requirement and Employment Land Requirement over the life of the Plan.

¹ <https://www.sepa.org.uk/environment/water/flooding/flood-maps/>

Current Aberdeen City and Aberdeenshire Potentially Vulnerable Areas

- 4.6. The City Region's Potentially Vulnerable Areas (PVAs) are listed below in Table 1, and are shown in Appendix 1. Of the twenty-three PVAs identified in the Regional Flood Risk Plan, eighteen of those are in Aberdeen City and Aberdeenshire. Three of the Potentially Vulnerable Areas have a transboundary impact and so are jointly managed by both Aberdeen City Council and Aberdeenshire Council.

Table 1: Local District Plan Summary – Potentially Vulnerable Areas		
Authority	Reference	Name
Aberdeenshire Council	06/02	Portsoy
	06/03	Banff
	06/04	MacDuff
	06/05	Fraserburgh and Rosehearty
	06/07	Turriff
	06/08	Peterhead
	06/09	Methlick
	06/10	Huntly
	06/11	Insch
	06/12	Ellon
	06/13	Inverurie and Kintore
	06/21	Banchory and Torphins
	06/23	Stonehaven
Aberdeen City Council/Aberdeenshire Council	06/15	Aberdeen City – Bridge of Don
	06/17	Westhill
	06/19	Peterculter
Aberdeen City Council	06/16	Denmore
	06/18	Deeside

5. Potential Sources of Flooding in Aberdeen City and Aberdeenshire

- 5.1. There are 6 main potential sources of flood risk: rivers (fluvial), the sea (coastal), surface water (pluvial), groundwater, drainage and sewers and infrastructure failure (e.g. reservoir or canal breaches). Consideration in relation to the City Region context is given below:

Fluvial and Coastal

- 5.2. SEPA's Flood Hazard Maps show the areas identified as being at risk of flooding from fluvial, coastal and surface water sources. For the purposes of planning, we are primarily concerned with areas affected by a 0.5% annual probability of flooding (1 in 200 years). SEPA have mapped natural susceptibility to coastal erosion based on natural features including the height and geology of the land (relative to sea level), distance to the sea and wave action.
- 5.3. There is over 600 kilometres of watercourses (both open and culverted) in Aberdeen City. Many of these are small watercourses which are not identified by the SEPA maps, but may still be vulnerable to localised flooding, particularly where blockages occur. It is important to consider the presence of small watercourses when assessing flood risk on individual sites. The main areas at high flood risk in Aberdeen City are along the large watercourses, including the River Dee, River Don and the Denburn and the coast and harbour-side area.
- 5.4. Aberdeenshire Council has over 4,000 kilometres of watercourses and around 200 kilometres of coastline. The watercourses include major rivers such as the Dee, Don, Deveron, Ythan and North Esk as well as around 80 minor rivers and burns. There are also many open and culverted or piped smaller watercourses. In Aberdeenshire the main areas of flood risk are along the major rivers such as the Rivers Dee, Don, Ythan and Deveron. There are also areas at risk of coastal flooding such as Stonehaven.

Pluvial (Surface Water) and Rising Groundwater

- 5.5. Pluvial flooding, or flooding due to excess surface water, occurs after periods of intense and prolonged rainfall which saturate either the natural substrate or urban drainage systems, so excess water cannot be safely drained away. Therefore, pluvial flooding is more likely to occur where the ground is naturally poorly drained or has been developed without adequate urban drainage systems in place.
- 5.6. SEPA has produced maps showing flood risk from surface water at a national level. These maps are available from the Scottish Environmental Protection Agency website ([access here](#)) and gives some indication that areas in Aberdeen and Aberdeenshire may be at risk from pluvial flooding.
- 5.7. Flooding due to rising groundwater is also likely to occur after periods of intense and prolonged rainfall, when the water table rises up from underlying rocks or

flowing from springs. Groundwater is generally a contributing factor to flooding rather than the primary source. The SEPA website has a map showing where groundwater could influence the duration and extent of flooding from other sources. It does not show where groundwater alone could cause flooding. This gives a broad indication of vulnerability to groundwater flooding. The Potential Vulnerable Areas datasheets also gives an indication of which catchment units may be at risk from rising groundwater; this type of flooding has the potential to affect a large part of the Aberdeen City Area.

Roads Drainage and Sewers

- 5.8. Roadside drains, sewers and culverts can also be the cause of flood events if they fail, become blocked or are inundated with water that exceeds their capacity. Many of the flood incident points occurred as a result of blocked drains, gullies, culverts and other small watercourses. These occurred all across Aberdeen City, although 'hotspots' may be identified.
- 5.9. Flooding due to blocked drains is addressed by Roads Maintenance Teams in both Councils. There is also a regime for the inspection of open watercourses in place, and hecks (debris screens) are inspected on a monthly basis and before anticipated high level rainfall.

