A map of the Waidebrdige catchment area. The map shows a network of roads and rivers. A prominent road runs from the top left towards the center, where it meets a junction. A red circle highlights the town of Waidebrdige, which is located at this junction. The surrounding area is mostly rural with some scattered buildings and fields. The title 'WADEBRDIGE CATCHMENT SUMMARY REPORT' is written in white capital letters on the left side of the map.

**WADEBRDIGE CATCHMENT
SUMMARY REPORT**

Flood Risk Management is changing.

The Environment Agency can help communities to manage their flood risk. We can not deliver this without community support and acceptance of the flood risk that remains.

This document aims to help the community understand these risks, the options available and the consequences of each option.

The community will need to decide on their preferred approach and in doing so, understand how this will be delivered.

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Wadebridge Catchment

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Wadebridge South/Town Centre

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Wadebridge Flood Risk Areas

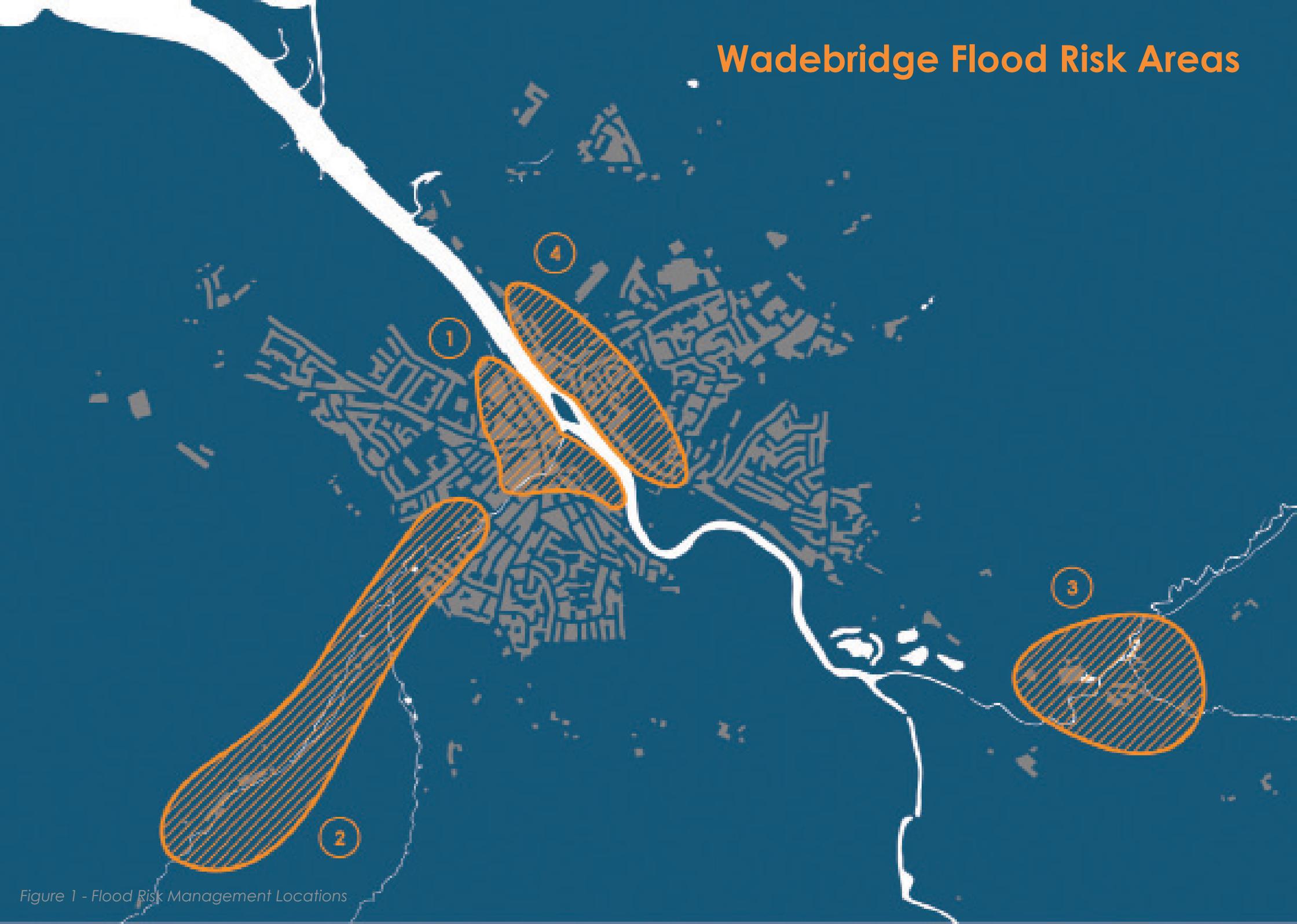


Figure 1 - Flood Risk Management Locations

Wadebridge can be divided into Four flood risk areas with discreet flooding mechanisms, vulnerability and management options

1 Wadebridge South/Town Centre

The south bank of Wadebridge is at risk of flooding from the sea. More than 700 homes and businesses benefit from the riverside defences. However the impacts of climate change will in the future reduce the standard of protection afforded by these defences.

