NRW PMO – Project Brief Ynysybwl Clydach Terrace

This Project Brief will be used for all NRW Projects to gain assurance and approval to initiate the project. Please note that projects within programmes have a different template that is bespoke to that situation

Summary of financial and risk information

Risk Potential Assessment (RPA) *Template here*	Medium
Total project costs	
Total project costs to reach next gateway	

Executive Summary

Ynysybwl flood risk management project is looking to reduce the fluvial flood risk to 17 properties situated on Clydych Terrace, Ynysybwl, which are currently at risk from flooding from the Nant Clydach.

The brief identifies a range of measures; from do nothing, business as usual; to the construction of flood risk management assets, and the purchase of properties at high risk from flooding. Following the HM treasury Green Book appraisal and evaluation process, these options will be considered at strategic outline case stage, those remaining viable will be further scrutinised at outline business case stage, if viable, a preferred option will be recommended at full business case stage for delivery.

Key to its success will be engaging with the local community, who have a wealth of knowledge in the area, and the considering of all 3 wellbeing objectives and SMNR principles, assessing the wider benefits of each option beyond flood risk management. Improving the wellbeing of the local community, whilst also reducing long term operational and maintenance liabilities for the organisation.

In summary, **this project brief seeks PMO assurance and financial approval to develop the strategic outline case** for the Ynysybwl flood risk management project.

Project Details

Timeframe	Start date:	30/06/2023	End Date:	31/03/2029
Project Name	Ynysybwl Clydach Terrace			
BP Code (PMO to allocate)				
Directorate	Operations			
Business Board	FRM			
LT Member Responsible				
Programme under which Project sits (if applicable)	FRM			

Project Roles	**Name**	**Post Title**
Project Manager	Alexia Dimitriou	Project Manager (PPD)
Project Executive	Mark Groves	Project Executive (PPD)
Budget Manager	Jeremy Parr	Head of Flood & Incident Risk Management
Programme Manager (if applicable)	Ross Akers	Manager, Flood Risk Strategic Planning and Investment
Senior Responsible Owner (SRO)	Jeremy Parr	Head of Flood and Incident Risk Management
Senior User (or Expert User Group)	Tim England	Operations Manager (Flood & Water Management)

Project Approver (in accordance with MoM)	Ross Akers	Manager, Flood Risk Strategic Planning and Investment

Risk Potential Assessment (RPA) (please provide location / hyperlink here, or indicate if appended to rear)	
Project Runway ⓘ	Runway 3
Justification for Project Runway selection	RPA Medium Risk

Strategic case

Strategic Context

Background

Ynysybwl is a village situated in the valley of Clydach, which forms part of the Nant Clydach Catchment, approximately 17km^2. The Clydach is a small tributary of the River Taff. The watercourse is short and steep, in a confined upland valley where its course is flanked by residential properties. Clydach Terrace lies on the natural floodplain in a very constrained section of the valley and has historically suffered from severe flooding. During Storm Dennis (2020), flood waters from the Nant Clydach overtopped the Rhondda Cynon Taff (RCT) local authority highway wall which runs along the length of the Terrace, flooding 17 properties. The flooding experienced was extreme, with rapid onset and internal property flood depths above 6ft at the lowest lying houses.