Infrastructure Failure

- 5.10. There is not considered to be any significant risk of flooding due to infrastructure failure in Aberdeen and Aberdeenshire. Although a number of reservoirs and canals do exist in and around the urban area, there are no large dams or levees and no records of previous flooding of this type. Flooding may occur as a result of burst water mains, however these are the responsibility of Scottish Water and it is not possible to predict these events. The majority of these are located in the Deeside area.

Natural Flood Management

- 5.11. SEPA's Natural Flood Management Maps identify areas where there are opportunities for alteration or restoration of natural features to help manage flood risk. The maps are of a strategic nature and are primarily to support Flood Risk Management planning decisions at the catchment level. They provide a high level assessment of those areas within catchments and along coastlines where the implementation of the specified Natural Flood Management techniques could be most effective and merit further investigation. Five natural flood management maps have been produced: run-off reduction; floodplain storage; sediment management; estuarine surge attenuation; wave energy dissipation.

6. Flood Protection

Aberdeen City Flood Protection

6.1. The Flood Protection Schemes currently in place or under construction in the Aberdeen City Council area include:

- Glashieburn, Bridge of Don close to Lochside Drive
- Fraser Road, to the north of Hutcheon Street
- Gilcomston Burn
- West Cults Farm (private scheme)
- Jacks Brae
- Aberdeen Beach Recharge -
To protect the revetments and the area around Aberdeen beach from continued erosion and failure, a programme of beach recharge took place in July and August 2006. To ensure the stability of the new beach and to protect the area from further erosion, rock t-head extensions to the present timber groynes were constructed.
- Leggart Terrace Culvert Diversion
- Bridge of Dee Flood Gates
- Stronsay Park Flood Control Structure
- Maidencraig Flood Storage Scheme
- Heathrefold Park Sustainable Urban Drainage System

Regional Sustainable Urban Drainage Schemes

6.2. Aberdeen City Council are currently identifying areas for upstream retention basins to help reduce run-off further downstream and prevent flooding in the more built up areas of the City. These areas will be identified through the next Local Development Plan and safeguarded from development. The Maidencraig Flood Storage Scheme² mentioned above is the first to be developed.

² https://news.aberdeencity.gov.uk/completion-of-flood-management-scheme-which-will-help-prevent-homes-from-being-flooded/?utm_source=Facebook&utm_medium=social&utm_campaign=SocialSignIn

Aberdeenshire Flood Protection

6.3. Aberdeenshire has a number of recently completed and currently in development flood risk management projects and interventions which are summarised below:

- Stonehaven – River Carron
Estimated completion end 2020 ([read more here](#))
- Huntly
Scheme completed in 2017 ([read more here](#))

Ongoing Flood Protection Studies across the City Region

6.4. The following studies are programmed to be completed by the end of 2019, so that the study outputs can be reflected during the next flood risk management planning cycle 2022 to 2028. Actions from the study (i.e. a Flood Protection Scheme) if feasible, will be considered in the national prioritisation for Scottish Government funding for delivery in the 2022 – 2028 Local Flood Risk Management Plan.

Table 2: Flood Protection Studies	
Ellon	Reduce flood risk in Ellon from the River Ythan, Modley Burn, Broomies / Bronie Burn.
Inverurie and Port Elphinstone	Reduce flood risk in Inverurie and Port Elphinstone from the River Don & River Urie.
Insch	Reduce flood risk in Insch from The Shevoch and the Valentine Burn.
Stonehaven (coastal)	Reduce risk in Stonehaven from coastal flooding.
Ballater	Reduce flood risk in Ballater from the River Dee.

Ongoing Surface Water Management Plans across the City Region

6.5. Surface Water Management Plans take an integrated approach to drainage accounting for all aspects of urban drainage systems and produces long term and sustainable actions. The aim is to ensure that during a flood the flows created can be managed in a way that will cause minimum harm to people, buildings, the environment and business.

