Plymouth City Council: Plan for Managing Local Flood Risk

Foreword

This document is one of a series of Delivery Plans which are being and will be created to support implementation of the Plymouth Plan.

Plymouth’s vision is to be one of Europe’s most vibrant waterfront cities where an outstanding quality of life is enjoyed by everyone.

The vision statement was conceived through an extensive period of partnership working and engagement in the early part of the 2000s, during which time the so-called ‘Mackay Vision’ was prepared (A Vision for Plymouth: A Past with a Future, Report of MBM Arquitectes with AZ Studio, 2003). It was initially integrated into the city’s planning policy in 2004 and then formally adopted into the Local Development Framework Core Strategy in April 2007. Since then it has been at the heart of policy and plan-making within the city. As part of the partner and community engagement process for the Plymouth Plan during 2014, work was undertaken to amplify what this vision meant for how Plymouth might look by 2031. In addition to identifying Plymouth’s strategic role in the region (see Module Four), three over-arching themes were identified to capture the essence of Plymouth in 2031 and build upon the city’s unique assets of people and place:

1. Plymouth as a healthy city.
2. Plymouth as a growing city.
3. Plymouth as an international city.

Since the ‘Mackay vision’ was published, Plymouth has aspired to grow to a city with a population in excess of 300,000. A key challenge will be to ensure that key infrastructure is in place to ensure the city has the right environment for growth and investment. It will also be crucial to ensure that growth does not damage the city’s special qualities but instead builds upon what is already good about the city; its local community spirit, its exceptional waterfront and green spaces, and its culture and heritage.

Growth also provides the opportunity to support a low carbon economy, responding to the challenge of climate change and making Plymouth more resilient to its impact. Cities that pro-actively respond to the business challenges and opportunities presented by the shift to a low carbon economy will be more competitive and resilient in the long term.

This Plan for Managing Local Flood Risk responds to the related challenges of climate change adaptation and infrastructure investment. It considers the flood risks in Plymouth today and how they are expected to change in response to the predicted effects of climate change. It sets standards of protection that new development should meet in order to keep flood risk within acceptable limits, and identifies where we need to upgrade strategic drainage and flood management infrastructure.
1. Introduction

Current Environment Agency data indicates that up to 5% of homes in Plymouth are at risk from flooding. This flooding is expected to increase in severity and frequency as a result of the extreme weather and sea level rise forecast as a result of climate change. Plymouth needs to be prepared for, and resilient to these changes. In addition, growth in Plymouth, leading to construction of more homes, business units and roads, will increase the risk of surface water flooding if no action is taken.

This document considers the flood risks in Plymouth today and how they are expected to change in response to the predicted effects of climate change. It sets standards of protection that new development should meet in order to keep flood risk within acceptable limits, and identifies where we need to upgrade strategic drainage and flood management infrastructure.

It is produced by Plymouth City Council as Lead Local Flood Authority (LLFA). It builds upon the Plymouth Preliminary Flood Risk Assessment (PFRA) and Strategic Flood Risk Assessments (SFRA), and should be considered with the PFRA and SFRAs together as meeting the requirements of the Flood and Water Management Act 2010 and the National Planning Policy Framework to provide evidence to manage flood risk. It also constitutes a supporting document for the Plymouth Core Strategy and the forthcoming Plymouth Plan, which will replace the Core Strategy as the local development plan for Plymouth.

Other flood Risk Management Authorities (RMAs) that manage flood risk in Plymouth are the Environment Agency (EA) and South West Water (SWW). Responsibilities for managing flood risk across the city are assigned as follows:

- Tidal - EA and PCC
- Fluvial - EA (main rivers) and PCC (ordinary watercourses)
- Surface water – PCC
- Sewer flooding - SWW.

The Strategy sets out the principles by which these RMAs will manage these risks, namely:


The City will manage risk in association with flooding by:

1. Working with South West Water, the Environment Agency and other relevant organisations including asset owners to ensure that Plymouth’s flood defence, coast protection, drainage and sewerage infrastructure is sustainable and meets the requirements placed upon it by population growth and climate change. Flood defence, water supply and wastewater infrastructure requirements should be put in place in tandem with planned growth to avoid adverse social, economic and environmental impacts.
2. Working with Environment Agency and South West Water to align priorities for the efficient and effective management of tidal, fluvial and surface water flood risk, and to improve and ensure the effective functioning of the city’s sewerage and drainage infrastructure.
3. Maintaining an emergency response plan, sufficient to address the risks to life and livelihood from extreme weather events.

