South Tyneside Council Level 1 Strategic Flood Risk Assessment

Final Report

June 2022

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South Tyneside Council

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Revision history

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V2 Final Report / October 2021	Stakeholder comments	Matthew Clifford
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Contract

This report describes work commissioned by Matthew Clifford, on behalf of South Tyneside Council. South Tyneside Council's representative for the contract was Matthew Clifford. Hannah Bishop and Mike Williamson of JBA Consulting carried out this work.

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Purpose

This document has been prepared as a Final Report for South Tyneside Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by South Tyneside Council for the purposes for which it was originally commissioned and prepared.

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Acknowledgements

JBA would like to thank representatives of South Tyneside Council, the Environment Agency and Northumbrian Water for information provided to inform this assessment.

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Executive summary

This Level 1 Strategic Flood Risk Assessment (SFRA) is an update to the Draft Level 1 Strategic Flood Risk Assessment, completed 2018, using up-to-date flood risk information together with the most-current flood risk and planning policy available from the National Planning Policy Framework[1] (NPPF) (2021) and Flood Risk and Coastal Change Planning Practice Guidance[2] (FRCC-PPG).

The Level 1 SFRA is focused on collecting readily available flood risk information from a number of stakeholders, the aim being to help identify the number and spatial distribution of flood risk sources present throughout the South Tyneside Council's Local Plan area to inform the application of the Sequential Test.

South Tyneside Council (STC) requires this Level 1 SFRA to initiate the sequential risk-based approach to the allocation of land for development and to identify whether application of the Exception Test is likely to be necessary. This will help to inform and provide the evidence base for the Local Planning Authority's (LPA) review of the Local Plan.

The LPA provided its latest assessed sites data and information. As assessment of flood risk is all assessed sites is provided to assist the LPA in its decision-making process for sites to take forward as part of the review of the Local Plan.

A number of STC's possible development sites are shown to be at varying risk from fluvial, tidal, surface water and residual risk. Development consideration assessments for all assessed sites are summarised through a number of strategic recommendations within this report and the development sites assessment spreadsheet in Appendix B. The strategic recommendations broadly entail the following:

- Strategic Recommendation A – consider withdrawal based on significant level of fluvial / tidal flood risk (if development cannot be directed away from areas of risk);
- Strategic Recommendation B – Exception Test required;
- Strategic Recommendation C – detailed consideration of site layout and design around flood risk will be required; OR must consider SW risk through a full drainage strategy;
- Strategic Recommendation D – development could be allocated subject to the findings of a site-specific Flood Risk Assessment; and
- Strategic Recommendation E – development could be allocated on flood risk grounds subject to suitable consultation with the Local Planning Authority and Lead Local Flood Authority.

Possible development sites

A total of 721 sites were screened against the latest available flood risk information. The majority of the sites were residential at 698 with an additional 23 employment sites.

Following the flood risk screening, 15 sites are recommended as being potentially unsuitable for development due to their location within the functional floodplain.

There are two sites to which Strategic Recommendation B applies. Overall, there are 62 potential sites to which Strategic Recommendation C applies. Of these sites, 43 have over 97% within Flood Zone 1, meaning surface water is the main source of risk requiring mitigation at these sites. For these sites, the developer should carefully

[1] https://www.gov.uk/government/publications/national-planning-policy-framework--2
[2] https://www.gov.uk/guidance/flood-risk-and-coastal-change

consider site layout and design with a view to removing the development site footprint from the flood zone that is obstructing development i.e. the high and medium risk surface water flood zones. If this is not possible then the alternative would be to investigate the incorporation of on-site storage of water into the site design through appropriate SuDS, following detailed ground investigation.

Strategic Recommendation D applies to 402 sites with 398 of these sites being wholly within Flood Zone 1. Strategic Recommendation E applies to 240 sites.

SFRA Recommendations

The main planning policy and flood risk recommendations to come out of this SFRA are outlined briefly below and are based on the fundamentals of the National Planning Policy Framework and the Flood Risk and Coastal Change Planning Practice Guidance. Section 8.2 of this report provides further detail.

SFRA recommendation:

- No development within the functional floodplain, unless development is water compatible;
- Surface water flood risk should be considered with equal importance as fluvial risk;
- The sequential approach must be followed in terms of site allocation and site layout;
- Ensure site-specific Flood Risk Assessment are carried out to a suitable standard, where required, with full consultation required with the LPA / LLFA, the EA, and Northumbrian Water;
- Appropriate investigation and use of suitably sourced SuDS;
- Natural Flood Management techniques must be considered for mitigation;
- Phasing of development must be carried out to avoid possible cumulative impacts; and
- Planning permission for at risk sites can only be granted by the LPA following a site-specific FRA.

Included within this Level 1 SFRA, along with this main report, are:

- Detailed interactive GeoPDF maps showing all available flood risk information together with the assessed sites – Appendix A;
- Development site assessment spreadsheet detailing the risk to each site with recommendations on development – Appendix B;
- A note on the delineation of the functional floodplain following discussion and agreement between STC and the EA – Appendix C; and
- A User Guide for the SFRA – Appendix D.

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Abbreviations

AAP	Area Action Plan
ABD	Area Benefitting from Defences
ACDP	Area with Critical Drainage Problems
AEP	Annual Exceedance Probability
BGS	British Geological Survey
CaBA	Catchment Based Approach
CC	Climate change
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
DPD	Development Plan Document
DTM	Digital Terrain Model
EA	Environment Agency
FAA	Flood Alert Area
FAS	Flood Alleviation Scheme
FCDPAG	Flood and Coastal Defence Project Appraisal Guidance
FCERM	Flood and Coastal Erosion Risk Management
FCRMS	Flood and Coastal Risk Management Strategy
FDGiA	Flood Defence Grant in Aid
FEH	Flood Estimation Handbook
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
FRCC-PPG	Flood Risk and Coastal Change Planning Practice Guidance
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FRMS	Flood Risk Management Strategy
FRR	Flood Risk Regulations
FSA	Flood Storage Area
FWA	Flood Warning Area
FWMA	Flood and Water Management Act
GI	Green Infrastructure
GIS	Geographical Information Systems
HFM	Historic Flood Map
IDB	Internal Drainage Board
LA	Local Authority
LASOO	Local Authority SuDS Officer Organisation
LDF	Local Development Framework
LFRMS	Local Flood Risk Management Strategy
LFRZ	Local Flood Risk Zone
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum
MAFRP	Multi-Agency Flood Response Plan
MHCLG	Ministry of Housing, Communities and Local Government

NFM	Natural Flood Management
NGO	Non-Governmental Organisation
NPPF	National Planning Policy Framework
NW	Northumbrian Water
PCPA	Planning and Compulsory Purchase Act
PFRA	Preliminary Flood Risk Assessment
RBD	River Basin District
RBMP	River Basin Management Plan
RFO	Recorded Flood Outline
RFCC	Regional Flood and Coastal Committee
RoFSW	Risk of Flooding from Surface Water
RMA	Risk Management Authority
RoFRS	Risk of Flooding from Rivers and the Sea
SA	Sustainability Appraisal
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SoP	Standard of Protection
SPD	Supplementary Planning Document
STC	South Tyneside Council
SuDS	Sustainable Drainage System
SWMP	Surface Water Management Plan
UKCP09	UK Climate Projections 2009
UKCP18	UK Climate Projections 2018
WCS	Water Cycle Study
WFD	Water Framework Directive
WwNP	Working with Natural Processes

1 Introduction

1.1 Commission

South Tyneside Council (STC) commissioned JBA Consulting for the updating of the Draft Level 1 Strategic Flood Risk Assessment (SFRA) from October 2018. STC requires this update to bring the SFRA fully in line with the Environment Agency's (EA) 'How to prepare a strategic flood risk assessment[3]' guidance, last updated August 2019, at the time of writing.

STC is preparing a new Regulation 18 Draft Local Plan which will replace the Core Strategy (2007) and the Site-Specific Allocations Development Plan Document (2012). In order to support the preparation of the Plan, it will be informed by an up-to-date evidence base.

1.2 Strategic Flood Risk Assessment

All local planning authorities should produce a level 1 SFRA. A level 2 SFRA may also be required depending on whether the Local Authority has plans for development in flood risk areas, identified in the Level 1 SFRA. The EA's SFRA guidance for local planning authorities states:

"Your SFRA will help your planning authority make decisions about:

- *your local plan or spatial development strategy*
- *individual planning applications*
- *how to adapt to climate change*
- *future flood management*
- *emergency planning (the resources needed to make development safe)*

You also need it to help you:

- *carry out the sequential test for the local plan or spatial development strategy, and individual planning applications*
- *do the exception test, when you're proposing to allocate land for development in flood risk areas*
- *establish if a development can be made safe without increasing flood risk elsewhere*
- *decide when a flood risk assessment will be needed for individual planning applications*
- *identify if proposed development is in functional floodplain*
- *do the sustainability appraisal of the local plan or spatial development strategy."*

1.3 South Tyneside Level 1 SFRA

This SFRA has been carried out in accordance with Government's latest development planning guidance including the revised National Planning Policy Framework (NPPF) (2021) and flood risk and planning policy guidance, the Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG) (last updated March 2014, at the time of writing).

The latest guidance is available online via:

[3] https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment

http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change

An updated version of the NPPF was published on 20 July 2021 and sets out Government's planning policies for England and how these are expected to be applied. This revised Framework replaces the previous versions of the NPPF published in March 2012, July 2018 and December 2019 and is available via:

https://www.gov.uk/government/publications/national-planning-policy-framework--2#history

The purpose of a SFRA is to highlight areas that may flood, taking into account known sources of flooding and the likely impacts of climate change. This enables the local planning authority to prepare policies for flood risk management of potential areas of flood risk and to make development allocations taking this constraint into account.

It is advised that the SFRA should be used to inform the Sustainability Appraisals of Local Development Documents and it will provide the basis from which to apply the Sequential Test and Exception Test (if applicable) which come into play when it is not possible to locate development in a zone with a lower probability of flooding, most preferably Flood Zone 1.

The objective for the Local Plan process is to allocate land for vulnerable uses in lower flood risk flood zones. The SFRA will provide an aid to decision-making and forms part of the evidence base for the new Local Plan on the issue of flooding.

This SFRA assesses the spatial distribution of flood risk across the local authority area, and provides the discussion and guidance required to put this information into practice when taking account of flood risk in development plans and the level of detail required to carry out site specific Flood Risk Assessments (FRAs).

This SFRA makes use of the most up-to-date flood risk datasets, available at the time of submission, to assess the extent of risk, at a strategic level, to potential development allocation sites identified by STC which acts as the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA).

The SFRA appendices contain interactive GeoPDF maps (Appendix A) showing the potential development sites overlaid with the latest, readily available, gathered flood risk information along with a Development Site Assessment spreadsheet (Appendix B) indicating the level of flood risk to each site following a strategic assessment of risk. Each potential site is assigned a strategic recommendation, discussed in Section 6.5. This information will allow the LPA to identify the strategic development options that may be applicable to each site and to inform on the application of the Sequential Test.

1.4 Aims and objectives

The aims and objectives of this Level 1 SFRA, in line with the NPPF (2021), FRCC-PPG (2014), EA SFRA guidance (2020) and as specified by STC, are to:

- Determine the variations in risk from all sources of flooding including:
    - Fluvial and tidal from main rivers, ordinary watercourses, estuaries and coastlines (Flood Map for Planning and functional floodplain),
    - Surface water (pluvial and sewer),
    - Groundwater,
    - Residual risk from reservoirs and canals,
- Determine the risks to and from neighbouring authorities in the same flood catchments,
- Assess existing and future flood risk management, including defence infrastructure, defence types, Standards of Protection, condition as per T98 specifications, Areas Benefitting from Defences and associated residual risk,

- Assess both existing risk and long-term risk using the EA's latest climate change allowances (where available), and also historic flood events,
- Inform the Sustainability Appraisal of the Council's new Local Plan (up to 2039) so that flood risk is fully taken into account when considering allocation options and in the preparation of policies for flood risk management to ensure no increase in flood risk,
- Screen all potential development sites against flood risk data to enable application of the Sequential Test as part of the Level 1 SFRA and, where necessary, the Exception Test, through a Level 2 SFRA, when determining potential land use allocations,
- Identify the requirements for site-specific flood risk assessments in targeted locations, including those at risk from sources other than rivers,
- Determine the acceptability of flood risk in relation to the emergency planning capabilities of the Local Resilience Forum, focusing in particular on identifying safe access and egress routes from new developments, and also EA flood warnings,
- Consider opportunities to reduce flood risk to existing communities, infrastructure and developments through better management of surface water, provision for conveyance, storage of floodwater through appropriate Sustainable Drainage Systems (SuDS). Also, through natural flood management and the use of green infrastructure and open space for flood storage and amenity use through blue/green corridors,
- Review locations where additional development may significantly increase flood risk elsewhere (cumulative impacts) and where development pressures may require the Exception Test to be applied (i.e. where a Level 2 assessment is required),
- Recommend possible flood mitigation solutions that may be integrated into site design (by the developer) to minimise risk to property and life where flood risk has been identified as a potential constraint to future development,
- Provide a reference and policy document to advise and inform the general public and private and commercial developers of their obligations under the NPPF,
- Enable the SFRA to be used as a tool to inform the Development Management process about the potential risk of flooding associated with future planning applications and the basis for requiring site-specific FRAs where necessary,

1.5 Consultation

The EA's 2019 SFRA guidance recommends consultation with the following parties, external to the LPA:

- the EA,
- the LLFA,
- emergency planners,
- emergency services,
- water and sewerage companies,
- reservoir owners or undertakers, if relevant,
- internal drainage boards, if relevant,
- highways authorities,
- district councils,
- regional flood and coastal committees.

1.6 SFRA Future Proofing

This SFRA has been developed using the most up-to-date data and information available at the time of submission. The SFRA has been future proofed as far as possible though the reader should always confirm with the source organisation (STC) that the latest information is being used when decisions concerning development and flood risk are being considered. The FRCC-PPG, alongside the NPPF, is referred to throughout this SFRA, being the current primary development and flood risk guidance information available at the time of the finalisation of this SFRA.

The EA's 2019 SFRA guidance states a review of a SFRA should be carried out when there are changes to:

- the predicted impacts of climate change on flood risk,
- detailed flood modelling - such as from the EA or LLFA,
- the local plan, spatial development strategy or relevant local development documents,
- local flood management schemes,
- flood risk management plans,
- local flood risk management strategies,
- national planning policy or guidance.

The SFRA should also be reviewed after a significant flood event. It is in any authority's interest to keep the SFRA as up to date as possible.

Where possible, the SFRA should be kept as a 'live' entity and continually updated when new information becomes available. The EA requests for reports and maps to be published online and be easily updateable, when required.

This SFRA uses the EA's Flood Map for Planning (FMfP) version issued in May 2021 to assess fluvial to the potential development sites. The Flood Map for Planning is updated at quarterly intervals by the EA, as and when new modelling data becomes available. The reader should therefore refer to the online version of the Flood Map for Planning to check whether the flood zones may have been updated since May 2021, via the following link:

https://flood-map-for-planning.service.gov.uk/

To assess the surface water risk to the potential development sites, this SFRA uses the EA's Risk of Flooding from Surface Water (RoFSW) dataset, last updated March 2020 at the time of writing. This dataset can be updated periodically when applicable local surface water modelling is carried out that adheres to the EA's required methodology. The reader should therefore refer to the online version of the RoFSW map to check whether the surface water flood outlines have been updated, via the following link:

https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

2 Study area

The unitary authority and Borough of South Tyneside is located in the north east of England and is one of the five metropolitan districts that comprise the conurbation of Tyne and Wear. The borough covers an area of 64.43 km^2 and has a population of approximately 148,127 according to the 2011 Census[4].

The nature of flood risk in South Tyneside is varied and there is no single cause of flooding. Surface water, groundwater, fluvial and coastal and sewer flooding are the main sources of flooding. In some instances, sites may suffer from a combination of more than one source of flooding.

South Tyneside contains the Main Rivers of the Rivers Tyne and Don and is located on the south bank of the River Tyne and extends from the mouth of the river at South Shields, west to Gateshead. South Tyneside is largely urbanised, particularly in the north where the main settlements of South Shields, Jarrow and Hebburn have developed along the riverside and expanded towards the south of the borough, which in contrast still retains open countryside with smaller settlements such as the urban fringes of Whitburn, Cleadon and the Boldons.

The borough is bordered by the City of Sunderland to the south, Gateshead to the West, the North Sea to the east and North Tyneside to the north. The tidally influenced River Tyne forms the northern boundary with North Tyneside.

The area has a history of mining, shipbuilding, heavy engineering and port related industries which formed important sources of income, employment and the economy, which helped to expand the tourism and culture industry of the borough

The Industrial Revolution enabled South Tyneside to become a popular destination for those in search of work. Irish and Scottish people flocked to the coalmines and shipyards in the area, so much so that Jarrow was nicknamed 'little Ireland' and Hebburn, 'Little Aberdeen'.

Coal mining was the first large scale non-agricultural industry to arrive in South Tyneside, and by 1794 a colliery was in operation in Hebburn. For over 200 years, coal was also used in the process for making salt. In 1768 South Shields had more than 200 salt pans making it the most important salt making town in Britain, thus, along with shipbuilding, was a major influence in both the social and economic development of South Tyneside.

Historically, flooding has significantly affected parts of South Tyneside with a number of large scale, damaging flood events having occurred (See Section 5.6). Due to the increasing effects of climate change, awareness and preparedness for flooding and coastal erosion, both at a local and national scale, is vital in reducing flood risk to local authority areas.

Many areas of the floodplain are disconnected due to the over - deepening on the River Don. There are steep sloping areas of land in the Cleadon Hills and West Boldon, where elevations reach over 90 m AOD (Above Ordnance Datum). The study area falls into the Northumbria River Basin District (RBD) and is served by Northumbrian Water Limited, the local water and sewerage provider.

4 https://www.ons.gov.uk/census/2011census

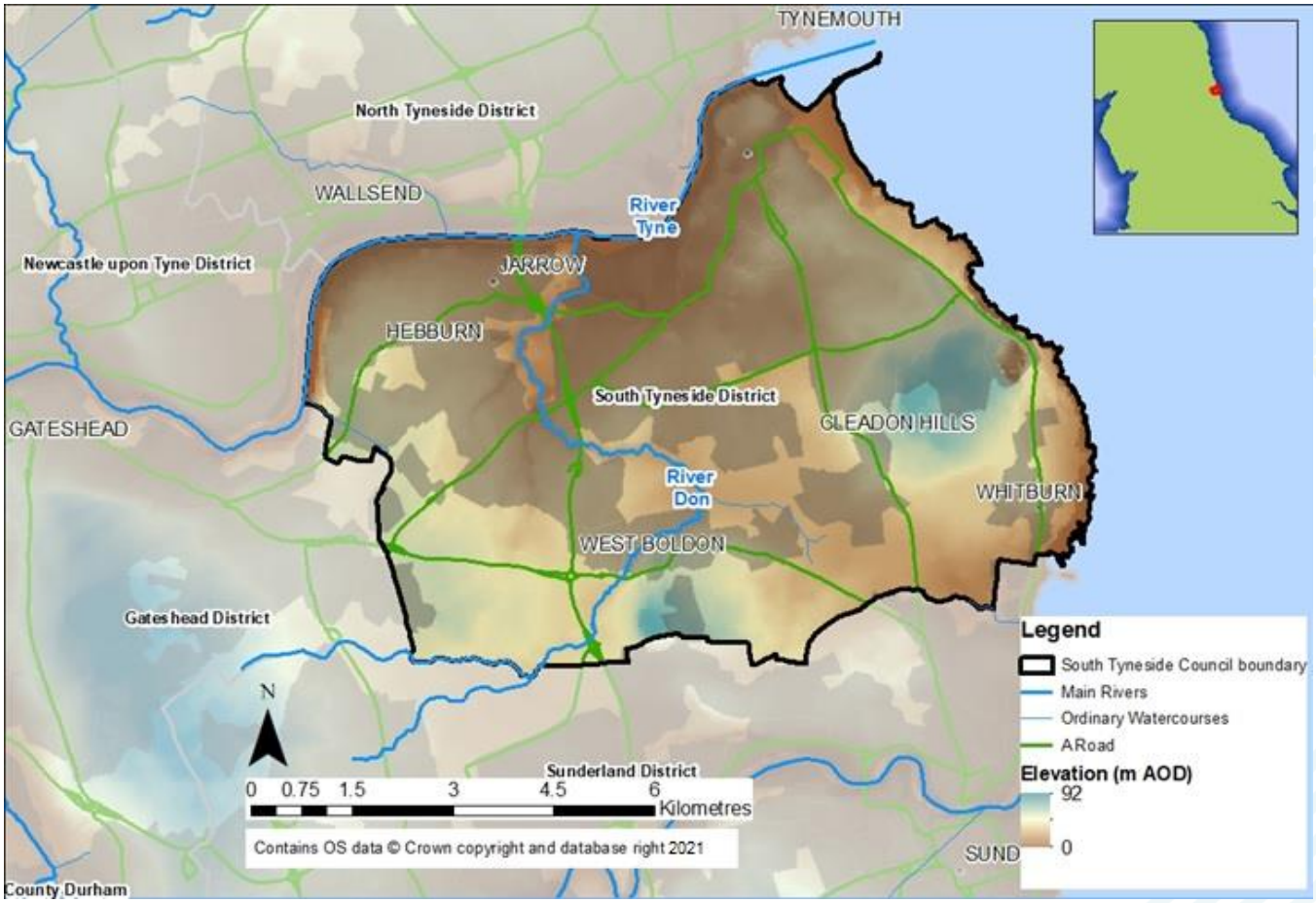

Figure 2-1: Study area

2.1 Main rivers

Main rivers are usually larger rivers and streams. The EA has permissive powers to carry out maintenance, improvement or construction work on main rivers to manage flood risk. The EA also regulate development or works on, over, under or within 8 metres of fluvial main river watercourses (16 metres for tidal main river watercourses) under the Environmental Permitting (England and Wales) Regulations 2016. This also includes within the floodplain, if the works do not have planning permission and works involving quarrying or excavation within 16 metres of any main river, flood defence or culvert.

https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

The main rivers of note where flood risk and flood management exist are primarily on the:

- River Tyne
- River Don

2.2 Ordinary watercourses

Ordinary watercourses are those that are not designated as Main River and therefore come under the control of the LLFA, who have Permissive Powers to carry out works when necessary and have regulatory control over certain development activities within the watercourse channel. Responsibility for the maintenance of ordinary watercourses lies with the riparian owner.

3 Understanding flood risk

3.1 Sources of flooding

Flooding is a natural process and can happen at any time in a wide variety of locations that are susceptible, as discussed below. It constitutes a temporary covering of land not normally covered by water and presents a risk when human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways. Major sources of flooding (also see Figure 3-1) include:

- **Fluvial** (main rivers and ordinary watercourses) – inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- **Tidal** – sea; estuary; overtopping of defences; breaching of defences; other flows (e.g. fluvial surface water) that could pond due to tide locking; wave action.
- **Surface water** – surface water flooding covers two main sources including direct run-off from adjacent land (pluvial) and surcharging of piped drainage systems (public sewers, highways drains, etc.)
- **Groundwater** – water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.
- **Infrastructure failure** – reservoirs; canals; industrial processes; burst water mains; blocked sewers or failed pumping stations.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.

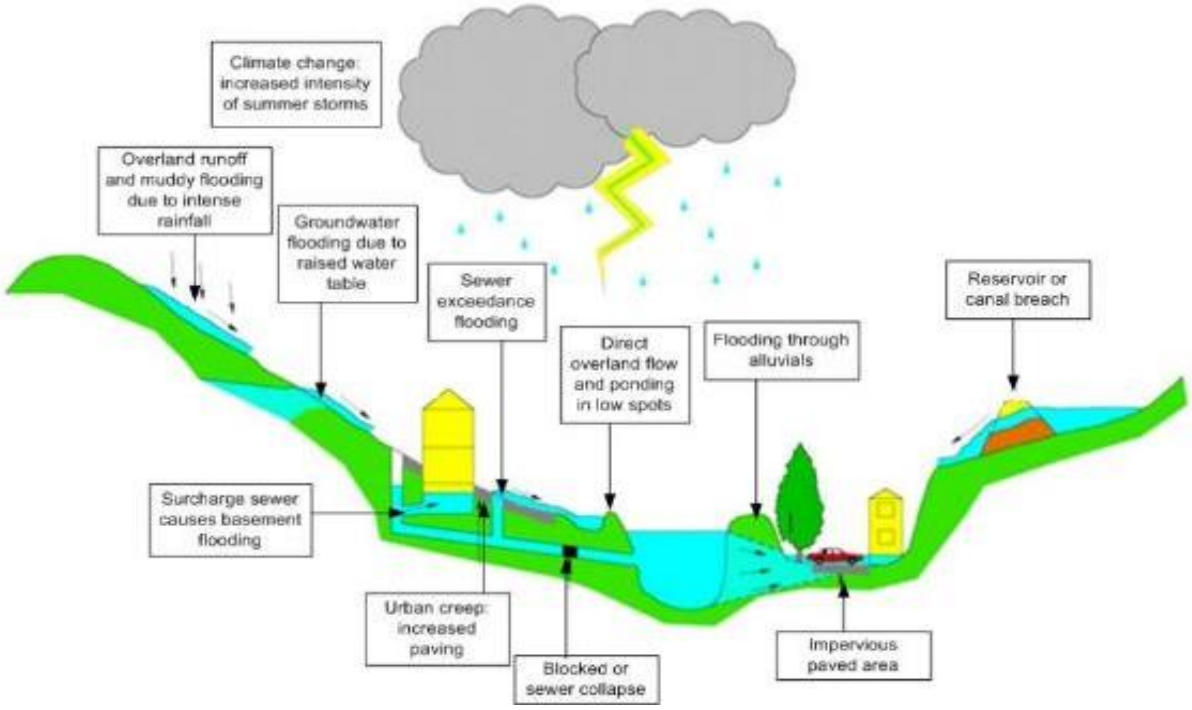

Figure 3-1: Flooding from all sources

3.2 Likelihood and consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 3-2 below. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

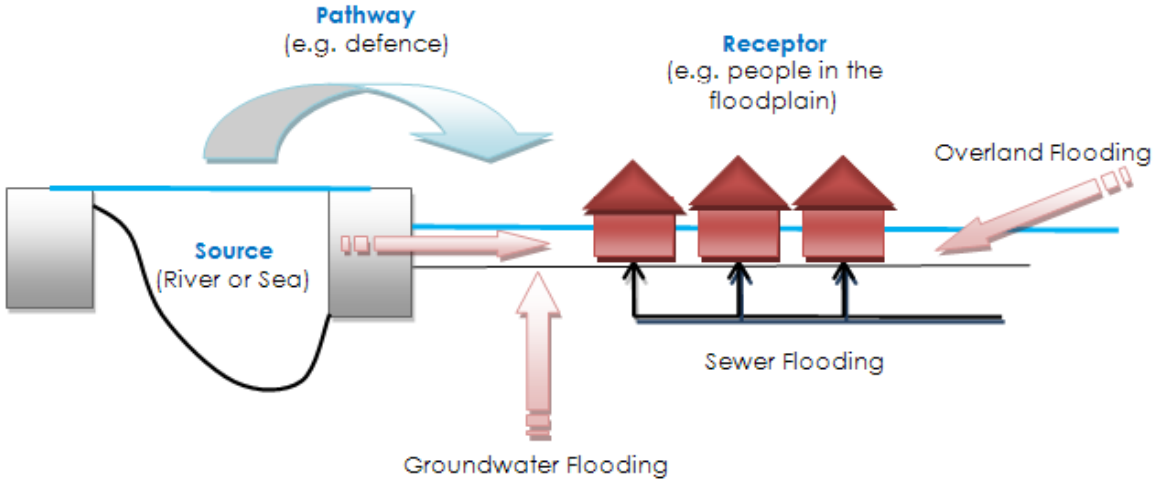

Figure 3-2: Source-Pathway-Receptor Model

The principal sources are rainfall or higher than normal sea levels, the most common pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets and the receptors can include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding, but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk in order to apply this guidance in a consistent manner.

3.2.1 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% AEP indicates the flood level that is expected to be reached on average once in a hundred years, i.e. it has a 1% chance of occurring in any one year, not that it will occur once every hundred years.

- 0.1% AEP = 1 in 1000-year event
- 1% AEP = 1 in 100-year event
- 3.33% AEP = 1 in 30-year event

The FRCC-PPG states that in terms of flood risk and coastal change, the lifetime of residential development should be considered as a minimum of 100 years, unless there is specific justification for considering a shorter period.

Table 3-1 provides an example of the flood probabilities used to describe the fluvial and tidal flood zones as defined in the FRCC-PPG and as used by the EA in its Flood Map for Planning (Rivers and Sea). Note that Flood Zone 3b (the functional floodplain) is not included in the FMfP but is used by the LPA to show where new development should not be permitted. Also note that the FMfP does not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map
Zone 3b The Functional Floodplain	**This zone comprises land where water has to flow or be stored in times of flood.** Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

Flood Zone	Definition
	(Not separately distinguished from Zone 3a on the Flood Map)

Table 3-1: NPPF flood zones[5]

3.2.2 Consequence

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g. financial loss, emotional distress, health problems). Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure of the population, presence and reliability of mitigation measures etc.). Flood risk is then expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

3.3 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences) and the vulnerability of receptors as mentioned above.

3.3.1 Actual risk

This is the risk 'as is' taking into account any flood defences that are in place for extreme flood events (typically these provide a minimum Standard of Protection (SoP)). Hence, if a settlement lies behind a fluvial flood defence that provides a 1 in 100-year SoP then the actual risk of flooding from the river in a 1 in 100-year event is generally low. However, the residual risk may be high in that the impact of flood defence failure would likely have a major impact.

Actual risk describes the primary, or prime, risk from a known and understood source managed to a known SoP. However, it is important to recognise that risk comes from many different sources and that the SoP provided will vary within a river catchment. Hence, the actual risk of flooding from the river may be low to a settlement behind the defence but moderate from surface water, which may pond behind the defence in low spots and is unable to discharge into the river during high water levels.

3.3.2 Residual risk

Defended areas, located behind EA, STC and private organisation flood defences, remain at residual risk as there is a risk of overtopping or defence breach during significant flood events. Whilst the potential risk of failure may be reduced, consideration of inundation and the impact on development needs to be considered.

Paragraph 041 of the FRCC-PPG defines residual risk as:

"…those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- *The failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;*
- *failure of a reservoir, or;*

[5] Table 1: Flood Zones, Paragraph 065 of the Flood Risk and Coastal Change Planning Practice Guidance

- *a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.*

Areas behind flood defences are at particular risk from rapid onset of fast-flowing and deep-water flooding, with little or no warning if defences are overtopped or breached."

Even when flood defences are in place, there is always a likelihood that these could be overtopped in an extreme event or that they could fail or breach. Where there is a consequence to that occurrence, this risk is known as residual risk. Defence failure can lead to rapid inundation of fast flowing and deep floodwaters, with significant consequences to people, property and the local environment behind the defence. Whilst the actual risk of flooding to a settlement that lies behind a fluvial flood defence that provides a 1 in 100-year SoP may be low, there will always be a residual risk from flooding if these defences overtopped or failed that must be taken into account. Because of this, it is never appropriate to use the term "flood free".

Developers must be able to demonstrate that development will be safe for the lifespan of the development. To that end, Paragraph 042 of the FRCC-PPG states:

"Where residual risk is relatively uniform, such as within a large area protected by embanked flood defences, the Strategic Flood Risk Assessment should indicate the nature and severity of the risk remaining, and provide guidance for residual risk issues to be covered in site-specific flood risk assessments. Where necessary, local planning authorities should use information on identified residual risk to state in Local Plan policies their preferred mitigation strategy in relation to urban form, risk management and where flood mitigation measures are likely to have wider sustainable design implications".

4 The planning framework and flood risk policy

4.1 Introduction

The main purpose of this section of the SFRA is to provide an overview of the key planning and flood risk policy documents that have shaped the current planning framework. This section also provides an overview and context of the LLFA's and LPA's responsibilities and duties in respect to managing local flood risk including but not exclusive to the delivery of the requirements of the Flood Risk Regulations (FRR) 2009 and the Flood and Water Management Act (FWMA) 2010[6].

Figure 4-1 illustrates the links between legislation, national policy, statutory documents and assessment of flood risk. The figure shows that whilst the key pieces of legislation and policy are separate, they are closely related, and their implementation should aim to provide a comprehensive and planned approach to asset record keeping and improving flood risk management within communities.

It is intended that the non-statutory Surface Water Management Plans (SWMPs) and SFRAs can provide much of the base data required to support the delivery of the LLFA's statutory flood risk management tasks as well supporting local authorities in developing capacity, effective working arrangements and informing Local Flood Risk Management Strategies (LFRMS) and Local Plans, which in turn help deliver flood risk management infrastructure and sustainable new development at a local level. This SFRA should be used to support the LPA's emerging Local Plan and to help inform planning decisions.