6.6. The following studies are programmed to be completed by the end of 2019, so that the study outputs can be reflected during the next flood risk management planning cycle 2022 to 2028:

Table 3: Surface Water Management Plan	
Aboyne	On target to be completed by end 2019
Peterhead	On target to be completed by end 2019
Fraserburgh	On target to be completed by end 2019
Portlethen	On target to be completed by end 2019
Huntly	On target to be completed by end 2019
Stonehaven	On target to be completed by end 2019
Inverurie	On target to be completed by end 2019
Westhill	On target to be completed by end 2019

Potential Flood Studies for 2022 – 2028 Cycle

- 6.7. The following are likely to become flood studies in the next cycle of the Flood Risk Management Plan (in no order)

Table 4: Potential Flood Studies for 2022-2028	
Kemnay	Reduce flood risk from the River Don.
Fettercairn	Reduce economic damages to residential and non-residential properties in Fettercairn caused by river flooding.
Aboyne	Reduce flood risk in Aboyne from Tarland Burn and River Dee.
Kintore	Reduce flood risk in Kintore from all watercourses (River Don, Torry Burn, Tuach Burn and Loch Burn).
Tarland	Reduce flood risk in Tarland from the Tarland Burn.
Roanheads, Peterhead	Reduce risk in Peterhead from coastal flooding.
Banff	Reduce risk in Banff from the River Deveron and coastal flooding.
Portsoy	Reduce flood risk in the vicinity of Loch Soy and Soy Avenue.

7. The Impacts of Climate Change on Flood Risk

7.1. Annual rainfall in Scotland has increased by 7% since 1961. [UK Climate Projections \(UKCP09\)](#) sets out climate information for areas of the UK and includes data for the North East of Scotland.

7.2. In the coming decades the climate of the City Region will change, with an increase in the frequency and severity of extreme weather events. Climate projections indicate that for this area this will mean:

- Average temperatures will increase in all seasons (H), with the greatest increase in summer (M). What is considered a heatwave or extremely hot summer today will occur more frequently in future (M).
- Rainfall is projected to become more seasonal, with an increase in average winter and autumn rainfall (M). Average summer rainfall may decrease (L). Heavy rainfall events may occur more frequently in winter, spring, and autumn (M). An increase in summer heavy rainfall events is uncertain (L)
- Snow is projected to be less frequent in coastal locations like Aberdeen with rising temperature (H), although by how much is complicated by increased winter precipitation (L).
- The growing season will continue to lengthen due to increasing temperatures in spring and autumn (H).
- Winter storms with extreme rainfall may become more frequent (L), although there is large uncertainty in models.
- Sea level will rise (H). Storm surge conditions may cause wave overtopping and coastal flooding and erosion.

(Assessment of 'Overall Confidence' in scientific evidence for individual statements: High (H), Medium (M) and Low (L).)

7.3. Sea level rise scenarios are shown in Table 5 below:

Table 5: Sea Level Rise Scenarios						
Sea Level Rise	Temperature Increase of 2 Degrees			Temperature Increase of 4 Degrees		
	2020	2050	2080	2020	2050	2080
Aberdeen	0.02m	0.09m	0.18m	0.13m	0.32m	0.56m

7.4. The United Kingdom Climate Change Risk Assessment 2017 Evidence Report – Summary for Scotland, indicates an increase in future flood risks affecting buildings, transport, energy, digital and communication networks, communities, habitats and heritage.

7.5. The National Flood Risk Assessment has considered the flood risk for the City Region river basin regions. Under the 'high emissions' scenario for 2080, average peak river flows for the Dee catchment by 2080 may increase by 24%.

This would potentially increase in the number of residential properties at risk of river flooding from approximately 8,400 to 11,000 and the number of non-residential properties from 1,800 to 2,100.

- 7.6. The same scenario on the River Don may increase flows for the Don catchment by 24%. This would potentially increase in the number of residential properties at risk of river flooding from approximately 2,600 to 4,200 and the number of non-residential properties from 530 to 680.
- 7.7. It is essential that there are long-term strategies in place to address these projected risks. Under the Flood Risk Management (Scotland) Act 2009 there is a strategic framework for considering appropriate mechanisms to manage flood risk. Flood Risk Management Strategies have been developed to reduce the devastating and costly impact of flooding in Scotland. They coordinate the efforts of all organisations that tackle flooding. The strategies focus the work of these organisations to where the risk of flooding and benefits of investment are greatest. We consider that the installation of property-level resilience measures (those that prevent flood water entering a property or that speed the recovery process if it does) could play an important role in making people and their property less vulnerable to the physical and mental impacts of flooding.