The LPA will follow a sequential approach to flood risk management, by:

4. Only considering the development of sites with a greater risk of flooding where essential for regeneration or where necessary to meet the development requirements of the city.
5. Requiring development in areas at risk of flooding to be resilient to flooding through design and layout, and to incorporate sensitively designed mitigation measures, which may take the form of on-site flood defence works and/or a contribution towards or a commitment to undertake such off-site measures as may be necessary, in order to ensure that the development remains safe from flooding over its lifetime.
6. Requiring development to incorporate sustainable water management measures to minimise surface water run-off, in compliance with the Local Flood Risk Management Plan and National Standard for sustainable urban drainage, and ensure that it does not increase flood risks elsewhere.
• Effective planning of new development, taking current and future flood risk into account
• The effective management of surface water
• Ensuring Sustainable Drainage Systems (SuDS) meet PCC design criteria.
• Ensuring a consistent standard of protection across the city, within practical and financial limitations.

This document will be supported by the Plan for Managing Local Flood Risk Part 2 – Technical Guide.
2. Flood risk in Plymouth

Flood risk currently threatens to cause increasingly frequent and severe disruption in Plymouth to people and to businesses\(^1\). Experience over the last few years, both in Plymouth and across the wider South West has underlined the very significant affect flooding can have to residential and commercial property, business continuity, critical infrastructure and key strategic transport links. This section summarises the current flood risks according to their source (tidal, fluvial, surface water) and location, as well as how these may change in the future in response to climate change.

Types of flood risk

The flood risk in Plymouth is from six sources, which could combine at certain times and places:

- **Tidal** – flooding from the sea as a result of storm-driven tidal surges and big waves. The majority of the City is elevated well above the level at risk of flooding from the sea, however areas where land has been reclaimed from the sea are particularly at risk from tidal flooding, as are the exposed coastal frontages.

- **Fluvial** – rivers and streams overtopping their banks after heavy rainfall, either because of insufficient channel capacity or blocked culvert screens, or a combination of the two. Development has occurred within the floodplains of many of the watercourses that flow through the City area, placing this development at risk of fluvial flooding.

- **Surface water** flooding is a risk for Plymouth due to the reliance on drains to take rainfall away and the large amount of hard surfacing in the city which prevents rainwater soaking into the ground. When the capacity of these drains are overwhelmed water flows overland and finds low spots and hollows which can result in flooding of property and infrastructure. In response to the severity of this risk the Environment Agency have identified most of the urban area of Plymouth as a ‘Critical Drainage Area’, demanding higher standards for new developments in relation to surface water management.

- **Sewer** flooding occurs when the sewers are overwhelmed by the volume of water entering them, or because of blockage. Flows of foul sewage are predictable and it is generally excess surface water entering the sewer during storm events that causes sewer flooding. Sewer flooding is characterized by backing up of drains, overflowing through drain covers and toilets. Both combined sewers (taking foul and surface water, and surface water sewers are vulnerable to this type of flooding.

- **Groundwater** - Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

- **Reservoir** flooding – Reservoirs are artificial water bodies making use of a constructed barrier and water control devices to withhold water. If either of these fail, large volumes of water can be released in a short space of time. This water ‘plume’ can cause significant damage.

\(^1\) A Summary of Climate Change Risks for South West England. Climate UK 2012.  
www.climateandus.com/download/southwestCCRA
To understand the scale of risk Table 1 shows the estimated number of residential properties at risk in Plymouth. Flooding also presents risks to commercial property, key transport links (road and rail) and utilities (gas, water, electricity) infrastructure.

Figure 1 illustrates the spatial distribution of these risks, and highlights key areas of flood risk in the city for which the Plymouth Plan may provide solutions. The higher priority areas generally include a combination of two or more of tidal, fluvial and surface water flood risks, necessitating more complex solutions. Many of these areas are coincident with key growth locations in the city, and flood risks consequently constitute a significant constraint to implementation of the Plymouth Plan.