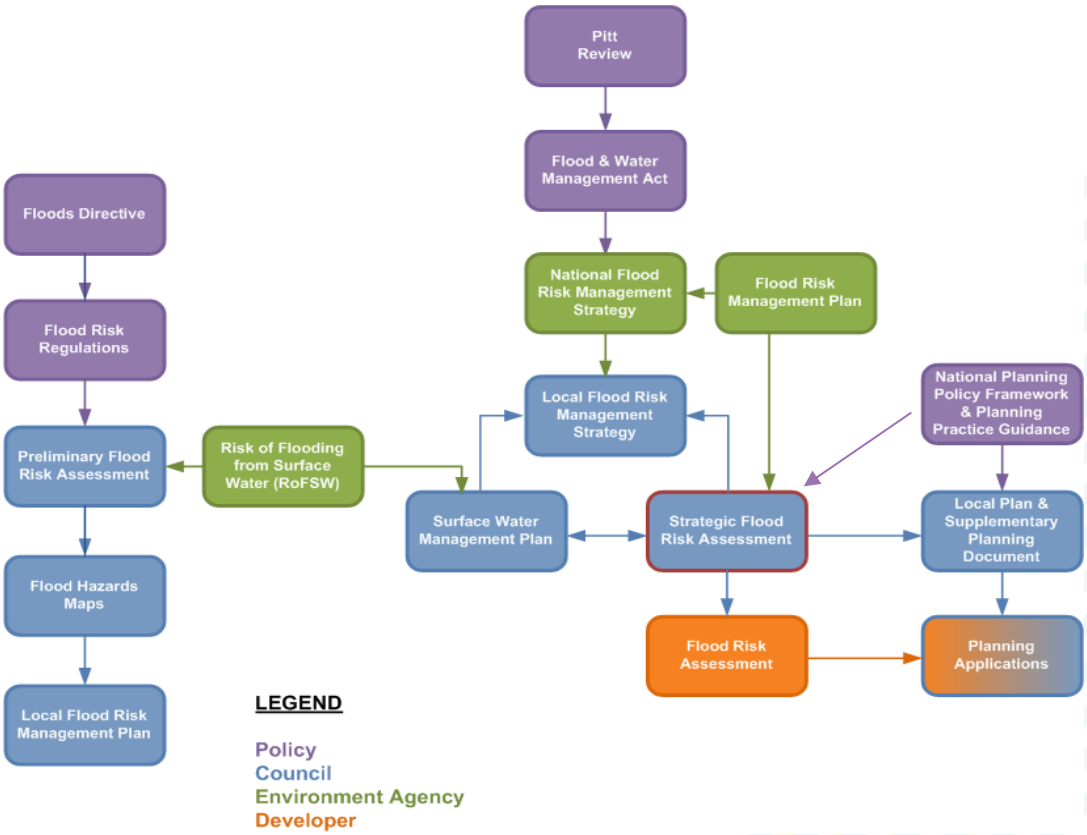

Figure 4-1: Key documents and strategic planning links with flood risk

[6] https://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

4.2 Legislation

4.2.1 EU Floods Directive & the Flood Risk Regulations

The European Floods Directive (2007) sets out the EU's approach to managing flood risk and aims to improve the management of the risk that floods pose to human health, the environment, cultural heritage and economic activity. The Directive was translated into English law by the Flood Risk Regulations which require LLFAs and the EA to produce Flood Risk Management Plans (FRMPs).

The Directive puts in place a six year cycle of producing Preliminary Flood Risk Assessments (PFRAs) with the aim of identifying significant Flood Risk Areas; preparing flood hazard and risk maps; and preparing FRMPs. The first six year cycle was completed in December 2015 and the second six year cycle is currently underway.

Figure 4-2: EU Floods Directive

PFRAs should cover the entire LLFA area for local flood risk (focusing on ordinary watercourses, surface water and groundwater flooding). Where significant Flood Risk Areas are identified using the national approach (and locally reviewed), the LLFA is then required to undertake flood risk hazard mapping and to produce FRMPs. FRMPs are also completed for each RBD in England and Wales by the EA.

The FRMP should consider objectives for flood risk management (reducing the likelihood and consequences of flooding) and measures to achieve those objectives. Significant Flood Risk Areas were not identified in South Tyneside therefore the LLFA was not required to produce a FRMP. A FRMP was however completed by the EA for the Northumbria RBD. See Section 4.2.5

The EA has implemented one of the exceptions for creating PFRAs, etc. for Main Rivers and coastal flooding, as they already have mapping (i.e. EA Flood Map for Planning (Rivers and Sea), Risk of Flooding from Rivers and Sea Map) and plans (i.e. CFMPs, SMPs) in place to deal with this. The EA has therefore focused their efforts on assisting LLFAs through this process.

4.2.2 South Tyneside Preliminary Flood Risk Assessments 2011 and 2017

The first cycle PFRA for South Tyneside was submitted to the EA in June 2011. The PFRA provides a high level overview of local flood risk, from sources including surface water, groundwater and ordinary watercourses.

The second cycle PFRA, reviewed during 2017 used all relevant current flood risk data and information to update the 2011 version, and was agreed with the EA in December 2017. There has been no change to the assessment of risk in the borough of South Tyneside since the previous 2011 PFRA.

The PFRA methodology, based on the EA's Final PFRA Guidance and DEFRA's Guidance on selecting Flood Risk Areas, did not identify any Flood Risk Areas within South Tyneside. The PFRA has evidence of 152 historic incidents within the borough, which have varied greatly in their impact and significance. These events, however have not caused 'significant harmful consequences' although these flood incidents may have been significant on a local level. The PFRA confirms that there are no 'significant flood risk areas' in relation to surface water, groundwater and ordinary watercourses within South Tyneside.

The PFRA still recognised the need to produce a Flood and Coastal Risk Management Strategy (2017-2022) for the area however, as part of STCs obligations as a LLFA under the Flood and Water Management Act. See Section 4.7.4.

4.2.3 Catchment Flood Management Plans (CFMP)

The CFMPs were carried out by the EA in 2009 and were designed to establish flood risk management policies which will deliver sustainable flood risk management for the long term. The CFMPs were used by the EA to help direct resources to where the areas of greatest risk are.

The CFMPs contain useful information about how the catchments work, previous flooding and the sensitivity of the river systems to increased rainfall. The EA draw on the evidence and previous measures and proposals set out in the CFMPs to help develop the FRMPs for RBDs. South Tyneside is included within the Tyne CFMP[7].

4.2.4 Shoreline Management Plans

The management of coastal flooding and coastal erosion risks is set out in Shoreline Management Plans (SMP) produced by Coastal Groups working with the EA and coastal district councils. The purpose of the SMPs is to provide a large-scale assessment of the risks associated with coastal processes and a policy framework to reduce these risks, both to people and the environment, in a sustainable way over the following 100 years.

The coastline of South Tyneside is covered by the River Tyne to Flamborough Head SMP2[8]. This SMP was produced in 2007 so is now 11 years old at the time of writing. The resulting Action Plan for the area of coastline along South Tyneside for which STC is responsible included the requirement for good integrated management of the developed coastal frontage immediately south of the Tyne, in relation to regeneration plans at the time. With this there was a requirement to ensure the enhancement of natural ecological features in this area. Further south, from Trow Point, the emphasis was on the management of the retreating coastline, including the planned relocation of car parks and possibly the coastal road.

At the time of writing, the SMP2 Action Plan is under review. STC is carrying out coastal monitoring to establish the next steps.

4.2.5 Flood Risk Management Plans

Following on from the CFMPs, completed in 2009, FRMPs are designed to set out the risk of flooding from rivers, sea, surface water, groundwater and reservoirs within each RBD and to detail how RMAs will work with communities to manage flood risk up to 2021 for current cycle, at the time of writing. Both the River Basin Management Plans (RBMP) and FRMPs have been developed by the EA in tandem to ensure that flood defence schemes can provide wider environmental benefits during the same six-year cycle. Both flood risk management and river basin planning form an important part of a collaborative and integrated approach to catchment planning for water. Each EU member country must produce FRMPs as set out in the EU Floods Directive 2007.

Northumbria RBD FRMP, 2016

South Tyneside is within the Northumbria RBD which covers an area of approximately 9,029 km^2 and contains 2.5 million people. The Northumbria RBD extends from the Scottish Border in the north through Northumbria to Stockton-upon-Tees in the south, including parts of Cumbria to the west and extends to the North Sea to the east.

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[7] https://www.gov.uk/government/publications/river-tyne-catchment-flood-management-plan
[8] Shoreline Management Plan 2, River Tyne to Flamborough Head, Final Plan, February 2007

The Northumbria RBD comprises four management catchments which range from industrial urban areas in the east to the moors, hills and valleys of the Pennines in the west. Around 67% of the RBD is farmed or used for forestry, with a mixture of arable and livestock production. There are almost 13,000 people at high risk of surface water flooding (more than a 1 in 30-year chance of being flooded in any year) and over 6,000 people are at high risk of flooding from rivers and sea with a high 1 in 30-year chance of being flooded in any one year, within the Northumbria RBD[9].

Figure 4-3 is an extract from the Northumbria FRMP showing all the catchments within the RBD. The majority of South Tyneside is within the Tyne catchment, with a small proportion in the south within the Wear catchment.

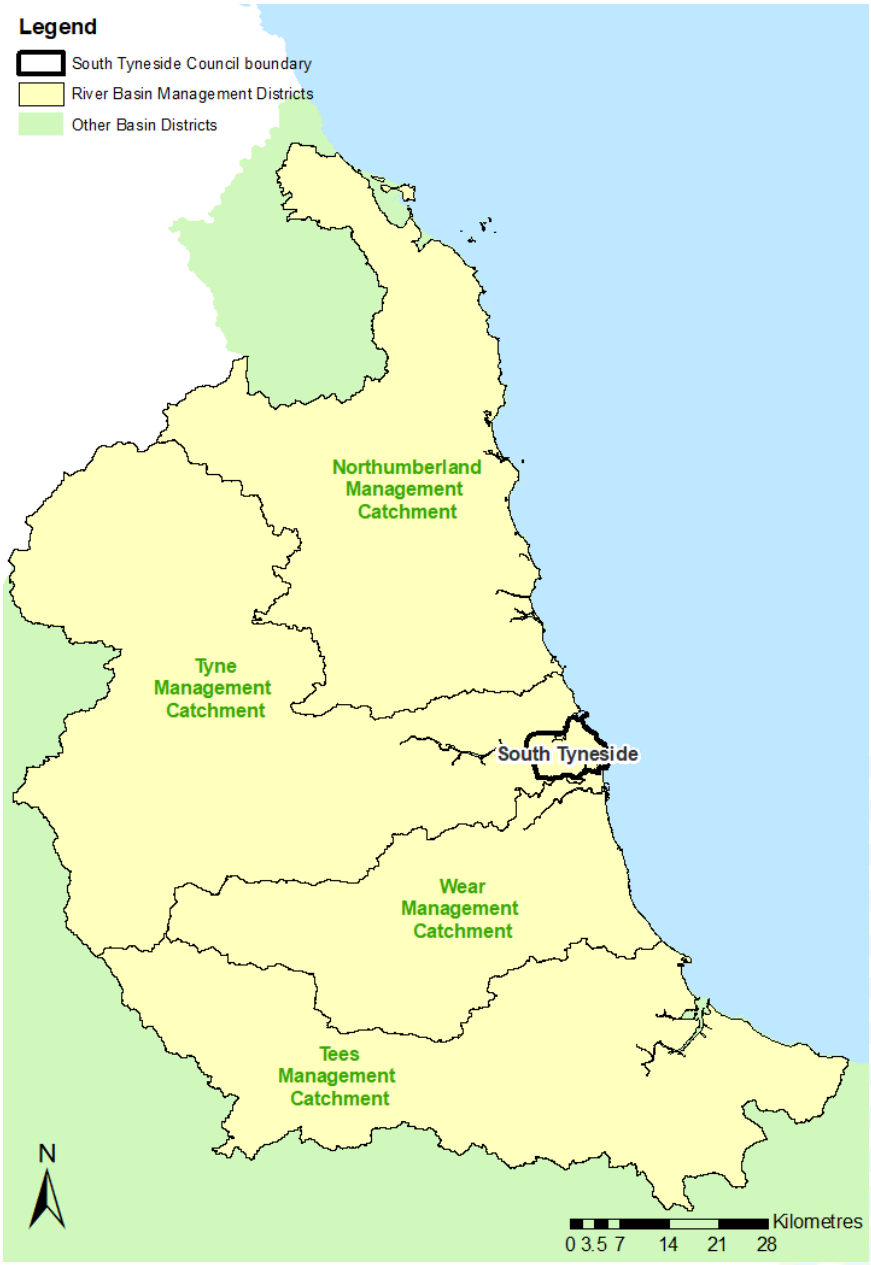

Figure 4-3: Overview of Northumbria RBD catchments

[9] Northumbria River Basin District Flood Risk Management Plan 2015-2021, PART B – Sub Areas in the Northumbria River Basin District, March 2016

River Tyne catchment

The River Tyne is generally a rural catchment located in the North East of England and has an agricultural based landscape in the west and the cities of Newcastle and Gateshead to the east of the catchment. The main consequences of flooding occur in the urban areas of the catchment, highlighted in Figure 4-4, extracted from the Northumbria RBD FRMP, which provides an overview of the River Tyne catchment.

The risk of flooding varies through the catchment with the changing character of the landscape and land use variances. The headwaters drain remote moorland and flow through narrow, steep valleys which dominate the western area. There are a number of regionally important reservoirs in the upland area of North Tyne, Rede and Derwent that provide water supply and can affect flood flows, these include the Kielder and Derwent reservoirs. They are also able to maintain river flows in the Rivers Tyne, Wear and Tees via water transfer infrastructure the eastern slopes of Cross Fell in the Pennines and flows eastward to the North Sea. The middle catchment contains fertile agricultural plains with a number of towns along the watercourses. The lower sections of the catchment include the urban areas of Newcastle, Gateshead, North Tyneside and South Tyneside. The River Tyne flows into the North Sea, along the northern border of South Tyneside, and is tidally influenced from Wylam to the coast. Flood risk management policies within the River Tyne catchment, upstream of South Tyneside, will have an impact on flood risk within South Tyneside[10].

Other sources of flooding from ordinary watercourses, groundwater and sewers are also significant in this catchment. The Risk of Flooding from Surface Water map (December 2013) shows a widespread problem. There have been many reported incidents in recent years of these types of problems affecting householders and businesses.

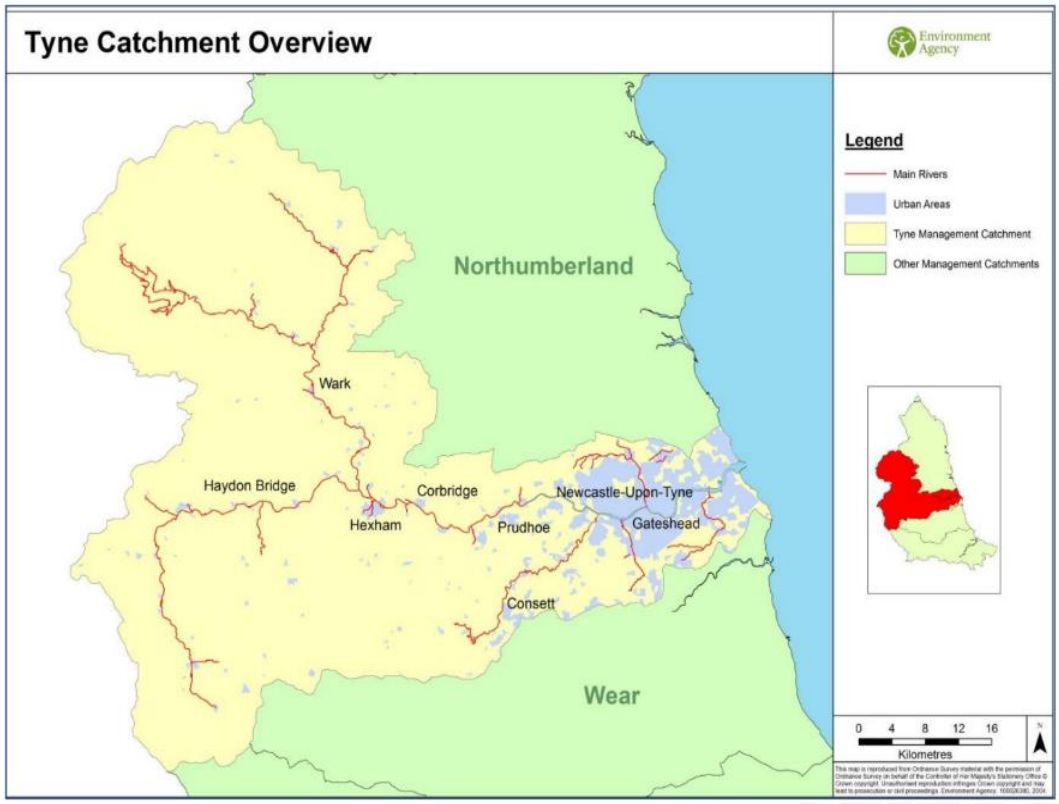

Figure 4-4: River Tyne catchment (Northumbria RBD FRMP)

[10] Northumbria River Basin District Flood Risk Management Plan 2015-2021, Part B. 2016

The Northumbria RBD FRMP summarised various measures to help manage flood risk in the Tyne catchment. Those that may apply to South Tyneside include:

- Prevention of risk:
  - Developing a register of structures which may impact on flood risk and ensure that such structures are maintained
  - Promote creation of floodplain woodland where the research indicates that it would have a beneficial in the North Tyne and South Tyne Catchments
  - Within the upland peat areas seek opportunities to block grips and drainage channels where there is evidence it will reduce run off rates in the North Tyne and South Tyne Catchments
- Preparation for risk:
  - Ensure that key infrastructure can operate during flooding or recover rapidly after flooding. This will assist in making communities more resilient to flooding and speeds up the recovery process. This action is assigned to all six LLFAs across the catchment
- Protection from risk:
  - Improving flood plain storage in the upper catchments of the Rede, South Tyne, Tyne and Team to reduce peak flood flows in the lower catchments (four measures)
  - Carry out an assessment of water company assets to ensure they are operational and resilient at all times across the catchment
  - Seek opportunities within the catchment to create habitat creation opportunities and to improve flood plain connectivity on the River Don
  - Investigate the opportunity and feasibility of providing improved flood protection to Newcastle Quayside area

River Wear catchment

The River Wear is a predominantly rural catchment located in the North East of England. The upper part of the catchment is almost entirely within the North Pennines, characterised by upland heather and peat moors, steep sided valleys and narrow bottoms and small market towns. As the river descends through the catchment it passes through a more agricultural landscape of wider valleys and more open floodplains. Figure 4-5, extracted from the Northumbria RBD FRMP, provides an overview of the River Wear catchment.

Figure 4-5: River Wear catchment (Northumbria RBD FRMP)

The Northumbria RBD FRMP summarised various measures to help manage flood risk in the Tyne catchment. Those that may apply to South Tyneside include:

- Preparing for risk
  - Assessing Flood Risk to infrastructure and developing emergency plan for them to ensure that they are resilient to flood risk, across the catchment.
- Protecting from risk
  - Carry out coastal flooding study around Seaburn to identify opportunities to reduce risk

4.2.6 Flood & Water Management Act (2010)

The Flood and Water Management Act (FWMA) was enacted in April 2010. It aims to improve both flood risk management and the way we manage our water resources.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for LAs, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth. Table 4-1 provides an overview of the key LLFA responsibilities under the FWMA.

FWMA Responsibility	Description of duties and powers	LLFA Status
Flood and Coastal Risk Management Strategy	The LLFA has a duty to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategies will build on information such as national risk assessments and will use consistent risk based approaches across different LA areas and catchments. The local strategy will not be secondary to the national strategy; rather it will have distinct objectives to manage local flood risks important to local communities.	2017 (See Section 4.7.4)
Duty to contribute to sustainable development	The LLFA has a duty to contribute towards the achievement of sustainable development.	Ongoing
Duty to comply with national strategy	The LLFA has a duty to comply with national flood and coastal risk management strategy principles and objectives in respects of its flood risk management functions.	Ongoing
Investigating flood Incidents	The LLFA, on becoming aware of a flood in its area, has (to the extent it considers necessary and appropriate) to investigate and record details of "locally significant" flood events within their area. This duty includes identifying the RMAs and their functions and how they intend to exercise those functions in response to a flood. The responding risk management authority must publish the results of its investigation and notify any other relevant risk management authorities.	Ongoing
Asset Register	A LLFA has a duty to maintain a register of structures or features, which it considers having a significant effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.	The Asset Register is an on-going project with watercourse inspections being carried out when conditions are appropriate. Can be viewed in person upon appointment at STC council offices
Duty to co-operate and Powers to Request Information	The LLFA must co-operate with other relevant authorities in the exercise of their flood and coastal erosion management functions.	Ongoing

FWMA Responsibility	Description of duties and powers	LLFA Status
Ordinary Watercourse Consents	The LLFA has a duty to deal with enquiries and determine watercourse consents where the altering, removing or replacing of certain flood risk management structures or features that affect flow on ordinary watercourses is required. It also has provisions or powers relating to the enforcement of unconsented works.	Ongoing
Works Powers	The Act provides a LLFA with powers to undertake works to manage flood risk from surface runoff, groundwater and on ordinary watercourses, consistent with the local flood risk management strategy for the area.	Ongoing
Designation Powers	The Act provides a LLFA with powers to designate structures and features that affect flooding or coastal erosion. The powers are intended to overcome the risk of a person damaging or removing a structure or feature that is on private land and which is relied on for flood or coastal erosion risk management. Once a feature is designated, the owner must seek consent to alter, remove, or replace it.	Ongoing
Emergency Planning	A LLFA is required to play a lead role in emergency planning and recovery after a flood event.	Northumbria Local Resilience Forum (Section 7.1.1)
Community Involvement	A LLFA should engage local communities in local flood risk management issues. This could include the training of community volunteers, the development of local flood action groups and the preparation of community flood plans, and general awareness raising around roles and responsibilities plans.	Various ongoing - Northumbria Community Risk Register -South Tyneside Council Emergency Plan (See Section 7) -Tyne and Wear shared community engagement officer
Planning Requirements for SuDS	Sustainable Drainage Systems (SuDS) are a planning requirement for major planning applications of 10 or more residential units or equivalent commercial development schemes with sustainable drainage. The LLFA is now a statutory planning consultee and it will be between the LPA and the LLFA to determine the acceptability of these proposed sustainable drainage schemes subject to exemptions and thresholds. Approval must be given before the developer can commence construction. Planning	North East Lead Local Flood Authorities Sustainable Drainage Local Standards, published

FWMA Responsibility	Description of duties and powers	LLFA Status
	authorities should use planning conditions or obligations to make sure that arrangements are in place for ongoing maintenance of any SuDS over the lifetime of the development.	July 2020[11]
Latest changes to FWMA legislation[12]		

Table 4-1: Key LLFA duties under the FWMA

4.3 Flood and water focused policies and plans

4.3.1 25 Year Environment Plan[13]

This Plan sets out government action to help the natural world regain and retain good health. It aims to deliver cleaner air and water in our cities and rural landscapes, protect threatened species and provide richer wildlife habitats. It calls for an approach to agriculture, forestry, land use and fishing that puts the environment first. The Plan also sets out how government will tackle the effects of climate change, considered to perhaps be the most serious long-term risk to the environment given higher land and sea temperatures, rising sea levels, extreme weather patterns and ocean acidification. The Plan aims to show that government will work with nature to protect communities from flooding, slowing rivers and creating and sustaining more wetlands to reduce flood risk and offer valuable habitats.

Focusing on flood risk, government will look to update the national flood and coastal erosion risk management strategy, looking to strengthen joint delivery across organisations. In terms of funding, government will look at current partnership arrangements ahead of a review of funding needs beyond 2021, seeking to attract more non-public sector investment, and make sure all relevant agencies are able to respond quickly and effectively to support communities if and when flooding does occur. The Plan states that the EA will use its role in statutory planning consultations to seek to make sure that new developments are flood resilient and do not increase flood risk. Government will also look strengthen the relevant protections in the NPPF.

For flood mitigation, government will focus on using more natural flood management solutions; increasing the uptake of SuDS, especially in new development; and improving the resilience of properties at risk of flooding and the time it takes them to recover should flooding occur.

[11] https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Roads-streets-and-transport/coastal%20erosion%20and%20flooding/SuDS%20%20Planning/NE-LLFA-SuDS-Standards-2020_final-July-2020-1.pdf
[12] http://www.legislation.gov.uk/ukpga/2010/29
[13] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/673203/25-year-environment-plan.pdf

Figure 4-6: Main goals and policy areas the Plan is intended to help work towards

4.3.2 Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through River Basin Management Plans (RBMP). The STC area is covered by the Northumbria Basin Management Plan, managed by the EA and published in 2015. Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques. The Northumbria RBMP, 2016, includes such examples whereby land management techniques have been designed to reduce flood risk whilst also reducing sediment loss and improving water quality. The EA is responsible for monitoring and reporting on the objectives of the WFD on behalf of Government. They work with Government, Ofwat, local government, non-governmental organisations (NGOs) and a wide range of other stakeholders including local businesses, water companies, industry and farmers to manage water[14].

The second management cycle of the WFD[15] has begun and the second RBMPs were completed in 2015, building upon the first set completed in 2009. RBMPs are designed to address the pressures facing the water environment in the river basin management plan districts and the actions that will address them. The plans describe required objectives and measures to protect and improve the water environment over the next 20 years and aim to achieve WFD targets from 2015 onwards to 2021.

The RBMPs, like the CFMPs, are important documents relevant to the development of the SFRA. The SFRA should take into account the wider catchment flood cell aims and objectives and understand how it can potentially contribute to the achievement of them.

The main responsibility for STC is to work with the EA to develop links between river basin management planning and the development of local authority plans, policies and assessments. In particular, the general programme of actions (measures) within the RBMPs highlight the need for:

- Strategic working with Northumbrian Water (NW) to seek partnership opportunities for improved infrastructure management e.g. reduced Combined Sewer Overflows (CSOs)
- Water Cycle Studies to promote water efficiency in new development through regional strategies and local development frameworks,
- Surface Water Management Plan implementation,
- Consideration of the WFD objectives (achieving good status or potential as appropriate) in the spatial planning process, including LDDs and Sustainable Community Strategies, and
- Promotion of the wide scale use of SuDS in new development.

4.4 Other related plans and policies

4.4.1 Catchment partnerships

The Catchment Based Approach (CaBA) embeds collaborative working at a river catchment scale to deliver cross cutting improvements to our water environments. The CaBA partnerships drive cost-effective practical delivery on the ground, resulting in multiple benefits including reduced flood risk and resilience to climate change.

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[14] https://www.gov.uk/government/publications/2010-to-2015-government-policy-water-quality/2010-to-2015-government-policy-water-quality#appendix-4-planning-for-better-water
[15] http://ec.europa.eu/environment/water/water-framework/info/timetable_en.htm

Catchment partnerships are groups of organisations with an interest in improving the environment in the local area and are led by a catchment host organisation. The partnerships work on a wide range of issues, including the water environment but also address other concerns that are not directly related to river basin management planning. Government is also working to strengthen or establish partnerships in the areas most affected by the December 2015 floods to encourage a more integrated approach to managing risk across all catchments.

The National Resilience Review will align closely with Defra's work on integrated catchment-level management of the water cycle in the Government's 25 year Environment Plan. Government's aspirations for the next cycle of planning (now to 2021) is for more integrated catchment planning for water, where Flood and Coastal Risk Management, River Basin Management, nature conservation and land management are considered together.

Catchment partnerships relevant to South Tyneside include:

- The Tyne Catchment Partnership hosted by the Tyne River Trust
- Wear Catchment hosted by the Wears Rivers Trust
- River Don partnership with a number of partners including Tyne River Trust, EA, Northumbrian Water, Wildlife Trust Durham, North East Local Nature Partnership Sunderland City Council, Gateshead Council and South Tyneside Council.

4.5 Planning legislation

4.5.1 Housing and Planning Act, 2016

The Act provides the statutory framework to build more homes that people can afford, expand home ownership, and improve housing management. The Act places a duty on local authorities to promote the development of starter homes, custom and self-build homes. The Act simplifies and speeds up the neighbourhood planning process to support communities that seek to meet local housing and other development needs through neighbourhood planning. In addition, the Act seeks to ensure that every area has a Local Plan, and gives the Secretary of State further powers to intervene if Local Plans are not effectively delivered.

The Secretary of State must also carry out a review of planning legislation, government planning policy and local planning policies, concerning sustainable drainage in relation to the development of land in England.

4.5.2 Localism Act

The Localism Act was given Royal Assent in November 2011 with the purpose of shifting power from Central Government back to local councils, communities and individuals. The Government abolished Regional Spatial Strategies, providing the opportunity for councils to re-examine the local evidence base and establish their own local development requirements for employment, housing and other land uses through the plan making process.

Additionally, this act places a duty to cooperate on local authorities, including statutory bodies and other groups, in relation to the planning of sustainable development. This duty to cooperate requires local authorities to:

"...engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter." (Provision 110).

This act, together with the Neighbourhood Planning (General) Regulations 2012, also provides new rights to allow Parish or Town Councils to deliver additional development

through neighbourhood planning (Neighbourhood Plans). This means local people can help decide where new homes and businesses should go and what they should look like. Local planning authorities can provide technical advice and support as neighbourhoods draw up their proposals. Neighbourhood Plans have a number of conditions and requirements as set out in the NPPF. Also refer to Paragraph 061-064 of the FRCC-PPG for information on neighbourhood planning and flood risk.

4.6 Planning policy

4.6.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was published in March 2012 and received a significant revision in July 2018. The latest update took place in July 2021. It forms the national policy framework in England and is based on core principles of sustainability. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions. The NPPF is accompanied by Planning Practice Guidance (PPG) notes which are updated as the need arises.

The PPG documents will, where necessary, be updated in due course to reflect the changes in the latest version of the NPPF.

The key changes compared to the 2012 NPPF include:

- Strategic policies should now 'manage flood risk from all sources' (para 160);
- Strategic policies should also now consider the 'cumulative impacts in, or affecting, local areas susceptible to flooding' (para 160), rather than just to or from individual development sites (see Section 6.8.1);
- Future risk from climate change. The 'sequential approach should be used in areas known to be at risk now or in the future from any form of flooding' (para 162) (see Sections 6.10 and Appendix B);
- Natural Flood Management. 'Using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management)' (para 161c) (see Section 5.7.4 and Appendix A);
- SuDS. 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 169) (see Section 6.11) and;
- Emergency planning. Emergency plans are required as part of an FRA that includes the inclusion of safe access and egress routes (para 167e) (Section 7).

As explained, the FRCC-PPG sits alongside the NPPF and sets out detailed guidance on how this policy should be implemented.

4.6.2 Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG)

At the time of writing, the current FRCC-PPG was published on 6 March 2014 and is available online via:

https://www.gov.uk/guidance/flood-risk-and-coastal-change

The Government will, where necessary be updating the FRCC-PPG to reflect the changes discussed above. It is advised that any hyperlinks within the FRCC-PPG that direct users to the previous 2012 NPPF should be disregarded.

Whilst the NPPF concentrates on high level national policy, the FRCC-PPG is more detailed. The practice guidance advises on how planning can take account of the risks associated with flooding and coastal change in plan making and the development management process. This is in respect of local plans, SFRAs, the sequential and

exception tests, permitted development, site-specific flood risk, Neighbourhood Planning, flood resilience and resistance techniques and the vulnerability of development to make development safe from flooding.

4.6.3 Local Plan

A Local Plan[16] is a statutory document prepared in consultation with the local community. It is designed to promote and deliver sustainable development. Local Plans have to set out a clear vision, be kept up to date and to set out a framework for future development of the local area, addressing needs and opportunities in relation to housing, the economy, community facilities and infrastructure as well as safeguarding the environment and adapting to climate change and securing good design.

Local Plans set the context for guiding decisions and development proposals and along with the NPPF, set out a strategic framework for the long-term use of land and buildings, thus providing a framework for local decision making and the reconciliation of competing development and conservation interests.

The aim of a Local Plan is to ensure that land use changes proceed coherently, efficiently, and with maximum community benefit. Local Plans should indicate clearly how local residents, landowners, and other interested parties might be affected by land use change. They are subject to regular periods of intensive public consultation, public involvement, negotiation and approval. The Local Plan should be the starting point when considering planning applications.

The NPPF requires that the evidence base for the Local Plan must clearly set out what is intended over the lifetime of the plan, where and when this will occur and how it will be delivered. The NPPF states that Local Plans should be supported by a SFRA and should take account of advice provided by the EA and other flood risk management bodies. This SFRA should be used to ensure that when allocating land or determining planning applications, development is located in areas at lowest risk of flooding. Policies to manage, mitigate and design appropriately for flood risk should be written into the Local Plan, informed by both this SFRA and the Sustainability Appraisal.

Government guidance on Local Plans can be found via:

https://www.gov.uk/guidance/local-plans--2

South Tyneside Local Plan

The Local Plan will be the statutory development plan for the borough, replacing the current Local Development Framework (April 2012) and with the exception of the International Advanced Manufacturing Park Area Action Plan, will replace the suite of Development Plan Documents. It will set out the spatial policies, guidance, land use designations and site allocations for the plan period against which all planning applications and development proposals in the borough will be assessed. It sets the formal legal framework for sustainable development patterns and lays the foundations for enabling regeneration and economic growth, whilst protecting our most valuable built and natural environment assets. The new Local Plan will cover the period 2021 to 2039.

International Advanced Manufacturing Park (IAMP) Area Action Plan (AAP)

Sets out site-specific policies for the comprehensive development of a new employment park on land to the north of the existing Nissan manufacturing plant. As this park straddles the border between Sunderland and South Tyneside, the Plan was jointly prepared by both Councils. The IAMP AAP was adopted in November 2017.

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[16] Town and Country Planning, England. The Town and Country Planning (Local Planning) (England) Regulations 2012

4.6.4 Sustainability Appraisal

The Sustainability Appraisal (SA) is a key component of the Local Plan evidence base, ensuring that sustainability issues are addressed during the preparation of local plans. The SA is a technical document which has to meet the requirements of the Strategic Environmental Assessment Directive 2001/42/EC which assesses and reports on a plan's potential impact on the environment, economy, and society. The SA carries out an assessment of the draft policies at various stages throughout the preparation of the Local Plan, and does this by testing the potential impacts, and consideration of alternatives are tested against the plan's objectives and policies. This ensures that the potential impacts from the plan on the aim of achieving sustainable development are considered, in terms of the impacts, and that adequate mitigation and monitoring mechanisms are implemented.