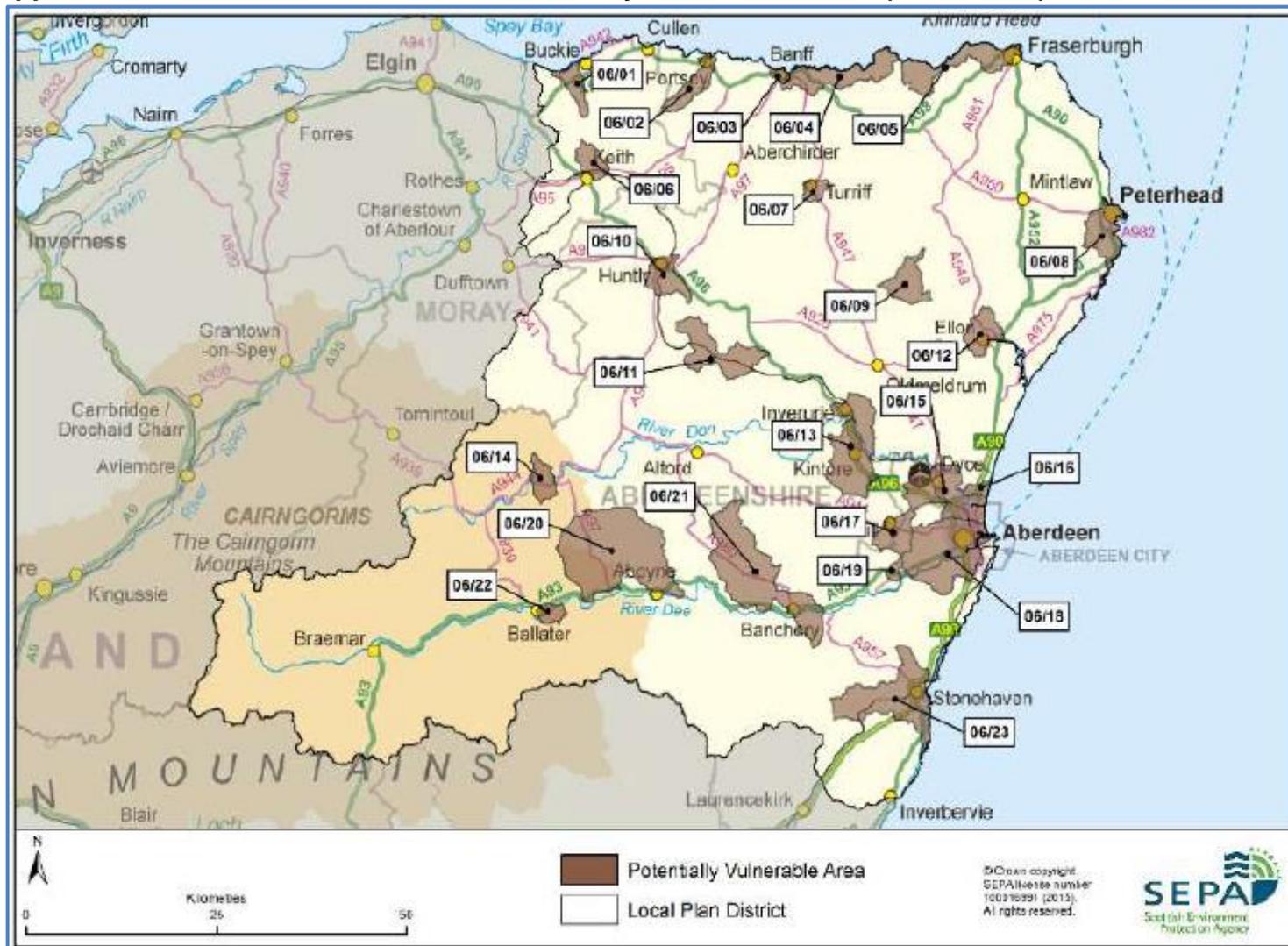
Assessment of Site Options According to Flood Risk

- 7.8. The main aim of collecting the evidence of the Strategic Flood Risk Assessment is to assist in directing development to areas of little or no flood risk wherever possible, referring to the Flood Risk Framework contained in Scottish Planning Policy. At a Local Development Plan stage assessment is undertaken for preferred Opportunity Sites in the Main Issues Report and sites likely to be carried forward from the existing Local Development Plans.
- 7.9. The flood risk category into which a site falls is identified using the following annual flood probabilities:
 - Little or No Risk – annual flooding probability less than 0.1% (1:1000)
 - Low to Medium Risk – annual flooding probability between 0.1 and 0.5% (between 1:1000 and 1:200), or site adjacent to but not within a medium to high risk area.
 - Medium to high risk – annual probability 0.5% (1:200) or greater.

8. Conclusion

- 8.1. In conclusion the Strategic Flood Risk Assessment has given consideration to the relevant accessible information relating to flood risk assessment and flood protection in the North East.
- 8.2. Continued joint working between the SDPA, the two Councils, SEPA and Scottish Water will help to ensure sharing of relevant information and the ability to assess future development in terms of potential flood risk.
- 8.3. Both Council's Local Development Plans will undergo separate and detailed Strategic Flood Risk Assessments. These assessments will give due consideration to the issues that this assessment has and will be undertaken at a more macro scale during the preferred site assessment process.