Table 1. Number of Residential Properties at risk of flooding in Plymouth

<table>
<thead>
<tr>
<th>Principal sources of flooding</th>
<th>Number of Residential properties at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tidal only flooding</td>
<td>537</td>
</tr>
<tr>
<td>Fluvial flooding from Main Rivers</td>
<td>387</td>
</tr>
<tr>
<td>Surface water flooding* (including ordinary watercourses)</td>
<td>3,886</td>
</tr>
</tbody>
</table>

* May include some dwellings that are also at risk from fluvial and/or tidal flooding

Note: Property numbers based on National Receptor Dataset and EA flood mapping
Figure 1. Catchment-based summary of flood risk
2 Adapting to Climate Change

Climate change will bring about changes that have direct consequences for flood risk. We expect that:

- rainfall events will increase in intensity (i.e. more rain will fall in a shorter space of time)
- severe events will happen more often.
- As a result of warming oceans and the melting of arctic sea ice we expect sea levels to continue to rise.
- more storms of greater intensity (e.g. stronger winds). The combination of these two factors greatly increase the risks of coastal flooding through the overtopping of coastal flood defences. Coastal properties will also be more vulnerable to storm damage from large waves and debris thrown up by them.

In planning for Plymouth’s future the following projections are being used for sea level rise and storm events, as recommended by government:

<table>
<thead>
<tr>
<th></th>
<th>1990 - 2025</th>
<th>2025 - 2055</th>
<th>2055 - 2085</th>
<th>2085 - 2115</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea level rise*</td>
<td>3.5mm</td>
<td>8mm</td>
<td>11.5mm</td>
<td>15mm</td>
</tr>
<tr>
<td>Rainfall intensity</td>
<td>+ 5%</td>
<td>+ 10%</td>
<td>+ 20%</td>
<td>+ 30%</td>
</tr>
<tr>
<td>River flows</td>
<td>+ 10%</td>
<td>+20%</td>
<td>+20%</td>
<td>+20%</td>
</tr>
<tr>
<td>Wave heights</td>
<td>+ 5%</td>
<td>+ 5%</td>
<td>+ 10%</td>
<td>+ 10%</td>
</tr>
</tbody>
</table>

*Net sea level rise (mm per year)

Table 2. Climate change projections (source: Climate change allowances for planners. Environment Agency 2013)

In order to adapt to these expected effects of climate change, we need to:

- consider carefully where new development is located
- make development more resilient to flood risks and storm events
- improve the capacity of the sewer system to remove surface water
- divert surface water from the drainage system through installing new surface water drains to replace combined sewers
- apply sustainable drainage systems to new development and consider retrofitting in high risk areas.

The following sections present summaries of the principal sources of flood risk in Plymouth: tidal flooding, fluvial flooding, and surface water flooding. Sewer flooding does not present a strategic risk.
2.1 Tidal Flooding in Plymouth

This section summarises the nature of tidal flood risk across Plymouth:

- Plymouth has 60km of coastline from Tamerton Lake to Jennycliff Bay including the Tamar and Plym estuaries.
- Tidal flooding is most often the result of extreme high tides which may combine with tidal surges and storm events. The Plymouth shoreline is also susceptible to wind and wave action that can lead to overtopping of defences.
- Tidal flooding affects residential and commercial property, key strategic transport links and critical infrastructure.
- Areas that have the greatest number of properties at risk from tidal flooding are Barbican (Sutton Harbour), Marsh Mills and Stonehouse. Other areas at risk include:
  - Millbay and parts of Union Street
  - Hooe/Oreston/Turnchapel
  - Devonport (Torpoint Ferry slipway)
  - Marsh Mills
  - The Ride (Saltram)
  - Embankment Road & Laira
  - West Hoe
  - Stonehouse Pool
  - Royal William Yard
  - Ernesettle.
- High tide levels can prevent surface water outfalls from discharging. This ‘tide locking’ may cause additional fluvial or surface water flooding.
- There are key tidal flood defences at:
  - Sutton Harbour lock gates
  - Marsh Mills (Longbridge Road/Marsh Close)
  - Mount Batten breakwater
  - Plymouth Sound Breakwater
  - Royal William Yard.
- Priority areas for works to improve the standard of protection are the Barbican (Sutton Harbour), Embankment Road, Turnchapel, Hooe, and Oreston.
- Map 1. details the location of current and future tidal flood risk in the city.
Map 1. Tidal flood risk
2.2 Fluvial and Reservoir Flooding in Plymouth