STC Sustainability Appraisal[17]

In August 2019, an interim sustainability appraisal for the Draft Local Plan was produced. The sustainability appraisal considers the whole draft Local Plan, including the assessment of reasonable alternatives. The process ensures that the 'proposals in the plan are the most appropriate given the reasonable alternatives' and supplies the justification and reasoning behind the preferred options carried forward in the Draft Local Plan. This process is the second stage (Stage B) of the SEA/SA process which must be undertaken to support the development of planning documents.

Stage A has already been completed by South Tyneside which has included producing a scoping report. The Scoping Report has been subject to two consultation periods, October – November 2013 and a consultation on an updated Scoping Report August – September 2018.

4.7 Flood risk management policy

4.7.1 STC Level 1 & 2 SFRA (February 2011)

In 2011, a combined Level 1 & 2 SFRA was commissioned by STC in order to review the existing Tyne and Wear SFRA (2007) and produce a Level 1 & 2 SFRA for South Tyneside alone. This SFRA was prepared in accordance with the now superseded PPS25 and its Practice Guidance. The study analysed current and future flooding issues in order to support the LPA assessment of future development sites, including providing data to inform the application of the Sequential Test. However, the evidence provided in the Level 1 SFRA was not detailed enough to justify development through the Exception Test. In this instance, a Level 2 SFRA was also completed.

The Level 2 SFRA provides a greater detail on the flood risk at key development and regeneration sites identified in the Level 1 Assessment. This includes more detail for the sites subject to flood risk and the Critical Drainage Areas (CDAs). Note: at the time of writing this 2021 Level 1 SFRA, the CDAs have since been removed as they have not been identified as areas of concern.

The Level 1 & 2 report stated that *"The CDAs identified in this SFRA should be taken as an initial starting point in the identification of areas for which a SWMP would be beneficial."* A SWMP was undertaken in 2014 following the findings of the Level 1 and 2 SFRA.

A number of conclusions were drawn from the report which are still current within this update, including:

- STC needs to carefully plan and control development

[17] https://www.southtyneside.gov.uk/article/36012/Emerging-Local-Plan

- STC needs to implement a robust approach to surface water management that controls surface water runoff from new and existing development
- Consistent regional development policies to manage runoff and development throughout the Tyne and Wear area are required
- Surface water management needs to take a holistic approach, taking into account all the sources of local flood risk, including from sewers, overland flow, culverted and open watercourses and groundwater
- Options to reduce flood risk in one location should not increase risk upstream or downstream.

4.7.2 Draft Level 1 SFRA (2018)

A Draft Level 1 SFRA was produced in 2018 to update the 2011 SFRA. This SFRA took account of the changes in policy due to the NPPF being first published in 2012.

4.7.3 Northumberland Water Cycle Study (2012)[18]

South Tyneside is included in the Northumberland Water Cycle Study (WCS). The objective of the WCS was to identify any constraints on housing and employment growth planned for the area up to 2031 that may be imposed by the water cycle and how these can be resolved i.e. by ensuring that appropriate water infrastructure is provided to support proposed development. Furthermore, it will provide a strategic approach to the management and use of water which ensures that the sustainability of the water environment in the region is not compromised.

The outline WCS carried out as a high level review of potential future development against the Water Cycle, such as water resources, water treatment and supply, wastewater, sewage treatment, flood risk and other environmental considerations.

4.7.4 National and Local Flood Risk Management Strategies

As presented in Figure 4-1 in Section 4.1, the FWMA establishes how flood risk will be managed within the framework of National Strategies for England and Local Strategies for each LLFA area.

The National Strategy for England has been developed by the EA with the support and guidance of Defra. It sets out principles for how flood risk should be managed and provides strategic information about different types of flood risk and which organisations are responsible for their effective management. The FWMA requires risk management authorities (local authorities, EA, sewerage companies and highways authorities) to work together and act consistently with the National Strategy in carrying out their flood and coastal erosion risk management functions effectively, efficiently and in collaboration with communities, businesses and infrastructure operators to deliver more effective flood risk management.

LLFAs have responsibility for developing a LFRMS for their area covering local sources of flooding (see Table 4-1). The local strategy produced must be consistent with the National Strategy. The local strategy should set out the framework for local flood risk management functions and activities and should raise awareness of local organisations with responsibilities for flood risk management in the area. The strategy should also facilitate partnership arrangements to ensure co-ordination between local organisations and an assessment of flood risk and plans and actions for managing risk, as set out under Section 9 of the FWMA.

The following link provides links to guidance for Risk Management Authorities (RMA) and local authorities on various subjects of flood risk management, including tools to

[18] http://www.northumberland.gov.uk/WAMDocuments/6927F080-A730-4C48-85A4-9024F4B56497_1_0.pdf?nccredirect=1

support LLFAs in developing their LFRMS or Flood and Coastal Risk Management Strategy (FCRMS) in STC's case:

https://www.gov.uk/guidance/flood-risk-management-information-for-flood-risk-management-authorities-asset-owners-and-local-authorities

South Tyneside Flood and Coastal Risk Management Strategy (2017-2022)[19]

The STC FCRMS sets out how the Council will manage flood risk and coastal management over a five year period from 2017-2022. The Strategy investigates flooding from surface water, groundwater, ordinary watercourses and sewers. The Strategy also examines coastal erosion risk management including how the Council aim to reduce the threat of coastal erosion as well as deliver social, economic and environmental benefits to the borough. The Strategy reflects the content of the National Flood and Coastal Erosion Risk Management Strategy and includes an action plan that details the significant actions required over the five year period to reduce risk to the borough, thus fulfilling the requirements of the FWMA 2010 (see Section 4.2.6).

STC will identify and address the issues highlighted in the Strategy regarding flood and coastal erosion risk management with a view to ensuring that STC remains active and at the forefront of protecting the borough from these issues. STC will continue to monitor actions identified as a result of the SWMP, 2014 (see Section 4.7.5), in the hope of finding ways in which to address the outstanding issues. At the time of writing, some of the actions have already been completed. The SWMP Action Plan will also be used to measure and evaluate the progress and performance of flood and coastal risk management in South Tyneside.

4.7.5 Surface Water Management Plans (SWMPs)

In June 2007, widespread extreme flooding was experienced in the UK. The Government review of the 2007 flooding, chaired by Sir Michael Pitt recommended that…

"…Local Surface Water Management Plans (SWMPs) … coordinated by local authorities, should provide the basis for managing all local flood risk."

The Government's SWMP Technical Guidance document[20], 2011, defines a SWMP as:

- *A framework through which key local partners with responsibility for surface water and drainage in their area, work together to understand the causes of surface water flooding and agree the most cost-effective way of managing surface water flood risk.*
- *A tool to facilitate sustainable surface water management decisions that are evidence based, risk based, future proofed and inclusive of stakeholder views and preferences.*
- *A plan for the management of urban water quality through the removal of surface water from combined systems and the promotion of SuDS.*

As a demonstration of its commitment to SWMPs as a structured way forward in managing local flood risk, Defra announced an initiative to provide funding for the highest flood risk authorities to produce SWMPs.

Defra's framework for carrying out a SWMP is illustrated by the SWMP wheel diagram, as shown in Figure 4-7. The first three phases involve undertaking the SWMP study,

[19] https://www.southtyneside.gov.uk/article/58236/Flood-and-Coastal-Risk-Management-Strategy
[20] Surface Water Management Plan Technical Guidance – https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance

whilst the fourth phase involves producing and implementing an action plan which is devised based on the evidence gained from the first three phases.

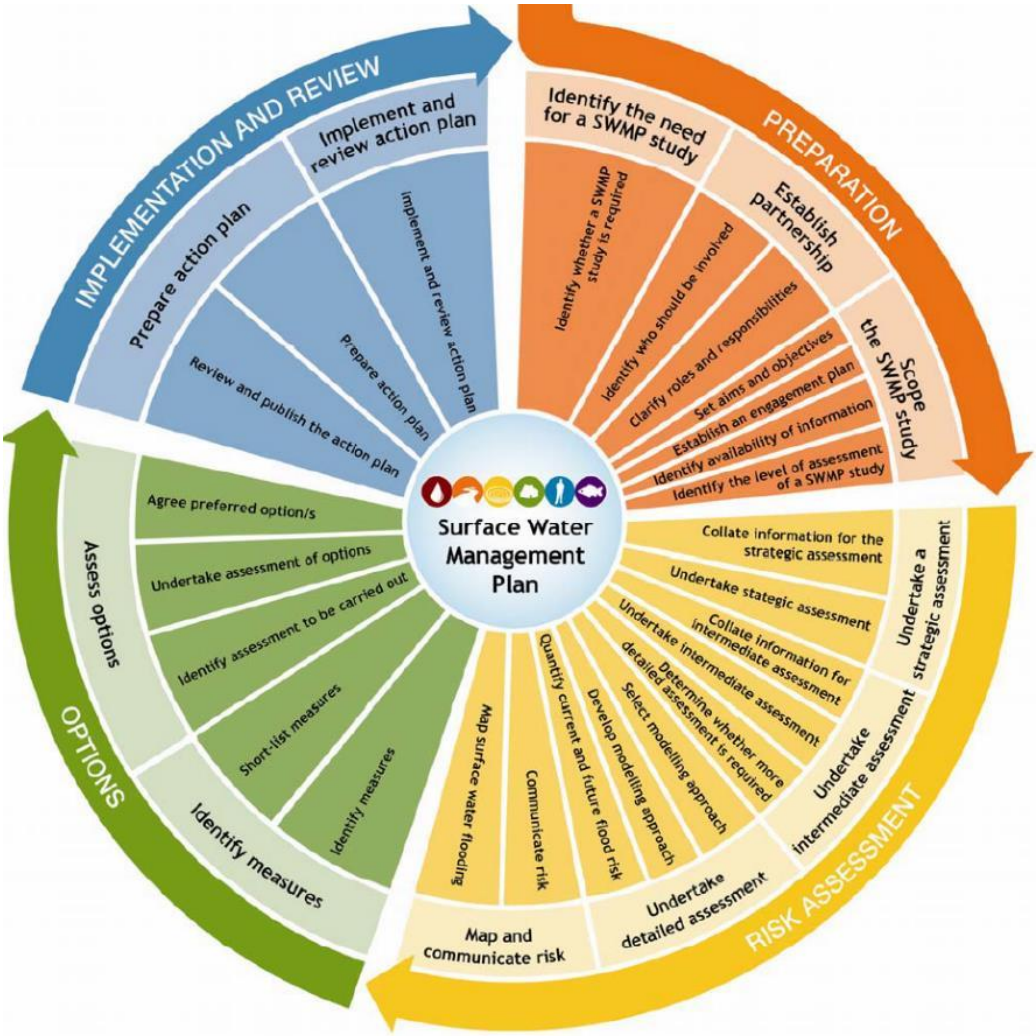

Figure 4-7: Defra wheel (taken from SWMP Technical Guidance)

South Tyneside Surface Water Management Plan, 2014

The South Tyneside Council Surface Water Management Plan (SWMP) was completed in November 2014 and provides both an overview of the surface water flood risk in the whole of the borough and further information on specific hotspots investigated in greater detail. The SWMP was developed over four phases.

- Phase 1 - Preparation: preparing and scoping the study requirements, identifying partners and stakeholders to be involved.
- Phase 2 - Intermediate Risk Assessment
- Phase 3 - Options and Action Plan
- Phase 4 - Implementation and Review: preparing to implement the strategy, delivering and monitoring actions.

The SWMP also identified 5 areas that were recommended for detailed assessment and consideration of options to reduce surface water flooding. These areas have been

delineated by STC as the LLFA. The detailed areas considered within the SWMP are located at:

- Cleadon Lea
- Cleadon Sunderland Road
- Fellgate
- Lindisfarne roundabout
- New Market Walk

4.7.6 Green Infrastructure Assessments

Open space, or Green Infrastructure (GI), should be designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities and should be provided as an integral part of all new development, alongside other infrastructure such as utilities and transport networks.

Open space can provide many social, economic and environmental benefits close to where people live and work including:

- Places for outdoor relaxation and play;
- Space and habitat for wildlife with access to nature for people;
- Environmental education;
- Local food production - in allotments, gardens and through agriculture;
- Improved health and well-being – lowering stress levels and providing opportunities for exercise;
- Climate change adaptation - for example flood alleviation and cooling urban heat islands.

The NPPF explains that open space can perform many functions, including flood risk mitigation, and that Local Plans should account for increased flood risk, resulting from climate change, through the planning of Green Infrastructure. GI can have an important role to play in reducing the likelihood of flooding by providing space for flood storage, reducing runoff and increasing infiltration, whilst also providing other benefits as stated above.

Alongside GI should be the implementation of SuDS, specifically within potential development sites, where possible. The suitability of GI and SuDS can be informed by this SFRA through utilisation of open space for water in the areas of greatest flood risk, which would be key to helping deliver sustainable development. Examples include:

- Restoration of the natural character of floodplains;
- Keeping and preserving of areas of existing natural floodplain;
- Introduction of new areas and enhancing existing areas of greenspace whilst incorporating sustainable drainage within new development; and
- Reduction of downstream flood risk.

The Town and Country Planning Association together with The Wildlife Trusts produced a guidance document for Green Infrastructure[21]. The guidance states that local plans should identify funding sources for GI and provision should be made for GI to be adequately funded as part of a development's core infrastructure. For new developments, GI assets can be secured from a landowner's 'land value uplift' and as

[21] Planning for a Healthy Environment – Good Practice Guidance for Green Infrastructure and Biodiversity, Published by the Town and Country Planning Association and The Wildlife Trusts, July 2012

part of development agreements. LPAs may include capital for the purchase, design, planning and maintenance of GI within the Community Infrastructure Levy (CIL) programme.

South Tyneside's Green Infrastructure Strategy[22]

A GI strategy was produced by South Tyneside Borough Council, which looked to identify all multifunctional green space and other relevant land and watercourses, which supports the activity, health and wellbeing of local people and wildlife across South Tyneside. The GI expands on Core Strategy Policy SC6 'Providing for Recreational Open Space, Sport and Leisure' and Development Management Policy DM7 on 'Local Biodiversity and Geodiversity Sites'. This statutory planning document provides and analysis of existing green infrastructure within the borough and setting out the vision for future improvement and provision.

Any investment must meet the ambitions of 'The South Tyneside Vision 2011-2031' as well as the priorities within the South Tyneside Council Strategy 2017-2020 document.

The South Tyneside GI Vision will:

- Contribute to the sustainability of South Tyneside and promote a high quality of life for future generations, by mitigating impacts of climate change and flooding.
- Play an important role in the regeneration of South Tyneside
- Help create good quality and healthy sustainable communities where people choose to live.
- Protect and enhance our natural and built environment, and help to promote biodiversity throughout the borough

4.7.7 Flood Risk Partnerships and Partnership Plans

STC has been involved in the development of several partnerships designed to provide collaboration between public agencies, businesses and the community. Partnerships and plans that affect the borough include:

- Northumbria Local Resilience Forum - see Section 7.1.1
- South Tyneside Council Emergency Plan
- Northumbria Community Risk Register
- Tyne and Wear Strategic Flood Risk Management Partnership
- NWL Liaison Meetings
- Northumbria Regional Flood and Coastal Committee (NRFCC)
- Northumbria Integrated Drainage Partnership (NIDP)
- Northumberland Water Cycle Study (2012)
- Key businesses and organisations – STC has ongoing relations with major land owners, employers and organisations such as the Rivers Trust, National Trust, National England, Highways England and Network Rail.

See Section 7 on Emergency Planning for more information.

4.8 Roles and responsibilities

The responsibilities for the RMAs under the FWMA and FRR, as summarised by Government[23] are summarised below.

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[22] South Tyneside Local Development Framework, SPD 3: Green Infrastructure Strategy, February 2013
[23] https://www.gov.uk/government/collections/flood-and-coastal-erosion-risk-management-authorities

4.8.1 EA as a RMA

- Has a strategic overview role for all forms of flooding;
- Provides and operates flood warning systems;
- Carries out works to manage flood risk from the sea and main rivers;
- Carries out works in estuaries to secure adequate outfalls for main rivers;
- Carries out surveys to inform FCERM works and has the right to enter private land to carry out such works;
- Issues consent for works on or near main rivers, and works affecting watercourses, flood and sea defences and other structures protected by its byelaws;
- Designates structures and features of the environment that affect flood or coastal erosion risk
- Has the power to request information from any partner in connection with its risk management functions;
- Must exercise its flood or coastal erosion risk management functions in a manner consistent with the National Strategy and Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the LLFA;
- Must help advise on sustainable development.

4.8.2 LPA as a RMA

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the LLFA;
- Has a duty to be subject to scrutiny from the LLFA;
- Has a duty to cooperate and share information with other RMAs.

4.8.3 LLFA as a RMA

- Must develop, maintain, apply and monitor a strategy for local flood risk management. This must be consulted on with all RMAs, the public and all other partners with an interest in local flood risk, and must comply with the National Strategy;
- Should prepare and maintain a preliminary flood risk assessment, flood hazard maps, flood risk maps and flood risk management plans;
- Is required to coordinate and share information on local flood risk management between relevant authorities and partners;
- Is empowered to request information from others when it is needed in relation to its flood risk management functions;
- Must investigate significant flooding incidents in its area where it considers it necessary or appropriate;
- Has a duty to establish and maintain a record of structures within its area that it considers to have a significant impact on local flood risk;
- Is empowered to designate structures and features that affect flooding;
- Has powers to undertake works to manage flood risk from surface runoff, groundwater and ordinary watercourses;

- Must exercise its flood and coastal erosion risk management functions in a manner consistent with the National Strategy and the Local Strategy;
- Can carry out work that may cause flooding or coastal erosion in the interests of nature conservation, preservation of cultural heritage or people's enjoyment of the environment or cultural heritage;
- Can acquire land in or outside of their district for use in flood risk management if necessary;
- Is permitted to agree the transfer of responsibilities for risk management functions (except the production of a local strategy) to other RMAs;
- Can take the lead on preparing SWMPs;
- Is permitted to agree the transfer of responsibilities for risk management functions (except the production of a Local Strategy) to other RMAs;
- Must aim to contribute to sustainable development;
- Should consider flooding issues that require collaboration with neighbouring LLFAs and other RMAs.

4.8.4 Northumbrian Water as a RMA

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the relevant LLFA;
- Has a duty to be subject to scrutiny from LLFAs;
- Has a duty to cooperate and share information with other RMAs;
- Is responsible for managing the risks of flooding from water and foul or combined sewer systems providing drainage from buildings and yards.

4.8.5 Highways Authority (STC) and Highways England as RMAs

- Have a duty to act in a manner that is consistent with the National Strategy and have regard to local strategies when:
  - carrying out highway drainage works,
  - filling in roadside ditches,
  - diverting or carrying out works on part of a watercourse;
- Have responsibility for ensuring effective drainage of local roads in so far as ensuring drains and gullies are maintained;
- Must be consulted on Local Strategies, if affected by the Strategy, by the LLFA;
- Have a duty to be subject to scrutiny from LLFAs.

4.8.6 The Local Community

- Must be consulted on Local Strategies by the LLFA;
- Has a key role in ensuring local strategies are capable of being successfully delivered within the community. They should actively participate in this process and be engaged by the LLFA.

4.8.7 Riparian Owners

A riparian owner is someone who owns land or property alongside a river or other watercourses. A watercourse is any natural or artificial channel through which water flows including flow through a culvert, ditch, drain, cut, dyke, sluice or private sewer.

Riparian owners have statutory responsibilities, including:

- Maintaining watercourses;
- Allowing the flow of water to pass without obstruction;
- Controlling invasive alien species

Further guidance for riverside property owners can be found via:

https://www.gov.uk/guidance/owning-a-watercourse

4.8.8 Developers

Have a vital role in ensuring effective local flood risk management by avoiding development in areas at risk of flooding. Local Strategies should form a key element of local planning guidance, along with consultation of this SFRA.

5 Flood risk across South Tyneside Local Plan area

5.1 Flood risk datasets

This section of the SFRA provides a strategic overview of flood risk from all sources within the STC authority area. The information contained is the best available at the time of publication and is intended to provide STC with an overview of risk. Table 5-1 provides a summary of the key datasets used in this SFRA according to the source of flooding.

Flood Source	Datasets / Studies
Fluvial	EA Flood Map for Planning (Rivers and Sea) (May 2021)
	EA Risk of Flooding from Rivers and Sea map
	Modelled Flood Outlines (MFO) from latest available EA Flood Risk Mapping Studies
	EA Historic Flood Map (HFM) (May 2021)
	EA Recorded Flood Outlines (RFO) (May 2021)
	EA Flood Warning Areas (May 2021)
Pluvial (surface water runoff)	EA Risk of Flooding from Surface Water (RoFSW) (March 2020)
	STC Preliminary Flood Risk Assessment (2011 and 2017)
	South Tyneside Surface Water Management Plans (2014)
Sewer	NW Historical Flood Incident Data
Groundwater	BGS Groundwater Potential Flood Map
Reservoir	EA Reservoir Flood Maps (available online)
All sources	Northumbria Flood Risk Management Plan 2015 to 2021
	Northumbria River Basin Management Plan (June 2018)
	River Tyne and Wear Catchment Flood Management Plans (2009)
	STC Flood and Coastal Erosion Risk Management Strategy (2017-2022)
Flood risk management infrastructure	EA Spatial Flood Defence data (May 2021)
	LLFA FRM asset register critical assets

Table 5-1: Flood source and key datasets

5.2 Fluvial and tidal flooding

Fluvial flooding is associated with the exceedance of channel capacity during higher flows or as a result of blockage. The process of flooding from watercourses depends on a number of characteristics associated with the catchment including geographical location and variation in rainfall; steepness of the channel and surrounding floodplain and; infiltration and rate of runoff associated with urban and rural catchments.

Tidal flooding is caused by storm surge and wave action in times of high astronomical tides.

The SFRA Maps in Appendix A present the EA's Flood Map for Planning which shows the fluvial and tidal coverage of flood zones 2 and 3 across the study area.

5.2.1 EA Flood Map for Planning (Rivers and Sea)

The EA's Flood Map for Planning is the main dataset used by planners for predicting the location and extent of fluvial and tidal flooding. This is supported by the CFMPs and FRMPs along with a number of detailed hydraulic river modelling reports which provide further detail on flooding mechanisms.

The Flood Map for Planning provides flood extents for the 1 in 100 AEP (1%) fluvial event and 1 in 200 AEP (0.5%) tidal event (Flood Zone 3) and the 1 in 1000 AEP (0.1%) fluvial and tidal flood events (Flood Zone 2). Flood zones were originally prepared by the EA using a methodology based on the national digital terrain model (NextMap), derived river flows from the Flood Estimation Handbook (FEH) and two-dimensional flood routing. Since their initial release, the EA has regularly updated its flood zones with detailed hydraulic model outputs as part of their national flood risk mapping programme.

The Flood Map for Planning is precautionary in that it does not take account of flood defence infrastructure (which can be breached, overtopped or may not be in existence for the lifetime of the development) and, therefore, represents a worst-case scenario of flooding. The flood zones do not consider sources of flooding other than fluvial and tidal, and do not take account of climate change. As directed by the FRCC-PPG, this SFRA subdivides Flood Zone 3 into Flood Zone 3a and Flood Zone 3b (functional floodplain – see Section 5.2.2).

The EA also provides a 'Risk of Flooding from Rivers and Sea Map'. This map shows the EA's assessment of the likelihood of flooding from rivers and the sea, at any location, and is based on the presence and effect of all flood defences, predicted flood levels and ground levels. **This dataset is not used in the assessment of flood risk for planning applications** but is a useful source of information to show the presence and effects of flood risk management infrastructure. This dataset is further discussed in Section 5.2.3.

This SFRA uses the Flood Map for Planning issued in May 2021 to assess fluvial risk to the potential development sites, as per the NPPF and the accompanying FRCC-PPG. The Flood Map for Planning is updated at quarterly intervals by the EA, as and when new modelling data becomes available. The reader should therefore refer to the online version of the Flood Map for Planning to check whether the flood zones may have been updated since May 2021:

https://flood-map-for-planning.service.gov.uk/

5.2.2 Functional floodplain (Flood Zone 3b)

The functional floodplain forms a very important planning tool in making space for flood waters when flooding occurs. Development should be directed away from these areas.

Table 1, Paragraph 065 of the FRCC-PPG defines Flood Zone 3b as:

"…land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency."

Paragraph 015 of the FRCC-PPG explains that:

"…the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would naturally flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood (such as a flood attenuation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point to help identify the functional floodplain.

The area identified as functional floodplain should take into account the presence and effect of all flood risk management infrastructure including defences. Areas which

would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain. If an area is intended to flood, e.g. an upstream flood storage area designed to protect communities further downstream, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often."

The functional floodplain outline has been delineated as part of this Level 1 SFRA, as required by the EA's SFRA guidance (2019). The final outline was agreed upon by the LPA, the LLFA and the EA, based on their in-depth local knowledge.

It is important to note that the extent of the functional floodplain outline produced from this Level 1 SFRA should always be assessed in greater detail where any more detailed study such as a Level 2 SFRA or site-specific FRA are undertaken.

A technical note is provided in Appendix C which explains the methodology used in creating the functional floodplain outline.

5.2.3 EA Risk of Flooding from Rivers and the Sea map

This Risk of Flooding from Rivers and Sea map (RoFRS) shows the likelihood of flooding from rivers and the sea based on the presence and effect of all flood defences, predicted flood levels and ground levels and is shown on the Appendix A maps. The RoFRS map splits the likelihood of flooding into four risk categories:

- High – greater than or equal to 1 in 30 AEP event (3.3%) chance in any given year
- Medium – less than 1 in 30 AEP event (3.3%) but greater than or equal to 1 in 100 AEP event (1%) chance in any given year
- Low – less than 1 in 100 AEP event (1%) but greater than or equal to 1 in 1000 AEP flood event (0.1%) chance in any given year
- Very Low – less than 1000 AEP event (0.1%) chance in any given year

The RoFRS map is included on the SFRA maps to act as a supplementary piece of information to assist the LPA in the decision-making process for site allocation.

This dataset is not suitable for use with any planning application nor should it be used for the sequential testing of site allocations. The EA's Flood Map for Planning should be used for all planning purposes, as per the FRCC-PPG.

5.3 Surface water flooding

Surface water flood risk should be afforded equal standing in importance and consideration as fluvial and tidal flood risk, given the increase in rainfall intensities due to climate change and the increase in impermeable land use due to development.

Surface water flooding, in the context of this SFRA, includes:

- **Surface water runoff (also known as pluvial flooding); and**
- **Sewer flooding**

There are certain locations, generally within urban areas, where the probability and consequence of pluvial and sewer flooding are more prominent due to the complex hydraulic interactions that exist in the urban environment. Urban watercourse connectivity, sewer capacity, and the location and condition of highway gullies all have a major role to play in surface water flood risk.

Paragraph 013 of the FRCC-PPG states that SFRAs should address surface water flooding issues by identifying areas of surface water flooding and areas where there may be drainage issues that can cause surface water flooding. The EA's Risk of Flooding from Surface Water (RoFSW) map along with information within the LFRMS (see Section A.6.4 of Appendix A) should assist with this and various mitigative

measures, i.e. SuDS, should be identified. Sections 6.9 and 6.11 provide guidance on mitigation options and SuDS for developers.

It should be acknowledged that once an area is flooded during a large rainfall event, it is often difficult to identify the route, cause and ultimately the source of flooding without undertaking further site-specific and detailed investigations.

5.3.1 Pluvial flooding

Pluvial flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. In these instances, the volume of water from rural land can exceed infiltration rates in a short amount of time, resulting in the flow of water over land. Within urban areas, this intensity can be too great for the urban drainage network resulting in excess water flowing along roads, through properties and ponding in natural depressions. Areas at risk of pluvial flooding can, therefore, lie outside of the fluvial flood zones.

Pluvial flooding within urban areas across the country will typically be associated with events greater than the 1 in 30 AEP design standard of new sewer systems. Some older sewer and highway drainage networks will have a lower capacity than what is required to mitigate for the 1 in 30 AEP event. There is also residual risk associated with these networks due to possible network failures, blockages or collapses.

Risk of Flooding from Surface Water dataset

The Risk of Flooding from Surface Water (RoFSW), formally referred to as the updated Flood Map for Surface Water (uFMfSW) is the third-generation national surface water flood map, produced by the EA, aimed at helping to identify areas where localised, flash flooding can cause problems even if the Main Rivers are not overflowing. The RoFSW, used in this SFRA to assess risk from surface water, has proved extremely useful in supplementing the EA Flood Map for Planning by identifying areas in Flood Zone 1, which may have critical drainage problems. However, any sites identified to be at risk from surface water flooding should be assessed in more detail, following this SFRA, as the RoFSW is a national-scale dataset and may therefore overestimate or underestimate risk.

The RoFSW includes surface water flood outlines, depths, velocities and hazards for the following events:

- 1 in 30 AEP event (3.3%) – high risk
- 1 in 100 AEP event (1%) – medium risk
- 1 in 1000 AEP event (0.1%) – low risk

The National Modelling and Mapping Method Statement, May 2013 details the methodology applied in producing the map. The RoFSW is displayed on the SFRA maps.

Localised surface water flood modelling

Cleadon Flood Alleviation Study, 2017

A history of surface water flooding in Cleadon led to the commissioning of a flood alleviation study for Cleadon Village study to identify whether there are any cost-beneficial options for mitigating flood risk that could be implemented subject to funding being secured. The South Tyneside SWMP, 2014 (see Section 4.7.5), also identified Cleadon as an area requiring a further detailed assessment.

Part of the study involved the development of a detailed surface water hydraulic model based on a previous model used for the SWMP, together with a sewer network model

developed by NW in August 2017. The model build report contains detailed information on how the model was built and what data was used[24].

As this model is more detailed and considered to be more representative of the local area than the national RoFSW map, it has been used in place of the RoFSW to assess surface water flood risk to proposed development sites in Cleadon and should also be considered as the Council's 'locally agreed surface water information' for Cleadon (see Section 5.3.5). The results of the RoFSW sites screening are however still included within the Sites Assessment spreadsheet (Appendix B).

The model output extents used for the sites assessment include the 1 in 30 and 1 in 100 AEP events and also the 1 in 100 +40% AEP event to account for climate change (based on the total potential change in rainfall intensity for the period 2070 to 2115).

These events were modelled based on a 180 minute rainfall duration and a 'do nothing' scenario. The 'do nothing' scenario models the consequences of ceasing maintenance works within the model domain area. Section 6 of the model build report discusses the modifications made to the model in order to achieve this scenario. The SFRA Maps in Appendix A include the modelled outputs.

In total, there are 42 potential development sites within the Cleadon model domain (area covered by the model), that could be at risk from surface water flooding.

Monkton Village Flood Alleviation Scheme, 2017

Monkton Village and the outer area of Hebburn had suffered multiple flood events attributable to flooding from NW sewers; runoff from recreational and agricultural land; and flooding from culverted minor watercourses. A FAS was commissioned by STC which included the construction of a hydraulic model in 2016. The Monkton Village model build report[25] states:

" The purpose of the model is to understand the existing hydraulic performance of the catchment and to investigate options to resolve existing hydraulic issues as part of the outline design process. It is also to predict future sewerage and watercourse performance problems arising from catchment growth. In particular the model will be used to improve the understanding of the integration between the sewerage system and the Monkton Burn and Bedes Burn".

As with Cleadon, this model is more detailed and considered to be more representative of the local area than the national RoFSW map. However, although a number of return periods were produced from the model, only the 1 in 75 AEP event (1.3%) outputs were made available for this SFRA. The results of the RoFSW screening are therefore still relevant to potential sites in Monkton Village. The SFRA Maps in Appendix A include the modelled outputs.

In total, there are 37 potential development sites within the Monkton model domain (area covered by the model), that could be at risk from surface water flooding.

NOTE: the modelled surface water flood outlines from both the Cleadon and Monkton models used in the sites assessment are based on flood depths greater than 125 mm. This is based on thresholds used to map the national RoFSW dataset. At 125 mm, flooding would typically exceed kerb heights; likely exceed damp-proof course levels; and cause flooding to property in some areas.

5.3.2 Sewer flooding

Flooding which occurs when the capacity of the underground drainage network is exceeded, resulting in the surcharging of water into the nearby environment (or within

[24] Cleadon Flood Alleviation Scheme, Model Build Report (draft), December 2017
[25] Monkton Village SuDS, Model Build Report, August 2016, South Tyneside Council

internal and external building drainage networks) or when there is an infrastructure failure is known as 'sewer flooding'. The discharge of the drainage network into waterways and rivers can also be affected if high water levels in receiving waters obstruct the drainage network outfalls.

The impact of sewer flooding is usually confined to relatively small, localised areas but, because flooding is associated with blockage or failure of the sewer network, flooding can be rapid and unpredictable. Flood waters from this source are also often contaminated with raw sewage and pose a health risk. The spreading of illness and disease can be a concern to the local population if this form of flooding occurs on a regular basis.

Drainage systems often rely on gravity assisted dendritic systems, which convey water in trunk sewers located at the lower end of the catchment. Failure of these trunk sewers can have serious consequences, which are often exacerbated by topography, as water from surcharged manholes will flow into low-lying urban areas.

The diversion of "natural" watercourses into culverted or piped structures is a historic feature of the study area drainage network. Where it has occurred, deliberately or accidentally it can result in a reduced available capacity in the network during rainfall events when the sewers drain the watercourses catchment as well as the formal network. Excess water from these watercourses may flow along unexpected routes at the surface (usually dry and often developed) as its original channel is no longer present and the formal drainage system cannot absorb it.

In order to clearly identify problems and solutions, it is important to first outline the responsibilities of different organisations with respect to drainage infrastructure. The responsible parties are primarily the Highways Authority and Northumbrian Water (NW).