2. Polmorla

The Polmorla stream rises to the southwest of Wadebridge. Its relatively small and steep catchment responds rapidly to rainfall which can cause property flooding in Polmorla. However the greater risk comes from the outfall of the Polmorla Stream which can be tide-locked, thus becoming reliant on a pumping station to discharge at high tides.

3. Sladebridge

4. Wadebridge North

Overview

Tidal flooding presents the greatest flood risk to Wadebridge. The standard of protection provided by the current flood defences is satisfactory for the next 20 years.

As a result of climate change the standard of protection will be reduced in the future unless defences are upgraded.

With the current arrangements, national funding can be secured to contribute to flood defence maintenance for the next 50 years. There will be scope within this to maintain the standard of protection in line with climate change.

Beyond 2050, defence upgrade is only economically feasible with contributions from beneficiaries.

Because development now will have a lifetime that extends beyond 2050, planning is important to maintain Wadebridge as a sustainable community.

The risk of surface water and river flooding is exacerbated by high tides that can prevent their efficient drainage and discharge. Catchment land management practice can reduce flood risk and improve water quality.

A Local Flood Risk Management Strategy is necessary set the way forward.

A map of Wadebridge, showing the River Ouse flowing through the town. The left bank of the river is highlighted in orange, indicating the area of focus. The map shows a dense network of streets and buildings, with the river curving through the center. The text 'WADEBRIDGE LEFT BANK' is overlaid on the left side of the map.

**WADEBRIDGE
LEFT BANK**

Wadebridge South/Town Centre



Image © Stuart48 Google Earth

Key Points

- There are tidal defences in Wadebridge. The current Standard of Protection is 0.5%AEP (a 1 in 200 chance of flooding exceeding the defences occurring in any one year)
- This Standard of Protection will reduce without further investment. National funding can be justified to maintain the Standard of Protection for the next 50 years.
- Beyond this 50 years, full national funding cannot be justified as investment exceeds the value of homes and businesses in Wadebridge. Therefore to maintain the Standard of Protection contributions from beneficiaries will be required.
- To achieve this the community would need to accept that defences would be raised around a metre above the existing level. This may require more innovative defences, as outlined in Section 3.
- A Local Flood Risk Strategy would help ensure this is delivered.

Flood Warning



Warning for:

- Tidal event and flooding from river camel

Little or no warning for residential risks

- Breach of flood defence
 - Structure blockage
 - pump failures
 - Limited public awareness
-
- A tidal flooding event at Wadebridge that over tops defences will be widespread event in Cornwall.
 - Emergency services may be stretched and already committed elsewhere
 - 30-35% of properties are not registered for flood warning within Flood Zone 2
 - There is currently no flood wardens or community flood plan

Current Flood Risk - Tidal



Figure 3 - Cross section to show current level of protection and defended area of Wadebridge Left Bank

Current Policy

- Planned maintenance to continue
- No plans to upgrade the current flood defences at present
- Catchment Flood Management Plan policy to investigate