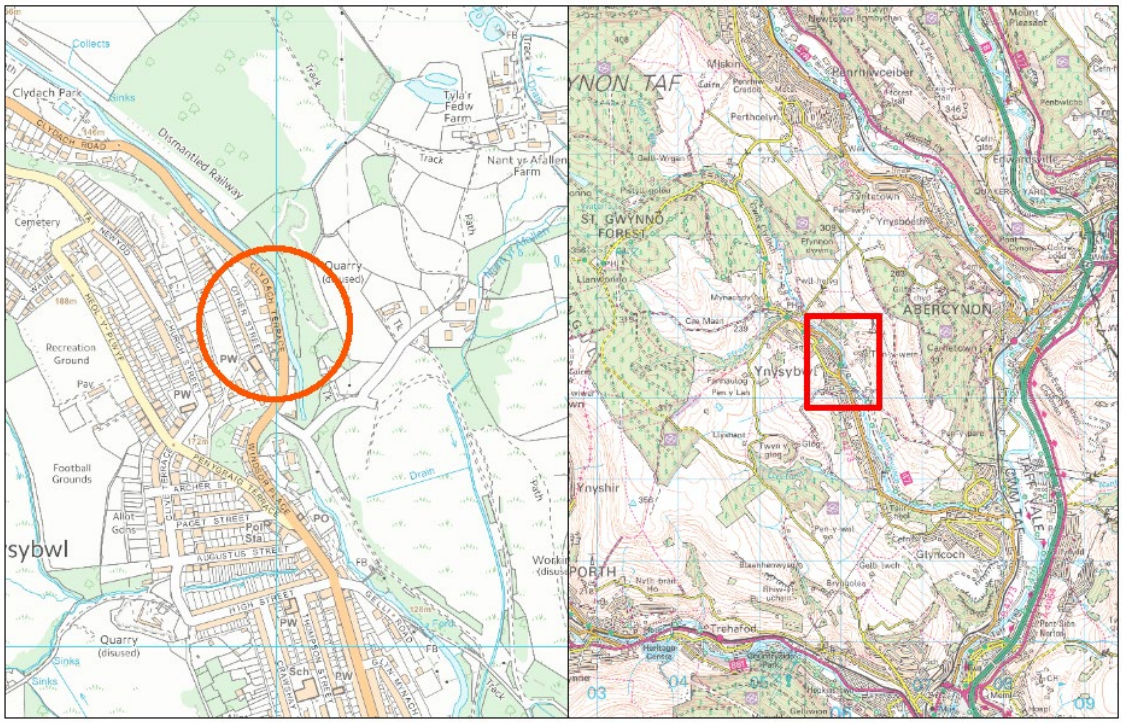


Figure 1: Location Plan; Clydach Terrace

The map below shows the properties flooded during storm Dennis, along with key features along Nant Clydach.