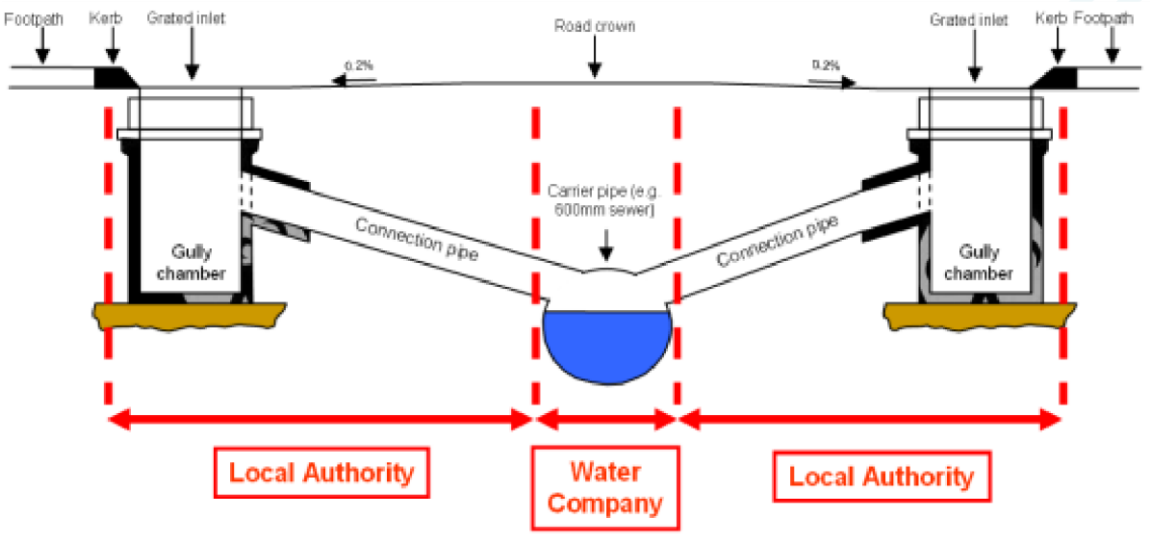

Figure 5-1: Surface water sewer responsibility

As illustrated in Figure 5-1 above, STC, as the Highways Authority, is responsible for maintaining an effective highway drainage system including kerbs, road gullies and the pipes which connect the gullies to the trunk sewers and soakaways. STC is also the Highways Authority for all roads except trunk roads. The sewerage undertaker (NW) is responsible for maintaining the trunk sewers.

Modern drainage networks are designed as separate foul and Surface water sewers. Modern surface water systems are typically designed to accommodate 1 in 30 year AEP

storm events. Modern foul sewers are designed for the population which is to be served, with allowance for infiltration.

Information has been received from NW which identifies locations where sewer flooding incidents have occurred in the Borough and is located in Section 5.6.

Developers should use all information provided in this Level 1 SFRA, the SWMP strategy and NW sewer flooding/incapacity data sets to assess the risk of sewer flooding to their site. Future development should be designed so that it does not contribute to existing sewer flooding problems.

Developers should work with STC as the LLFA as they will be responsible for managing surface water across South Tyneside. Developers should also take account of the guidance in 6.7, where appropriate, and liaise closely with NW over any localised sewer flooding problems that could affect the site.

It is recommended that developers complete a NW Pre-Planning Enquiry as this will help save a great deal of time and effort within the validation of the planning application. An up-to-date form can be found online via:

https://www.nwl.co.uk/services/developers/developer-sewerage-services/pre-planning-enquiries/

5.3.3 North East Drainage and Wastewater Management Plan (DWMP)[26]

The DWMP Framework was published in September 2018 and was a key recommendation of the 21st Century Drainage Programme. Northumbrian Water is committed to producing DWMP which will provide a basis for long-term planning of drainage and wastewater services. These plans are based upon guidance from Water UK and are being produced industry wide. The DWMP analyses sewer performance across the region and highlight where future work will be needed.

Some of the current drainage and wastewater concerns include flooding, water quality, surface water, sewage treatment, and sewer blockages. The DWMP is split into 5 phases and at the time of writing Phase 1 was complete and Phase 2 was in progress:

- Identify – analyse data, modelling and surveys to find the potential challenges and risks;
- Assess – assess identified locations and consider short and long term risks;
- Inform – opportunities with the customer, keep customers up to date;
- Plan of Action – work out logistics and agree a plan for next steps; and
- Review & Repeat – review outcomes of work so far and do it all over again.

5.3.4 Areas with Critical Drainage Problems and Critical Drainage Areas

The EA can designate Areas with Critical Drainage Problems (ACDPs). ACDPs may be designated where the EA is aware that development within a certain catchment / drainage area could have detrimental impacts on fluvial flood risk downstream, and / or where the EA has identified existing fluvial flood risk issues that could be exacerbated by upstream activities. In these instances, the EA would work with the LLFA and LPA to ensure that adequate surface water management measures are incorporated into new development to help mitigate fluvial flood risk.

EA guidance on carrying out Flood Risk Assessments[27] states that a FRA should be carried out for sites in Flood Zone 1 that are…

"…in an area with critical drainage problems as notified by the Environment Agency."

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[26] https://www.nwl.co.uk/services/sewerage/dwmp/

[27] https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas

This statement refers to sites within an ACDP, not a CDA. At the time of writing there are no ACDPs in South Tyneside.

CDAs can be designated by LPAs or LLFAs for their own purposes. The EA do not have to be consulted on sites that are within a CDA if such sites are in Flood Zone 1.

5.3.5 Locally agreed surface water information

EA guidance, taken from within the FWMA (2010), on using surface water flood risk information recommends that LLFAs, should:

"…review, discuss, agree and record, with the Environment Agency, Water Companies, Internal Drainage Boards and other interested parties, what surface water flood data best represents their local conditions. This will then be known as locally agreed surface water information".

Based on this, STC LLFA's 'locally agreed surface water information' should consist of:

- The LLFA localised surface water modelling outputs, where and when available, as discussed in Section 5.3.1 above,
- The RoFSW map, where the more detailed local LLFA modelling is not available, or
- A combination of both these datasets for defined locations in the LLFA area.

With the exception of parts of Cleadon and Hebburn (centred on Monkton Village), STC should consider the RoFSW to be its locally agreed surface water flood information as this is the latest, most robust surface water flood map available for the borough, at the time of writing.

5.4 Groundwater flooding

In simplistic terms, groundwater flooding occurs when the water table rises and water levels in the ground rise above the surface of the land. Flooding tends to occur after long periods of sustained heavy rainfall and can last for weeks or even months. The areas most at risk are often low lying areas where the water table is more likely to be at a shallow depth and flooding can be experienced through water rising up from the underlying aquifer, or from water flowing from springs. Flooding from groundwater is most common in areas where the underlying bedrock is chalk, but it can also happen in locations with sand and gravel.

The EA's 2019 SFRA guidance recommends the use of the British Geological Survey's (BGS) national dataset on the susceptibility of groundwater flooding. Based on geological and hydrogeological information, the digital data can be used to identify areas where geological conditions could enable groundwater flooding to occur and where groundwater may come close to the ground surface.

The dataset is split into three categories, based on the potential of groundwater flooding occurring:

1. Limited potential for groundwater flooding to occur,
2. Potential for groundwater flooding of property situated below ground level,
3. Potential for groundwater flooding to occur at the surface.

There is currently limited research which specifically considers the impact of climate change on groundwater flooding. The mechanisms of groundwater flooding are unlikely to be affected by climate change, however if winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may however be balanced by lower recharge during the predicted hotter and drier summers.

Further investigation should be carried out as part of the preparation of a site-specific FRA, for any site deemed to be at risk of groundwater flooding i.e. in BGS categories 2

or 3. The FRA should incorporate a site-based assessment of the potential risk of groundwater flooding to the site, confirming from borehole data whether groundwater is a source of flood risk for the site, and setting out any mitigation measures proposed. Onsite infiltration testing should also be carried out; however, it is unlikely that any areas within these categories would be suitable for infiltration-based SuDS.

Categories 2 and 3 are distributed across the majority of the STC borough with the main areas being located primarily close to the Tyne and Tyne Estuary affecting areas such as South Shields, Jarrow and the Tyne Dock area. There are also a few areas in the centre of the Council boundary that are affected such as Boldon Colliery, west of Cleadon Park and Monkton.

The BGS dataset is shown on the SFRA Maps in Appendix A.

5.4.1 Introduction to mining and groundwater considerations for sustainable development and drainage systems

Within the Environment Agency's EA North East area, there have been issues of groundwater flooding occurring. This is following on from the development of sites where infiltration into the ground has been increased, or where groundwater levels have recovered following the cessation of mining operations.

Large areas of the North East have been undermined by coal mine workings. When the mines were working, mine water pumping artificially lowered groundwater levels providing drainage pathways. Following the closure of the mines and cessation of pumping, groundwater levels are now recovering to the pre-mining position. In some areas with specific geology and a high water table, infiltration sustainable drainage system (SuDS) (or any SUDs with a component of infiltration) may not work and could result in groundwater flooding risks.

The large network of mining in the North East has also resulted in some areas where mine water is close to surface, being controlled by either surface discharges or being actively controlled by Coal Authority pumping sites. Infiltration (SuDS) (or any SUDs with a component of infiltration) in some of these areas could have a detrimental impact on the amount and quality of water entering mine workings resulting in increased mine water pollution, flooding risks, or impacts on pumping infrastructure.

To provide better information on this, the Environment Agency and Coal Authority have combined their knowledge to create a spatial screening tool for the Local Authorities to use in strategic planning, development planning, urban drainage, and engineering. This GIS screening tool and accompanying work flow identifies what developers need to consider in their development proposals to provide sustainable drainage systems.

This screening tool has been created by analysing data sets to model the current and final mine water levels, along with the surface levels across all the coalfield areas. This has enabled five different category areas to be identified, each with varying drainage requirements:

A. Off the coalfield areas – SuDS guidance and best practice for assessing pollution and flood risk should be followed.

B. On the coalfield area with no shallow mine workings, nearby controlling outflow, or shallow mine water – specific requirements for major development and deep ground works or deep drainage boreholes.

C1. On the coalfield area with shallow mine workings, or a nearby controlling outflow - major development and deep ground works or deep drainage boreholes require pre-consultation with the Coal Authority.

C2. On the coalfield area with shallow mine water - SuDS may not work, developer must suggest alternative methodologies that may require pre-consultation with the Environment Agency and / or Lead Local Flood Agency (LLFA).

D. On the coalfield area with shallow mine workings, nearby controlling outflow and shallow mine water - SuDS may not work, developer must suggest alternative methodologies that will require pre-consultation with the Coal Authority, Environment Agency and / or Lead Local Flood Agency (LLFA).

Minewater Schemes – Holborn Renewable Energy Network

The Holborn Renewable Energy Network project aims to generate renewable energy by using heat from abandoned flooded mines and the River Tyne. The scheme would use a combination of technologies:

- Solar panels, both floating and mounted on an energy centre, would provide much of the electricity to power water sourced heat pumps.
- Heat pumps would extract heat from water taken from abandoned flooded mines and the River Tyne, converting it into energy in the form of hot water. This hot water would be used to heat buildings in a network of insulated pipes.
- Gas produced from wood and green waste would also be converted into 100 percent renewable fuel for the energy centre.

The overall scheme is still in the development phase with the Council attracting over £4 million Government funding for initial enabling works including drilling of boreholes to extract the minewater. It is expected that the overall project with be completed in 2024 / 2025.

Minewater Schemes – Hebburn Minewater Project

The Hebburn mine water project will provide renewable heat to public sector buildings in Hebburn by collecting mine water from Hebburn Colliery. Two boreholes will be drilled into the ground and pumps will be used to get water from disused flooded mines. The water will go into an energy centre to provide buildings with heat.

The project is expected to reduce 319 tonnes of CO2 each year and help towards the goal of South Tyneside becoming carbon neutral by 2030. The overall cost of the project is £7.7 million with the European Regional Development Fund contributing 50%.

Planning permission for the initial testing phase has been granted and work on the project has begun. The project is due to be completed in June 2023.

5.5 Canal and reservoir flood risk

5.5.1 Canals

There are no canal systems within the South Tyneside Council area.

5.5.2 Reservoirs

A reservoir can usually be described as an artificial lake where water is stored for use. Some reservoirs supply water for household and industrial use, others serve other purposes, for example, as fishing lakes or leisure facilities. The EA is the enforcement authority for the Reservoir Act 1975 (reservoirs that hold over 25,000 m^3 of water). The FWMA updated the Reservoirs Act and targeted a reduction in the capacity at which reservoirs should be regulated from 25,000 m^3 to 10,000 m^3. This reduction is, at the time of writing, yet to be confirmed meaning the requirements of the Reservoirs Act 1975 should still be adhered to. The EA ensures that large reservoirs are regularly inspected, and essential safety work is carried out. However, the responsibility for safety lies with the reservoir owners.

There are different requirements for reservoirs that hold 25,000m^3 or more of water above ground level and for reservoirs that hold less than 25,000m^3 of water above ground level. A reservoir must be registered with the EA if it holds, or has the capacity

to hold, 25,000 m³. For reservoirs that contain less than 25,000 m³ of water, the Reservoir Act does not apply and as a result there is less regulatory control over these smaller reservoirs. Responsibility for maintenance rests with the landowner.

Reservoir Flood Map (RFM)

The EA has produced Reservoir Flood Maps (RFM) for all large reservoirs that they regulated under the Reservoirs Act 1975.

The maps show the largest area that might be flooded if a reservoir were to fail and release the water it holds, including information about the depth and speed of the flood waters. In September 2016, the EA produced the RFM guidance 'Explanatory Note on Reservoir Flood Maps for Local Resilience Forums – Version 5[28]' which provides information on how the maps were produced and what they contain.

The RFM can be viewed nationally at:

https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

The RFM extent shows the worst credible area that is susceptible to dam breach flooding. The map should be used to prioritise areas for evacuation/early warning. The RFM shows that there are no reservoirs / impounded waterbodies within the South Tyneside authority boundary. There are however, Kielder Water and Derwent Reservoir located outside of the authority area which may have an effect on locations such as East Jarrow, South Shields and Hebburn along the northern boundary of South Tyneside in the unlikely event of a breach. It is worth considering that reservoirs within the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

If development is proposed downstream of a reservoir, there will need to be an assessment of whether work is needed to improve the design or maintenance of the reservoir. Together with the reservoir undertakers, the LPA should look to avoid an intensification of development within the risk areas and/or ensure that reservoir undertakers can assess the cost implications of any reservoir safety improvements required due to changes in land use downstream of these assets.

The LPA will need to evaluate:

- The potential loss of life and damage to buildings in the event of dam failure,
- How any impounding reservoirs will affect existing flood risk,
- Whether emergency drawdown of the reservoir (reducing the water level) will add to flooding,
- Emergency planning requirements with appropriate officers to ensure safe, sustainable development

5.6 Historic flooding

South Tyneside has a long history of flood risk, after experiencing significant flood events attributable to a number of sources which include ordinary watercourses, overland flow, the main rivers of the Rivers Tyne and Don and from the sea. Some areas have suffered more frequently than others, either suffering the effects of long, persistent rainfall events, whereas for others it has been shorter but heavier extreme storm events.

Water levels along the River Tyne are primarily dependent on tide levels and the tidal cycle. It is considered unlikely, according to the previous 2011 SFRA[29], that any land use changes along the River Tyne could have a significant impact on tidal flood levels.

[28] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/558441/LIT_6882.pdf
[29] South Tyneside Council. Level 1 and 2 SFRA. 2011

Figure 5-2 shows STC's historic flood incidents / records, which includes multiple sources of flooding. There is visible clustering of incidents around the larger settlement of Hebburn and along the River Don at Hedworth. As LLFA, STC are required, under the FWMA, to maintain and update its historic flood incidents database as and when any flood incidents occur.

The NW flood incident register includes 50 flood incidents of multiple sources having occurred across the authority area, all of which are located within the drainage areas of South Tyneside. The dates of these incidents have not been recorded. The recorded flood incidents include flooding of property, gardens to property, highways and footpaths. STC also provided more sensitive historic flooding records, with 1,407 incidents recorded from 2004 – June 2021 and largely attributed to surface water / drainage issues or blockages. The location of these incidents are more dispersed than the flood incident data provided by NW, however the majority are also clustered around Hebburn, Jarrow and overall in the northern area of the borough. Tyne and Wear Fire and Rescue service also provided their historic flooding record database with 32 incidents recorded between 2004 - 2009 only. Incident types include pluvial and surface water flooding with the majority within South Shields and Hebburn. Many of these incidents are at the property level and as such are considered as sensitive information and have therefore not been included on the detailed large scale SFRA maps. They are however shown at the smaller scale of the whole authority.

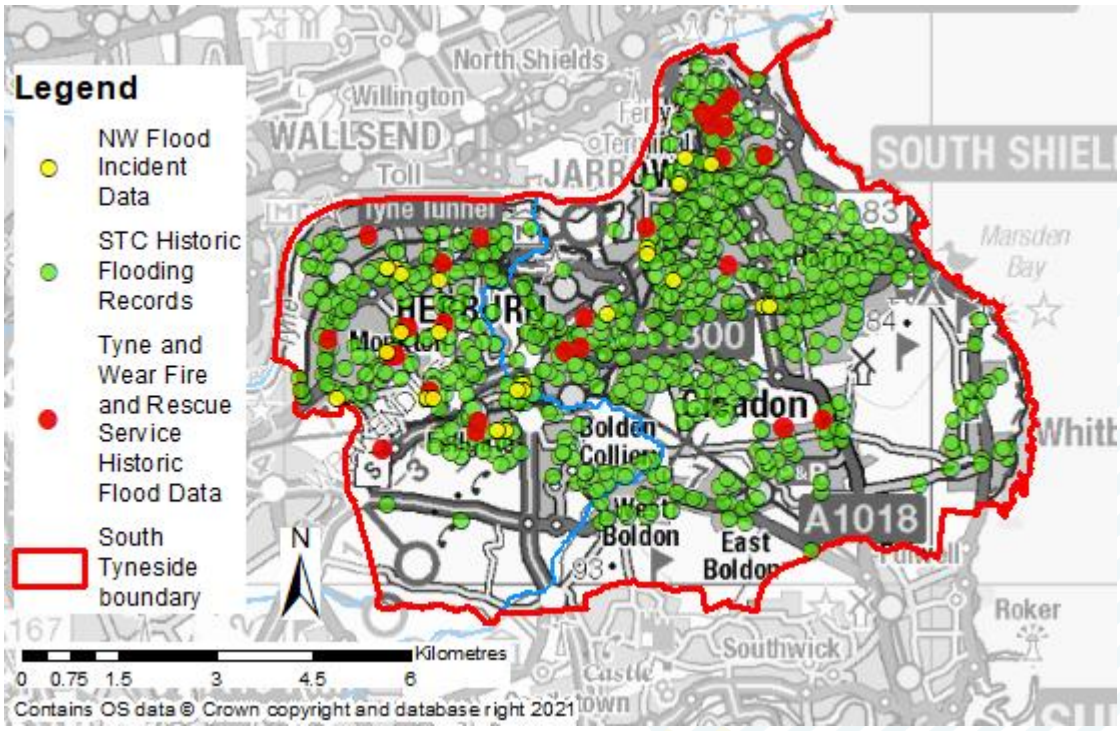

Figure 5-2: NW, STC and Tyne and Wear Fire and Rescue Service Historic Flood Records

Flooding has particularly affected South Tyneside with large scale damaging events. Flooding records provided from the PFRA from a number of organisations are listed below in

Location	Road	Reported Historic Flood Events*
South Shields Town Centre	Ocean Road	7
	Westoe Road	5
South Shields	South Eldon Street	3
	Newcastle Road / Jarrow Road Roundabout	4
Jarrow	Church Bank / Straker Street	9
	Lindisfarne Roundabout and adjacent A194	19
	York Avenue / Calf Close Lane	7
Hebburn	Lukes Lane	7
	Campbell Park Estate	4
Boldon	Tescos Roundabout / A19	13
	Reay Crescent	4
Cleadon	Cleadon Lea	7
	Moor Lane	4
Total		93
*Timeframes unknown		

Table 5-2. A total of 152 flooding records have been analysed to try and gain a further understanding of flood risk in South Tyneside. It is possible that other historical flooding data exists within other organisations; however, this was not available in time for consideration within the PFRA. There are a number of areas, outlined in Table 5-3, where flood incidents have occurred frequently.

Table 5-2: Historic flood records

Organisation	Number of reported flooding incidents*
South Tyneside Council	33
Northumbria Police	87
Tyne and Wear Fire and Rescue Service	26
Highways Agency	6
Total	**152**
*Timeframes unknown	

Table 5-3: Distribution of historic flooding records

There is notable evidence of historical flooding within the borough.

5.6.1 Historic pluvial / fluvial flooding

2012 flood events

Two of the most severe rainfall events in South Tyneside were experienced in 2012. Over 400 residential properties and 33 businesses were affected by flooding, as well as a number of road closures. Following this event, the borough suffered further severe rainfall on 5th August 2012. This event saw approximately 100 properties flooded and

businesses on Monkton Business Park, Boldon Business Park and Ocean Road as well as a number of road and school closures. Areas particularly affected by internal flooding as a result of the 2012 flood events were Wuppertal Court in Jarrow, Fellgate Estate and Lukes Lane Estate, Hebburn. The main source of flooding to residential development is associated with the River Don.

According to rainfall data provided by the EA, 45mm of rain fell within 2.5 hours on the 28th June, with 30mm of this falling within the first hour. This event was estimated to have a calculated return period of 1 in 80 years. However, South Tyneside's nearest rain gauge is based 8 miles way, in Howden, and therefore can be difficult to obtain an accurate figure.

Tyne and Wear Fire and Rescue Service, NW and STC have provided their historic flood incident databases, as shown in Figure 5-2, with the majority of incidents attributable to pluvial flooding or surface water flooding.

South Tyneside experienced a severe storm on the 5th August 2012, that indicated that 29 mm of rainfall fell within 2 hours, which is 60% of the anticipated monthly rainfall for August.

2014 flood event

As stated in the 2017 report to seek Cabinet agreement to STC's Flood and Coastal Risk Management Strategy, more heavy rainfall fell in 2014 causing saturated ground conditions, rivers and watercourses reached capacity and broke their banks and sewerage systems were unable to cope with the extra rainfall. Critical infrastructure was destroyed and essential services including power supplies, transport links and telecommunications were disrupted across many areas.

5.6.2 Historic tidal flooding

December 2013

On the 5th and 6th December 2013, the North East experienced its most severe tidal surge on record. The arrival of several severe weather storms, persistent heavy rainfall and strong winds affected businesses on Wapping Street, South Shields. Parts of the River Tyne around Mill Dam and at Hebburn were also affected by this tidal surge. Coastal regions experienced the highest tides on record not only destroying sea defences, infrastructure and cliff faces, but taking with it homes and the belongings of those living next to the sea.

Due to the close proximity to the sea, the risk of events reoccurring cannot be completely managed or predicted, and therefore the only action that can reasonably be taken to minimise risk is to increase resilience, alongside preparedness for recovery after an event has occurred.

South Tyneside has completed a multi-million-pound project to replace the former coastal defence at Littlehaven in 2014. The previous sea wall suffered many years of erosion causing the car park behind it to become flooded on many occasions. The wall was close to collapse before a new sea wall was constructed, designed to ensure that this part of the coastline is protected from coastal erosion and flooding in the future.

5.6.3 Historic surface water flooding

According to the Flood and Coastal Risk Management Strategy, surface water flooding has historically been the main contributor to the problems encountered in many events across the borough. The floods of June and August 2012 resulted in over 400 residential properties affected by flooding from this source.

The degree, however, to which surface water flooding has been recorded in South Tyneside is limited, some historic flood information contains limited flood extent information such as estimates of depth and extent of flooding. The majority of this

information is however limited to the date and time of the flooding incident with limited accuracy regarding the precise location of the flooding event.

According to the 2011 SFRA, the 2007 summer flooding highlighted the widespread damage and disruption attributable to surface water flooding. Making Space for Water (2005) and Future Water (2008) both acknowledge the importance of integrated urban drainage. As stated in The Foresight Report (2004), 80,000 properties were at very high risk from surface water flooding.

STC used the EA's updated Flood Map for Surface Water 1 in 200 year dataset to estimate the number of properties at risk from surface water flooding, highlighted in Table 5-4.

Location	Estimated number of properties at risk of surface water flooding* *[flooding to a depth of 0.3m from an event with a 1 in 200 annual chance of occurring]*
South Shields	2000
Hebburn	900
Jarrow	500
Whitburn, Cleadon and Boldon	600
All South Tyneside	4000
*Property counts rounded to the nearest 100 properties	

Table 5-4: Residential properties at risk from surface water flooding

5.6.4 EA Historic Flood Map

The Historic Flood Map (HFM) is a spatial dataset, available from the EA, showing the maximum extent of all recorded historic flood outlines from river, sea and groundwater, and shows areas of land that have previously been flooded across England. Records began in 1946 when predecessor bodies to the EA started collecting information about flooding incidents. The HFM accounts for the presence of defences, structures, and other infrastructure where such existed at the time of flooding. It includes flood extents that may have been affected by overtopping, breaches or blockages. It is also possible that historic flood extents may have changed and that some areas would not flood at present i.e. if a flood defence has been built.

The HFM does not contain any information regarding the specific flood source, return period or date of flooding, nor does the absence of the HFM in an area mean that the area has never flooded, only that records of historic flooding do not exist. The Recorded Flood Outlines (RFO) dataset however does include details of flood events. The difference between the two datasets is that the HFM only contains flood outlines that are 'considered and accepted' by the EA following adequate verification using certain criteria.

The HFM shows an area of HFM that follows the River Tyne along the entire north boundary of South Tyneside, some small areas of flooding along the River Don near the residential area of Bolden Colliery, and parallel to the A19 from Hedworth to Monkton.

The HFM and RFO datasets are shown on the SFRA maps in Appendix B.

5.7 Flood risk management

The aim of this section of the SFRA is to identify existing Flood Risk Management (FRM) assets and previous / proposed FRM schemes. The location, condition and design standard of existing assets will have a significant impact on actual flood risk mechanisms. Whilst future schemes in high flood risk areas carry the possibility of reducing the probability of flood events and reducing the overall level of risk. Both

existing assets and future schemes will have a further impact on the type, form and location of new development or regeneration.

5.7.1 EA inspected assets (Spatial Flood Defences dataset)

The EA maintains a GIS dataset called the Spatial Flood Defences dataset. This national dataset contains such information as:

- Asset type (flood wall, embankment, high ground, demountable defence, bridge abutment, beach, dunes);
- Flood source (fluvial, tidal, fluvial and tidal combined);
- Design Standard of Protection (SoP);
- Asset length;
- Asset age;
- Asset location; and
- Asset condition.

See Figure 5-3 for condition assessment grades using the EA's Condition Assessment Manual[30] (CAM).

The design standard of protection (SoP) for a flood defence is a measure of how much protection a flood defence gives. If the SoP is 100, the defence protects against a flood with the probability of occurring once in 100 years.

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no impact on performance
2	Good	Minor defects that will not reduce the overall performance of the asset
3	Fair	Defects that could reduce the performance of the asset
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation needed.
5	Very Poor	Severe defects resulting in complete performance failure.

Figure 5-3: EA flood defence condition assessment grades

Defence Location	Asset Type	Flood Source	Watercourse	Design standard	Condition
Reay Crescent	3 Embankments	Fluvial	River Don	25 (3)	2 (2) 3 (1)
Near Mill Dene View	1 Flood Wall	Fluvial	River Don	100 (1)	5 (1)

[30] Environment Agency. (2012). Visual Inspection Condition Grades. In: EA Condition Assessment Manual. Bristol: Environment Agency. p9.

Defence Location	Asset Type	Flood Source	Watercourse	Design standard	Condition
Hylton Bridge Farm	1 Embankment	Fluvial	River Don	5 (1)	4 (1)
Number in brackets = number of assets					

Table 5-5: Major flood defences

In total, there are five flood defence assets within South Tyneside, according the EA's spatial flood defence dataset. Table 5-5 highlights the main locations within the borough that have significant FRM assets, all of which are located along the River Don, defending the urbanised areas that are vulnerable to flood risk within South Tyneside.

The defended areas of South Tyneside were prone to flooding due to the natural topography of the catchment and the fact that the River Don runs through the urban centre of the town, hence why the defences were constructed. The catchment has areas of flat floodplain adjacent to the main channel and tributaries.

There are five constructed fluvial flood defence assets that run along the River Don through South Tyneside, one of which are floodwalls and four are flood embankments. The floodwalls aim to prevent the Don from flooding residential properties in the urban area of the borough. The asset, adjacent to Mill Dene View, extends only on the left bank of the river as it flows downstream towards the River Tyne. This defence has a design standard of 100 and can therefore be described as providing a 1 in 100-year standard of protection, although it is the only defence with a 'very poor' condition according to the EA's CAM meaning defences having 'severe defects resulting in complete performance failure'. As a result, surrounding areas are vulnerable to fluvial flooding from the River Don. Note that this asset is in riparian ownership and is therefore the responsibility of the riparian owners to maintain.

Three flood embankment defences, located in Boldon Colliery, look to be designed to protect the residential properties in Reay Crescent and Kipling Avenue that could be affected by fluvial flooding from the Don. These defences have a design standard of 25 and a condition range of 2-3 (Good/Fair). There is an embankment located on the southern boundary of the borough, near Hytlon Bridge Farm which has the lowest design standard of '5' out of all the assets, and a 'Poor' condition. The reliability of this defence is therefore questionable and further investigation is needed to ensure prevention of flood risk to the agricultural land surrounding the area.

The most common condition associated with the defences in South Tyneside along the River Don is 2, which is considered 'Good' according to the EA's CAM with defences 'having minor defects that will not reduce the overall performance of the asset'.

As well as the ownership and maintenance of a network of formal defence structures, the EA carries out a number of other flood risk management activities that help to reduce the probability of flooding, whilst also addressing the consequences of flooding. These include:

- Maintaining and improving existing flood defences, structures and watercourses.
- Enforcement and maintenance where riparian owners carry out work that may be detrimental to flood risk.
- Identifying and promoting new Flood Risk Management Schemes were appropriate.
- Working with local authorities to influence the location, layout and design of new and redeveloped property and ensuring that only appropriate development is permitted relative to the scale of flood risk.

- Operation of Floodline Warnings Direct and warning services for areas within designated Flood Warning Areas (FWA) or Flood Alert Areas (FAA). EA FWAs are shown on the SFRA Maps in Appendix A.
- Promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and therefore sufficiently prepared in the event of flooding.
- Promoting resilience and resistance measures for existing properties that are currently at flood risk or may be in the future as a result of climate change.

5.7.2 STC assets and future flood risk management schemes

The LLFA will own and maintain a number of assets throughout the borough which includes culverts, bridge structures, gullies, weirs and trash screens. The majority of these assets will lie along ordinary watercourses within smaller urban areas where watercourses may have been culverted or diverted, or within rural areas. All these assets can have flood risk management functions as well as an effect on flood risk if they become blocked or fail. In most cases responsibility lies with the riparian / land owner.

STC provided GIS layers to illustrate where a number of their critical assets are located throughout the authority area including; structural culverts, sea defences, SuDS, gullies and manholes. Surface water drains, private surface water and foul water drains, structural culverts and SuDS are included on the large scale GeoPDFs maps in Appendix A.

There are 28 structural culverts within South Tyneside, with the majority located along the River Don, specifically around the areas of Hedworth and Monkton. Twenty-three of these are culverts and five are road bridges, located on the southern half of the River Don.

Surface water drains are located across the entire authority area, with the majority located along the A194 from Monkton Burn to Simonside. Private surface water and foul drains are predominantly clustered in the northern area of South Tyneside, specifically in South Shields, West Harton, East Jarrow and along the A19, west of Primrose. As part of its FWMA duties, the LLFA has a duty to maintain a register of structures or features, which are considered to have a significant effect on flood risk, including details on ownership and condition as a minimum. The Asset Register should include those features relevant to flood risk management function including feature type, description of principal materials, location, measurements (height, length, width, diameter) and condition grade. The Act places no duty on the LLFA to maintain any third-party features, only those for which the authority has responsibility as land/asset owner.

STC's asset register is available to view via appointment at:

South Shields Town Hall

Town Hall and Civic Offices

Westoe Road

South Shields

NE33 2RL

The LLFA should carry out a strategic assessment of structures and features on the FRM Asset Register to inform capital programme and prioritise maintenance programme. Critical assets (i.e. culverts in poor condition) to be prioritised for designated works.

5.7.3 Water company assets

South Tyneside is largely serviced by a traditional combined sewer network however, various specific areas across the borough have been improved and continue to be improved through the installation of separated foul and surface water sewers. NW is responsible for the management of the adopted sewerage systems, including for surface water and foul sewage. There may however be some private foul and surface water sewers in the Borough as only those connected to the public sewer network prior to 1st July 2011 were transferred to the water companies under the Private Sewer Transfer in October 2011 if they met certain criteria. In addition, there are likely to have been sewers and drains constructed since this transfer date which have not been offered for adoption or have not met the requirements of a Section 104 adoption agreement and therefore these remain private too. Many surface water sewers discharging to watercourses were not part of this transfer and would therefore not be under the ownership of the sewerage undertaker, unless they were offered for adoption either at the time of construction under a Section 104 agreement or retrospectively under a Section 104 adoption agreement.

Water company assets include Wastewater Treatment Works, Combined Sewer Overflows, pumping stations, detention tanks, sewer networks and manholes.

5.7.4 Natural Flood Management / Working with Natural Processes

Natural flood management (NFM) or Working with Natural Processes (WwNP) is a type of flood risk management used to protect, restore and re-naturalise the function of catchments and rivers to reduce flood and coastal erosion risk. WwNP has the potential to provide environmentally sensitive approaches to minimising flood risk, to reduce flood risk in areas where hard flood defences are not feasible and to increase the lifespan of existing flood defences. NFM and WwNP are used interchangeably in the UK though the term WwNP will be used throughout this report.