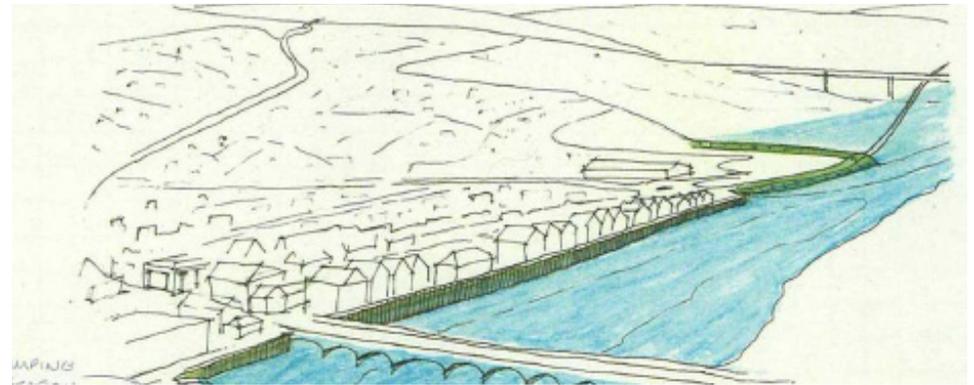


Figure 4 - Wadebridge current day 1 in 200 year event

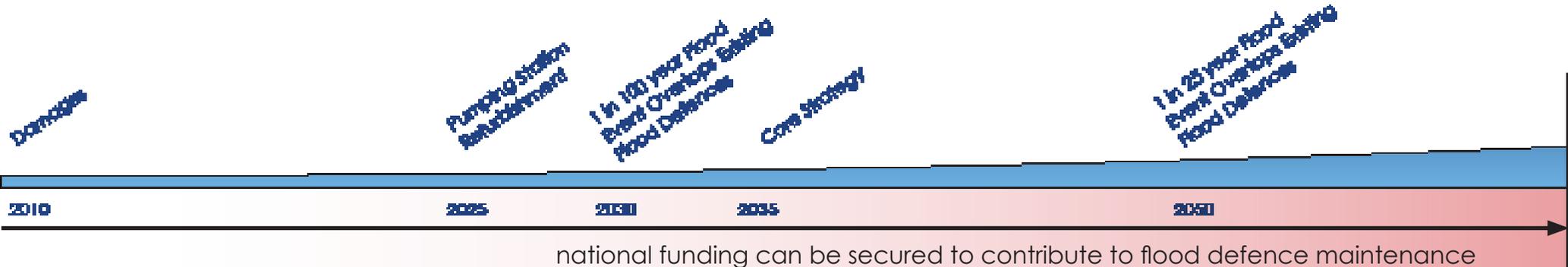


Figure 5 -Wadebridge Defences Timeline

Future Flood Risk - Tidal



Figure 6 - Cross section to show flooding from a 1 in 25year flood event in 2050

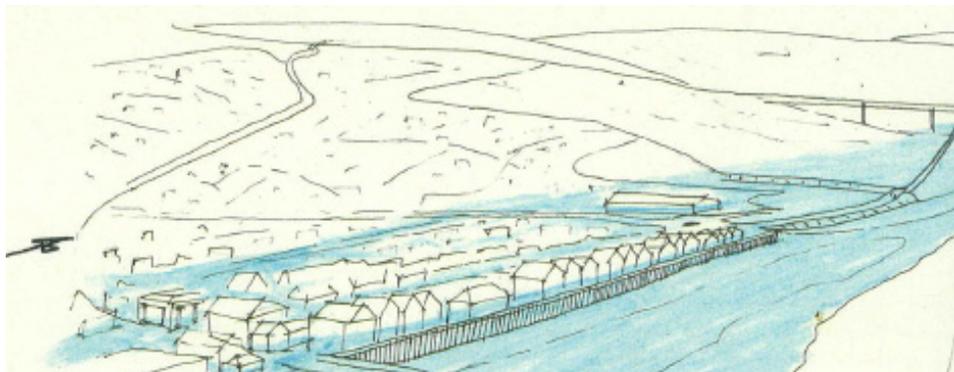
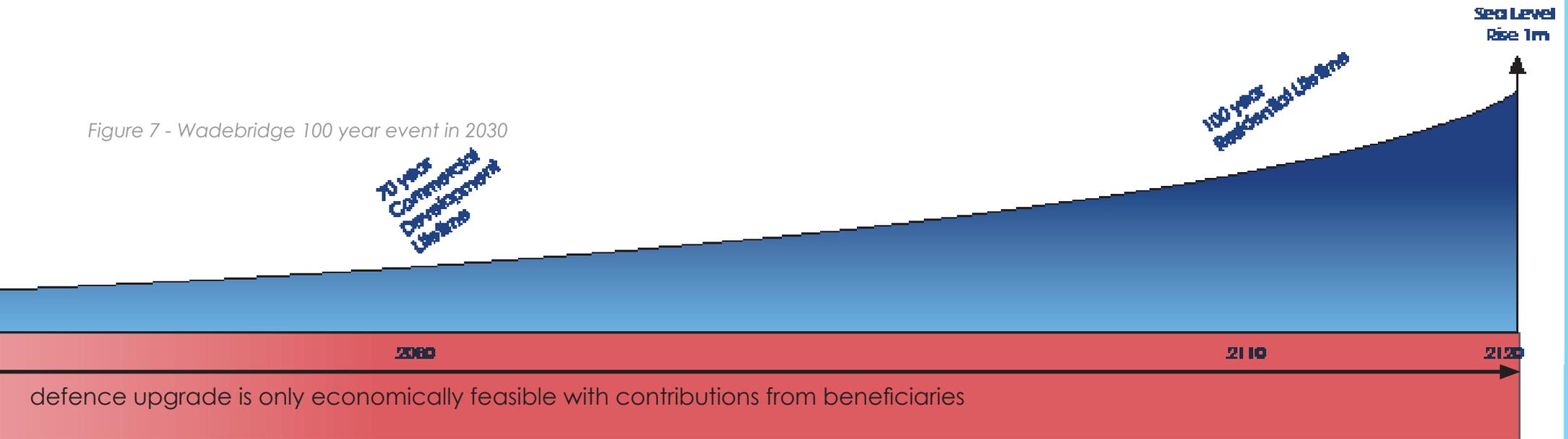