Appendix 1 – North East Plan District Potentially Vulnerable Areas (SEPA 2015)



Appendix 2 - Local Flood Risk Management Plan 2016-2022 - Flood Management Actions

Potentially Vulnerable Area	Flood protection scheme/works	Natural flood management works	New flood warning	Flood protection study	Natural flood management study	Surface water plan/study	Strategic mapping and modelling	Maintain flood protection scheme*	Maintain flood warning*	Flood forecasting	Property level protection scheme	Community flood action groups	Self help	Awareness raising	Maintenance	Site protection plans	Emergency plans/response	Planning policies
06/02				✓			✓		N/A	✓			✓	✓	✓		✓	✓
06/03							✓		✓	✓			✓	✓	✓		✓	✓
06/04							✓		✓	✓			✓	✓	✓		✓	✓
06/05						✓	✓		✓	✓			✓	✓	✓		✓	✓
06/07							✓		✓	✓			✓	✓	✓		✓	✓
06/08			✓			✓	✓		✓	✓			✓	✓	✓		✓	✓
06/09										✓			✓	✓	✓		✓	✓
06/10	✓					✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
06/11				✓			✓			✓			✓	✓	✓		✓	✓
06/12				✓			✓			✓			✓	✓	✓		✓	✓
06/13				✓		✓	✓		✓	✓			✓	✓	✓		✓	✓
06/15			✓	✓		✓	✓		✓	✓			✓	✓	✓		✓	✓
06/16				✓		✓	✓	✓		✓			✓	✓	✓		✓	✓
06/17						✓	✓			✓			✓	✓	✓		✓	✓
06/18			✓	✓		✓	✓		✓	✓		✓	✓	✓	✓		✓	✓
06/19	✓				✓	✓	✓			✓			✓	✓	✓		✓	✓
06/21							✓		✓	✓			✓	✓	✓		✓	✓
06/23	✓		✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓

Appendix 3 – Historic Significant Flooding Events in Aberdeen City and Aberdeenshire

Events in Aberdeen City

- Aberdeen City Council Committee Reports and media reports provide a useful source of information on significant flooding events experienced in Aberdeen.
- Historic flood events on the River Dee have been reported in 1789, 1790, 1829, 1873, 1876, 1881, 1882, 1892, 1894, 1909, 1920, 1922, 1926, 1927, 1928, 1929, 1938 and 1946. The Den Burn is reported to have flooded in 1869, 1872, and 1874.
- The Bridge of Don area experienced flooding in 2000 and 2001, when problems with the drainage system resulted in ponding. This was exacerbated by gullies surcharging due to the high water level in the Glashieburn and properties in Lochside Drive, Jesmond Drive and Brook Crescent were affected. Regular surcharging of the combined sewer in Jesmond Drive has been reported, as has flooding at Ellon Road due to debris accumulation blocking the watercourse.
- In September 2009, weeks of solid rain across the City Region also resulted in heavy flooding in parts of Aberdeen. Many properties affected had previously been flooded, thus highlighting their vulnerability.
- On 25 August 2012 Aberdeen experienced a localised, intense rainfall event of relatively short duration. It is believed that up to 30 millimetres fell within one hour, meaning the downpour was at least a 1 in 100 year event. This gave rise to a number of flooding incidents across the City, affecting both commercial and residential properties, as well as disrupting travel. The Committee Report EPI 12 240 (6 November 2012) details all of the recorded flooding incidents for this day.
- In November 2012 the coastal village of Footdee was engulfed in sea foam after intense storms swept Aberdeen. The foam caused a good deal of damage and nuisance, and required a large expenditure on clean up operations.
- Large parts of Aberdeen were affected by surface water flooding in July 2015. Many manhole covers became dislodged, roads were submerged and Aberdeen International Airport's terminal building was flooded. Many roads were affected by flooding, including Market Street, Guild Street and Holburn Street. Cars on Polmuir Road started to float due to the depth of the water. A nursery had to be evacuated due to flooding in its basement.
- In January 2017 Storm Frank causes extensive flood damage to housing and other properties throughout the City Region. Areas especially

affected on the River Don include Kemnay, Inverurie, Kintore and into Aberdeen including Riverside Drive and the Grandholm area.

Events in Aberdeenshire

Portsoy

- The Soy Burn and Loch Soy are known sources of flood risk with a number of properties having been repeatedly flooded. For example, the Soy Burn caused flooding of properties in Soy Avenue, Portsoy in 2001, 2008, and 2009.