This section characterizes the nature of fluvial flood risks across Plymouth:

- There are 137 km of watercourses in Plymouth, including 106 km designated as ordinary watercourse.
- Due to the steep topography of Plymouth, watercourses can respond extremely rapidly to rainfall such that watercourse levels can rise and cause flooding with little warning.
- Key areas at risk from fluvial flooding are:
  - Plympton, associated with the Tory Brook and Long Brook, and Boringdon Stream and Chaddlewood Stream,
  - Marsh Mills associated with the River Plym
  - Tamerton Foliot
  - Weston Mill
  - Stonehouse, associated with the Pennycomequick Stream
  - Billacombe Brook, Plymstock
- ‘Critical Culverts’ and key fluvial flood defences located on Plymouth’s watercourses play an important role in flood defence and need to be maintained to reduce the risk of flooding to property, critical infrastructure and transport links.
- High watercourse levels can prevent highway drainage and surface water outfalls from discharging and may cause additional surface water flooding.
- Map 2 details the location of fluvial flood risk in the city and of the critical culverts which are most sensitive to flood events.
- As well as the small Drake Reservoir in the city, Plymouth is potentially affected by failures of Burrator Reservoir in the Plym catchment, and Roadford Reservoir in the upper Tamar catchment.
Map 2. Fluvial flood risk, showing critical culverts (i.e. culverts most sensitive to flood events)
2.3 Surface Water Flooding in Plymouth

This section summarises the nature of surface water flood risk across Plymouth:

- Plymouth is mainly urban with large impermeable areas which, combined with steep-sided catchments, leads to high rates and volumes of surface water run-off. This causes watercourse and drainage systems within the catchment to respond rapidly to rainfall events leading to the hydraulic overloading of the sewerage and drainage systems.

- Plymouth has a significant number of combined sewerage systems that take both foul and surface water flow. These sewers can be overwhelmed due to the large surface water flows entering the system. This ‘surcharging’ of the combined sewers can lead to sewage spills and flooding and the operation of consented CSO’s (Combined Sewer Overflows) which can have pollution implications.

- Pollution from surface water flooding can have a significant detrimental impact on Bathing Water Quality at designated bathing beaches at East and West Hoe.

- Surface water flooding can be linked to fluvial and tidal flooding where high watercourse and tide levels can prevent surface water outfalls from discharging, which can cause additional flooding. Sea water infiltrating the drainage network reduces capacity for surface water storage and conveyance.

- Plymouth has a notable level of surface water flood risks and the majority of the city has been designated a Critical Drainage Areas. This Environment Agency designation recognises that as a result of historical flood problems and constraints within the existing surface water drainage system there is a need to restrict rates of run off from new developments.

- To prioritize action PCC has identified 14 ‘Local Significant Areas of Surface Water Flooding’. These are defined as where there are 10 or more residential properties or one critical infrastructure asset (e.g. railway, hospital) at risk. These are:
  - Colebrook and Golden Square
  - Longbridge Road, Plympton
  - Stenlake Place, Laira
  - Laira Avenue
  - Union Street & Octagon
  - St Levan Road, Keyham
  - Lipson Road, Greenbank
  - Wellhay Close, Elburton
  - The Broadway, Plymstock
  - Dean Cross, Plymstock
  - Billacombe Road, Plymstock
  - Market Road, Plympton
  - Edgcumbe Avenue, Stonehouse
  - Elburton Road, Plymstock
• Map 3 details the location of surface water flood risk in the city, the predicted flood depths, and the designated Local Significant Areas of Surface Water Flooding.

• Annex 2 details the extent of the Critical Drainage Area notified by the Environment Agency, and the drainage standards that apply.
Map 3. Surface water flood risk
2.4 Area-based summaries

This section summarises how flood risk varies across the city on a catchment by catchment basis, and brings together a consideration of how the different types of flooding may interact.

These areas, the location of the catchments, and the issues which characterize them are indicated in Figure 1 and summarised in the following paragraphs which refer to the risks by drainage catchment. Additional, detailed maps are provided, where relevant, in Annex 1.

Crownhill catchment
The Crownhill catchment is at risk from surface water flooding which requires management of drainage (through the use of sustainable drainage systems for new developments) and sewerage networks to reduce this risk. There is also a history of flooding and pollution incidents in the Forder Valley Stream.