Figure 7 - Wadebridge 100 year event in 2030

Without intervention:
 Damages will increase with time
 Frequency of flooding increase with time
 Increased risks to people in Defended area
 Extent of flood risk does not significantly change



defence upgrade is only economically feasible with contributions from beneficiaries

In 50 years time it may not be viable to fund raised defences. While this seems a long way off, if a Local Flood Risk Management Strategy is not in place to enable these improvements, development that occurs now needs to take into account the increasing flood risks.

Even where defences can be raised, development needs to accept that there are still flood risks when building behind defences. In extreme events there is significant hazard from the speed with which overtopping of defences can occur, and the potential depth of flooding that results. This hazard needs to be acknowledged when considering appropriate uses for regeneration within Wadebridge.

The safety of people who live within and use the area must also be considered. Residential units above the flood level may provide safe refuge, but can result in isolated occupants during flooding. This may be acceptable, if implemented in conjunction with a Community Flood Plan which allows the approach to be understood and accepted by the community.

FLOOD MITIGATION OPTIONS

Raise defences to maintain Standard of Protection for the next 100 years



Figure 15 - Raised defences - Potential Solution



Image © IBS Engineered Products LTD

To maintain the Standard of Protection over the next 100 years defences would have to be raised by 1 metre, based on current sea level rise allowances. National Funding will not fully fund this upgrade.

Planning seeks to ensure that development takes into account flood risk for its lifetime. To deliver the raised defences contributions would be required from beneficiaries, including any development occurring in the next 50 years. This could be delivered through a Local Flood Risk Management Strategy.

- Raising defences maintains the current form of flood risk management as widely accepted by the community.
- The existing sheet piles will need replacement in the future. At the time of replacement the height can be increased.
- If built in the current form, the height of the walls required would block the view of the river, negatively impacting on the character of the town.
- Innovative products such as glass topped walls increasingly offer options that seek to reduce the visual impact of raising flood walls.
- Options also exist for demountable structures. Again this adds to the cost. The installation and operation also needs to be considered.
- Construction in Wadebridge would be problematic due to limited space and the negative environmental impacts of encroaching on the estuary. This adds to the cost.
- Flood defences are still vulnerable to failure or overtopping, increasing the residual flood risk over time.

Flood Resilience / Adaption Options

If the defences are not to be raised then the Local Flood Risk Management Strategy would need to address flood resilience. Resilience for individual developments includes providing safe refuge for occupants, arranging internal layouts and employing construction techniques designed to minimise damage and allow the property to quickly recover back to its intended use.

Accept Significant Flood

This option requires the community to accept that properties will be at significant flood risk and that property will be damaged during a flood.

Buildings are designed with all habitable rooms above extreme future flood levels, limiting ground floor space to commercial and parking uses.

Flood damages can be high for commercial properties and flood hazards at street level can be significant preventing safe access and egress.

This approach is only likely to be acceptable to address residual flood risk behind defences where the defences are upgraded. If defences are not raised then:-

- Single storey ground floors have no safe refuge. Evacuation would be required for occupants safety, unless refuge could be incorporated into upper levels.
- The depth of flooding is likely to exceed that which could be controlled by demountable defences.
- Given that flooding of the property would occur, minimising damage would be reliant on flood warning and the ability to remove content from buildings.