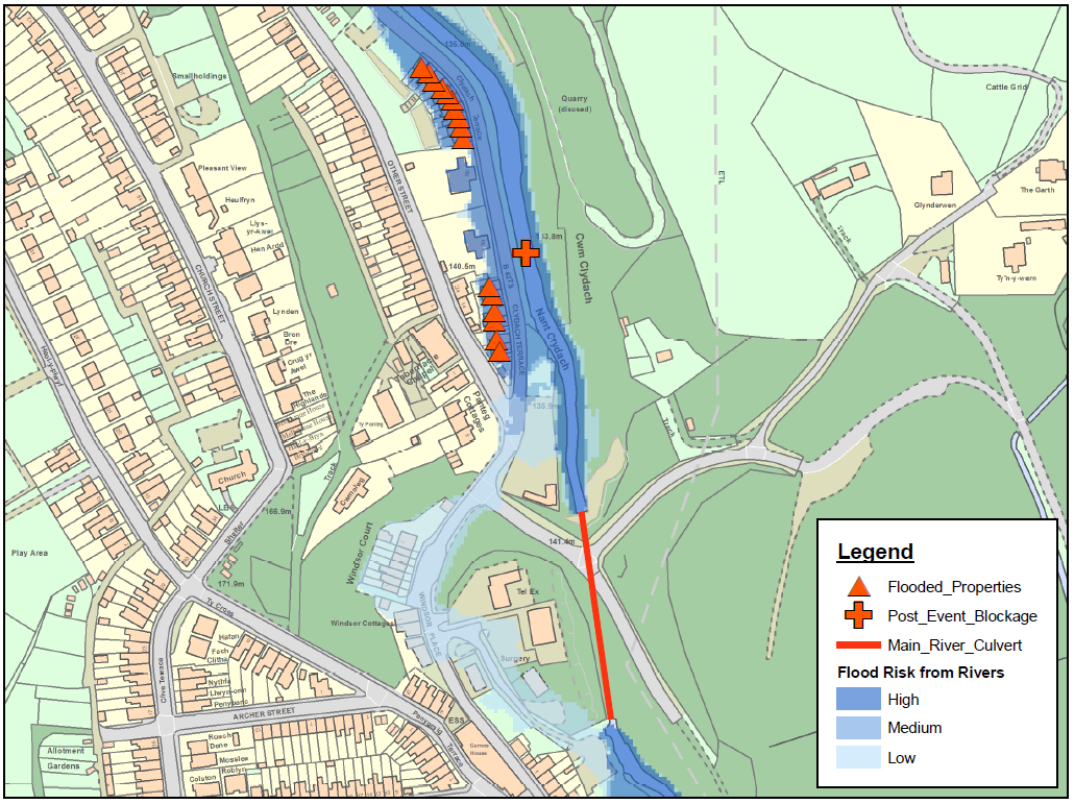


Figure 2: Map of Nant Clydach

The Nant Clydach is covered by the Taff and Ely catchment flood management plans CFMP (2009), it forms part of policy unit 3 – Clydach, Lower Cynon, Taff Vale. No flood studies of the Nant Clydach have previously been undertaken by NRW or its predecessor bodies.

Following the aftermath of Storm Dennis, NRW undertook an initial assessment to better understand the flood risk and undertake a high-level assessment of potential options to manage said risk. NRW currently has no flood risk management assets in Ynysybwl. NRW and its predecessor bodies have undertaken channel maintenance to remove shoal material from the river channel adjacent to Clydach Terrace, with around 500 tonnes of river shoal material removed from the channel in July 2020 and more recently in February 2023, when 220 tonnes of material was removed from the riverbed at a cost of £12.5k.

The benefit to flood risk of such maintenance works will be considered as part of this assessment.

National Strategy for Flood and Coastal Erosion Risk Management

The National Strategy for Flood and Coastal Erosion Risk Management (FCERM) in Wales, as required under the Flood and Water Management Act 2010, sets the framework for managing flood and coastal erosion risks across Wales.

Every flood risk management action undertaken in Wales must aim to fit with overarching National FCERM Strategy objectives. This assessment will aim to contribute to the following objectives:

1. **Improving our understanding and communication of risk**

   NRW have developed a direct rainfall model, improving the baseline understanding of the level of risk to the local community. Our understanding of the risks will be further developed through the appraisal of flood risk management options.

   Communication with the local residence and wider stakeholders will be key to the success of this project. Initial engagement has been held, advising on the likely timescales for delivery. Throughout, the project the team will develop and manage a communications plan to inform stakeholders of our findings.

2. **Preparedness and building resilience**

   Currently, there are no flood risk management assets that directly benefit Clydach Terrace. In addition to this project, NRW has committed to de-shoaling a section of the riverbed and has installed a gauge board to allow monitoring of river levels. An aim of the project is to identify the most viable flood risk management solution.

3. **Prioritising investment to the most at-risk communities**

   Flooding at Clydach Terrace. Ynysybwl directly impacts 17 properties. Ynysybwl has a fluvial max rank of 147 on the NRW Communities at Risk Register (CaRR). The CaRR provides a national flood risk index and a way of considering risk of flooding from all sources. Using NRW mapping along with demographic information, the CaRR prioritises areas of Wales based on modelled data.

4. **Preventing more people becoming exposed to risk**

   During the assessment process, NRW will assess the impact of potentially viable flood risk management options to consider if they will cause adverse impacts elsewhere, if required, detriment mitigation measures will be considered to address this issue.

5. **Providing an effective and sustained response to events**

   NRW have committed to de-shoaling the riverbed along Clydach Terrace along with further investigation in to flood risk management options through the development of this business case.

The latest FCERM strategy incorporates new legislation that has been introduced since 2010, that fundamentally influences how flood risk management is undertaken in Wales:

- Well-Being of Future Generations (Wales) Act 2015
- Environment (Wales) Act 2016
- Planning (Wales) Act 2015

The Environment (Wales) Act and The Well-being of Future Generations (Wales) Act and Corporate Plan

NRW has a duty under the Well-being of Future Generation (Wales) Act to maximise its contribution to the seven well-being goals, supported by the corporate plan and area statements.