Banff

- There is a long history of flooding in Banff from the River Deveron. The earliest recorded flood was in 1768 when the Deveron flooded and destroyed an important bridge. The Deveron has also flooded at Banff in 1835, 1855, 1859, 1873, 1875 and 1882 affecting property, farmland and the railway line. The most damaging flood on record is the 1953 North Sea flood. A gasworks was washed into the sea, buildings and their protective wall were destroyed and many properties inundated with floodwater.
- The golf course was badly flooded in 2009 however the flooding did not extend to Duff House or the town. In December 2013 there was localised coastal flooding of five properties and significant wave damage in the inner part of Banff Bay. Coastal flooding from overtopping waves is also known to impact on some local access roads including the road to the community centre. Surface water flooding affected Low Street, Banff in August 2006.

MacDuff

- The earliest recorded flood was in 1880, when waves overtopped the sea wall in Macduff causing damage to the harbour and boats. The 1953 North Sea flood undermined and washed away sections of seawall and damaged the slipway and boat launching beach. Wave overtopping caused flooding to properties in Macduff and Gardenstown. In Crovie the flooding was so severe the village was abandoned after the 1953 storm event. In 1957 coastal flooding affected properties on the sea front, washed away the cliff road, and required the evacuation of families.
- In August 2008 surface water flooding in Macduff affected properties in Duff Street, Commercial Street, and George Street. Old Gamrie Road in Macduff flooded in 2009 following a heavy rainstorm.

Fraserburgh

- Fraserburgh suffered from flooding in 1863 and 1895. During the 1953 North Sea flood properties were destroyed by coastal flooding in Rosehearty and flooding occurred in various locations across the area, including Sandhaven and Pennan.
- Between 2002 and 2012 there were seven floods caused by various small burns including the Kessock Burn, and surface water runoff. These floods were generally due to heavy rainfall overwhelming road drainage and the small burns. Properties at Murison Drive in Rosehearty have also flooded several times, including in 2002 and 2009 due to excess surface water runoff and overflow from a small watercourse. In August 2006, the road and public park flooded due to water backing up behind a trash screen on the Kessock Burn and overtopping the culvert entrance. Rosehearty and Sandhaven harbours both suffered damage from the coastal storms in December 2012 and 2013. Coastal storms also caused erosion at Kinnaird Head in Fraserburgh affecting a public footpath. Five properties were damaged as a result of flooding events in December 2015.

Turriff

- The Burn of Turriff flooded in 1829 and 1859; the latter destroying several bridges including a railway bridge. In 1999, heavy rainfall overwhelmed the sewer causing flooding in Crooked Lane, Turriff. Ten properties were damaged as a result of flooding events in December 2015. Turriff United football ground has flooded on a number of occasions from the Burn of Turriff and Gassie Burn including in 2000 and 2002. Surface water flooding also occurred in Turriff in 2004, 2005, and 2008 due to the drainage infrastructure being unable to cope with runoff from heavy rainfall. This resulted in the flooding of properties and roads.

Peterhead

- Peterhead was flooded in 1881 and 1882 by the River Ugie. In the 1953 North Sea flood, Peterhead was badly affected with many cottages being washed away.
- There have been 15 floods since 2002, with the majority being related to surface water. The areas affected include Wood End House, Upperton Industrial Estate, Howe of Buchan, Lendrum Terrace, Station Road/A90 junction, Queen Street, Mallard Drive, central Peterhead, Braehead Crescent, Balmoor Terrace, Springbank, River View, A90 bypass, A950, Forman Drive, Schivas Road, Petergrange Road, Hawthorn Road, Geary Place and Crossfolds Crescent.
- Properties on Catto Drive, Collieburn Crescent, Golf Road, Riverside Drive and York Street experienced surface water flooding in August 2012; several properties were evacuated during this event. In December

2012, around 30 people were evacuated from the Roanheads area of the town due to coastal flooding, which was exacerbated by wave overtopping. Four properties were affected as a result of flooding events in December 2015.

Methlick

- There was a flood on the River Ythan in January 2003 affecting Woodhead Road in Methlick; seven properties were flooded. Flooding of the River Ythan was reported again in 2012 and in January 2016.

Huntly

- Huntly has flooded from the River Deveron, River Bogie and Meadow Burn. Residents in the Meadows area have been evacuated on several occasions in recent years. The earliest recorded flood was in 1829 when the town was surrounded by water and bridges destroyed by the Bogie and Deveron. There are also floods recorded from the Bogie in 1865, 1872, 1878 and 1881. The Deveron caused flooding in 1839, 1865, 1869, 1874 and 1881.
- More recently, there was flooding of the Meadows area in 1995 and a further 12 floods have been recorded since 1997 from various sources including the Ittingstone Burn, Meadows Burn (2009), the Bogie (2002, 2003, 2005, and 2006) and the Deveron (2009). The highest impact flood on record occurred in November 2009 when over 100 people had to be evacuated from the Meadows area, including from a nursing home, due to flooding from the Meadows Burn. Flooding from surface water runoff has also been recorded at various locations in Huntly. These floods have affected properties, roads, caravan parks, car parks and a care home. The areas of Huntly which have been affected include central, south east, and east Huntly, including Bleachfield Street, Burnside Road, Green Road and Glamourhaugh, George Street, and the Meadows area.