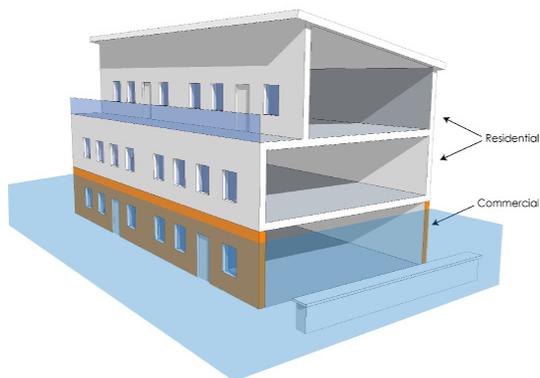


Figure 12 - Accept significant flood risk

Adaptive Ground Floor

Design buildings to be adapted in the future to account for increased flood risk, moving habitable rooms off the ground floor.

Issues include those of 'Accept Significant Flood Risk' with the additional issue as to when and how to manage an adaptive change.

1 ½ storey non-residential property on the ground floor allows development to :-

- Maintains streetscape for next 20 years, while defences considered to be appropriate
- Additional ceiling height allows floor level to be raised as required in the future as part of a wider adaptation response, such as raised pavements.
- allows raising of contents from current extreme flooding risk.

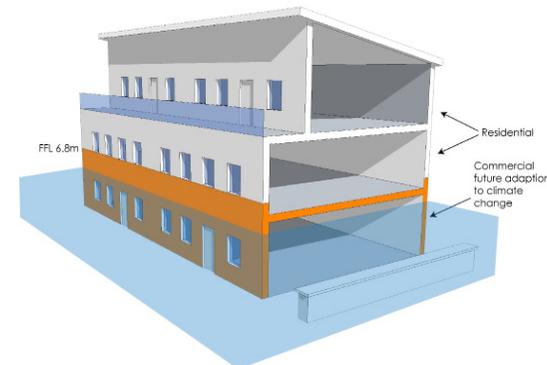


Figure 13 - Adaptive Ground Floor

Lower 2 Storeys linked

A reactive approach is one where the property is designed to allow occupants to owners take measures to reduce flood damages in reaction of flood warning.

By having the lower 2 storeys of the development linked allows moving belonging upstairs and taking steps to improve the resilience and resistance of the property to flooding.

The approach requires effective flood warning. It may therefore be appropriate in tidal areas where longer lead time allows appropriate response.

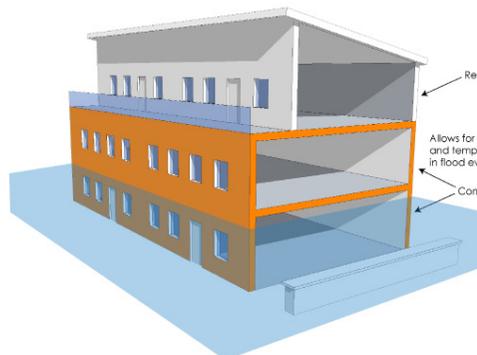


Figure 14 - Reactive Flood Warning

Raise Floor Levels

Option Description

Raise the ground of development sites to bring the site above predicted future flood levels.

Advantages

- Little or no maintenance required
- Reduced risk of failure
- Large scale implementation can provide large areas of benefit

Disadvantages

- Difficult to achieve on a small scale due to sudden changes in topography between raised and non-raised sites
- Development can be out of character to surroundings
- Properties can be left isolated during a flood with no access or egress
- Large scale implementation in Wadebridge would require demolished of existing properties.



Figure 16 - Raised ground level



POLMORLA

An aerial photograph of Polmorla, India, showing a river flowing through the center. A road network is visible, with a specific route highlighted in orange. The word 'POLMORLA' is written in white capital letters on the left side of the image.



Key Points

- Polmorla is at risk of fluvial flooding
- Polmorla stream is a rapidly responding watercourse
- We do not provide a fluvial Flood Warning Service for Polmorla
- A number of properties in Polmorla are protected by individual property protection measures
- Individual property protection measures require routine maintenance and effective flood warning
- The Environment Agency maintains a pumping station that discharges the Polmorla Stream into the River Camel during high tides. Without this pumping station the area around the pumping station would frequently flood.