STC are actively engaged with the Tyne Catchment Partnership mentioned above and the Tyne Rivers Trust and Wear Rivers Trust with a view to setting aside land for WwNP. A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down flood waters before they can damage flood risk receptors (e.g. people, property, infrastructure, etc.). WwNP involves taking action to manage flood and coastal erosion risk by protecting, restoring and emulating the natural regulating functions of catchments, rivers, floodplains and coasts. Techniques and measures, that may not all be applicable to South Tyneside, include:

- Peatland and moorland restoration in upland catchments
- Re-meandering streams
- Targeted woodland planting
- Reconnection and restoration of functional floodplains
- Restoration of rivers and removal of redundant structures
- Installation or retainment of large woody material in river channels
- Improvements in management of soil and land use
- Creation of rural and urban SuDS
- Restoration and management of sand dunes, saltmarshes and mudflats on the coast
- Managed realignment of the coastline
- Beach nourishment

Both the European Commission and UK Government are actively encouraging the implementation of WwNP measures within catchments and coastal areas in order to assist in the delivery of the requirements of various EC Directives relating to broader environmental protection and national policies. It is fully expected that the sustained interest in WwNP implementation across the UK will continue in the post-Brexit era as a fundamental component of the flood risk management tool kit.

Evidence base for WwNP to reduce flood risk

There has been much research on WwNP, but to date it has never been synthesised into one location. This has meant that it has been hard for flood risk managers to access up-to-date information on WwNP measures and to understand their potential benefits. The EA has produced the WwNP evidence base which includes three interlinked projects:

- Evidence directory
- Mapping the potential for WwNP
- Research gaps

The evidence base can be accessed via:

https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk

The evidence base can be used by those planning projects which include WwNP measures to help understand:

- Their potential FCRM benefits and multiple benefits
- Any gaps in knowledge
- Where it has been done before and any lessons learnt
- Where in a catchment they might not be most effective

The evidence directory presents the evidence base, setting out the scientific evidence underpinning it. Its purpose is to help flood risk management practitioners and other responsible bodies access information which explains what is known and what is not about the effectiveness of the measures from a flood risk perspective. There is also a guidance document which sits alongside the evidence directory and the maps which explains how to use them to help make the case for implementing WwNP when developing business cases.

Mapping the potential for WwNP

The JBA Trust has worked with Lancaster Environment Centre (LEC) to produce an interactive catalogue of nature-based flood risk management projects in the UK. This map includes a catalogue of projects where WwNP is being applied on the ground or being considered as an option to reduce flood risk. Additionally, the map includes a set of layers that indicates the potential areas where WwNP would be beneficial based on research by the EA, Defra and NRW. The interactive map is available using this link:

https://naturalprocesses.jbahosting.com/

JBA Consulting has also been working with the EA and LEC to update national maps of Potential for Working with Natural Processes. LEC has developed a new spatial model of slowly permeable soils to identify areas where shrub or tree-planting could increase hydrological losses and slow the flow based on British Geological Survey (BGS) 1:50k maps, who have also agreed to an open government license for the maps. The new national maps for England make use of different mapping datasets and highlight potential areas for tree-planting (for three different types of planting), runoff

attenuation storage, gully blocking and floodplain reconnection. The maps can be used to signpost areas of potential and do not take into account issues such as land-ownership and drainage infrastructure, but they may well help start the conversation and give indicative estimates of, for example, additional distributed storage in upstream catchments.

These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them. There are limitations with the maps, however it is a useful tool to help start dialogue with key partners. The maps are provided as spatial data for use in GIS and also interactive GeoPDF format, supported by a user guide and a detailed technical guide.

The WwNP types are listed in Figure 5-4.

WWNP Type	Open data licence details
Floodplain reconnection	• Risk of Flooding from Rivers and Seas (April 2017) • Data derived from the Detailed River Network, which is not displayed, rescinding the licence requirements for displaying the dataset (to be superseded by OS Water Network but not available for project in time). • Constraints data
Run-off attenuation features	• Data derived from Risk of Flooding from Surface Water (Depth 1 percent annual chance and Depth 3.3 percent annual chance) (October 2013). The original data is not displayed, due to licensing restrictions.[2] • Constraints data • Gully blocking potential (a subset of run-off attenuation features on steeper ground) • Data derived from OS Terrain 50 (2016) to classify each run-off attenuation feature based on median slope.
Tree planting (3 categories)	• Floodplain: Flood Zone 2 from Flood Map for Planning (April 2016) and new constraints layer • Riparian: 50m buffer OS water features from Section 2.2.3 with constraints layer • Wider catchment woodland: - Based on slowly permeable soils. - BGS Geology 50,000 Superficial and Bedrock layers (both V8, 2017). Used with new science to derive new 100m gridded open data. This new layer can be used to signpost areas of SLOWLY PERMEABLE SOILS and can be checked in more detail on the BGS portal. - To the north of the line of Anglian glaciation, the presence of till-diamicton has been shown to be a strong predictor of slowly permeable soils. - To the south of this line, particular bedrock geologies have shown a similarly strong spatial relationship to the presence of slowly permeable soils.

Figure 5-4: WwNP measures and data[31]

[31]https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/677592/Working_with_natural_processes_mapping_technical_report.pdf

The WwNP datasets are included on the SFRA Maps in Appendix A and should be used to highlight any sites or areas where the potential for WwNP should be investigated further as a means of flood mitigation:

- Floodplain Reconnection:
  - Floodplain Reconnection Potential – areas of low or very low probability based on the Risk of Flooding from Rivers and Sea dataset (see Section 5.2.3), which are in close proximity to a watercourse and that do not contain properties, are possible locations for floodplain reconnection. It may be that higher risk areas can be merged, depending on the local circumstances.
- Runoff Attenuation Features (Run-off attenuation features are based on the premise that areas of high flow accumulation in the RoFSW) maps are areas where the runoff hydrograph may be influenced by temporary storage if designed correctly):
  - Runoff Attenuation Features 1% AEP
  - Runoff Attenuation Features 3.3% AEP
- Tree Planting:
  - Floodplain Woodland Potential and Riparian Woodland Potential – woodland provides enhanced floodplain roughness that can dissipate the energy and momentum of a flood wave if planted to obstruct significant flow pathways. Riparian and floodplain tree planting are likely to be most effective if close to the watercourse in the floodplain, which is taken to be the 0.1% AEP flood extent (Flood Zone 2), and within a buffer of 50 metres of smaller watercourses where there is no flood mapping available. There is a constraints dataset that includes existing woodland.
  - Wider Catchment Woodland Potential – slowly permeable soils have a higher probability of generating 'infiltration-excess overland flow' and 'saturation overland flow'. These are best characterised by gleyed soils, so tree planting can open up the soil and lead to higher infiltration and reduction of overland flow production.

Limitations

The effectiveness of WwNP measures is site-specific and depends on many factors, including the location and scale at which they are used. It may not always be possible to guarantee that these measures alone will deliver a specified standard of defence. Consequently, flood risk management measures should be chosen from a number of options ranging from traditional forms of engineering through to more natural systems. The research gaps that need to be addressed to move WwNP into the mainstream are identified in the evidence directory.

Working with Natural Processes in STC

According to the spatial model of slowly permeable soils there are areas within South Tyneside whereby removing existing defences and reconnecting the floodplain could create areas for potential without causing risk to properties. These areas are predominately located downstream along the River Don, with the largest area located from the A194 Leam Lane to where the Don meets the River Tyne at a confluence. Reconnecting the river with its floodplain and naturalising the river itself should lead to reduced peak flood levels which will protect properties and infrastructure in settlements downstream.

NFM measures are designed to reduce the flow of floodwater to minimise the risk of flooding to areas downstream. Tree planting can play a vital role in reducing flood risk within an area. Increased rainfall interception and infiltration may reduce surface water

runoff and therefore increase the potential of NFM in the area. There are vast expanses across the more rural areas of South Tyneside that would benefit from tree planting, however the urban areas town centre and along the River Don are also included from this potential.

STC should look to become actively engaged with the catchment partnerships and the Rivers Trust's NFM investigations, as well as using the WwNP dataset as shown on the SFRA maps (Appendix A) to gauge possible land which could be set aside for NFM.

5.7.5 River Don Catchment Project

This is a joint project lead by STC, but also including the other local councils, the EA and Highways England. The project aims to identify areas across the Don catchment that are at risk of flooding from fluvial, sewer and surface water, but also looking at opportunities for improvements to fish passage, river restoration and habitat creation. Stage 1 has been completed and identified several opportunities for weir removal and culvert improvements to improve fish passage.

In addition, four studies have been identified, namely Simonside, Mill Dene View, Reay Crescent and Tileshed Burn to progress to a Stage 2 to develop options for further flood risk management. Mill Dene View and Reay Crescent are fluvial studies whilst Simonside is at risk from surface water / sewer flooding. Tileshed Burn is a river restoration opportunity. Stage 2 will evaluate the risk and options providing an initial business case for the Council if any of the options are potentially viable.

5.7.6 EA flood risk management activities and Flood and Coastal Erosion Risk Management research and development

The FCERM Research and Development programme is run by the EA and Defra and aims to serve the needs of all flood and coastal operating authorities in England. The programme provides the key evidence, information, tools and techniques to:

- Inform the development of FCERM policy and strategy.
- Understand and assess coastal and flood risk and the processes by which these risks arise.
- Manage flood and coastal erosion assets in a sustainable way.
- Prepare for and manage flood events effectively.

In March 2020, funding was secured for the next 6 years of investment. At the time of writing, a new investment programme is being developed that will link to the ambitions of the FCERM strategy for England.

The EA regularly reviews the programme to take into account changes such as:

- Serious flooding.
- Local partnership funding contributions.
- New flood risk information.

We develop projects to reduce flooding and coastal erosion by working with:

- Local authorities.
- Internal drainage boards.
- Local communities.

Follow the link below for the latest news:

https://www.gov.uk/government/publications/programme-of-flood-and-coastal-erosion-risk-management-schemes

The potential works in STC, at the time of writing, associated with the FCERM Development Programme include:

- Property Level Protection (PLP) and Newcastle Road (south Shields) (2019-2021) – Stanhope Road PLP Scheme to be completed this financial year
- Cleadon Village and Boldon Flats - Appraisal, Design and Construction (2017-2021) - completed
- Newmarket Walk South Shields Flood Alleviation Study (2019-2021+) - completed
- *Marsden Bay Cliff Erosion Study (2019-2021) – on hold

*At study stage and progression is subject to cost beneficial business case

NW provides a community portal to ensure that the community is not only kept fully informed of the activities that affect their community, but also to have visible and audible input into them. These include; general projects, Rainwise Schemes, Water Network Improvements, Eel Protection Schemes and 'Every Drop Counts' schemes.

NW's community portal is available to view at: https://nwlcommunityportal.co.uk/

6 Development and flood risk

6.1 Introduction

This section of the SFRA provides a strategic assessment of the suitability, relative to flood risk, of the potential development sites to be considered through the Local Plan.

The information and guidance provided in this chapter (also supported by the SFRA Maps in Appendix A and the Development Site Assessment spreadsheet in Appendix B) can be used by the LPA to inform its Local Plan and provide the basis from which to apply the Sequential Approach in the development allocation and development management process.

The LPA should use Appendix C to record its decisions on how to progress each site or whether to remove a site from allocation, based on the evidence and strategic recommendations provided in this Level 1 SFRA. Recording decisions in the Sites Assessment Spreadsheet demonstrates that a sequential, sustainable approach to development and flood risk has been adopted.

6.2 The Sequential Approach

The FRCC-PPG provides the basis for the Sequential Approach. It is this approach, integrated into all stages of the development planning process, which provides the opportunities to reduce flood risk to people, property, infrastructure and the environment to acceptable levels.

The approach is based around the FRM hierarchy, in which actions to avoid, substitute, control and mitigate flood risk is central. For example, it is important to assess the level of risk to an appropriate scale during the decision-making process, (starting with this Level 1 SFRA). Once this evidence has been provided, positive planning decisions can be made and effective FRM opportunities identified.

Figure 6-1 illustrates the FRM hierarchy with an example of how these may translate into each authorities' management decisions and actions.

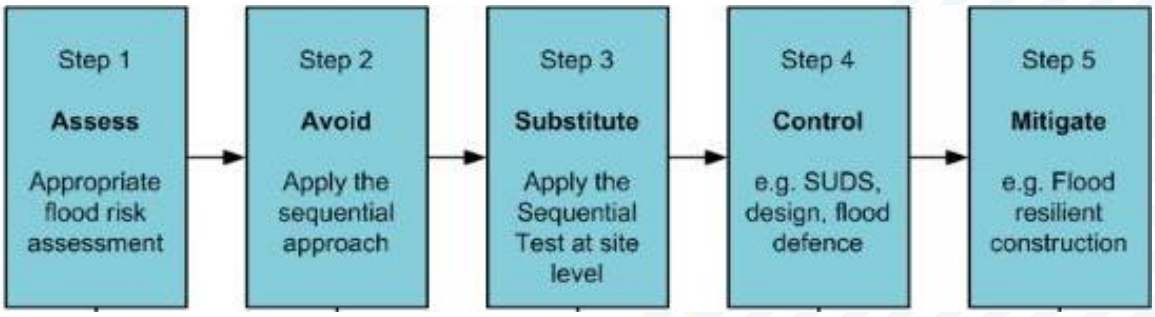

Figure 6-1: Flood risk management hierarchy

Using the EA's Flood Map for Planning, the overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3, be considered. This should take into account the flood risk vulnerability of land uses and the likelihood of meeting the requirements of the Exception Test if required.

There are two different aims in carrying out the Sequential Approach depending on what stage of the planning system is being carried out i.e. LPAs allocating land in Local Plans or determining planning applications for development. This SFRA does not remove the need for a site-specific Flood Risk Assessment at a development management stage.

The following sections provide a guided discussion on why and how the Sequential Approach should be applied, including the specific requirements for undertaking Sequential and Exception Testing.

6.3 Local Plan Sequential and Exception tests

The FRCC-PPG, para 019, states the aim of the Sequential Test is:

"…to steer new development to areas with the lowest probability of flooding. The flood zones as refined in the Strategic Flood Risk Assessment for the area provide the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required."

The NPPF, paras 164-165, sets out the Exception Test as below:

"The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. For the exception test to be passed it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Both elements of the exception test should be satisfied for development to be allocated or permitted."

The LPA should seek to avoid inappropriate development in areas at risk of flooding by directing development away from areas at highest risk and ensuring that all development does not increase risk and where possible can help reduce risk from flooding to existing communities and development.

At a strategic level, this should be carried out as part of the LPA's Local Plan. This should be done broadly by:

1. Applying the Sequential Test and if the Sequential Test is passed, applying and passing the Exception Test, if required;
2. Safeguarding land from development that is required for current and future flood management (i.e. using potential for WwNP data);
3. Using opportunities offered by new development to reduce the causes and impacts of flooding;
4. Identifying where flood risk is expected to increase with climate change so that existing development may not be sustainable in the long term; and
5. Seeking opportunities to facilitate the relocation of development including housing to more sustainable locations.

Figure 6-2 illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess sites put forward in the Local Plan against the EA's Flood Map for Planning flood zones and development vulnerability classification.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded.

This can be done using the Development Site Assessment spreadsheet in Appendix C. This spreadsheet will help show that the LPA, through the SFRA, has applied the Sequential Test for sites at fluvial risk and also considered surface water flood risk in its decision making.

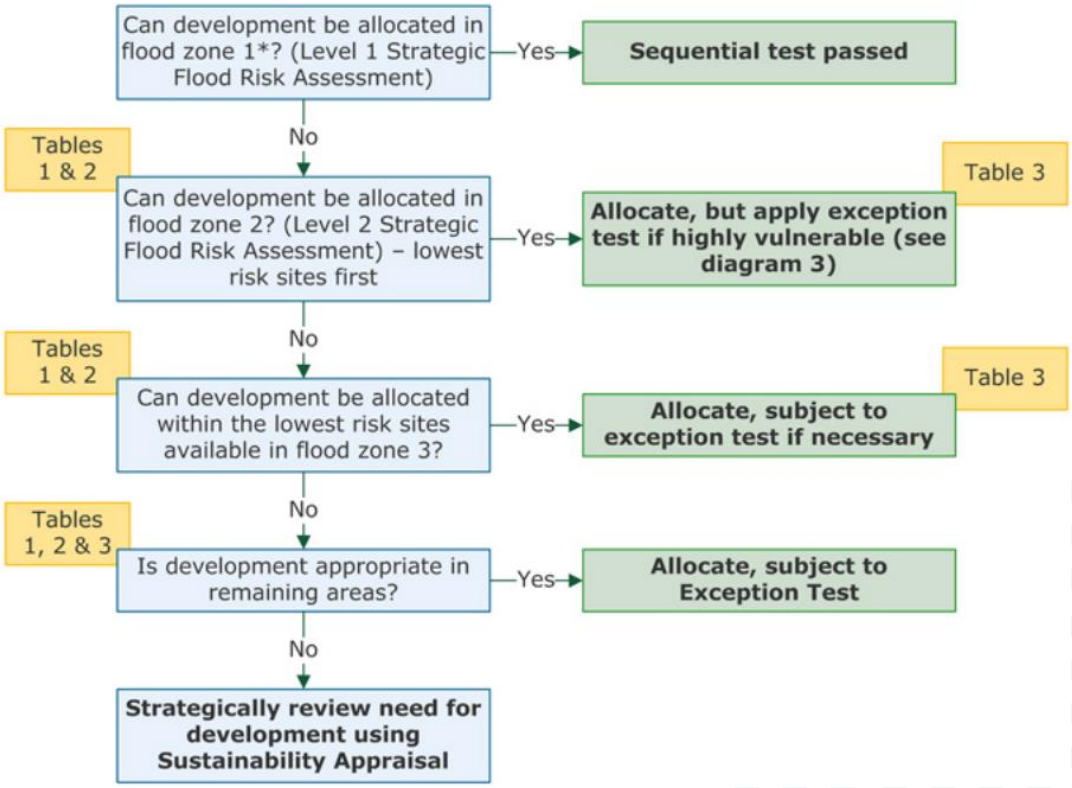

Figure 6-2: Local Plan sequential approach to site allocation[32]

**Other sources of flooding also need to be considered*

(Tables 1, 2, 3 refer to the Flood Zone and flood risk tables of the FRCC-PPG Paragraphs 065-067).

The approach shown in Figure 6-2 provides an open demonstration of the Sequential Test being applied in line with the NPPF and the FRCC-PPG. The EA works with local authorities to agree locally specific approaches to the application of the Sequential Test and any local information or consultations with the LLFA should be taken into account.

This Level 1 SFRA provides the evidence base required to carry out this process. The process also enables those sites that have passed the Sequential Test, and may require the Exception Test, to be identified. Following application of the Sequential Test the LPA and developers should refer to 'Table 3: Flood risk vulnerability and flood zone

[32] https://www.gov.uk/guidance/flood-risk-and-coastal-change#Sequential-Test-to-Local-Plan

compatibility' of the FRCC-PPG (Paragraph 067) when deciding whether a development may be suitable or not.

Although passing the Exception Test will require the completion of a site-specific FRA, the LPAs should be able to assess the **likelihood** of passing the test at the Local Plan level by using the information contained in this SFRA to answer the following questions:

a. Can development within higher risk areas be avoided or substituted?
b. Is flood risk associated with possible development sites considered too high; and will this mean that the criteria for Exception Testing are unachievable?
c. Can risk be sustainably managed through appropriate development techniques (resilience and resistance) and incorporate Sustainable Drainage Systems without compromising the viability of the development?
d. Can the site, and any residual risks to the site, be safely managed to ensure that its occupiers remain safe during times of flood if developed?

Where it is found to be unlikely that the Exception Test can be passed due to few wider sustainability benefits, the risk of flooding being too great, or the viability of the site being compromised by the level of flood risk management work required, then the LPA should consider avoiding the site altogether.

Once this process has been completed, the LPA should then be able to allocate appropriate development sites through its Local Plan as well as prepare flood risk policy including the requirement to prepare site-specific FRAs for all allocated sites that remain at risk of flooding or that are greater than one hectare in area.

6.4 Local Plan sites assessment

STC provided a GIS layer of possible development sites with potential to be included as site allocations in the new Local Plan. 721 potential sites have been provided, including the following proposed uses, detailed in Table 6-1.

Proposed site use	Flood risk vulnerability (Table 2 of FRCC-PPG)	Number of sites
Housing	More vulnerable	698
Employment	Less vulnerable	23

Table 6-1: Proposed site uses and flood risk vulnerability

In order to inform the Sequential Approach to the allocation of development through the Local Plan (as illustrated in Figure 6-2), this SFRA entails a high-level GIS screening exercise overlaying the allocated sites against Flood Zones 1, 2, 3a and 3b and calculating the area of each site at risk. Flood Zones 1, 2 and 3a are sourced from the EA's Flood Map for Planning (Rivers and Sea) and Flood Zones 3b (functional floodplain) was delineated as part of this Level 1 SFRA. Surface water risk to potential sites is assessed by way of the EA's Risk of Flooding from Surface Water (RoFSW). Results are presented in the Development Site Assessment spreadsheet in Appendix B.

It is important to consider that each individual site will require further investigation, following this review, as local circumstances may dictate the outcome of the recommendation. Such local circumstances are discussed in the following section.

For this SFRA, surface water flood risk is afforded the equivalent level of importance as fluvial and tidal risk in terms of the strategic recommendations assigned to each potential development site.

6.5 Screening of potential development sites

This section of the report draws together the results included in the Development Site Assessment spreadsheet (Appendix B), produced from the GIS screening exercise. The LPA should use the spreadsheet to identify which sites should be avoided during the Sequential Test. If this is not the case, or where wider strategic objectives require development in areas already at risk of flooding, then the LPA should consider the compatibility of vulnerability classifications and Flood Zones (refer to FRCC-PPG) and whether or not the Exception Test will be required before finalising sites. The decision-making process on site suitability should be transparent and information from this SFRA should be used to justify decisions to allocate land in areas at high risk of flooding.

The Appendix B spreadsheet provides a breakdown of each site and the area (in hectares) and percentage coverage of each fluvial / tidal flood zone and each surface water flood zone. Fluvial / tidal Flood Zones 3b, 3a, 2 and 1 are considered in isolation. Any area of a site within the higher risk Flood Zone 3b that is also within Flood Zone 3a is excluded from Flood Zone 3a and any area within Flood Zone 3a is excluded from Flood Zone 2. This allows for the sequential assessment of risk at each site by addressing those sites at higher risk first. For surface water, the risk from the flood zones is assessed cumulatively rather than in isolation.

Table 6-2 shows the number of sites within each fluvial / tidal flood zone, Table 6-3 shows the number of sites within each surface water flood zone of the RoFSW map and Table 6-4 shows the number of sites within the surface water flood zones of the localised surface water modelling carried out in Cleadon and Monkton (see Section 5.3.1).

Potential development site	Number of sites within...			
	Flood Zone 1*	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Housing	652	42	32	37
Employment	16	7	7	5
TOTAL	**668**	**47**	**37**	**40**
*Sites with 100% area within Flood Zone 1				

Table 6-2: Number of potential development sites at risk from fluvial / tidal flooding

Site type	RoFSW flood zone		
	Low risk (1 in 1000)	Medium risk (1 in 100)	High risk (1 in 30)
Housing	424	296	147
Employment	18	13	7
Total	**440**	**307**	**153**

Table 6-3: Number of potential development sites at risk from surface water flooding as per the RoFSW map

Site Type	Cleadon 1 in 100 +CC	Cleadon 1 in 100	Cleadon 1 in 30	Monkton 1 in 75
Housing	43	41	38	36
Employment	0	0	0	1
Total	**42**	**40**	**37**	**37**

Table 6-4: Number of potential development sites at risk from surface water flooding as per localised surface water modelling in Cleadon and Monkton

The spreadsheet also includes high level broad-brush strategic recommendations on the viability of development for each site. Development viability is assessed, based on Tables 1, 2 and 3 of the flood risk and flood zone tables[33] of the FRCC-PPG (Paragraphs 065 – 067). The strategic recommendations are intended to assist the LPA in carrying out the Sequential Test and to highlight those sites at greatest flood risk. It is important to reiterate that surface water flood risk is afforded the equivalent level of importance as fluvial and tidal risk in terms of the strategic recommendations assigned to each potential development site. Table 6-5 shows the number of sites each strategic recommendation applies to.

Strategic recommendations:

- Strategic Recommendation A - consider withdrawing the site based on significant level of fluvial / tidal flood risk;
- Strategic Recommendation B - Exception Test required if site passes Sequential Test;
- Strategic Recommendation C - consider site layout and design around the identified flood risk if site passes Sequential Test OR must consider SW flood risk through a full drainage strategy;
- Strategic Recommendation D - site-specific FRA required; and
- Strategic Recommendation E - site permitted on flood risk grounds due to little perceived risk, subject to consultation with the LPA / LLFA.

Site/proposed use	Strategic Recommendation				
	A	**B**	**C**	**D**	**E**
Housing	12	2	58	390	236
Employment	3	0	4	12	4
Total	**15**	**2**	**62**	**402**	**240**
*23 due to Flood Zone 3b					

Table 6-5: Number of sites per strategic recommendation

It is important to note that this Level 1 SFRA does not assess each individual site in detail. Each individual site will require further investigation, as local circumstances may dictate the outcome of the strategic recommendation. The strategic recommendation may therefore change upon further investigation.

Such local circumstances may include the following:

- Flood depths and hazards will differ locally to each at risk site therefore modelled depth, hazard and velocity data should be assessed for the relevant flood event outlines, including climate change (using the EA's February 2016 allowances), as part of a site-specific FRA or Level 2 SFRA.
- Current surface water drainage infrastructure and applicability of SuDS techniques are likely to differ at each site considered to be at risk from surface water flooding. Further investigation would therefore be required for any site at surface water flood risk.
- If sites have planning permission but construction has not started, the SFRA will only be able to influence the design of the development e.g. finished floor

[33] https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-zone-and-flood-risk-tables

levels. New, more extensive flood extents (from new models) cannot be used to reject development where planning permission has already been granted.

- It may be possible at some sites to develop around the flood risk. Planners are best placed to make this judgement i.e. will the site still be deliverable if part of it needs to be retained to make space for flood water?
- Surrounding infrastructure may influence scope for layout redesign/removal of site footprints from risk.
- Safe access and egress must exit at all times during a flood event for emergency response and evacuation
- Current land use. A number of sites included in the assessment are likely to be brownfield, thus the existing development structure could be taken into account as further development may not lead to increased flood risk.
- Existing planning permissions may exist on some sites where the EA may have already passed comment and/or agreed to appropriate remedial works concerning flood risk. Previous flood risk investigations/FRAs may already have been carried out at some sites.
- Cumulative effects. New development may result in increased risk to other potential or existing sites. This should be assessed through a Level 2 SFRA or drainage strategy, if required.

NOTE: In September 2018 it was agreed between the EA and STC that employment site E14 (Tyne Dock Infill) had previously been developed as a concrete platform at a level of 4.63 mAOD. STC confirmed this level is above the level of the 1 in 20 AEP event from the 2015 Tyne Model, as informed by the site-specific FRA at the time. Having previously been within the functional floodplain outline, it was agreed that the outline should be edited to remove the functional floodplain from this site footprint, given the construction had taken place before this SFRA was commissioned. This site has been removed from the 2021 functional floodplain outline within this SFRA update.

The following strategic recommendations provide only a guide, based on the fluvial and surface water flood risk information made available for this Level 1 SFRA. Information regarding local, site specific information is beyond the scope of this Level 1 SFRA. It is STC's responsibility to carry out sequential testing of each site using the information provided in this SFRA and more specifically using their local, site specific knowledge and advice from the EA and LLFA. The strategic recommendations should be read alongside the Development Site Assessment spreadsheet in Appendix B, which assists the LPA in carrying out the Sequential Test for each site.

6.5.1 Strategic Recommendation A – consider withdrawal of site

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a flood zone.

Strategic Recommendation A applies to any site where the following criteria is true:

- 10% or greater of the site area is within Flood Zone 3b. The FRCC-PPG flood risk vulnerability classification states that only water-compatible uses and essential infrastructure should be permitted in Flood Zone 3b, though any essential infrastructure must pass the Exception Test and water-compatible uses must be designed and constructed to remain operational and safe for users in times of flood; must result in no net loss of floodplain storage; and not impede water flows and not increase flood risk elsewhere. Development should not be permitted for sites within the highly, more or less vulnerable categories (see Table 6-1) that fall within Flood Zone 3b. If the developer is able to avoid 3b however, then part of the site could still be delivered.

The 10% threshold is not included within any policy, it is merely considered that it may prove difficult for developers to deliver a site where 10% or more of the site area is considered as undevelopable, based on the NPPF. This 10% threshold does not account for local circumstances therefore it may be possible to deliver a site, upon more detailed investigation through a Level 2 SFRA or drainage strategy.

Depending on local circumstances, if it is not possible to adjust the site boundary to remove the site footprint from Flood Zone 3b to a lower risk zone then development should not be permitted.

Strategic Recommendation A applies to 15 sites, of which 12 are housing and 3 are for employment. The 15 sites are displayed below in Table 6-6.

Any area within Flood Zone 3b must be left as open green space or the site boundary amended to remove the developable area from the risk area. For the smaller sites, this approach is unlikely to be achievable compared to larger sites where there may be enough space to limit the impact through effective SuDS. If this is not possible, the site should be withdrawn. The EA supports recommendation for withdrawing sites within Flood Zone 3b.

Site ID	Site name	Site area (ha)	% area in FZ3b
SBC010	Land at Cleadon Lane Industrial Estate	6.52	36.89
SBC088	Land south east of Natley Avenue	1.89	30.56
SBC091	Land to North and West of Cleadon Lane Ind. Est	2.97	31.39
SBC092	Land to North and West of Cleadon Lane Ind. Est	6.39	32.23
SBC093	Land to south of Tileshed Lane	4.63	36.34
SBC133	Land off Station Approach	2.33	12.12
SFG041	Land at Monkton Fell	3.82	12.19
SHB028	Large Open Grassed Space adjacent to the Cock Crow Inn	0.99	12.18
SHB040	Former Hawthorn Leslie Shipyard	4.37	36.75
SHB120	Vacant Former Balfour Beatty Utility Solutions Ltd	0.36	16.33
SBC130	Land west of Moor Lane	4.45	90.92
SOS014	Land at Holborn	10.08	16.18
E1	Former Hawthorn Leslie Shipyard, Ellison Street, Hebburn	3.67	31.41
E3	Green Business Park, Hebburn/Jarrow Staithes	6.33	21.10
E11	Beside MH Southern	0.28	12.73

Table 6-6: Sites potentially unsuitable for development based on fluvial / tidal flood risk (if development cannot be directed away from risk areas, the site will be unsuitable for development)

Of the 15 sites recommended as being potentially unsuitable for development, 12 are proposed for housing and 3 for employment, shown on the SFRA maps in Appendix A. These sites have been recommended as potentially unsuitable (if development cannot be directed away from flood risk areas, the site will be unsuitable for development) based on being located within the functional floodplain; any area within the functional floodplain must be either be removed from the site boundary (i.e. redrawn site boundaries) or the risk area incorporated into the site design as open space / amenity areas free from development and allowed to flood.

Sites SHB028, SHB120 and E11 may struggle to accommodate the fluvial / tidal risk on site due to the site's areas being less than 1 hectare. Housing yields may be impacted for sites SHB028 and SHB120. These sites will require a more detailed assessment to gauge the viability of development going forwards.

6.5.2 Strategic Recommendation B – Exception Test required

NOTE: This strategic recommendation DOES NOT consider site-specific circumstances, only that part of a site area falls within a flood zone.

Strategic Recommendation B applies to sites where it is likely the Exception Test would be required, assuming the Sequential Test has been passed in the first instance. This does not include any recommendation on the likelihood of a site passing the Exception Test. A more in-depth investigation such as a Level 2 SFRA would be required to assess this. The developer / LPA should always attempt to avoid the risk area where possible

Strategic Recommendation B applies to sites where the following criteria is true:

- A significant proportion (10%) of a more vulnerable site (residential and mixed use) is within Flood Zone 3a. Less vulnerable (employment) uses of land do not require the Exception Test.

NOTE: All development proposals in Flood Zone 3a must be accompanied by a flood risk assessment.

Strategic Recommendation B applies to two assessed sites shown in Table 6-7. All sites must pass both parts of the Exception Test in order to proceed. It is up to the LPA to prove whether the first part of the Exception Test can be satisfied, before moving on to the second part.

Site ID	Site name and location	Proposed Use	Site area (ha)	% area in FZ3a
SOS104	Land behind Ghandis Temple	Housing	0.39	14.93
SHB042	Hebburn boatyard	Housing	0.52	13.63

Table 6-7: Sites where the Exception Test is required

6.5.3 Strategic Recommendation C – careful consideration of site layout and design around flood risk

NOTE: This strategic recommendation DOES NOT consider site-specific circumstances, only that part of a site area falls within a flood zone.

Strategic Recommendation C applies to sites where one or more of the following criteria is true:

- A manageable proportion (<10%) of any site type is within Flood Zone 3b.
- A manageable proportion (<10%) of any housing (more vulnerable) site is within Flood Zone 3a.
- 10% or greater of the site area of any site type is within the high risk surface water flood outline, and therefore at significant surface water flood risk.
- 10% or greater of the site area of more vulnerable sites are within the medium risk surface water flood outline, and therefore at significant surface water flood risk.
- 10% or greater of the site area of more vulnerable sites are within the Cleadon 1 in 30 AEP surface water flood zone.

Overall, there are 62 sites to which Strategic Recommendation C applies; of these sites, 43 have over 97% within Flood Zone 1, meaning surface water risk is what chiefly needs to be mitigated at these sites; though fluvial risk should still be assessed. For these sites, complex flood risk issues may exist meaning site layout should be tailored with a view to removing the developable area from the flood zone that is obstructing development i.e. the high and medium risk surface water flood risk zones. If this is not possible then the alternative would be to investigate the incorporation of onsite storage of water into the site design through appropriate SuDS.