Insch

- The earliest recorded floods occurred in 1864 from The Shevock and in 1879, when the railway flooded from a burn in Insch. There were floods in 1903 and 1930 from The Shevock, resulting in minor damage. The highest impact flood on record within this Potentially Vulnerable Area occurred in November 2002, when a nursing home had to be evacuated due to flooding by The Shevock; residential properties were also affected. Local knowledge also refers to the nursing home being affected by flooding in 1995, however SEPA have no records to confirm this event or its impacts. There have been seven floods since 2002 coming variously from the Valentine Burn, The Shevock and surface water runoff. There were two floods in 2004; one in June from The Shevock, which affected properties in southwest Insch, and the other from the Valentine Burn in August which affected property in north west Insch. Both floods were exacerbated by drainage systems being unable to cope

with the heavy rainfall. Roads are often affected by surface water flooding, for example in 2008 the B9002 was flooded. Twenty-six properties were damaged as a result of flooding events in December 2015

Ellon

- There are two recorded floods from the Modley Burn in Ellon. In 2000 a wall collapsed, causing flooding. In 2002 the basements of property located on the culverted section of the burn flooded due to water backing up. In 2004, two properties in Findhorn Gardens flooded due to runoff from the adjacent housing development. In 2009 there was a flood from Broomies Burn, which affected Castle Way Industrial Estate, Ellon and damaged two bridges. Two industrial units and a school were affected. Flooding in December 2015 resulted in damage to over 80 properties within Ellon. Eighteen homes were evacuated in the Meadows area and an electricity substation flooded causing power cuts to 150 homes. Thirty-seven people attended rest centre in Ellon. The road between Ythanbank and Methlick was closed.

Inverurie and Kintore

- The earliest recorded flood was in 1768 when flooding on the Don destroyed most of the agricultural crops in affected areas. Similar floods were recorded on the Don in 1828, 1838, 1872, 1903, 1905, 1928, 1948, and 1951. The Gas Burn flooded Blackall Road in Inverurie in 1924.
- The River Don caused flooding in 1995, 2002, 2003, 2004, and 2009. The 2002 flood had the highest water level recorded at the Bridge of Don and flooding from the canal affected Canal Road. In 2003, the flood barrier at Keithhall Road, Inverurie was breached and residential properties were flooded.
- The Strath Burn caused flooding to properties in central Inverurie in 2002, 2005, 2006, 2008, 2009, and 2010 due to the culvert backing up and blockage of the trash screen. In 2009 Oldmeldrum Road and Souterford Road flooded due to overtopping of the River Urie. Other floods in this location were recorded in 1995 and 2002.
- There was flooding in Kintore from the Tuach Burn in 2002, 2003, 2006, and 2009, when water backed up the burn from the River Don. Properties in south east Kintore, including Kingsfield Road, were flooded. Water levels backing up from the River Don caused flooding on the Loch Burn in the eastern areas of Kintore in 2002, 2005, and 2009 affecting commercial property in the area between the two railway culverts and properties on Northern Road. Over 2 events in January 2016 there were reports of 56 properties damaged by flooding in Kintore and over 80 properties in Inverurie. The fire brigade and the coast guard conducted rescue efforts to evacuate residents from Canal Road, Canal Crescent, Riverside Park, where houses were inundated by several feet

of water. Inverurie Academy was opened as temporary accommodation and the Port Elphinstone Bridge on Elphinstone Road was closed.

Westhill

- Surface water runoff has caused flooding in parts of Westhill in the past. Flooding has also been reported at Brodiach Road near Cairdhillock and at Rotten of Gairn due to blocked gully outlets. Locally, issues with ground water flooding have also been reported. Ten properties were affected as a result of flooding events in December 2015

Aboyne

- In 2000 and 2002 the Tarland Burn caused flooding in Aboyne and Tarland when it overtopped its banks, flooding properties and roads. Flooding has occurred at Burnside Road, Tarland, due to the Tarland Burn, in March 2006 and again in February and November 2009. In December 2005 and July 2009, surface water flooding impacted residential properties in Tarland. In June 2005 the Logie Burn overtopped its banks causing localised flooding. Surface water flooding has also affected parts of Aboyne, south of the A93 which is just outside the southern boundary of the Potentially Vulnerable Area. Flooding in December 2015 resulted in damage to over 20 residential properties. This event also resulted in Bonty Court care home being evacuated as precautionary measure, residential properties on Low Road evacuated and roads flooded from the Dee in Aboyne.