Flood Warning



No Warning for:

- Fluvial Flooding from the Polmorla Stream

No warning for:

- surface water and flash flooding

Little or no warning for residential risks

- Breach of flood defence
- Structure blockage
- pump failures
- Limited public awareness

Wadebridge Left Bank Small Fast Responding Watercourses and Surface Water Flooding

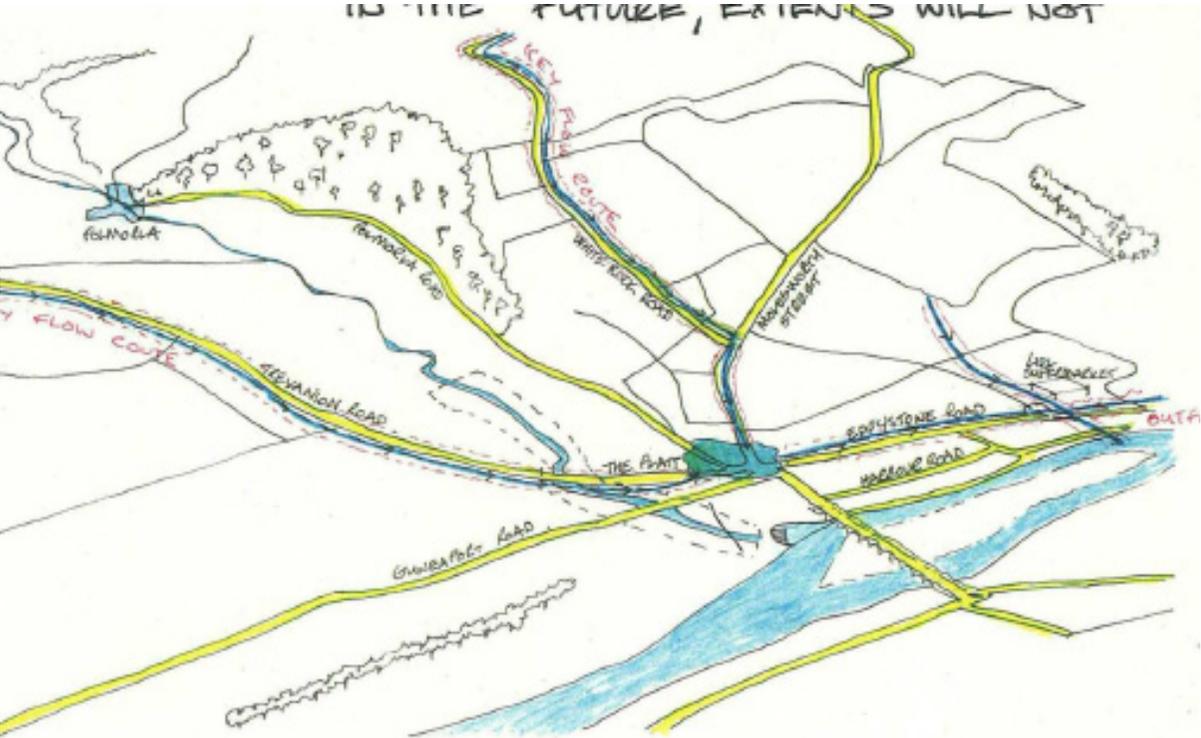


Figure 8 - Surface water flooding

KeyPoint

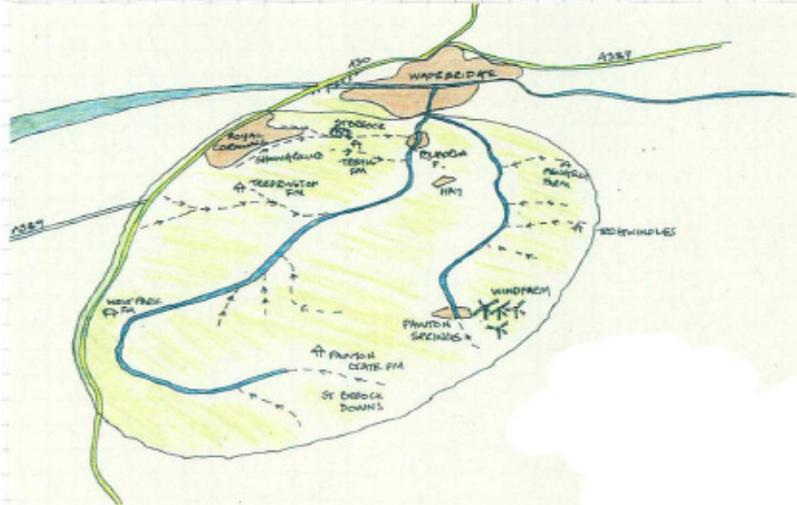
Key flood areas at Polmorla and the platt
 frequency of flooding will increase in the future, extents will not

Catchment Flood Management Plan recommends:

- Inform Surface Water Management Plan
- Reduce peak flow and time to peak
- Investigate land management practice and flooding
- Maintain Standard of Protection at Polmorla village and Polmorla pumps