Strategic Recommendation C applies in instances where, from a high-level strategic viewpoint, there looks to be a greater potential for onsite management of risk. A Level

2 SFRA and/or detailed site-specific FRA would be required to help inform on suitable site layout and design.

Where Strategic Recommendation C applies to a potential site, the sequential approach to site layout should be applied, with a view to excluding the developable area from the flood extent that is obstructing development. If this is not possible then the alternative would be to investigate the incorporation of onsite storage of water into the site design.

Development planning should always be aware of the requirement to not develop within 8 metres of any watercourse, flood defence structure or culvert, or within 16 metres on a tidal river which is likely to be a regulated flood risk activity under Schedule 25 of the Environmental Permitting (England and Wales) Regulations 2016. The 8 metre no development buffer zone of watercourses, shown indicatively on the SFRA maps in Appendix B, is recommended by the EA to allow ease of access to watercourses for maintenance works. Any site redesign, where Flood Zones 3b and 3a, are included within the site footprint, should allow water to flow naturally or be stored in times of flood through application of suitable SuDS

6.5.4 Strategic Recommendation D – development can proceed to FRA stage

NOTE: This strategic recommendation DOES NOT consider site-specific circumstances, only that part of a site area falls within a flood zone.

This recommendation applies to sites where risk is not deemed to require complex investigation and such sites can progress subject to an FRA. Note, a site within low risk Flood Zone 2 could still be rejected if the conclusions of the FRA decide development is unsafe or inappropriate.

Strategic Recommendation D applies to sites where one or more of the following criteria is true:

- Any site within Flood Zone 2 that does not have any part of its footprint within Flood Zone 3a, with the exception of highly vulnerable development which would be subject to, and have to pass, the Exception Test.
- Less vulnerable and water compatible sites within Flood Zone 3a. No part of the site can be within Flood Zone 3b.
- Less vulnerable sites which are 100% within Flood Zone 1 where surface water flood risk is apparent but not considered significant.
- Any site which is 100% within Flood Zone 1 that is greater than or equal to 1 hectare in area.
- Any site at no present risk, but subject to risk from climate change

Strategic Recommendation D applies to 402 assessed sites. Of which 398 of these sites are 100% within Flood Zone 1 with a further two sites having over 99% within Flood Zone 1. The surface water risk at these sites will be nominal although will still require appropriate assessment through an FRA. There are also two sites (SJA055 and SJA058) at some risk from Flood Zone 2 and must therefore be subject to an FRA at planning application stage by the applicant. Each site-specific FRA should investigate the risk and mitigate accordingly, including consideration of plans for safe site access and egress during a possible flood event. Each FRA should include its own emergency plan.

6.5.5 Strategic Recommendation E – development could be allocated on flood risk grounds subject to consultation with the LPA / LLFA

NOTE: This strategic recommendation DOES NOT consider site-specific circumstances.

This recommends that development could be allocated on flood risk grounds due to very low risk, based on the evidence provided within this SFRA. Further investigation (i.e. FRA) may be required by the developer at the planning application stage if any further or new information becomes available since the publication of this SFRA. Strategic Recommendation E applies to 240 sites.

> Strategic Recommendation E applies to any site with 100% of its area within Flood Zone 1 and not within any surface water flood zone, and therefore considered to be at very low risk.

6.6 Assessment of climate change

At the strategic level, it could be said that any site currently at risk, will likely be at increased risk in the long term, due to climate change. Though this does not account for any existing or planned flood defence works or mitigation solutions. However, for this SFRA, it should be assumed that all potential development sites identified to be at existing risk from fluvial / tidal flooding, are at risk from the effects of climate change. This accounts for 27 (~4%) of the 719 potential development sites assessed.

To represent the increased flood risk resulting from climate change, 20yr +CC, 200 yr +CC, and 1000yr +CC for the River Tyne Tidal model were modelled. There are 35 sites identified at risk from these climate change modelled outlines.

The absence of appropriate modelling across the whole of STC means it cannot be gauged as to what extent a site may be at increased risk. However, for this SFRA, Flood Zone 2 is used as a proxy for Flood Zone 3 + 50% peak flow uplift for climate change. Based on climate change modelling elsewhere in England, Flood Zone 2 is generally larger in extent than the +50% upper end allowance for the 2080s, therefore this approach can be considered to be a worst-case scenario.

It could also be said that sites that are currently wholly located in Flood Zone 1 may also be at long term risk from climate change. Again, without appropriate modelling it is not possible to robustly identify such sites. In the absence of modelling we have therefore used a precautionary approach by identifying whether any sites wholly within Flood Zone 1 are within 20 metres of Flood Zone 2 and therefore may to be at some level of fluvial risk in the future. Again, this is a precautionary approach that is somewhat arbitrary in that there are a number of localised factors, such as topography; existing and future flood risk management practices; existing and future flood defence infrastructure, that would dictate whether any such sites would be at increased risk in the future. Using this approach, there are zero sites that are currently shown to be wholly within Flood Zone 1 that may be at risk in the long term. All together this adds up to 62 (~9%) of the 719 sites assessed.

It should be noted that changes in flood zone extents in well-defined floodplains will be more negligible compared to very flat floodplains. However, changes in flood depth within the more well-defined floodplains will be greater. The expected increase in flood extents and depths as a result of climate change will have implications for the type of development that is considered appropriate according to its vulnerability.

Using the above approaches, all sites identified to be at increased risk from climate change are indicated in the Sites Assessment Spreadsheet in Appendix C. It is recommended that each of these sites is subject to climate change modelling as part of, either, an addendum to this Level 1 SFRA, at the Level 2 SFRA stage, or the site-specific FRA stage.

The EA's 2020 SFRA guidance states that the LPA…

…may need to commission new or updated modelling if:

- *models are not available*

- *climate change allowances (predicted effects of climate) in the model are not in line with current climate change allowances.*

You may be able to commission modelling with other planning authorities, the Environment Agency or relevant developers to share the benefits and costs. Any new modelling will need to go through a transparent quality assurance process to make sure it is fit for purpose. Contact your local Environment Agency office for the available data and to discuss joint working and quality assurance.

Time and budget constraints has not allowed for new modelling to be carried out as part of this Level 1 SFRA; however, the Council should consider carrying this out in the short term.

6.7 Summary of sites assessment outcomes

There are several consequential development considerations which could come out of the site assessment sequential testing process. Each outcome is discussed below. The LPA should refer to Section 6.5 and Appendix B for details on the site assessments carried out for this SFRA.

6.7.1 Rejection of site

A site which fails to pass the Sequential Test and / or the Exception Test should be rejected, and development should not be permitted or allocated. Rejection would also apply to any more (residential, mixed use inclusive of residential) or less vulnerable (employment) sites within the functional floodplain where development should not be permitted or allocated. If the developer is able to avoid the functional floodplain, part of the site could still be delivered. However, depending on local circumstances, if it is not possible to adjust the site boundary to remove the site footprint from the functional floodplain to a lower risk zone then development should not be permitted.

In terms of surface water flood risk, if risk is considered significant, based on AEP or development vulnerability, or where the size of the site does not allow for onsite storage or application or appropriate SuDS then such sites could be rejected. The LLFA will be best placed to advise on site-specific surface water flood risk and whether sites can be taken forward or not.

6.7.2 Exception Test required

Applies to those sites that, according to the FRCC-PPG vulnerability tables, would require the Exception Test. Only water-compatible and less vulnerable land uses would not require the Exception Test in Flood Zone 3a. More vulnerable uses and essential infrastructure are only permitted if the Exception Test is passed and all development proposals in Flood Zone 3a must be accompanied by an FRA at the planning application stage.

6.7.3 Consideration of site layout and design

Applies to sites where, based on the strategic assessment of risk, it may be possible to alter the site boundary to remove the risk from the site or to incorporate the risk within the site layout through careful design. Site layout and site design is important at the site planning stage where flood risk complexities exist. The site area would have to be large enough to enable any alteration of the developable area of the site to remove development from the functional floodplain, or to leave space for onsite storage of flood water. Careful layout and design at the site planning stage may apply to such sites where it is considered viable based on the level of risk. Surface water risk and opportunities for SuDS should also be assessed through a suitable drainage strategy.

Depending on local circumstances, if it is not possible to adjust the site boundary to remove the site footprint from the functional floodplain to a lower risk zone then development should not be allocated or permitted. If it is not possible to adjust the developable area from Flood Zone 3a to a lower risk zone or to incorporate onsite storage of water within site design, then the site could be rejected.

Any development within 8 metres of any flood defence structure or culvert on a Main River is likely to be regulated flood risk activity under Schedule 25 of the Environment Permitting (England and Wales) Regulations 2016. Any site design, where Flood Zone 3a is included within the site footprint, should allow water to flow naturally or be stored in times of flood through application of appropriate SuDS techniques (see Section 6.7

of the main report). Similarly, any change or alteration to an ordinary watercourse within the site would need consent from the LLFA under the Land Drainage Act 1991[34]

6.7.4 Site-specific Flood Risk Assessment

A site-specific FRA is required for the majority of site planning applications. The FRA should assess whether a potential development is likely to be affected by current or future flooding (including effects of climate change) from any source. This should include referencing this SFRA to establish sources of flooding. Further analysis should be performed to improve the understanding of flood risk including agreement with the LPA and the EA on areas of functional floodplain that have not been specified within this SFRA. The LLFA should be consulted on risk from surface water and from ordinary watercourses.

According to the FRCC-PPG (Para 030), a site-specific FRA is:

"…carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary (see footnote 50 in the National Planning Policy Framework), the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users (see Table 2 – Flood Risk Vulnerability of FRCC-PPG)."

The objectives of a site-specific FRA are to establish:

- Whether the development will increase flood risk elsewhere;
- Whether the measures proposed to deal with these effects and risks are appropriate;
- The evidence for the local planning authority to apply (if necessary) the Sequential Test;
- Whether the development will be safe for its lifetime and can pass the Exception Test, if applicable; and
- That an appropriate Emergency Plan is in place that accounts for the possibility of a flood event and shows the availability of safe access and egress points accessible during times of flood. (Para 030)

[34] https://www.legislation.gov.uk/ukpga/1991/59/contents

When is a Site-Specific FRA Required?

According to the NPPF (2021), a site-specific FRA should be prepared when the application site is:

- Situated in Flood Zone 2 and 3; for all proposals for new development (including minor development and change of use);
- 1 hectare or greater in size and located in Flood Zone 1;
- Located in Flood Zone 1 on land which has been identified by the EA as having critical drainage problems (i.e. within an ACDP);
- Land identified in the SFRA as being at increased flood risk in future (i.e. those sites identified in Appendix C via the methods described above in Section E.2);
- At risk of flooding from other sources of flooding, such as those identified in this SFRA; or
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding.

Optionally, the LPA may also like to consider further options for stipulating FRA requirements, such as:

- Situated in an area currently benefitting from defences;
- At residual risk from reservoirs or canals;
- Within a council designated CDA; or
- Situated over a culverted watercourse or where development will require controlling the flow of any watercourse, drain or ditch or the development could potentially change structures known to influence flood flow.

These further options should be considered during the preparation and development of the Local Plan.

Paragraph 031 of the FRCC-PPG contains information regarding the level of detail required in the FRAs and indicates that it should always be proportionate to the degree of flood risk whilst making use of existing information, including this SFRA. Paragraph 068 of the FRCC-PPG contains an easy to follow FRA checklist for developers to follow.

Together with the information in the FRCC-PPG, there is further detail and support provided for the LPA and developers via:

https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

advice for LPAs:

https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities

also, EA guidance for Flood Risk Assessments for planning applications:

https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Section 6.9 of the main report provides further guidance for developers

6.7.5 Sites passing the Sequential and Exception Tests

Development sites can be allocated or granted planning permission where the Sequential Test and the Exception Test (if required) are passed and agreement is reached between the LPA, the EA, the LLFA, NW and any ancillary stakeholders. In addition, a site is likely to be allocated without the need to assess flood risk where the indicative use is for open space. Assuming the site is not to include any development and is to be left open then the allocation is likely to be acceptable from a flood risk

point of view. However, for sites where there is potential for flood storage, options should be explored as part of an FRA.

In terms of opportunities for reducing flood risk overall as a requirement of the Exception Test, the FRCC-PPG states:

"Local authorities and developers should seek opportunities to reduce the overall level of flood risk in the area and beyond. This can be achieved, for instance, through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems, through safeguarding land for flood risk management, or where appropriate, through designing off-site works required to protect and support development in ways that benefit the area more generally." (Paragraph 50).

6.7.6 Surface water risk to assessed site

For sites at surface water flood risk the following should be considered:

- Possible withdrawal, redesign or relocation for those sites considered to be at significant risk, as identified through this SFRA. More detailed surface water modelling may reveal increased risk or less risk to a site. The LLFA should be consulted when considering development viability at such sites;
- Outline drainage strategy to ascertain natural flow paths and topographic depressions, particularly for the larger sites which may influence sites elsewhere;
- A detailed site-specific FRA incorporating surface water flood risk management;
- Full drainage strategy encompassing detailed surface water modelling of proposed site layouts, attenuation areas, diversion of flow routes;
- Ensuring the future maintenance of surface water and SuDS assets through s106 agreements;
- The size of development and the possibility of increased surface water flood risk caused by development on current greenfield land (where applicable), and cumulative impacts of this within specific areas;
- Management and reuse of surface water onsite, assuming the site is large enough to facilitate this and achieve effective mitigation. Effective surface water management should ensure risks on and off site are controlled;
- Larger sites could leave surface water flood-prone areas as open greenspace, incorporating social and environmental benefits;
- SuDS should be implemented where possible, following the principles of the SuDS Management Train. Appropriate SuDS may offer opportunities to control runoff to greenfield rates or better. Restrictions on surface water runoff from new development should be incorporated into the development planning stage. For brownfield sites, where current infrastructure may be staying in place, then runoff should attempt to mimic that of greenfield rates, unless it can be demonstrated that this is unachievable or hydraulically impractical. Developers should refer to the national 'non-statutory technical standards for sustainable drainage systems' and other guidance documents cited in Section 6.8 of the main report;
- Hydrogeological conditions, infiltration characteristics and possible groundwater pollution should be investigated before assessing SuDS options;
- Runoff up to and including the 1 in 100 AEP event (1%) should be managed onsite where possible;
- Measures of source control should be required for development sites;

- Developers should be required to set part of their site aside for surface water management, to contribute to flood risk management in the wider area and supplement green infrastructure networks;
- Developers should be required to maximise natural or semi-natural permeable surfaces; and
- Flow routes on new development where the sewerage system surcharges as a consequence of exceedance of the 1 in 30 AEP design event should be retained.

6.8 Sustainability Appraisal (SA) and flood risk

The Sustainability Appraisal (Section A.5.4 of Appendix A) of the Local Plan should help to ensure that flood risk is taken into account at all stages of the planning process with a view to directing development away from areas at flood risk, now and in the future, by following the sequential approach to site allocation, as shown in Figure 6-2. The SA should be informed by this SFRA so that flood risk is fully taken into account when considering allocation options and in the preparation of plan policies, including policies for flood risk management to ensure that flood risk is not increased (para 010 FRCC-PPG).

By avoiding sites identified in this SFRA as being at significant risk, such as those listed in Section 6.5.1 or by considering how changes in site layout can avoid those parts of a site at flood risk, such as any site included within Section 6.5.3, the Council would be demonstrating a sustainable approach to development.

In terms of surface water, the same approach should be followed whereby those sites at highest risk should be avoided or site layout should be tailored to ensure sustainable development. This should involve investigation into appropriate SuDS techniques (see Section 6.11).

Surface water flood risk should be considered with the same importance as fluvial flood risk.

Once the LPA has decided on a final list of sites following application of the Sequential Test and, where required, the Exception Test following a Level 2 SFRA, a phased approach to development should be carried out to avoid any cumulative impacts that multiple developments may have on flood risk. For example, for any site where it is required, following the Sequential Test, to develop in Flood Zone 3, detailed modelling would be required to ascertain where displaced water, due to development, may flow and to calculate subsequent increases in downstream flood volumes. The modelling should investigate scenarios based on compensatory storage techniques to ensure that downstream or nearby sites are not adversely affected by development on other sites.

6.8.1 Cumulative impacts

The NPPF (2021) states that strategic policies…

"…should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards". (para 160)

Previous policies have relied on the assumption that if each individual development does not increase the risk of flooding, the cumulative impact will also be minimal. However, if there is a lot of development occurring within one catchment, particularly where there is flood risk to existing properties or where there are few opportunities for mitigation, the cumulative impact may be to change the flood response of the catchment.

Consideration should be given to the following:

- The importance of phasing of development, as discussed in Section 6.8.4;

- Cross boundary impacts i.e. there should be dialogue between STC and neighbouring authorities upstream and downstream of STC, namely Gateshead, North Tyneside and Sunderland, in terms of decisions taken on upstream development, flood risk management practices and capital works (see Section 6.8.2);
- Leaving space for floodwater, utilising greenspace for flood storage and slowing the flow (see Sections 6.8.3 and 5.7.4);
- Must ensure floodplain connectivity; and
- SuDS and containment of surface water onsite as opposed to directing elsewhere (Section 6.11).

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volumes, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe.

All new development plans must comply with the NPPF and demonstrate flood risk will not be increased elsewhere. Therefore, providing all new development complies with the latest guidance and legislation relating to flood risk and sustainable drainage, in theory there should not be any increase in flood risk downstream.

Strategic solutions may include upstream flood storage, integrated major infrastructure/ Flood Risk Management schemes, new defences, and watercourse improvements as part of regeneration and enhancing green infrastructure, with opportunities for Working with Natural Processes and retrofitting of SuDS to existing development.

Through the Local Plan, the LPA should consider the following strategic solutions:

- Use of sustainable flood storage and mitigation schemes to store water and manage surface water runoff in locations that provide overall flood risk reduction as well as environmental benefits,
- In areas where flood risk is being managed effectively, there will be a need in the future to keep pace with increasing flood risk as a result of climate change,
- Assessment of long-term opportunities to move development away from the floodplain and to create blue/green river corridors throughout the Borough,
- Identification of opportunities to use areas of floodplain to store water during high flows, to reduce long-term dependence on engineered flood defences located both within and outside the Borough,
- Safeguarding the natural floodplain from inappropriate development,
- Where possible, changes in land management should look to reduce runoff rates from development whilst maintaining or enhancing the capacity of the natural floodplain to retain water. Land management and uses that reduce runoff rates in upland areas should be supported,
- Development should maintain conveyance of watercourses through hamlets and villages to help reduce the impact of more frequent flood events and to improve the natural environment and WFD targets,
- Use of this SFRA to inform future development and minimise flood risk from all sources,
- Implementation of upstream catchment management i.e. slow the flow and flood storage schemes could be implemented in upper catchments to reduce risk downstream and across neighbouring authority boundaries, and

- Promotion and consideration of SuDS at the earliest stages of development planning.

According to the NPPF, the LPA should work with neighbouring authorities to consider strategic cross boundary issues and infrastructure requirements. Local authorities also have a duty to cooperate whereby councils work together on strategic matters and produce effective and deliverable policies on strategic cross boundary matters.

6.8.2 Hydrological linkages and cross boundary issues

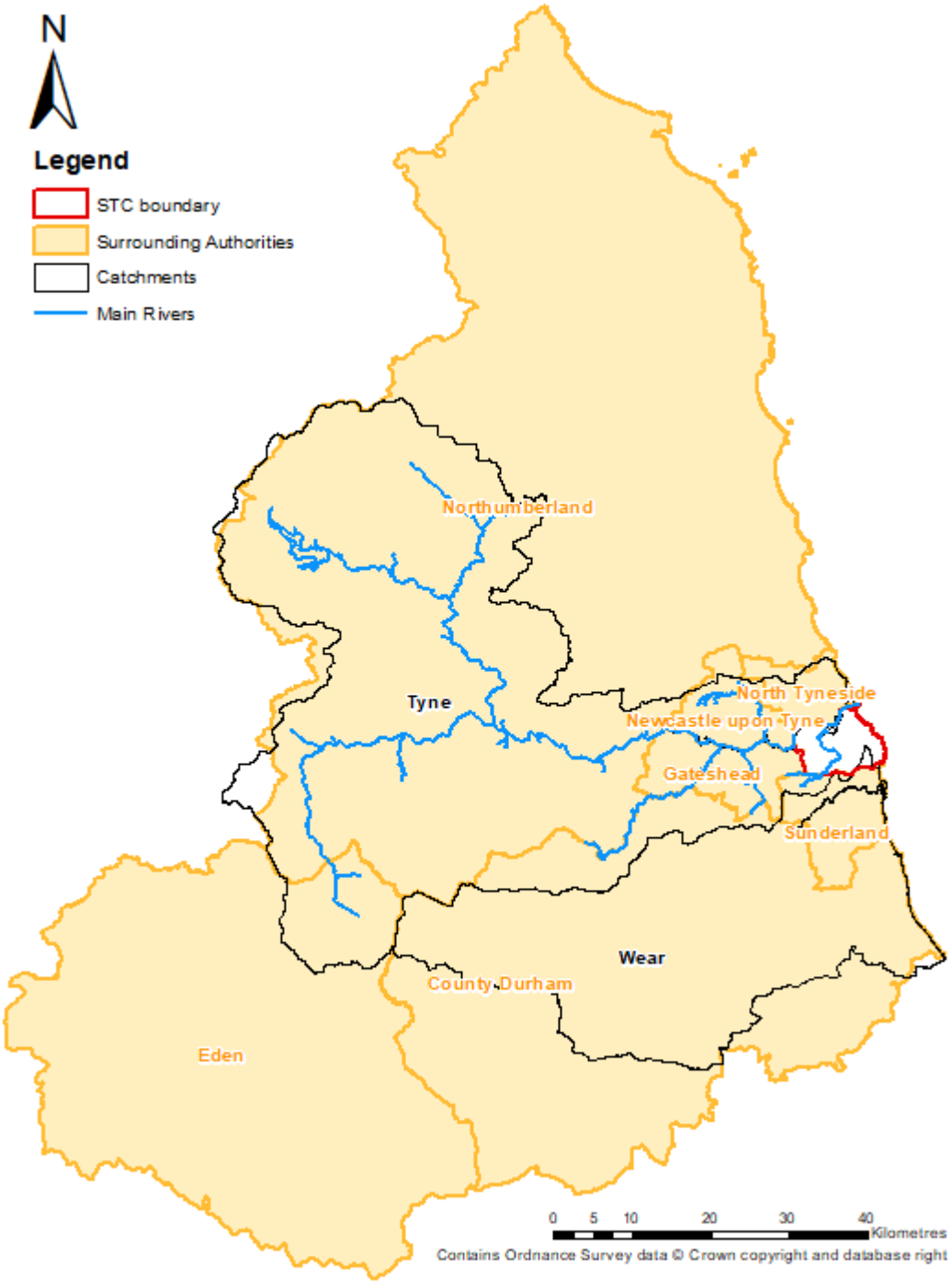

Figure 6-3 illustrates the fluvial and tidal hydraulic linkages for the catchments in and around South Tyneside. The River Don originates within Sunderland City Council

authority area before flowing through the centre of South Tyneside where it meets the Tyne at the northern boundary edge. The River Tyne flows along the northern boundary of South Tyneside from Gateshead District before flowing into the sea.

It is important that the strategic solutions stated above are fully considered in development planning in these catchments, to ensure there are no adverse effects on flood risk in the downstream authority. In this case, South Tyneside is the downstream authority from Gateshead district and Sunderland district.

Were these strategic solutions not considered in upstream development planning, the following issues may occur:

- Reduction in upstream floodplain storage capacity; and
- Increase in impermeable areas leading to a reduction in rainfall infiltration and subsequent increased runoff.

These issues highlight the importance of the Northumbria Flood Partnership and the need to work together on flood risk management, particularly where actions could exacerbate flooding in downstream communities. The need for consistent regional development policies controlling runoff or development in floodplains within contributing districts is therefore crucial as this would have wider benefits for North East authorities as a whole as well as South Tyneside. Appropriate flood risk management policies will be required in the Local Plan.

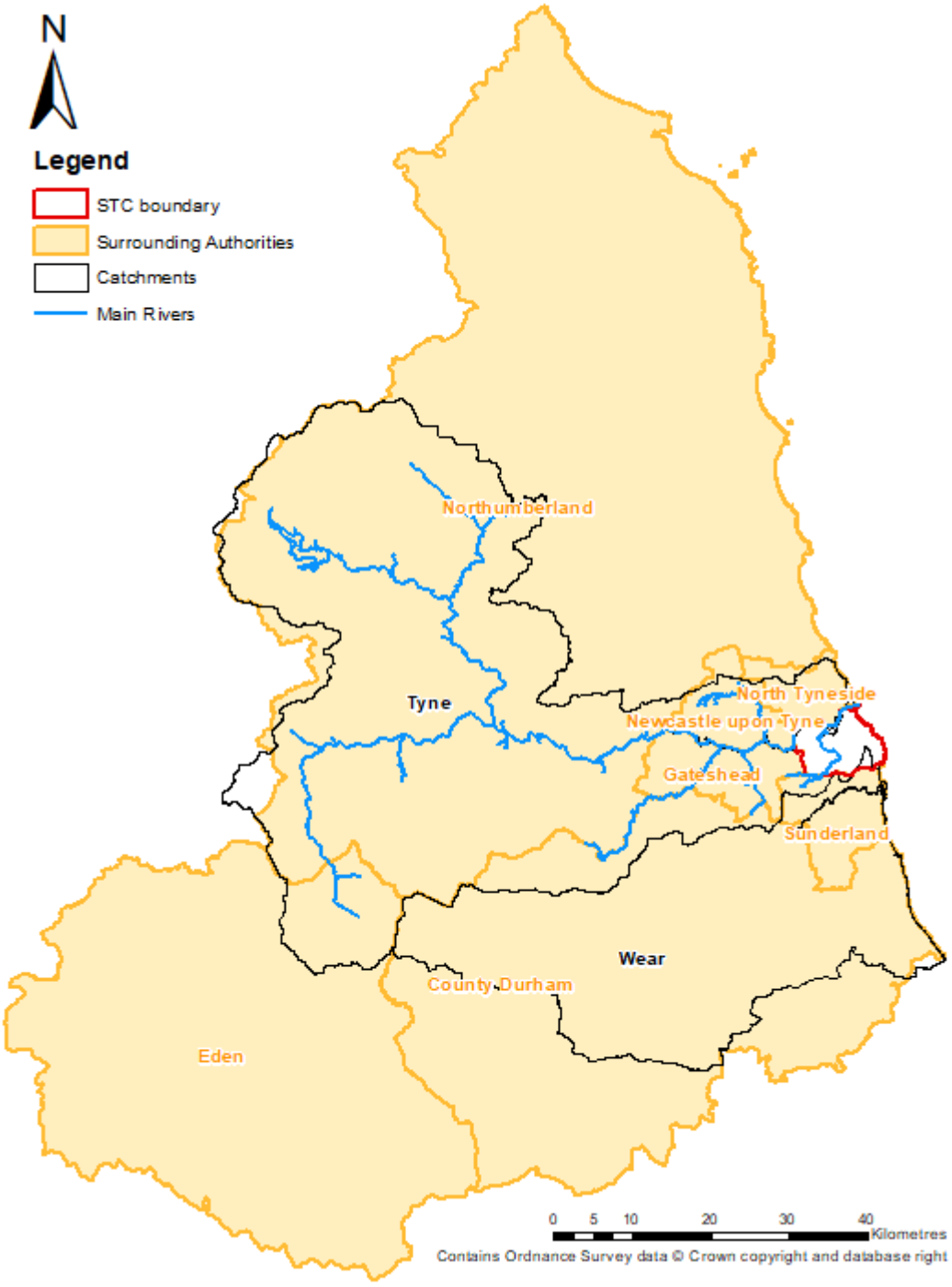

Figure 6-3: Hydraulic linkages for catchments in and around South Tyneside

6.8.3 Safeguarding land for flood storage

Where possible, the LPA may look to allocate land for flood storage functions. Such land can be explored through the site allocation process whereby an assessment is made, of the flood risk at assessed sites and what benefit could be gained by leaving the site undeveloped.

In some instances, the storage of flood water can help to alleviate flooding elsewhere, such as downstream developments. Where there is a large area of a site at risk that

is considered large enough to hinder development, it may be appropriate to safeguard this land for the storage of flood water.

Section 14 Paragraph 161 of the NPPF states that, to avoid where possible, flood risk to people and property they should manage any residual risk by:

'safeguarding land from development that is required, or likely to be required, for current or future flood management'

Applicable sites assessed through this SFRA may include any current greenfield sites:

- That are considered to be large enough (>1 hectare) to store flood water to achieve effective mitigation,
- With large areas of their footprint at high or medium surface water flood risk (based on the RoFSW),
- That are within the functional floodplain (Flood Zone 3b),
- With large areas of their footprint at risk from Flood Zone 3a, and
- That are large enough and within a suitable distance to receive flood water from a nearby development site using appropriate SuDS techniques which may involve pumping, piping or swales / drains.

Brownfield sites could also be considered though this would entail site clearance of existing buildings and hardstanding areas, conversion to greenspace and contaminated land assessments.

By using the sequential approach to site layout, the LPA and developers should be able to avoid the areas at risk and leave clear for potential flood storage. See the SFRA Maps in Appendix A to spatially assess the areas of the sites at risk.

6.8.4 Phasing of development

Flood risk should be taken into account at all stages of the planning process with a view to directing development away from areas at flood risk, now and in the future, by following the sequential approach to site allocation, as shown in Figure 6-2.

Using a phased approach to development, based on modelling results of floodwater storage options, should ensure that any sites at risk of causing flooding to other sites are developed first in order to ensure flood storage measures are in place before other sites are developed, thus ensuring a sustainable approach to site development. Also, it may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites. Large strategic multiple development sites should also carry out development phasing within the overall site boundary so as to avoid cumulative impacts within the site, as well as off the site (see Section 5.7.4 for information on Natural Flood Management and Working with Natural Processes).

6.9 Guidance for developers

This SFRA provides the evidence base for developers to assess flood risk at a strategic level and to determine the requirements of an appropriate site-specific FRA. Before carrying out an FRA, developers should check with the LPA whether the Sequential Test has been carried out. If not, the developer must apply the Sequential Test as part of their FRA by comparing their indicative development site with other available sites to ascertain which site has the lowest flood risk. The EA provides advice on this process via:

https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants

Table 6-8 identifies, for developers, when the Sequential and Exception Tests are required for certain types of development and who is responsible for providing the evidence and those who should apply the test if required.

Development	Sequential Test Required?	Who Applies the Sequential Test?	Exception Test Required?	Who Applies the Exception Test?
Allocated Sites	No (assuming the development type is the same as that submitted via the allocations process)	LPA should have already carried out the test during the allocation of development sites	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Windfall Sites	Yes	Developer provides evidence, to the LPA that the test can be passed. An area of search will be defined by local circumstances relating to the catchment and for the type of development being proposed	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Regeneration Sites Identified Within Local Plan	No	-	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Redevelopment of Existing Single Properties	No	-	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Changes of Use	No (except for any proposal involving changes of use to land involving a caravan, camping or chalet site)	Developer provides evidence to the LPA that the test can be passed	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

Table 6-8: Development types and application of Sequential and Exception Tests for developers

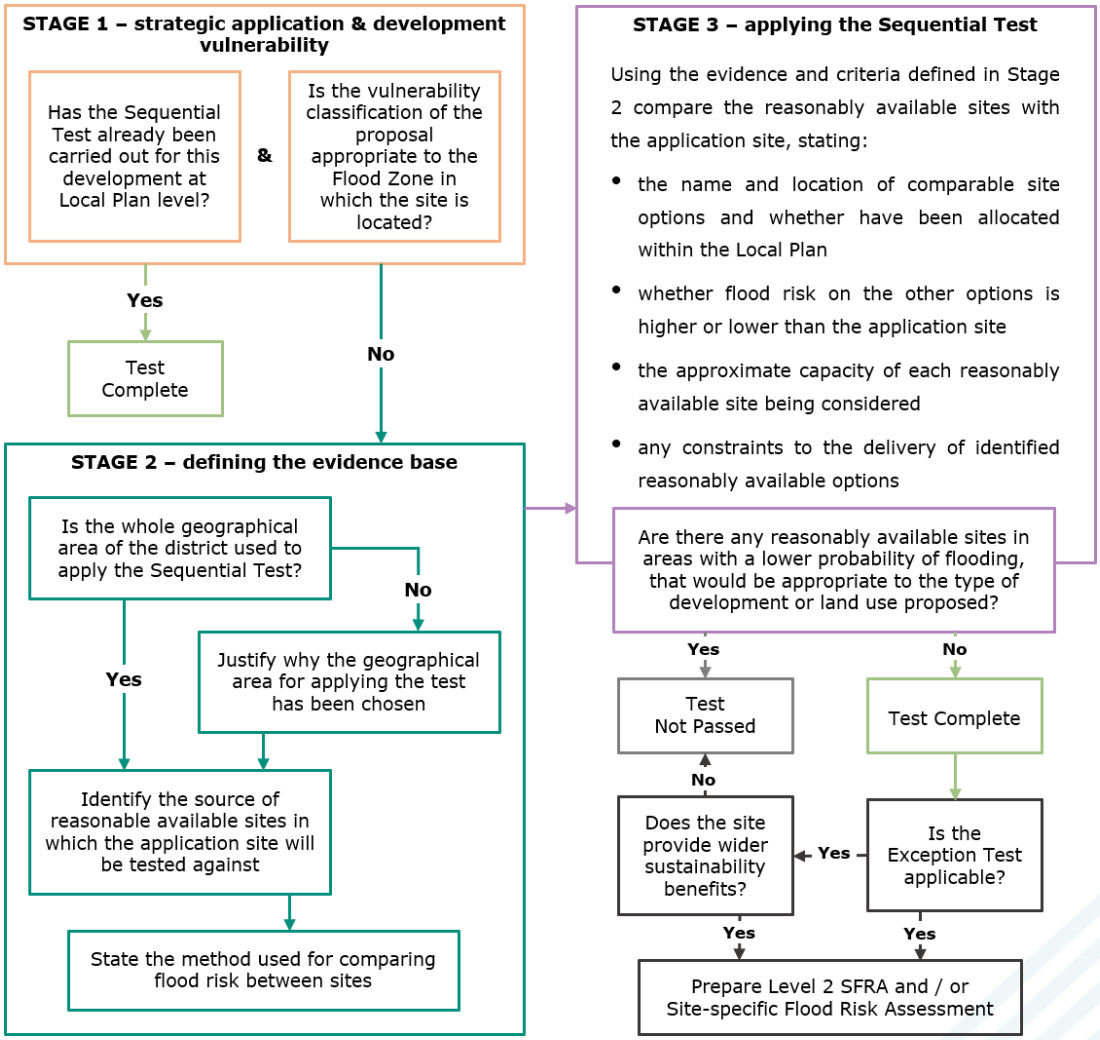

Figure 6-4: Development management Sequential Test process

Figure 6-4 shows what developers should do with regards to applying the Sequential Test if the LPA has not already done so.