Dockyard catchment
The main flood risk in this catchment is from surface water run-off, particularly around the St Levan road area. There is risk of tidal flooding affecting the ferry slipways from Devonport to Torpoint, and adjacent Ministry of Defence land.

Hamoaze catchment
The area around Wolseley Road and Weston Mill is at risk from flooding from surface water due to the limited capacity of the combined sewerage system and watercourses. The areas around Riverside, the Dockyard, and Little Ernesettle are at risk from future tidal flooding, associated with sea level rise.

Marsh Mills catchment
The flood risk from the River Plym and from tidal flooding is significant in the May’s Marsh and Marsh Mills area, and particularly for transport infrastructure (Marsh Mills roundabout, the railway line and B3416) and residential properties in Marsh Close area. Much of the area is predicted to flood to a depth of 1.5m or greater during a 1 in 200 year (0.5% AEP) tidal flood event in 2110. This severity of flooding is significantly higher than now, increasing because of the predicted effects of sea level rise.

Flooding in this area is managed by raised flood banks and walls, however there are risks that these could be overtopped without ongoing maintenance and upgrades. Tidal and fluvial flooding is also significant in the Long Bridge area of Plympton with the railway line and sewage treatment works at risk. Surface water flooding is also a risk in Laira Avenue and Lipson Vale as they are low-lying making it difficult to drain rain water away. Combined flooding associated with heavy rainfall occurring during high tide events presents another risk to this area.

Millbay and City catchment
Millbay is a tidal inlet much of which has been reclaimed and now comprises the eastern end of Union Street and the Octagon area. It is very low-lying such that
drains become tide-locked and surface water cannot drain away when tides are high. A storage tank exists in Millbay to store rain water during storm events. Around the Octagon and Union Street the highway drains are insufficient to cope during heavy rain and increased capacity is required in these and the sewage system to prevent flooding.

There are areas of tidal flood risk in the immediate vicinity of the docks, the extent of which and the depth to which they flood will increase over time with sea level rise. There is also a future risk of overtopping of sea defences leading to flooding in Bath Street, Martin Street, and Union Street/Octagon. This risk of tidal flooding is currently being remediated with improved defences (through raising ground levels) in connection with new developments in Millbay. Sewerage capacity is expected to have been improved with the works recently completed on Millbay Tanks. However, surface water drainage remains a problem.

**Plym Valley catchment**
The sources of flood risk in this catchment are from fluvial and surface water run-off, plus tidal flooding in the south of the catchment.

There are operational sewerage system issues around Glenholt and the Glenholt pumping station which cause some pollution incidents in the River Plym. SWW have investigated urban diffuse pollution incidents and identified situations where private foul sewerage has been incorrectly connected to the surface water drainage network.

**Plympton Longbrook catchment**
This catchment is at risk from tidal, fluvial and surface water flooding. The main issue is surface water being unable to get into the Long Brook and causing flooding rather than the Long Brook overtopping. The catchment is recognized as having a rapid response to rainfall, and there are also issues from agricultural land run off causing algal growth and pollution of watercourses.

Flood risk can be reduced by improving the surface water connection to and the capacity of the Long Brook, and reducing the tidal influence on the existing sewerage and drainage systems.

**Plympton Tory Brook catchment**
The flood risk in this catchment is from fluvial sources such as the Tory Brook, Stoggy Lane Stream, Chaddlewood Stream and Boringdon Stream which are all designated as Main River watercourses. There is also a risk of flooding from surface water run-off and inadequate combined sewerage capacity.

The watercourses in this catchment respond rapidly to rainfall which limits flood warning options, however flood risk can be managed by improving the capacity of the watercourses and separating surface water from the combined sewerage network.
Plympton Woodford catchment
Plympton faces flood risk issues from fluvial and surface water sources, which may be exacerbated by blockage of structures or failure of defences. A number of locations are at risk from flooding from fluvial and surface water flooding.

Pomphlett Lake catchment
There is a risk of tidal flooding around Oreston, Hooe and Turnchapel which is predicted to increase in the future, with predicted sea level rise. The Mountbatten breakwater provides some protection from waves propagating from the open sea.