Figure 9 - Individual Property Protection in Polmorla



Polmorla Stream Pumping Station

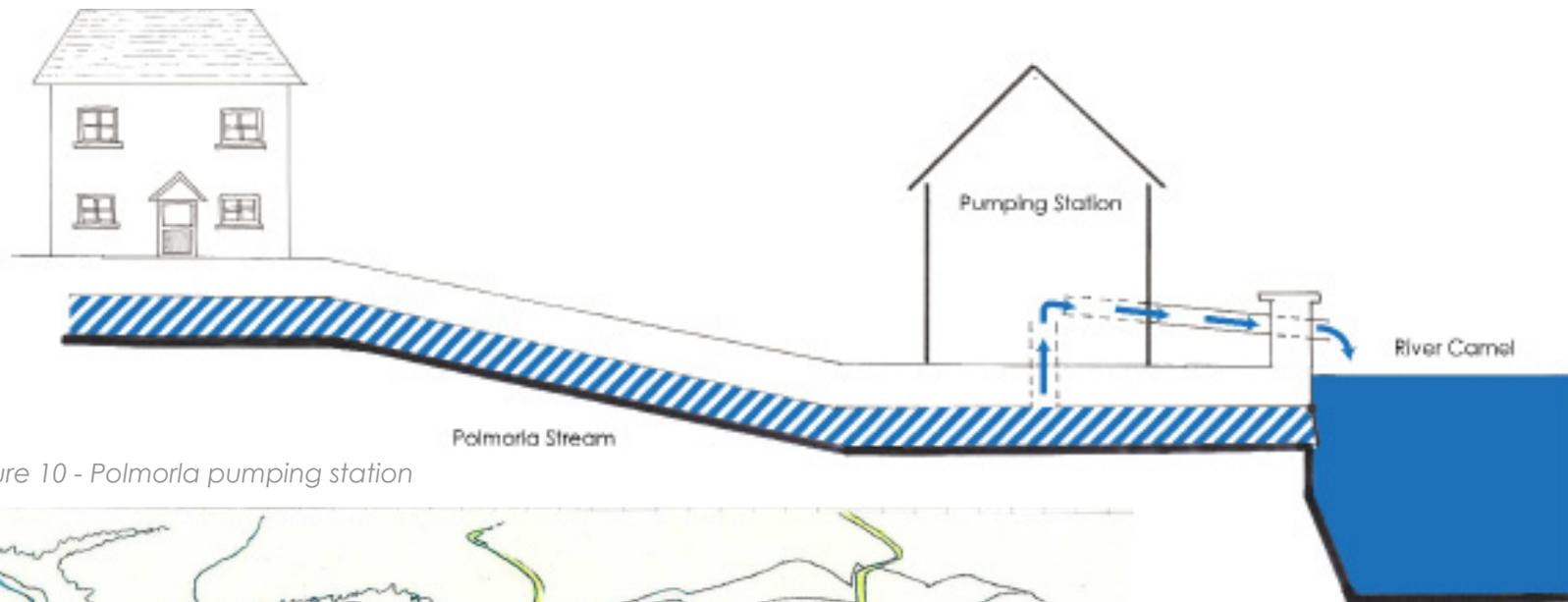


Figure 10 - Polmorla pumping station

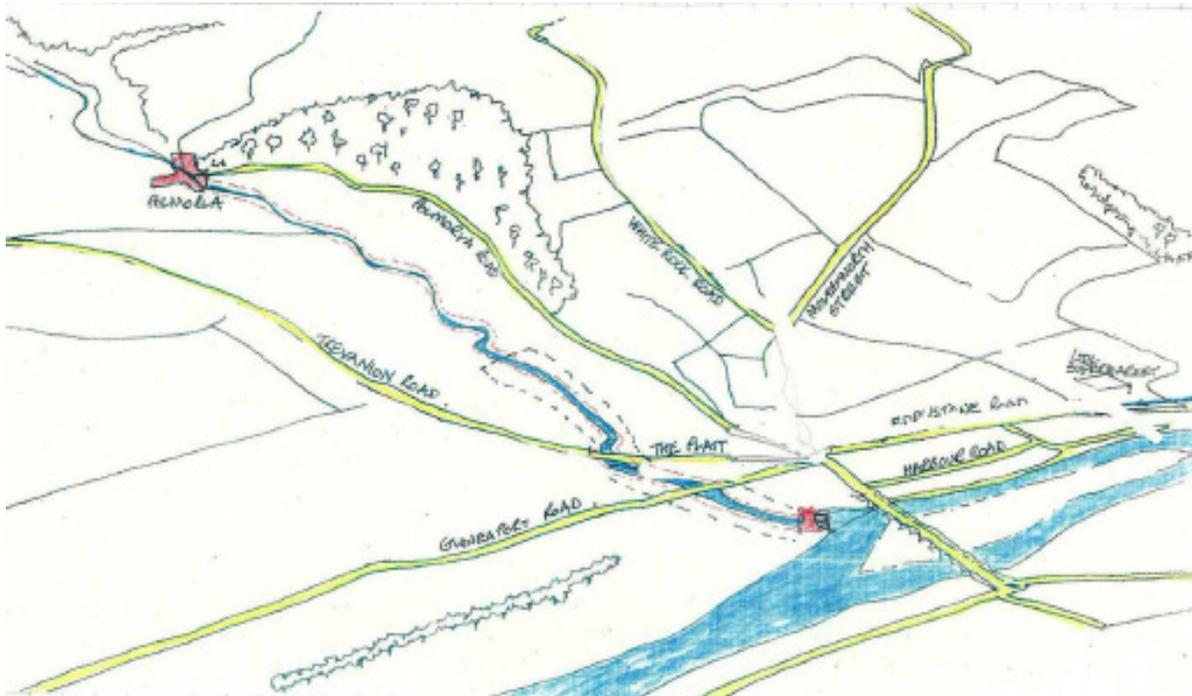


Figure 11 - Polmorla stream and pumping station

Key Point

River flows and frequency of high flows are likely to increase in the future

What is the Catchment Flood Management Plan Action?

Most sustainable option:

- Land management to slow flows
- Increase Polmorla pump station capacity £750k +

**POLMORLA - FLOOD RISK
MANAGEMENT PLANS AND
STRATEGIES**

Catchment Flood Management Plan Actions

- Inform Surface water management plan (SWMP)
- Progress rapid response catchment study
- Investigate links between land management practices and flooding
- Assist with maintaining standard of protection at Polmorla village and Polmorla pumps

Water Framework Development

- Look to reduce soil erosion and sediment carryover.
- Introduce pollution pathway blockers to reduce risk to designated Shellfish Waters and Bathing Waters in the Camel estuary.
- Control diffuse inputs thereby reducing the nutrient loading to the River Camel. This would help protect the designated Salmonid habitat and Fishery
- Reduction in the need for engineered solutions by modifying land use. This will help to maintain the “natural” drainage regime of the Camel and its tributaries. This will help maintain the flora and fauna at “Good” levels as required by the Water Framework Directive.
- Look to maintain a sustainable agricultural industry by soil and nutrient conservation.

Strategic Flood Risk Assessment

- Inform Surface water management plan (SWMP)
- Progress rapid response catchment study
- Investigate links between land management practices and flooding
- Assist with maintaining standard of protection at Polmorla village and Polmorla pumps

Shoreline Management Plan

- Look to reduce soil erosion and sediment carryover.