The Sequential Test does not apply to change of use applications unless it is for change of land use to a caravan, camping or chalet site, or to a mobile home site or park home site. The Sequential Test can also be considered adequately demonstrated if both of the following criteria are met:

- The Sequential Test has already been carried out for the site (for the same development type) at the strategic level (Local Plan); and
- The development vulnerability is appropriate to the Flood Zone (see Table 3 of the FRCC-PPG).

If both these criteria are met, reference should be provided for the site allocation of the Local Plan document and the vulnerability of the development should be clearly stated.

When applying the Sequential Test, the following should also be considered:

- **The geographic area in which the Test is to be applied;**
- **The source of reasonable available sites in which the application site will be tested against; and**
- **The evidence and method used to compare flood risk between sites.**

Sites could be compared in relation to flood risk, Local Plan status; capacity; and constraints to delivery including availability, policy restrictions, physical problems or limitations, potential impacts of the development on the local area, and future environmental conditions that would be experienced by the inhabitants of the development.

The test should conclude if there are any reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use that has been put forward in the Local Plan.

The LPA should now have sufficient information to be able to assess whether or not the indicative site has passed the Sequential Test. If the Test has been passed, then the developer should apply the Exception Test in the circumstances set out by tables 1 and 3 of the FRCC-PPG.

In all circumstances, where the site is within areas at risk of flooding and where a site-specific FRA has not already been carried out, a site-specific should be completed in line with the NPPF and the FRCC-PPG.

In addition to the formal Sequential Test, the NPPF sets out the requirement for developers to apply the sequential approach to locating development within the site. As part of their application and masterplanning discussions with applicants, LPAs should seek whether or not:

- Flood risk can be avoided by substituting less vulnerable uses or by amending the site layout;
- Less vulnerable uses for the site have been considered; or
- Density can be varied to reduce the number or vulnerability of units located in higher risk parts of the site.

When initially considering the development options for a site, developers should use this SFRA, the NPPF and the FRCC-PPG to:

- ***Identify whether the site is***
    - *A windfall development, allocated development, within a regeneration area, single property or subject to a change of use to identify if the Sequential and Exception Tests are required.*
- ***Check whether the Sequential Test and / or the Exception Test have already been applied***
    - *Request information from the LPA on whether the Sequential Test, or the likelihood of the site passing the Exception Test, have been assessed;*
    - *If not, provide evidence to the LPA that the site passes the Sequential Test and will pass the Exception Test.*
- ***Consult with the LPA, the LLFA and the EA and the wider group of flood risk consultees, where appropriate, to scope an appropriate FRA if required***
    - *Guidance on FRAs is provided in Appendix E.3.4 of this SFRA;*
    - *Also, refer to the EA Standing Advice, the NPPF and the FRCC-PPG;*
    - *Consult the LLFA*
- ***Submit FRA to the LPA for approval; the LPA can then consult the EA if required who will then review the FRA within their remit and give recommendations to the LPA***

6.10 Planning for climate change

In relation to flood risk and climate change in the planning system, the NPPF states:

"All plans should apply a sequential, risk-based approach to the location of development – taking into account the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property." (para 161).

Local plans should do this by safeguarding land from development that is required, or likely to be required, for current or future flood management; and to seek opportunities for the relocation of development, including housing, to more sustainable locations from areas where climate change is expected to increase flood risk.

6.10.1 EA climate change allowances

The EA revised the climate change allowances in 2021, for use in FRAs and SFRAs and will use these revised allowances when providing advice. There have been several updates carried out to the allowances since the release of UKCP18. The most up-to-date allowances are available online via:

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Developers should refer to the climate change allowances on the Government website to ensure those outlined below are the most up-to-date available.

The climate change allowances are predictions of anticipated change for:

- Peak river flow by Management Catchment (see Table 6-9 for Tyne and Wear allowances);
- Peak rainfall intensity;
- Sea level rise; and
- Offshore wind speed and extreme wave height.

There are allowances for different climate scenarios over different epochs, or periods of time, over the coming century.

Management catchment	Allowance Category	Total Potential Change Anticipated for…		
		2020s (2015-2039)	2050s (2040-2069)	2080s (2070-2115)
Tyne	Upper end	+31%	+42%	+64%
	Higher central	+22%	+28%	+42%
	Central	+18%	+22%	+34%
Wear	Upper end	+28%	+33%	+50%
	Higher central	+20%	+21%	+32%
	Central	+16%	+16%	+25%

Table 6-9: Recommended peak river flow allowances for the Tyne and Wear management catchments

To gauge the impacts of climate change on surface water, the EA states the allowances for peak rainfall intensities provided in Table 6-10 should be used. The peak rainfall intensity allowances apply to the whole of England for small catchments (less than 5 km^2) and urban catchments. SFRAs and FRAs should assess both the central and upper end allowances to gauge the range of impacts. Note: surface water climate change modelling has not been carried out for this SFRA.

Allowance Category	Total Potential Change Anticipated for…		
	2015-2039	2040-2069	2070-2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

Table 6-10: Peak rainfall intensity allowances in small and urban catchments for England

Sea level allowances are based on different regions of England. The allowances for the Northumbria RBD are shown in Table 6-11. The number in brackets is the cumulative sea level rise for each year within each range. The EA expects SFRAs and FRAs to assess both allowance categories and also the H++ allowance in some cases. The H++scenario for sea level rise for England is set at a total sea level rise of 1.9 metres, up to the year 2100.

Allowance category	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Higher central	4.6 (161)	7.5 (225)	10.1 (303)	11.2 (336)	1.03
Upper end	5.8 (203)	10 (300)	14.3 (429)	16.5 (495)	1.43

Table 6-11: Sea level allowance for the Northumbria RBD

UKCP18

In November 2018 Defra released a new set of UK Climate Projections (UKCP18). These projections replace the UKCP09 projections which have been used for the past ten years. In February 2019, the EA stated that the 2016 guidance is being revised in line with the UK Climate Projections 2018. An update was provided in December 2019 whereby the EA stated the following updates to the guidance:

1. Updated the sea level rise allowances using UKCP18 projections.
2. Added guidance on how to
    a. calculate flood storage compensation,
    b. use peak rainfall allowances to help design drainage systems,
    c. account for the impact of climate change on storm surge,
    d. assess and design access and escape routes for less vulnerable development.
3. Changed the guidance on how to apply peak river flow allowances so the approach is the same for both flood zones 2 and 3.

In July 2021, there was a further update in which the peak river allowances were updated with the UKCP18 projections to be based on management catchments rather than river basin districts. There were also changes to guidance on how to apply peak river flow allowances. You now use:

a) the central allowance for all assessments except for essential infrastructure, where you use the higher central allowance
b) the upper end for 'credible maximum scenario' assessments, and
c) the central allowance to calculate flood storage compensation, except for where essential infrastructure is affected, where you use the higher central allowance.

6.10.2 Climate change modelling

The River Tyne model was updated to produce updated modelled results and climate change outlines to support the SFRA. As the River Tyne model is tidal, the values in Table 6-11 were used. The modelled climate change outlines are presented on the SFRA maps in Appendix A.

Watercourse	Model name	Return periods modelled
River Tyne	Tyne Tidal (2015)	Q20 Q200 Q1000

Table 6-12: EA models updated for climate change allowances

6.11 Sustainable Drainage Systems (SuDS)

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and consequently a potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure. Managing surface water discharges from new development is therefore crucial in managing and reducing flood risk to new and existing development downstream. Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding.

The Department for Communities and Local Government (DCLG) (now Ministry of Housing, Communities & Local Government (MHCLG)) announced, in December 2014, that the local planning authority, in consultation with the LLFA, should be responsible for delivering SuDS[35] through the planning system. Changes to planning legislation gave provisions for major applications of ten or more residential units or equivalent commercial development to require sustainable drainage within the development proposals in accordance with the 'non-statutory technical standards for sustainable drainage systems'[36], published in March 2015. A Practice Guidance[37] document has also been developed by the Local Authority SuDS Officer Organisation (LASOO) to assist in the application of the non-statutory technical standards.

In order to manage flood risk, all development, regardless of development type, flood zone and development size, must give priority use to SuDS. Particularly for major developments, there is a requirement to assess and include SuDS for managing surface water at the development unless it is demonstrated during the assessment that it is inappropriate for the site.

In order to satisfy the NPPF and its accompanying PPG, applicants must demonstrate that priority has been given to the use of SuDS in their development proposals. SuDS should be provided by default unless demonstrated to be inappropriate. Where priority use of SuDS cannot be achieved, applicants must justify this by submitting robust and acceptable evidence.

The NPPF, para 169, states:

"Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a. take account of advice from the lead local flood authority;

b. have appropriate proposed minimum operational standards;

c. ***have maintenance arrangements, in place to ensure an acceptable standard of operation for the lifetime of the development;*** *and*

d. where possible, provide multifunctional benefits".

Although the NPPF states only 'major' developments should incorporate SuDS, all development proposals, for both major and minor development, should include SuDS, providing multiple benefits that contribute to many other NPPF policies, including climate change. Where site conditions may be more challenging, the types of SuDS may need to be adapted. At a strategic level, this should mean identifying SuDS opportunities and constraints according to geology, soil type, topography, groundwater / minewater conditions and potential impacts on site allocation and yields. Local SuDS

35 http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/

36 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

37 http://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf

guidance should then be developed including instructions on adoption and maintenance.

Maintenance options must clearly identify who will be responsible for SuDS maintenance and funding for maintenance should be fair for householders and premises occupiers, and, set out a minimum standard to which the SuDS must be maintained.

Sustainable drainage should form part of an integrated design methodology secured by detailed planning conditions to ensure that the SuDS to be constructed is maintained to a minimum level of effectiveness.

The North East LLFAs including STC produced Sustainable Drainage Local Standards in 2020 where the guidance provides the approach the NE LLFAs will take on some key questions often asked through the planning process by developers with the aim to improve the submission of flood risk assessments, drainage strategies and SuDS design and promote consistency and best practice within the NE LLFA area. The Local Standards are available via:

https://www.newcastle.gov.uk/sites/default/files/Flooding/NE%20LLFA%20SuDS%20Standards%202020_final%20July%202020.pdf

6.11.1 SuDS hierarchy

The runoff destination should always be the first consideration when considering design criteria for SuDS including the following possible destinations in order of preference:

1. Into the ground;
2. To surface waterbody;
3. To surface water sewer;
4. To combined sewer.

Effects on water quality should also be investigated when considering runoff destination in terms of the potential hazards arising from development and the sensitivity of the runoff destination. Developers should also establish that proposed outfalls are hydraulically capable of accepting the runoff from SuDS through consultation with the LLFA and NW as appropriate. The EA would look at potential impact of the outfall structure through the planning consultation and Environmental Permitting Regulation Process.

The non-statutory technical standards for sustainable drainage systems (March 2015) sets out appropriate design criteria based on the following:

1. Flood risk outside the development;
2. Peak flow control;
3. Volume control;
4. Flood risk within the development;
5. Structural integrity;
6. Designing for maintenance considerations;
7. Construction.

Many different SuDS techniques can be implemented. As a result, there is no one standard correct drainage solution for a site. In most cases, using the Management Train principle (see Figure 6-5), will be required, where source control is the primary aim.

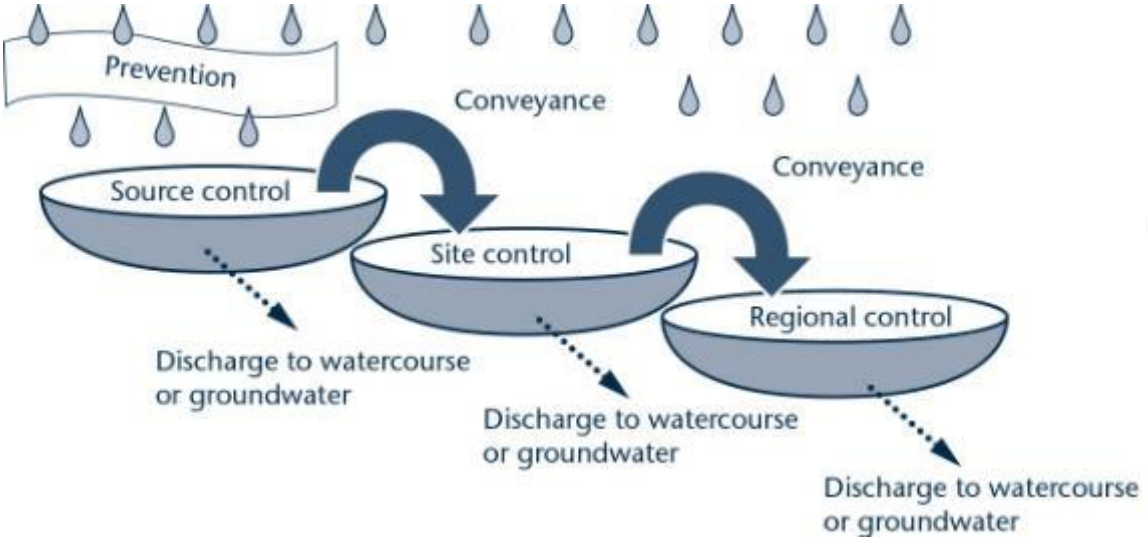

Figure 6-5: SuDS management train principle

The effectiveness of a flow management scheme within a single site is heavily limited by land use and site characteristics including (but not limited to) topography, geology and soil (permeability), and available area. Potential ground contamination associated with urban and former industrial sites should be investigated with concern being placed on the depth of the local water table and potential contamination risks that will affect water quality. The design, construction and ongoing maintenance regime of any SuDS scheme must be carefully defined as part of a site-specific FRA. A clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential for successful SuDS implementation.

In addition to the national standards, the LPA may set local requirements for planning permission that include more rigorous obligations than the non-statutory technical standards. More stringent requirements should be considered where current Greenfield sites lie upstream of high-risk or densely populated areas. This could include improvements on Greenfield runoff rates. The LPA and LLFA should always be contacted with regards to any local requirements at the earliest opportunity in development planning. With regard to STC, the North East LLFAs produced SuDS Local Standards in July 2020.

The CIRIA SuDS Manual[38] 2015 should also be consulted by the LPA and developers. The SuDS manual (C753) is highly regarded and incorporates the latest research, industry practice, technical advice and adaptable processes to assist in the planning, design, construction, management and maintenance of good SuDS. The SuDS Manual complements the non-statutory technical standards and goes further to support the cost-effective delivery of multiple benefits.

6.12 Drainage for new developments

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure.

Managing surface water discharges from new development is crucial in managing and reducing flood risk to new and existing development.

38 https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding. The Planning System has a key role to play in setting standards for sustainable drainage from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage plays an important part in reducing flows in the sewer network and in meeting environmental targets, alongside investment in maintenance by the water companies on their assets. Water companies plan their investment on a five-year rolling cycle, in consultation with key partners, including the EA and local authorities.

6.12.1 Overland flow paths

Underground drainage systems have a finite capacity and regard should always be given to larger events when the capacity of the network will be exceeded. Hence there is a need to design new developments with exceedance in mind. This should be considered alongside any surface water flows likely to enter a development site from the surrounding area.

Masterplanning should ensure that existing overland flow paths are retained within the development. As a minimum, the developer should investigate, as part of a site-specific FRA, the likely extents, depths and associated hazards of surface water flooding on a development site, as indicated at the strategic level by the RoFSW dataset. This is considered to be an appropriate approach to reduce the risks of flooding to new developments. Green infrastructure should be used wherever possible to accommodate such flow paths.

The EA states that ground floor levels should be a minimum (in relation to Ordnance Datum) of whichever is higher of:

- 300 mm above the general ground level of the site, or
- 600 mm above the estimated river level

unless local guidance states otherwise.

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography; geology and soil (permeability); development density; existing drainage networks both onsite and in the surrounding area; adoption issues; and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined at an early stage and a clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential.

6.13 Property Flood Resilience (PFR)

PFR measures should only be applied retrospectively to existing development that is at flood risk, as new development should not be constructed in areas at flood risk. Para 167 of the NPPF explains that development must only be allowed in areas at flood risk where, following the Sequential and Exception Tests, and supported by an FRA, the development is appropriately flood resistant and resilient.

Flood resilience and resistance measures are mainly designed to mitigate flood risk and reduce damage and adverse consequences to existing property. Resistance and resilience measures may aim to help residents and businesses recover more quickly following a flood event.

It should be noted that it is not possible to completely prevent flooding to all communities and businesses.

Research carried out by the then DCLG (now the MHCLG) and the EA has recommended that the use of resistance measures should generally be limited to a nominal protection

height of 600 mm above ground level, in relation to Ordnance Datum, the lowest point of ground abutting the external property walls. This is because the structural integrity of the property may be compromised above this level.

It should be noted that PFR measures would not be expected to cause an increase in flood risk to other properties or other parts of the local community. They will help mitigate against flood risk but, as with any flood alleviation scheme, flood risk cannot be removed completely. Emergency plans should, therefore, be in place that describe the installation of measures and residual risks.

As the flood risk posed to a property cannot be removed completely, it is recommended that PFR products are deployed in conjunction with pumps of a sufficient capacity. Pumps help manage residual flood risks not addressed by resistance measures alone such as rising groundwater.

6.13.1 Definitions

Flood resilience measures aim to reduce the damage caused by floodwater entering a property. Flood resilience measures are based on an understanding that internal flooding may occur again and when considering this eventuality, homes and businesses are encouraged to plan for flooding with an aim of rapid recovery and the return of the property to a habitable state.

For example, tiled floors are easier to clean than carpets, raised electricity sockets and high-level wall fixings for TVs / computers may mean that that power supply remains unaffected. Raising kitchen or storage units may also prevent damage that may not require replacement after a flood. There is a lot of information available about what items get damaged by floodwater and features that are considered to provide effective resilience measures that can be installed at a property.

Flood resistance measures aim to reduce the amount of floodwater entering the property. Obvious inflow routes, such as through doors and airbricks may be managed, for example, by installing bespoke flood doors, door flood barriers and automatic closing airbricks. However, the property's condition and construction are also key to understanding how floodwater may enter and move between buildings. For example, flood water can also flow between properties through connecting cavity walls, cellars, beneath suspended floors and through internal walls. Flood resistance measure alone may not keep floodwater out. Building condition is a critical component of any flood mitigation study.

6.13.2 Property mitigation surveys

To define the scale and type of resistance or resilience measures required, a survey will need to be undertaken to pick up property threshold levels, air brick levels, doorways, historic flood levels and a number of ground spot levels required to better understand the flood mechanisms for flood water arriving at the property (e.g. along road, pavements, etc.). The depth of flooding at each property will help guide the selection of resistance measures proposed. Surveys will need to include consideration of issues such as:

- Detailed property information
- An assessment of flood risk, including property (cross) threshold levels
- Routes of water ingress (fluvial, ground and surface water flooding)
- An assessment of the impact of flood waters
- A schedule of measures to reduce risk (resistance and resilience)
- Details of recommendations (including indicative costs)
- Advice on future maintenance of measures

- Advice on flood preparedness

All sources of flooding will need to be considered, including a comprehensive survey of openings (doors, windows and air bricks), as well as potential seepage routes through walls and floors, ingress through service cables, pipes, drains and identify possible weaknesses in any deteriorating brickwork or mortar.

7 Emergency Planning

The provisions for emergency planning for local authorities as Category 1 responders are set out by the Civil Contingencies Act, 2004 and the National Flood Emergency Framework for England, December 2014[39]. This framework is a resource for all involved in emergency planning and response to flooding from the sea, rivers, surface water, groundwater and reservoirs. The Framework sets out Government's strategic approach to:

- Ensuring all delivery bodies understand their respective roles and responsibilities when planning for and responding to flood related emergencies;
- Giving all players in an emergency flooding situation a common point of reference which includes key information, guidance and key policies;
- Establishing clear thresholds for emergency response arrangements;
- Placing proper emphasis on the multi-agency approach to managing flooding events;
- Providing clarity on the means of improving resilience and minimising the impact of flooding events;
- Providing a basis for individual responders to develop and review their own plans; and
- Being a long-term asset that will provide the basis for continuous improvement in flood emergency management.

Along with the EA flood warning systems, there are a range of flood plans at a sub-regional and local level, outlining the major risk of flooding and the strategic and tactical response framework for key responders. The Environment Agency and the Association of Directors of Environment, Economy, Planning and Transport (ADEPT) have produced guidance on flood risk emergency plans for new development[40] (September 2019). The EA do not however, review and approve flood risk emergency plans as it falls under the LPA's remit alongside their emergency planners.

This SFRA contains useful data to allow emergency planning processes to be tailored to the needs of the area and be specific to the flood risks faced. The SFRA Maps in Appendix A and accompanying GIS layers should be made available for consultation by emergency planners during an event and throughout the planning process.

7.1 Civil Contingencies Act

Under the Civil Contingencies Act (CCA, 2004)[41], the LLFA and LPA are classified as Category 1 responders and thus have duties to assess the risk of emergencies occurring, and use this to:

- Inform contingency planning;
- Put in place emergency plans;
- Put in place business continuity management arrangements;
- Put in place arrangements to make information available to the public about civil protection matters;
- Maintain arrangements to warn, inform and advise the public in the event of an emergency;

[39] https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england
[40] https://www.adeptnet.org.uk/floodriskemergencyplan
[41] https://www.gov.uk/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others#the-civil-contingencies-act

- Share information with other local responders to enhance coordination; and
- Cooperate with other local responders to enhance coordination and efficiency and to provide advice and assistance to businesses and voluntary organisations about business continuity management.

During an emergency, such as a flood event, the local authority must also co-operate with other Category 1 responders (such as the emergency services and the EA) to provide the core response.

7.1.1 Northumbria Local Resilience Forum (LRF)

The aim of the Northumbria LRF[42] is to ensure an appropriate level of preparedness to enable an effective multi-agency response to emergency incidents that may have a significant impact on the communities in Northumbria. The LRF consists Category 1 and 2 responders. Category 1 responders include, amongst several others, STC, other local district councils, Northumberland County Council, the EA, Northumberland and Tyne and Wear Fire and Rescue Service, Maritime and Coastguard Agency, North East Ambulance Service, NHS trust, Northumbria Police, British Transport Police, Health Protection Agency (HPA), Trust, Port of Tyne Health Authority. Category 2 responders include: NW, Northern Powergrid (NE), Scottish Power and National Grid.

Northumbria Community Risk Register[43]

The Community Risk Register (CRR) considers the likelihood and consequences of the most significant risks and hazards the area faces, including fluvial and urban flooding. This SFRA can help to inform this. The CRR is considered as the first step in the emergency planning process and is designed to reassure the local community that measures and plans are in place to respond to the potential hazards listed within the CRR.

7.1.2 Community Emergency Plan

Communities may need to rely on their own resources to minimise the impact of an emergency, including a flood, before the emergency services arrive. Many communities already help each other in times of need, but experience shows that those who are prepared cope better during an emergency. Communities with local knowledge, enthusiasm and information are a great asset and a Community Emergency Plan can help. Details on how to produce a community emergency plan, including a toolkit and template, are available from the Government's website[44]. STC havs also provided information on a family emergency plan, which offers a range of advice, which is available from:

https://www.southtyneside.gov.uk/article/35136/Being-prepared-When-an-emergency-occurs

7.1.3 Local flood plans

This SFRA provides a number of flood risk data sources that should be used when producing or updating flood plans. The LPA will be unable to write their own specific flood plans for new developments at flood risk. Developers should write their own. Generally, owners with individual properties at risk should write their own individual flood plans, however larger developments or regeneration areas, such as retail parks, hotels and leisure complexes, should consider writing one collective plan for the assets within an area.

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[42] http://www.northumberland.gov.uk/WAMDocuments/EA8C1111-801D-49F0-A985-3C7B42668E8F_1_0.pdf?nccredirect=1

[43] https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Local-Resilience-Forum/Northumbria-Community-Risk-Register-version-7.pdf

[44] https://www.gov.uk/guidance/resilience-in-society-infrastructure-communities-and-businesses#community-resilience

This SFRA can help to:

- Update these flood plans if appropriate;
- Inform emergency planners in understanding the possibility, likelihood and spatial distribution of all sources of flooding (emergency planners may however have access to more detailed information, such as for Reservoir Inundation Maps, which have not been made available for this SFRA);
- Identify safe evacuation routes and access routes for emergency services;
- Identify key strategic locations to be protected in flooding emergencies, and the locations of refuge areas which are capable of remaining operational during flood events;
- Provide information on risks in relation to key infrastructure, and any risk management activities, plans or business continuity arrangements;
- Raise awareness and engage local communities;
- Support emergency responders in planning for and delivering a proportionate, scalable and flexible response to the level of risk; and
- Provide flood risk evidence for further studies.

The following guidance written by the Environment Agency and the Association of Directors of Environment, Economy, Planning and Transport is aimed at Local Planning Authorities to help assist in setting up their own guidelines on what should be included in the flood risk emergency plans:

https://www.adeptnet.org.uk/floodriskemergencyplan

7.2 Flood warning and evacuation plans

Developments that include areas that are designed to flood (e.g. ground floor car parking and amenity areas) or have a residual risk associated with them, will need to provide appropriate flood warning and instructions so users and residents are safe in a flood. This will include both physical warning signs and written flood warning and evacuation plans. Those using the new development should be made aware of any evacuation plans.

In relation to new development it is up to the LPA to determine whether the flood warning and evacuation plans, or equivalent procedures, are sufficient or not. If the LPA is not satisfied, taking into account all relevant considerations, that an indicative development can be considered safe without the provision of safe access and exit, then planning permission should be refused.

Whilst there is no statutory requirement on the EA or the emergency services to approve evacuation plans, LPAs are accountable under their Civil Contingencies duties, via planning condition or agreement, to ensure that plans are suitable. This should be done in consultation with development management officers. Given the cross-cutting nature of flooding, it is recommended that further discussions are held internally to the LPA between emergency planners and policy planners / development management officers, the LLFA, drainage engineers and also to external stakeholders such as the emergency services, the EA, NW, Internal Drainage Boards and Canal & River Trust (if applicable).

It may be useful for both the LLFA and spatial planners to consider whether, as a condition of planning approval, flood evacuation plans should be provided by the developer which aim to safely evacuate people out of flood risk areas, using as few emergency service resources as possible. Northumbria Local Resilience Forum are essential to establish the feasibility / effectiveness of such an approach, prior to it being progressed. It may also be useful to consider how key parts of agreed flood evacuation

plans could be incorporated within local development documents, including in terms of protecting evacuation routes and assembly areas from inappropriate development.

Once the development goes ahead, it will be the requirement of the plan owner (developer) to make sure the plan is put in place, and to liaise with the LPA and LLFA regarding maintenance and updating of the plan.

7.2.1 What should the Plan include?

Flood warning and evacuation plans should include the information stated in Table 7-1. Advice and guidance on plans are accessible from the EA website and there are templates available for businesses and local communities.

Consideration	Purpose
Availability of existing flood warning system	The EA offers a flood warning service that currently covers designated Flood Warning Areas in England and Wales. In these areas, they are able to provide a full Flood Warning Service.
Rate of onset of flooding	The rate of onset is how quickly the water arrives and the speed at which it rises which, in turn, will govern the opportunity for people to effectively prepare for and respond to a flood. This is an important factor within Emergency Planning in assessing the response time available to the emergency services.
How flood warning is given and occupants awareness of the likely frequency and duration of flood events.	Everyone eligible to receive flood warning should be signed up to the EA flood warning service. Where applicable, the display of flood warning signs should be considered. In particular sites that will be visited by members of the public on a daily basis such as sports complexes, car parks, retail stores. It is envisaged that the responsibility should fall upon the developers and should be a condition of the planning permission. Information should be provided to new occupants of houses concerning the level of risk and subsequent procedures if a flood occurs.
The availability of staff / occupants / users to respond to a flood warning and the time taken to respond to a flood warning	The plan should identify roles and responsibilities of all responders. The use of community flood wardens should also be considered.
Designing and locating safe access routes, preparing evacuation routes and the identification of safe locations for evacuees	Dry routes will be critical for people to evacuate as well as emergency services entering the site. The extent, depth and flood hazard rating, including allowance for climate change, should be considered when identifying these routes.
Vulnerability of occupants	Vulnerability classifications associated with development as outlined in the FRCC-PPG. This is closely linked to its occupiers.
How easily damaged items will be relocated, and the expected time taken to re-	The impact of flooding can be long lasting well after the event has taken place affecting both the property which has been flooded and the lives that have been disrupted. The resilience of the community to get

Consideration	Purpose
establish normal use following an event	back to normal will be important including time taken to repair / replace damages.

Table 7-1: Flood warning and evacuation plans

7.2.2 EA Flood Warning Areas (FWA) and flood awareness

The EA monitors river levels within the Main Rivers across England and, based upon weather predictions provided by The Met Office, make an assessment of the anticipated maximum water level that is likely to be reached within the proceeding hours (and/or days). Where these predicted water levels are expected to result in inundation of a populated area, the EA will issue a series of flood warnings within a defined FWA, encouraging residents to take action to avoid damage to property in the first instance.

More information on flood warnings is provided by the EA via:

https://www.gov.uk/government/publications/flood-warnings-what-they-are-and-what-to-do

There is one EA FWA in operation across South Tyneside, located near South Shields, to the east of the northern boundary of the authority area and parallel to the River Tyne. This is in a heavily urbanised area of South Tyneside providing warning to properties and businesses in South Shields. The FWA dataset is shown on the SFRA maps in Appendix A.

Live information on flood warning and flood alerts for any location in England is available via:

https://flood-warning-information.service.gov.uk/

Emergency planners may also use the outputs from this SFRA to raise awareness within local communities. This should include raising awareness of flood risk, roles and responsibilities and measures that people can take to make their homes more resilient to flooding from all sources whilst also encouraging all those at fluvial flood risk to sign up to the EA's Flood Warning service.

https://www.gov.uk/sign-up-for-flood-warnings

It is also recommended that Category 1 responders are provided with appropriate flood response training to help prepare them for the possibility of a major flood with an increased number of people living within flood risk areas, to ensure that adequate pre-planning response and recovery arrangements are in place.

8 Summary and Recommendations

8.1 Summary

This Level 1 SFRA provides a single repository planning tool relating to flood risk and development in South Tyneside. Key flood risk stakeholders namely the EA, LPA / LLFA, NW, local emergency services, emergency planners and local resilience forums were consulted to collate all available and relevant flood risk information on all sources into one comprehensive assessment. Together with this main report, this SFRA also provides a suite of interactive GeoPDF flood risk maps (Appendix A) and a development site assessment spreadsheet (Appendix B) illustrating the level of risk to potential development sites.

The flood risk information, assessment, guidance and recommendations provided in this SFRA will provide the LPA with the evidence base required to apply the Sequential Test, as required under the NPPF, and demonstrate that a risk-based, sequential approach has been applied in the preparation of its new Local Plan.

Whilst the aim of the sequential approach is the avoidance of high flood risk areas, in some locations where the council is looking for continued growth and/or regeneration, this will not always be possible. This SFRA therefore provides the necessary links between spatial development, wider flood risk management policies, local strategies and plans and on the ground works by combining all available flood risk information together into one single repository. As this is a strategic study based on current available information, detailed, site-specific local information on flood risk is not fully accounted for. For a more detailed assessment of specific areas or sites, a Level 2 SFRA may be carried out following on from the completion of a Level 1 assessment, if required.

The data and information used throughout the SFRA process is the most up-to-date data available at the time of writing (August 2021). Once new, updated or further information becomes available, the LPA should look to update this SFRA. The Level 1 SFRA should be considered to be, and maintained as, a 'live' entity which is updated as and when required (when new modelling or flood risk information becomes available). The LPA and LLFA can decide when to update the SFRA, and the EA as a statutory consultee on local plans can also advise the LPA to update the SFRA.

8.1.1 Summary of risk

The risk across the STC area is varied:

- The main fluvial risk comes from the River Don that runs through the centre of the site affecting towns and villages such as Hebburn, Boldon Colliery, and East Boldon.
- The main tidal risk comes from the River Tyne which runs along the northern boundary edge and the North Sea located off the east site boundary.
- Surface water risk is spread across the whole of the STC borough. The main areas of risk are primarily centred around the Main Rivers; and
- The areas with the highest levels of groundwater vulnerability are located primarily close to the Tyne and Tyne Estuary affecting areas such as South Shields, Jarrow and the Tyne Dock area. There are also a few areas in the centre of the Council boundary that are affected such as Boldon Colliery, west of Cleadon Park and Monkton.