There is a risk of surface water flooding in the rest of the catchment, particularly in Dean Cross, Billacombe Road and the Broadway which is caused by insufficient sewerage capacity. Pollution from this catchment impacts on Bathing Water quality at Plymouth’s designated bathing beaches, so the potential for this should be reduced.

Royal William Yard catchment
This catchment is at risk from tidal flooding, specifically around Cremyll Street and Royal William Yard which is exacerbated by strong winds. This risk would be expected to increase as sea levels rise due to the impacts of climate change.

Saltram catchment
This is a predominantly rural catchment with existing natural flow routes. There is a risk of tidal and fluvial flooding from the River Plym along the Ride. A potential source of pollution is from Chelson Meadow, which would impact on Bathing Water quality at Plymouth’s designated bathing beaches.

Stonehouse Creek catchment
The Pennycomequick Stream is for parts of its length a culverted watercourse from Milehouse to Stonehouse Creek. The culverted nature of this watercourse causes problems as water can only enter into the culvert in specific areas. The culvert also has a finite capacity and flooding occurs during times of heavy rain when the capacity is exceeded. Flooding also occurs when the flap valves at Stonehouse Bridge are either not working properly or are locked by high tides and the Pennycomequick Stream cannot discharge.

Sutton and Laira catchment
This area is affected by flood risk from fluvial and surface water sources. The high land in this area is impacted by surface water flooding flowing into urbanised valleys and the watercourses close to Embankment Road are constrained by long culverts running under raised ground. The ability for these watercourses to discharge into the Plym Estuary is impeded during high tides and during periods of tidal flooding.

Surface water flooding is also an issue on Embankment Road and Gdynia Way, which can be exacerbated by high tidal water levels.

On the Western bank of the Plym estuary there is a risk of tidal flooding to key infrastructure (railway main line, Laira Depot railway sidings and works, and Embankment Road), to areas identified for possible development, and existing residential areas. Much of this area is predicted to flood to a depth of 1.5m or
greater during a 0.5% AEP tidal flood event in 2110. This severity of flooding is significantly higher than now, increasing because of the predicted effects of climate change. Recent highway works to construct a section of flood wall have mitigated some of this risk.

The Barbican area (Sutton Harbour) is at risk from tidal flooding and is currently protected by a tidal flood gate. This area is susceptible to deep flooding should the flood defences fail and the upgrade in their level is required due to the predicted impact of sea level rise. Mountbatten breakwater also provides protection to Sutton Harbour from waves from the open sea.

**Tamerton Lake catchment**
The watercourse flowing through Tamerton Foliot is raised above the bottom of the valley. If flood water leaves the channel in this area it flows overland and can lead to flooding of residential and commercial property, before rejoining the watercourse once it returns to the valley bottom. There is limited sewerage capacity and consented discharges from CSOs cause pollution. Also this is a steep catchment that responds very quickly to rainfall.
3. The Management Plan

3.1 Aims
Plymouth City Council, South West Water and the Environment Agency aim to reduce the risk of current and future flooding in Plymouth, providing protection to people, places and property.

In seeking to achieve this aim, flood risk management authorities will apply the following principles and actions to their work in the Plymouth area:

1. **Standards of protection.** PCC will require/maintain a standard of protection for new works in Plymouth of 0.5% AEP against tidal flooding, 1% AEP against fluvial flooding, and 1% AEP with a 1-hour storm duration for surface water flooding, all including an allowance for climate change for 100 years.

2. **Strategic Drainage corridors.** To facilitate the installation of sustainable urban drainage on development sites and other locations, the Council will seek contributions for the development of strategic drainage corridors to channel surface waters to natural water bodies where it is not possible to manage rainfall on site and where no surface water drains are available. This is to facilitate development, where flood risks would otherwise present a barrier to development. See Annex 3 for more detail of the corridors.

3. **Sustainable drainage systems (SuDS).** PCC will require sustainable urban drainage for all new residential developments of more than one building within areas at risk of flooding, and all major developments. As a minimum the Council will expect SuDS to be designed and constructed in accordance with Non-statutory Technical Standards for Sustainable Drainage, and will be subject to the proposed drainage system addressing the requirements of Plymouth’s Plan for Managing Flood Risk Part 2: Technical Guide (which may set a higher standard in response to local circumstances). Arrangements should be put in place to ensure maintenance is sufficient to preserve system performance over the life-time of the development.