- Introduce pollution pathway blockers to reduce risk to designated Shellfish Waters and Bathing Waters in the Camel estuary.
- Control diffuse inputs thereby reducing the nutrient loading to the River Camel. This would help protect the designated Salmonid habitat and Fishery
- Reduction in the need for engineered solutions by modifying land use. This will help to maintain the “natural” drainage regime of the Camel and its tributaries. This will help maintain the flora and fauna at “Good” levels as required by the Water Framework Directive.
- Look to maintain a sustainable agricultural industry by soil and nutrient conservation.

Regeneration in high flood risk areas provides an opportunity to 'do things better' and create great places to live. This report explores options for development in areas of Wadebridge at risk of flooding, making it safe and delivering good place making outcomes. The aim is to provide an understanding of the issue of flood risk and potential response strategies to assist spatial planning and demonstrate how regeneration can be effectively delivered in high flood risk areas. For example:

- _ What is the current flood risk in Wadebridge?
- _ Is it possible to sustain this?
- _ How could this be funded?
- _ What kind of flood risk mitigation measures might be needed?
- _ Can this keep the occupants safe from flooding?
- _ What will the development look like?
- _ Will it be a place where people want to live?

The report puts forward a series of positive strategies that can be employed to manage and mitigate the risk of flooding. It also seeks to highlight the co-ordinated and collaborative approach across both spatial and vertical (within a development) scales that will be needed to implement these strategies. This will help in considering whether development is feasible, considering wider economic, sustainability and technical issues.