8.2 Planning and flood risk policy recommendations

The following planning flood risk policy recommendations are designed to enable the LPA to use the information provided in this Level 1 SFRA to inform Local Plan policy direction:

Recommendation 1: No development within the functional floodplain…

…as per the National Planning Policy Framework (2021) and Flood Risk and Coastal Change Planning Practice Guidance, unless in exceptional circumstances such as for essential infrastructure, which must still pass the Exception Test, or where development is water compatible.

Development must not impede the flow of water within the functional floodplain nor should it reduce the volume available for the storage of floodwater. Sites within the functional floodplain may still be developable if the site boundary can be removed from the functional floodplain or the site can accommodate the risk on site and keep the area of functional floodplain free from development or obstruction and allowed to flow freely.

Refer to tables 1 to 3 of the FRCC-PPG.

Recommendation 2a: Consider surface water flood risk…

…with equal importance alongside fluvial risk including possible withdrawal, redesign or relocation for sites at significant surface water risk.

Sustainable Drainage Systems on all new development must adhere to industry standards and to the applicable runoff discharge rate and storage volume allowances stated by the Lead Local Flood Authority.

Site specific Flood Risk Assessments should always consider surface water flood risk management and options for on-site flood storage through appropriate Sustainable Drainage Systems. The Local Planning Authority / Lead Local Flood Authority must always be consulted during this process, as should Northumbrian Water and the EA, if required.

Recommendation 2b: Use of appropriately sourced SuDS…

…required for all major developments of 10 or more residential units or equivalent commercial development. This is in accordance with Para 163 of the National Planning Policy Framework (2021).

As per the NPPF (2021), in terms of Sustainable Drainage Systems, development in areas at flood risk should only be permitted where SuDS are incorporated into the design, unless clear evidence demonstrates this would be inappropriate.

SuDS scoping and design, as part of a site-specific Flood Risk Assessment, must be included within the early stages of the site design in order to incorporate appropriate SuDS within the development.

The Local Planning Authority / Lead Local Flood Authority, Northumbrian Water (if appropriate) must be consulted during the site design stage and the Flood Risk Assessment must be submitted to and approved by the Local Planning Authority, considering all consultation with key stakeholders.

All SuDS must be designed to meet industry standards, as specified below, including any replacement standards/documents which update or are in addition to those listed:

- North-East Lead Local Flood Authorities Sustainable Drainage Local Standards
- Interim national standards published in March 2015
- Technical Standards for Sustainable Drainage Systems (Defra)
- C753 The SuDS Manual
- Sewers for Adoption 8

Recommendation 3: Sequential approach to site allocation and site layout...

...must be followed by the Local Planning Authority to ensure sustainable development when either allocating land in Local Plans or determining planning applications for development.

The overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3a, be considered. This should take into account the flood risk vulnerability of land uses, residual surface water and/or groundwater flood risk and the likelihood of meeting the requirements of the Exception Test, if required.

This SFRA, the National Planning Policy Framework and Flood Risk and Coastal Change Planning Policy Guidance must be consulted throughout this process along with the Local Planning Authority / Lead Local Flood Authority, EA, and Northumbrian Water.

Recommendation 4: Requirement for a site-specific Flood Risk Assessment…

…from a developer when a site is:

- Any site located within Flood Zone 2 or 3
- Any site that has an area greater than 1 ha
- Within Flood Zone 1 where any part of the site is identified by the Risk of Flooding from Surface Water maps as being at risk of surface water flooding.
- Identified by the EA as having critical drainage problems (within an Area with Critical Drainage Problems)
- Situated over or within 8 metres of a culverted watercourse or where development will be required to control or influence the flow of any watercourse
- Within 20 metres of a Main River
- Identified as being at increased flood risk in future
- At risk of flooding from other sources of flooding or at residual risk
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding
- Situated in an area currently benefitting from defences
- Within a council designated Critical Drainage Area

Before deciding on the scope of the Flood Risk Assessment, this SFRA should be consulted along with the LPA / LLFA, and Northumbrian Water. The Flood Risk Assessment should be submitted to and be approved by the LPA including suitable consultation with the LLFA and the EA and any other applicable parties.

Recommendation 5: Natural Flood Management techniques…

…must be considered, where possible, to aid with flood alleviation and implementation of suitable SuDS, depending on the location.

The national Working with Natural Processes mapping (included in this SFRA) should be consulted in the first instance, followed by local investigation into whether such techniques are appropriate and whether the benefits are proportionate to the work required to carry out the identified Working with Natural Processes approaches.

Natural drainage features should be maintained and enhanced and there should be a presumption against culverting of open watercourses. Where possible, culvert removal should be explored.

Recommendation 6: Phasing of development…

…must be carried out by the Local Planning Authority on a site by site basis and also within sites by the developer to avoid any cumulative impacts of flood risk (reinforced by the revised National Planning Policy Framework (2021)).

Using a phased approach to development, should ensure that any sites at risk of causing flooding to other sites are developed first to ensure that flood storage measures are in place and operational before other sites are developed, thus contributing to a sustainable approach to site development during all phases of construction. It may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites.

Development phasing within large strategic sites of multiple developments should also be considered where parts of such sites are at flood risk.

Recommendation 7: Planning permission for at risk sites…

…can only be granted by the Local Planning Authority where a site-specific Flood Risk Assessment shows that:

- The National Planning Policy Framework and Flood Risk and Coastal Change Planning Practice Guidance have been referenced together with appropriate consultation with the Lead Local Flood Authority, the EA, and Northumbrian Water, where applicable
- The effects of climate change have been taken into account using the latest allowances developed by the EA
- There is no loss in floodplain storage resulting from the development i.e. where development takes place in a fluvial flood zone or is at risk from surface water flooding, compensatory storage must be found to avoid loss of floodplain and subsequent displacement of water which may cause flooding elsewhere
- The development will not increase flood risk elsewhere
- For previously developed sites, the development should look to meet greenfield runoff rates where practicable (in line with the Non-Statutory Technical Standards for Sustainable Drainage (March 2013)), achieved through providing Sustainable Drainage Systems as appropriate or through the use of appropriate flow and volume control devices.
- There is no adverse effect on the operational functions of any existing flood defence infrastructure
- Proposed resistance / resilience measures designed to deal with current and future risks are appropriate
- Whether the development will be safe for its lifetime and has passed the Exception Test, if applicable
- An appropriate Emergency Plan is included that accounts for the possibility of a flood event and shows the availability of safe access and egress points accessible during times of flood.

8.2.1 Recommendations for further work

The SFRA process has developed into more than just a planning tool. Sitting alongside the SA, LFRMS, SWMP and FRMP, it can be used to provide a much broader and inclusive vehicle for integrated, strategic and local flood risk management and delivery.

There are a number of plans and assessments listed in Table 8-1 that may be of benefit to the LPA, in developing their flood risk evidence base to support the delivery of the Local Plan, or to the LLFA to help fill critical gaps in flood risk information that have become apparent through the preparation of this Level 1 SFRA.

Type	Study	Reason	Timeframe
Understanding of local flood risk	Level 1 SFRA update	When there are changes to: • the predicted impacts of climate change on flood risk • detailed flood modelling - such as from the EA or LLFA • the local plan, spatial development strategy or relevant local development documents • local flood management schemes • flood risk management plans • shoreline management plans • local flood risk management strategies • national planning policy or guidance Or after a significant flood event.	As required
	Level 1 SFRA update; Level 2 SFRA; site-specific FRA	Reviewing of EA flood zones in those areas not covered by existing detailed hydraulic models i.e. the Flood Map for Planning does not cover every watercourse such as those <3km^2 in catchment area or Ordinary Watercourses. If a watercourse or drain is present on OS mapping but is not covered by the Flood Map for Planning, this does not mean there is no potential flood risk. A model may therefore be required to ascertain the flood risk, if any, to any nearby sites.	Short term
	Level 2 SFRA	**Further, more detailed assessment of flood risk to high risk sites, large strategic sites, as notified by this Level 1 SFRA. Dependant on the availability EA river model data.**	**Short term**
	Preliminary site-screening FRAs / outline drainage strategy	Further, more detailed assessment of larger strategic sites.	Short term
	SWMP / drainage strategy / detailed surface water modelling	STC developed a SWMP for the borough in 2014 and thus should be updated.	Short to Medium term

Type	Study	Reason	Timeframe
	Water Cycle Study	STC has not developed a WCS for the borough. If the Local Plan highlights large growth and urban expansion, the LLFA should produce a WCS to look at capabilities of water and sewerage providers.	Short to Medium term
	Possible CDA delineation	Refining existing or creation of new CDAs/ACDPs for use on development restrictions in Local Plan.	Medium term
Flood storage and attenuation	Community Infrastructure Levy (CIL) and Green Infrastructure (GI)	For new developments, GI assets can be secured from a landowner's 'land value uplift' and as part of development agreements. The LPA could include capital for the purchase, design, planning and maintenance of GI within its CIL programme.	Short term
	Working with Natural Processes	Promote creation of floodplain and riparian woodland, floodplain reconnection and runoff attenuation features where the research indicates that it would be beneficial in South Tyneside.	Ongoing
Data collection	Flood Incident data	STC, as LLFA, has a duty to investigate and record details of significant flood events within their area. General data collected for each incident, should include date, location, weather, flood source (if apparent without an investigation), impacts (properties flooded or number of people affected) and response by any Risk Management Authority.	Short term
	FRM Asset Register	STC has a responsibility to update and maintain a register of structures and features, which are considered to have an effect on flood risk.	Ongoing
Risk Assessment	Asset Register Risk Assessment	STC, as LLFA, should carry out a strategic flood risk assessment of structures and features on the Asset Register to inform capital programme and prioritise its maintenance programme.	Short Term / Ongoing
Capacity	SuDS review / guidance	The LLFA should clearly identify its requirements of developers for SuDS in new developments. Internal capacity, within STC should be in place to deal with SuDS applications, set local specification and set policy for adoption and future maintenance of SuDS.	Short Term / Long Term
Partnership	Northumbrian Water	The LLFA should continue to collaborate with NW on sewer and surface water projects. The LPA should be kept informed and carry out an assessment of water company assets to ensure they are operational and resilient at all times across the catchment and that capacity for new development is appropriate.	Ongoing

Type	Study	Reason	Timeframe
	EA	STC should continue to work with the EA on fluvial flood risk management projects. Potential opportunities for joint schemes to tackle flooding from all sources should be identified.	Ongoing
	Community	Continued involvement with the community through STC's existing flood risk partnerships.	Ongoing

Table 8-1: Recommended further work for STC or developers

8.2.2 Level 2 SFRA

The LPA should review the sites where they expect the main housing numbers and employment sites to be delivered, using Section 6.5, the SFRA maps in Appendix A and the development site assessment spreadsheet in Appendix B. A Level 2 SFRA may be required for sites where any of the following applies:

- The Exception Test is required,
- Further evidencing i.e. climate change modelling is required at the strategic level in order to allocate,
- A large site, or group of sites, are within Flood Zone 3 and have strategic planning objectives, which means they cannot be relocated or avoided,
- A cluster of sites are within Flood Zone 2 or are at significant risk of surface water flooding.

A Level 2 SFRA should build on the source information provided in this Level 1 assessment and should show that a site will not increase risk elsewhere and will be safe for its lifetime, once developed.

As discussed in Section 6.10, a Level 2 assessment can be used to model the February 2016 climate change allowances, where current EA models are available. A Level 2 study may also further assess locations and options, in more detail, for the implementation of open space, or Green Infrastructure, to help manage flood risk in key areas, and also to assess residual risk.

Ultimately, the LPA will need to provide evidence in its Local Plan to show that housing numbers, economic needs and other sites can be delivered. Proposals within the Local Plan may be rejected if a large number of sites require the Exception Test to be passed but with no evidence that this will be possible.

As sites within this Level 1 assessment have been reviewed by the LPA in the consideration of planning applications, then further advice or guidance may be required to establish how best to progress future development proposals, possibly by a further review of the SFRA.

Those sites with Strategic Recommendation A should be withdrawn based on significant levels of fluvial / tidal flooding; if a site is still going to be taken forward then a Level 2 assessment should be carried out to assess depths and hazards of flooding in order for the site to pass the Exception Test (if applicable). Certain Strategic Recommendation C sites may also benefit from a more in-depth assessment through a Level 2 SFRA.

Appendices

A SFRA maps

Interactive GeoPDF maps

The SFRA Maps consist of all flood risk information used within the SFRA, by way of interactive GeoPDFs. Open the Overview Map in Adobe Acrobat. The Overview Map includes a set of five squares; clicking on one of these squares will open up on of the Index Maps. The Index Maps then contains a set of index squares covering the authority area at a scale of 1:10,000. Clicking on one of these index squares will open up a more detailed map of that area (scale = 1:10,000) by way of a hyperlink.

Within the detailed maps, use the zoom tools and the hand tool to zoom in/out and pan around the open detailed map. In the legend on the right-hand side of the detailed maps, layers can be switched on and off when required by way of a dropdown arrow. The potential development site reference labels can also be switched on and off if, for example, smaller sites are obscured by labels.

The table below lists the datasets that are included in the maps with a short description of what they show.

Dataset	Description
Areas Benefitting from Defences	This dataset shows those areas that benefit from the presence of defences in a 1 in 100 (1% AEP) chance of flooding each year from rivers; or 1 in 200 (0.5% AEP) chance of flooding each year from the sea. Note: in mapping these areas, it is assumed that flood defences and other operating structures act perfectly and give the same level of protection as when the assessment of the area was done.
BGS Potential for Groundwater Flooding map	Dataset from the British Geological Survey shows which areas are susceptible to groundwater flooding classified into three categories.
Council Boundary	A shapefile showing STC's administrative area.
Climate Change Modelled Flood Outlines	Climate change modelled flood outlines from the EA hydraulic models provided for this SFRA.
Flood Alert Areas	Geographical areas where it is possible for flooding to occur from rivers, sea and, in some locations, groundwater. Flood Alerts are issued to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early/low impact preparations for flooding.
Flood Storage Areas	Geographical areas that act as a balancing reservoir, storage basin or balancing pond with a purpose to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel.
Flood Warning Areas	Geographical areas where we expect flooding to occur and where the Environment Agency provide a Flood Warning Service.
Flood Zone 3b (functional floodplain)	The functional floodplain was delineated as part of this SFRA (see Appendix C for methodology note) as it is not included in the Flood Map for Planning. This zone is for the use of LPAs and developers.
Flood Zones 2 and 3	The flood zones that are included within the Environment Agency's Flood Map for Planning. Note: Flood Zone 3b was delineated so Flood Zone 3 is therefore classed as Flood Zone 3a.
Recorded Flood Outlines	Dataset from the Environment Agency showing all records of historic flooding from rivers, the sea, groundwater and surface

Dataset	Description
	water. This dataset contains a consistent list of information about the recorded flood.
Historic Flood Map	Dataset from the Environment Agency showing the maximum extent of all individual Recorded Flood Outlines from river, the sea and groundwater. It differs from the Recorded Flood Outlines dataset as the HFM only contains outlines that are 'considered and accepted'.
Main Rivers	Dataset from the Environment Agency of the designated Main Rivers that the EA has permissive powers to carry out maintenance, improvement and construction work.
Main River buffer	EA guidance states that a buffer is required along all watercourses, which may be needed for access, maintenance or future flood risk management to make sure development in these areas does not increase flood risk. An 8-metre buffer, either side of each watercourse, has therefore been used in this SFRA, based on typical EA advice. Note: this buffer area is indicative and any plans for development should, through an FRA, further investigate the area required for the buffer zone.
Risk of Flooding from Rivers and Sea (RoFRS)	Dataset from the Environment Agency showing the chance of flooding from rivers and/or the sea, based on cells of 50 metres. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition.
Risk of Flooding from Surface Water (RoFSW)	Previously known as the updated Flood Map for Surface Water (uFMfSW); shows the extent of flooding from surface water that could result from a flood. Note: this data should not be used for property level investigations.
Spatial Flood Defences	Dataset from the Environment Agency showing all flood defences currently owned, managed or inspected by the EA. It has been symbolised to show raised flood walls and embankments within the study area.
Working with Natural Processes	There are 6 shapefiles located on the maps showing working with natural processes interventions that can be used as more natural forms of flood management.
Northumbrian Water boundary	A shapefile of NW's administrative area.

B Development site assessment spreadsheet

Excel spreadsheet containing an assessment of flood risk to the potential development sites based on Flood Zones 1, 2, 3a and 3b; the Risk of Flooding from Surface Water (RoFSW); and bespoke climate change considerations. Each site is allocated a strategic recommendation based on the identified risk.

C Functional floodplain delineation

Technical note explaining the methodology behind the delineation of the functional floodplain (Flood Zone 3b) for this SFRA.

D South Tyneside Level 1 SFRA User Guide

A support document to provide guidance on the use of the SFRA to developers, spatial planners, development management, flood risk management and emergency planners.

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
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Isle of Man
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South Tyneside Council

Level 1 SFRA Local Plan Sites Assessment

30 May 2022

Summary Table

			Fluvial / Tidal Flood Zone Coverage								Risk of Flooding from Surface Water						Localised Surface Water Flood Modelling in Cleadon and Monkton							
			Flood Zone 1		Flood Zone 2		Flood Zone 3a		Flood Zone 3b		Low Risk (1 in 1000 year outline)		Medium Risk (1 in 100 year outline)		High Risk (1 in 30 year outline)		Cleadon Model 1 in 100 +CC year outline		Cleadon Model 1 in 100 year outline		Cleadon Model 1 in 30 year outline		Monkton Model 1 in 75 year outline	
Proposed Use	Number of Sites	Area (ha)	Area (ha)	No. 100%	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.
Housing	61	343.67	335.76	57	1.40	4	2.21	3	4.29	4	25.16	43	8.95	29	3.29	18	0.86	4	0.60	4	0.41	4	0.28	5
Employment	13	46.54	1.85	9	1.41	3	0.38	3	1.72	4	2.93	11	0.70	8	0.41	6	0.27	1	0.20	1	0.11	1	0.20	1
Education	1	1.15	0.00	1	0.00	0	0.00	0	0.00	0	0.04	1	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
TOTAL	**74**	**390.20**	**337.62**	**66**	**2.81**	**7**	**2.59**	**6**	**6.02**	**8**	**28.09**	**54**	**9.65**	**37**	**3.71**	**24**	**1.13**	**5**	**0.80**	**5**	**0.52**	**5**	**0.48**	**6**

Key

Flood Zone 3b	The colour coding shows the highest risk element of the flood zone that is present on site and is not in itself an indication of whether the site should or shouldn't be developed for flooding reason
Flood Zone 3a	
Flood Zone 2	
Flood Zone 1 + Surface Water	
Flood Zone 1	

Main Table

				Fluvial / Tidal Flood Zone Coverage								Risk of Flooding from Surface Water						Localised Surface Water Flood Modelling in Cleadon and Monkton														
				Flood Zone 1		Flood Zone 2		Flood Zone 3a		Flood Zone 3b		Low Risk (1 in 1000 year outline)		Medium Risk (1 in 100 year outline)		High Risk (1 in 30 year outline)		Cleadon Model 1 in 100 +CC year outline		Cleadon Model 1 in 100 year outline		Cleadon Model 1 in 30 year outline		Monkton Model 1 in 75 year outline								
Site Reference	Site Name	Proposed Use	Area (ha)	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Significant Surface Water Risk?	At Risk from Fluvial / Tidal Climate Change?	Flood Risk Vulnerability Classification (NPPF)	Level 1 Strategic Recommendation (see SFRA Report)	Development Considerations	Recommended Next Steps	Council Comments
SBC003	Land at North Farm (West)	Housing	9.5580600	9.1742150	95.9840700	0.0895620	0.9370312	0.0379020	0.3965449	0.2563810	2.6823540	0.4161580	4.3540007	0.0788840	0.8253139	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Medium risk as at existing risk	More vulnerable	Strategic Recommendation C	Consider site layout and design	Flood risk should be manageable through careful consideration of site layout and design around the flood risk early on in the planning stage	
SBC010	Land at Cleadon Lane Industrial Estate	Housing	6.5154400	2.5135610	38.5785304	0.4944010	7.5881445	1.1040070	16.9444734	2.4034710	36.8888517	1.5565890	23.8907733	0.4075720	6.2554793	0.2287710	3.5112134	0.3194620	4.9031531	0.1173880	1.8016895	0.0044520	0.0683300	0.0000000	0.0000000	No	Medium risk as at existing risk	More vulnerable	Strategic Recommendation A	Consider withdrawal based on significant level of fluvial / tidal flood risk (if development cannot be directed away from areas at risk)	Withdraw from allocation or carry out Level 2 SFRA to assess depths of flooding	
SBC025	The Disco Field	Housing	2.2475700	2.2475700	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.6211375	27.6359595	0.1164000	5.1789266	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SBC051	Land at West Hall Farm	Housing	10.2603000	10.2603000	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.9643395	9.3987454	0.2982849	2.9071750	0.0912406	0.8892583	0.5327324	5.1921721	0.4749297	4.6288094	0.3942642	3.8426188	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SBC084	Former MoD bunkers, medical stores and associated land on Green Lane	Housing	7.5648500	7.5648500	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	2.6698861	35.2933119	1.0290768	13.6034005	0.3537454	4.6761719	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	Yes	Very low risk	More vulnerable	Strategic Recommendation C	Must consider SW risk through a full drainage strategy	Surface water flood risk should be managed through careful consideration of site layout and design around the flood risk early on in the planning stage through a full drainage strategy	
SBC087	Land south of St John's Terrace and Natley Avenue	Housing	1.5428800	1.5349922	99.4887606	0.0030444	0.1973161	0.0000000	0.0000000	0.0048435	0.3139233	0.0252800	1.6384924	0.0178765	1.1586455	0.0000000	0.0000000	0.0002119	0.0137324	0.0002119	0.0137324	0.0002119	0.0137311	0.0000000	0.0000000	No	Medium risk as at existing risk	More vulnerable	Strategic Recommendation C	Consider site layout and design	Flood risk should be manageable through careful consideration of site layout and design around the flood risk early on in the planning stage	
SBC100	Land south of Cleadon Park	Housing	3.4124800	3.4124800	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1652675	4.8430331	0.1039079	3.0449385	0.0544953	1.5969412	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SBC101	Land west of Sunniside Farm	Housing	5.9864600	5.9864600	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0340000	0.5679483	0.0148000	0.2472246	0.0108000	0.1804071	0.0078411	0.1309800	0.0075601	0.1262872	0.0066700	0.1114178	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SBC102	Land to North of Town End Farm	Housing	22.2532000	22.2532000	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	1.3218269	5.9399406	0.7397833	3.3243906	0.2137595	0.9605788	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SBC121	Open space at Dipe Lane/Avondale gardens	Housing	0.4210250	0.4210250	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0019910	0.4728912	0.0000000	0.0000018	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SBC133	Cleadon Lane Industrial Estate	Employment	2.3273600	1.8546270	79.6880156	0.1904800	8.1843806	0.0002610	0.0112144	0.2819920	12.1163894	0.2627280	11.2886704	0.1253130	5.3843411	0.0815020	3.5019077	0.2670190	11.4730424	0.2042140	8.7744913	0.1137440	4.8872542	0.0000000	0.0000000	No	Medium risk as at existing risk	More vulnerable	Strategic Recommendation A	Consider withdrawal based on significant level of fluvial / tidal flood risk (if development cannot be directed away from areas at risk)	Withdraw from allocation or carry out Level 2 SFRA to assess depths of flooding	
SFG043	Land at Trent Drive	Housing	0.2348930	0.2348930	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SFG044	Land at Heathway	Housing	0.0738235	0.0738235	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SFG045	Land at Heathway/Greenlands	Housing	0.1839070	0.1839070	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SFG046	Land at Kings Meadow	Housing	0.5158510	0.5158510	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SFG048	Land at Calf Close Walk	Housing	0.8893920	0.8893920	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SFG068	Land to North and East of Holland Park Drive	Housing	0.8235060	0.8235060	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0271181	3.2929999	0.0026212	0.3182917	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SFG072	Land South of Fellgate	Housing	191.1780000	191.1780000	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	11.7574328	6.1499926	4.1947874	2.1941789	1.8322083	0.9583782	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1083069	0.0566524	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SHB004	Hebburn New Town	Housing	2.2380400	2.2380400	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0065413	0.2922803	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SHB012	Ashworth Frazer Ind Estate and Hebburn Community centre	Housing	2.6766500	2.6766500	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0027918	0.1043007	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SHB013	Land to North of former day care centre	Housing	0.1266650	0.1266650	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000431	0.0340149	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SHB024	Land at Campbell Park Road	Housing	1.3198400	1.3198400	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0566861	4.2949227	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0914166	6.9263402	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SHB034	South Tyneside College, Hebburn Campus - playing fields	Housing	5.7018100	5.7018100	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0816000	1.4311245	0.0348000	0.6103325	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0618793	1.0852565	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SHB045	Land south-west of Prince Consort Road	Housing	1.1308200	1.1308200	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SHB046	Father James Walsh Day Centre	Housing	0.6535840	0.6535840	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1576083	24.1144720	0.0137189	2.0990203	0.0025189	0.3853921	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SHB092	Land off Mountbatten Avenue	Housing	0.4476710	0.4476710	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1699413	37.9612103	0.0890044	19.8816624	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0153821	3.4360348	Yes	Very low risk	More vulnerable	Strategic Recommendation C	Must consider SW risk through a full drainage strategy	Surface water flood risk should be managed through careful consideration of site layout and design around the flood risk early on in the planning stage through a full drainage strategy	
SHB121	Land at Lilac Garden	Housing	0.1749300	0.1749300	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0522004	29.8407620	0.0015085	0.8623433	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0021812	1.2469125	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SIS006	Former South Shields Library	Housing	0.3404270	0.3404270	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0289741	8.5111083	0.0075044	2.2044205	0.0009263	0.2720883	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SIS007	Land at Winchester Street / Fowler Street	Housing	0.8746180	0.8746180	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SIS009	Land at Fowler Street / Thomas Street	Housing	0.2929780	0.2929780	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SIS018	Land at Chatsworth Court	Housing	0.0835007	0.0835007	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SIS062	Land at Queen St and North St car park	Housing	0.6686190	0.6686190	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SJA008	Land at Salcombe Avenue	Housing	0.9492760	0.9492760	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.2591744	27.3023206	0.0063392	0.6677983	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SJA013	Perth Green Youth Centre	Housing	1.2153100	1.2153100	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0536639	4.4156586	0.0196000	1.6127572	0.0168000	1.3823633	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SJA019	Land at previously Martin Hall	Housing	0.3990710	0.3990710	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0284000	7.1165281	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SJA020	Land at previously Nolan Hall	Housing	0.4572540	0.4572540	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0517531	11.3182435	0.0005547	0.1213095	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SJA021	Land at Leamside	Housing	0.3731250	0.3731250	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0003211	0.0860481	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SJA049	Land at Falmouth Drive	Housing	1.3311400	1.3311400	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0002758	0.0207186	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SJA053	Open space (Peel Gardens)	Housing	0.2365990	0.2365990	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0353401	14.9366988	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SJA072	Land at Shaftesbury Avenue	Housing	2.1301100	2.1301100	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.4836359	22.7047366	0.1133956	5.3234629	0.0232302	1.0905625	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SJA103	Land at Kirkstone Avenue	Housing	0.0902634	0.0902634	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0006860	0.7600050	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS001	South Shields and Westoe Sports Club and playing fields	Housing	2.7670900	2.7670900	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS009	South Shields Community School - Brinkburn campus	Housing	7.8312200	7.8312200	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1826956	2.3329140	0.0510818	0.6522836	0.0139830	0.1785540	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS014	Land at Holborn	Housing	10.0767000	6.5651460	65.1517461	0.8084840	8.0233013	1.0730200	10.6485258	1.6300500	16.1764268	0.5320043	5.2795491	0.3720000	3.6916848	0.2424000	2.4055494	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	High risk due to modelling - At risk from Tyne Tidal 5% AEP +CC HC and UE, 0.5% AEP +CC HC and UE, and 0.1% AEP +CC HC and UE	More vulnerable	Strategic Recommendation A	Consider withdrawal based on significant level of fluvial / tidal flood risk (if development cannot be directed away from areas at risk)	Withdraw from allocation or carry out Level 2 SFRA to assess depths of flooding	
SOS040	Land at Chuter Ede Education Centre (excluding Brydon Court)	Housing	7.7839000	7.7839000	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.4653186	5.9779618	0.0304000	0.3905497	0.0232000	0.2980511	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS043	Former Temple Park Infant School	Housing	0.7117910	0.7117910	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0410241	5.7635010	0.0132000	1.8544769	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS044	Connoly House	Housing	0.3676060	0.3676060	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SOS050	Open space (Bradley Avenue)	Housing	0.9403380	0.9403380	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0493881	5.2521650	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS080	Tyne Dock Regeneration Scheme	Housing	1.4962000	1.4962000	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0104000	0.6950942	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS087	Land at Ryedale Court	Housing	0.3823020	0.3823020	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0012932	0.3382692	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS221	Lizard Lane shops/flats	Housing	0.3556180	0.3556180	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SOS222	Land at Dean Road	Housing	0.4295740	0.4295740	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SOS230	Land at Essex Gardens	Housing	0.1385860	0.1385860	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SOS231	Land at Brockley Avenue	Housing	0.0213077	0.0213077	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SWH009	Land at Wellands Farm	Housing	6.5691900	6.5691900	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.9363372	14.2534647	0.4308000	6.5578861	0.0792000	1.2056281	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SWH013	Former Charlie Hurley Centre	Housing	3.8027700	3.8027700	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	1.2422011	32.6656921	0.6094692	16.0269800	0.0244827	0.6438120	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	Yes	Very low risk	More vulnerable	Strategic Recommendation C	Must consider SW risk through a full drainage strategy	Surface water flood risk should be managed through careful consideration of site layout and design around the flood risk early on in the planning stage through a full drainage strategy	
SWH025	Land at Whitburn Lodge	Housing	0.8696470	0.8696470	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0045252	0.5203525	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SWH026	Land to North of Shearwater	Housing	1.8275300	1.8275300	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.4682888	25.6241384	0.1275833	6.9811853	0.0671622	3.6750234	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS007	South Tyneside College - South Shields campus	Housing	9.4682900	9.4682900	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1982550	2.0938836	0.0288000	0.3041732	0.0144000	0.1520866	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
E2	Land at Wagonway Industrial Estate, Hebburn	Employment	0.4794240	0.4794240	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1474380	30.7531538	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
E4	Former Rohm & Haas , Ellison Street	Employment	14.0608000	12.5760290	89.4403519	0.2949690	2.0978109	0.1448520	1.0301832	1.0449500	7.4316540	0.5861930	4.1689875	0.2444000	1.7381657	0.1992000	1.4167046	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	High risk due to modelling - At risk from Tyne Tidal 5% AEP +CC HC and UE, 0.5% AEP +CC HC and UE, and 0.1% AEP +CC HC and UE	Less vulnerable	Strategic Recommendation C	Consider site layout and design	Flood risk should be manageable through careful consideration of site layout and design around the flood risk early on in the planning stage	
E6	Land East of Pilgrims Way, Bedesway	Employment	0.4219200	0.4219200	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
E7	West of Pilgrims Way (east of Mitsumi), Bede Ind Est	Employment	1.4002100	1.4002100	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
E8	North of Tesco, Towers Place, Simonside Ind Est	Employment	1.4350900	1.4350900	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1401583	9.7665185	0.0070923	0.4942080	0.0068732	0.4789379	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
E10	South of Heddon Way, Middlefields Ind Est	Employment	0.6904080	0.6904080	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0008913	0.1290967	0.0002286	0.0331109	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
E17	Tyne Dock Enterprise Park (former NcNulty Offshore), Commercial Road	Employment	7.2496700	5.6971840	78.5854253	0.9257030	12.7688984	0.2316580	3.1954282	0.3951250	5.4502481	0.0397901	0.5488539	0.0268000	0.3696720	0.0152000	0.2096647	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	High risk due to modelling - At risk from Tyne Tidal 5% AEP +CC HC and UE, 0.5% AEP +CC HC and UE, and 0.1% AEP +CC HC and UE	Less vulnerable	Strategic Recommendation C	Consider site layout and design	Flood risk should be manageable through careful consideration of site layout and design around the flood risk early on in the planning stage	
E18	Land to rear of Western Approach Trade Park, Wilson Street	Employment	0.3093760	0.3093760	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1567344	50.6614573	0.0035384	1.1437183	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
E20	Northern end of Boldon BP	Employment	0.6199050	0.6199050	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0125180	2.0193417	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
E21	Land west of 16 Brooklands Way, Boldon Business Park	Employment	0.5245390	0.5245390	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.1264880	24.1141269	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SIS004	South Shields Town Centre College Regeneration Site	Education	1.1538220	1.1538220	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0372000	3.2240675	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
SOS083	Land at Biddick Hall Drive	Housing	0.1266710	0.1266710	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SOS119	Land at Cheviot Road	Housing	0.0802860	0.0802860	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation E	Development could be allocated on flood risk grounds subject to consultation with LPA and LLFA	LPA to make decision on allocation	
SOS151	Land at Bonsall Court	Housing	0.0460220	0.0460220	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0003050	0.6627265	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	More vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	
E12	Land East of Lukes Lane, Monkton Fell (West) Hebburn	Employment	4.2467670	4.2447110	99.9515867	0.0000000	0.0000000	0.0000000	0.0000000	0.0020560	0.0484133	0.4055610	9.5498764	0.0588520	1.3858071	0.0197490	0.4650361	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.2027180	4.7734665	No	Medium risk as at existing risk	Less vulnerable	Strategic Recommendation C	Consider site layout and design	Flood risk should be manageable through careful consideration of site layout and design around the flood risk early on in the planning stage	
P5	Wardley Colliery	Employment	12.7722440	12.7722440	100.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	1.0480990	8.2060678	0.2341300	1.8331156	0.0911740	0.7138448	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	No	Very low risk	Less vulnerable	Strategic Recommendation D	FRA required	Site can progress to FRA stage	