4. **Coastal defences.** Plymouth’s shoreline is made up of hard defences interspersed with small sections of natural shore that is subject to coastal erosion. The preferred policy to the year 2105 identified in the South Devon and Dorset Shoreline Management Plan from Mount Batten breakwater to Tamerton Lake is ‘Hold the line’, and defences will be maintained in line with this policy subject to the availability of funds. The small section of undeveloped coast to the south of Mountbatten Breakwater (Batten Bay and Jennicliff Bay) is subject to a ‘no active intervention’ policy.

5. **Development Planning and Regeneration.** PCC will take flood risks into account in planning for future development, by applying the sequential test as required in the National Planning Policy Framework (NPPF), and
through requiring the submission of Flood Risk Assessments and sustainable drainage strategies where deemed necessary.

6. **Evidence** - PCC, the EA, and SWW will collaborate to ensure the city's evidence on flood risk is fit for purpose, and commission studies to inform combined work priorities.

### 3.2 Delivery and implementation

1. Plymouth City Council, South West Water and the Environment Agency (the Risk Management Authorities: RMAs) will collaborate in managing flood risk and managing flood protection assets by means of regular liaison meetings at technical and strategic level (no less than twice per annum). PCC will convene and chair the meetings as Lead Local Flood Authority. Table 3 illustrates the mechanisms available.

2. PCC will investigate events in which 10 or more dwellings are flooded or one or more critical service\(^2\) affected. This information will be used to identify causes and help in defining solutions and prioritising works.

3. Registers will be kept of flood management assets for main (EA) and ordinary (PCC) watercourse and tidal defences (PCC), and sewerage network (SWW) to ensure that information is available to enable prioritisation and planning of works, and strategy revision.

4. Annual assessment to guide the implementation of these priorities will be undertaken at a catchment scale, in relation to:
   - needs arising from flood incidents (assessed as they arise)
   - opportunities to align works and funding as development takes place
   - opportunities to align scheduling and funding of schemes by RMAs, to enhance the overall reduction of flood risk, the cost effectiveness of works, and the optimization of wider benefits.

5. PCC will designate features and structures as flood management assets where appropriate, and will control works that may impact upon the flood management function of any asset through a consents process. The criteria for designating critical assets are set out in *Part 2: Technical Guide*. This is to ensure that the standard of protection for the city is not diminished.

\(^2\) Critical Services (as defined in PFRA):
EA critical service location is based on information contained within the NRD dataset. This data includes all critical services considered to be nationally significant. A review has been undertaken with Plymouth City Council’s Civil Protection Unit to ensure that it contains all critical service information that is relevant for Plymouth.
Table 3. Responsibilities and mechanisms available for flood risk management

<table>
<thead>
<tr>
<th>Investigations and evidence</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Studies</strong> (by all RMAs, Defra)</td>
<td><strong>Management of Assets</strong></td>
</tr>
<tr>
<td>• Local flood event investigations</td>
<td>• <strong>New infrastructure works.</strong> Funded through local Levy and Flood Defence Grant in Aid (FDGiA) from central government via PCC and the EA, by SWW Asset Management Plan, by PCC Capital Programme, by developer contributions</td>
</tr>
<tr>
<td>• Strategic and technical studies</td>
<td>• <strong>Maintenance/upgrading works.</strong> Funded from Risk Management Authority operational budgets, FDGiA</td>
</tr>
<tr>
<td>• Climate change predictions</td>
<td>• <strong>PCC planning consents:</strong> requiring SuDS schemes and/or developer contributions for flood management works</td>
</tr>
<tr>
<td><strong>Maintain Asset Registers:</strong></td>
<td>• <strong>SuDS schemes for new developments:</strong> installed by developers, subject to consents procedures and performance standards operated by PCC</td>
</tr>
<tr>
<td>• Ordinary watercourse (culverts etc) (PCC)</td>
<td>• <strong>Consents for works:</strong> on or adjacent to flood management assets. Ordinary watercourse - PCC; Main River – EA; Shoreline structures - PCC</td>
</tr>
<tr>
<td>• Main River (EA)</td>
<td></td>
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<tr>
<td>• Shoreline (PCC)</td>
<td></td>
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<tr>
<td>• SuDS (PCC)</td>
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</tbody>
</table>