Banchory and Torphins

- The Beltie Burn flooded in 1799, 1829, 1872, and 1876 affecting the railway (now abandoned) and damaging bridges. Flooding on the River Dee occurred in 1876 and 1902, which affected the railway at Glassel and Banchory.
- In 1998 and 2000 the Burn of Canny overtopped its banks in several places causing flooding to properties at Millbank and Inchmarlo. More recently, there was flooding in Torphins at Craigour Avenue in 2000, Craigmyle Road in 2002 from a small spring, Waulkmill Farm in 2002 from the Beltie Burn, Grove Cottage in 2002 from ground water, Grove Terrace in 2003 and Kincardine Road in 2009. There was surface water flooding reported at Briarwood, Upper Lochton at Banchory in 2002. Flooding due to the Burn of Canny overtopping and surface water runoff occurred in Brathens in 2003. Following this flood, the river was realigned and rock armour used to improve flows.

Ballater

- Flooding occurred on the River Dee in 1829, destroying the Ballater Bridge and in 1839, the bridge at Tullich was damaged. In 1877, cellars in the lower part of Ballater were flooded, and in 1920 and 1929 the town and roads were flooded. Local reports are that in the late 1980s the bottom part of the village was badly flooded with water coming up through the drains. Deebank Road, Bridge Street Richmond Place, Braichlie Road were all affected.
- In 2008 surface runoff entered the Netherley Guest House at Netherley Place. In August 2014, the caravan park and a number of roads were closed due to flooding from the River Dee. As a result, 150 people were evacuated from the caravan site. Large areas of Ballater were affected by flooding from the River Dee in December 2015. More than 100 residents had to be evacuated from Anderson Road, Deebank Road and Albert Road. Over 300 properties were flooded. A section of the A93 between Ballater and Balmoral Castle (near Braemar) was washed away and the Cambus O'May Bridge was extensively damaged. The police station flooded and suffered substantial damage, leading it to operate mobile surgeries a few days per week. Victoria Barracks were used as emergency care centre and subsequent flood relief centre.

Stonehaven

- There is a long record of flooding in Stonehaven dating back to the early 1800s, with flooding affecting property, agriculture, bridges and roads. A number of these floods resulted in several feet of water in the town. There is extensive and valuable local knowledge of historic flooding and further work is required to fully reconcile this knowledge with existing recorded events listed below.
- The earliest recorded flood on Carron Water was in 1829, with additional floods recorded in 1835 (when large areas of the town were submerged by several feet of water) 1836, 1878 (when one fatality occurred), 1881, and 1895. There are floods recorded on Cowie in 1878, 1881, 1882, 1884, 1895, 1896 and 1949.
- In December 1985 there was a flood on both the Carron and Cowie rivers, which affected Arduthie Street, Carron Terrace, and Cameron Street. In 2002, the Carron flooded Low Wood Road. In November 2009, the Carron burst its banks at the green bridge and flooded 97 properties in Stonehaven with 50 people needing to be evacuated. The River Carron and its tributary, the Glaslaw Burn, flooded again in December 2012 when 40 properties were evacuated and suffered significant damage. Surface water also contributed significantly to this flood.
- In 1998, the Farrochie Burn flooded Arduthie Gardens in Stonehaven affecting three properties; it flooded again in 2002. In 2006, a trash screen became blocked with debris and caused Farrochie Burn to flood a public park and road. In 2006, Victoria Street was flooded from an unnamed watercourse, with a culvert blockage causing the water to back

up. In 2008 the gardens of Touck Cottages were affected by surface runoff from agricultural land. On 15 December 2012, a coastal storm overtopped the sea defences and around 20 properties were flooded internally. Around 25 vulnerable residents had to be evacuated and there was significant structural damage to further seafront properties from wave action. Seafront properties were again affected in October 2014 by wave overtopping and many vulnerable people were evacuated from their homes.

- Wave overtopping frequently impacts seafront businesses to the north of the River Cowie. Residential properties in Cowie village are also affected during periods of high water levels and wave activity. The village of Catterline is affected by surface water flooding. Erosion of the toe of the coastal slopes by wave action, combined with the impact of surface water and springs on slope stability, have contributed to coastal landslips in the village. This erosion threatens a significant proportion of the property in the village and the access road to the harbour. The neighbouring village of Crawton has also suffered from flooding.

Fettercairn

- In December 2012 a small number of properties were flooded in Fettercairn after the Cauldcotts Burn overtopped flood defences. In October 2009 Fettercairn was hit by flood water when the Cauldcotts Burn burst its banks near the distillery. The water flowed down a field and flooded a number of properties.