In response to requirements under the Well-being Act and the Environment (Wales) Act, NRW developed Well-Being Objectives to contribute to the delivery of the Well-Being Goals and ensure the principles of Sustainable Management of Natural Resources (SMNR) throughout its functions. NRW's Corporate Plan is delivered via NRW Well Being Objectives. The following table provides a summary of scheme opportunities to align with the Well Being Objectives:

NRW Well-being Objective	Example Scheme Opportunities
Nature is recovering	Take a holistic approach, identifying wider benefits, not just flood risk management that support community cohesion and resilience, and mental and physical health. Provide enhancement opportunities and consider nature based solutions where viable e.g. natural flood management, building the **resilience of ecosystems.** Achieve biodiversity **net gain** and provide ecosystems with greater diversity and connectivity. Implement measures to contribute to the control of invasive non-native species (INNS) which are known in the area, pests and diseases, where species have widespread negative impacts on the economy, environment and people's health.
Communities are resilient to climate change	Consider the impacts of climate change on flood risk and include flood resilience within the options appraisal assessment. Identify a range of options that consider: land and water issues holistically, recommending management options that maximise SMNR to reap multiple benefits management of flood risk into the future, including allowances for predicted climate change. water quality and quantity, identifying opportunities that will contribute to their improvement, benefiting both people and ecosystems.
Pollution is minimised	Implement **whole life carbon assessment** as a key performance indicator within the procurement strategy.

NRW Well-being Objective	Example Scheme Opportunities
	Engage with **supply chain** early to appraise options that are resource efficiency and implement where feasible the use of alternative materials.

South Central Wales Area Statement

Natural Resources Wales has published seven 'Area Statements'. The Area Statements can be seen as a collaborative response to what is known as the Natural Resources Policy, published by the Welsh Government in 2017, which sets out the key challenges and opportunities for the sustainable management of Wales' natural resources into the future. Each Area Statement outlines the key challenges facing that particular locality, what can be done to meet those challenges, and how management of natural resources can be improved for the benefit of future generations.

The South Central Area Statement is dominated by a desire to bridge the urban and the natural environments. It consists of five key themes – sets out to address the legacies of the past along with the challenges and opportunities of the future, exploring ways to work together to protect, value and embrace the natural environment.

Working with Water is identified as a key theme. Within that theme there are many opportunities which overlap with the project desires including:

- Maintaining, enhancing and restoring floodplains and hydrogeological systems to reduce flood risk and improve water quality and quantity
- Restoring uplands and managing them for biodiversity, carbon, water, flood risk, energy and recreational benefits
- Increasing green infrastructure in and around urban areas
- Reducing the risk of flooding

Flood Risk Management Plan for Wales: South Central Wales

Flood Risk Management Plans (FRMP) cover all of Wales and provides information on the scale of flood risk, as well as NRW's priorities for managing the risk of flooding, and measures proposed to take, over the coming years. NRW's FRMPs cover flooding from rivers, reservoirs and the sea. They do not include flooding from surface water and smaller watercourses. The FRMP fulfills NRWs requirements under section 25 of the Flood Risk Regulations (2009) but also takes into account recent fluvial and coastal flooding events and subsequent work arising from them.

The South Central Wales Area Statement identifies Working with Water as a key theme. The information and proposed actions within the FRMP are directly relevant to this challenge and set out NRWs flood risk management ambitions to help address it. The South Central Wales Place section provides information about the level of risk at a local scale and describes what NRW have planned for the communities that we are most concerned about. In line with Welsh Government's National Flood and Coastal Erosion

Risk Management Strategy Objectives, NRW prioritise our work and direct efforts on a prioritised flood risk basis to communities at greatest risk of flooding. This uses our Communities at Risk Register (CaRR) that considers a number of factors to identify the locations (communities) at greatest risk of flooding across the South Central Wales area. The CaRR is used to inform, plan and prioritise our investment programme to target investment in the most at risk communities. Ynysybwl has a fluvial max rank of 147 and is identified as one of the communities at most risk of flooding in the Area Statement, the FRMP identifies the following work to be delivered in Ynysybw:

- Undertake initial assessment and feasibility work for reducing flood risk
- Investigate feasibility for new flood warning service
- Build hydraulic model

A direct rainfall fluvial model has been built and an initial assessment undertaken, this project will build on this to undertake feasibility work for reducing flood risk. Feasibility for new flood warning service will not form part of this project.

Need / Opportunity ⓘ

Clydach Terrace, lies on the natural floodplain and has suffered periodically from varying degrees of flooding. The most recent events were in Storm Dennis in February 2020, resulting in internal flooding to 17 properties. Dating back to 1955, there are records of flooding within the area, these are listed in the table below, noting the properties affected and impact recorded.

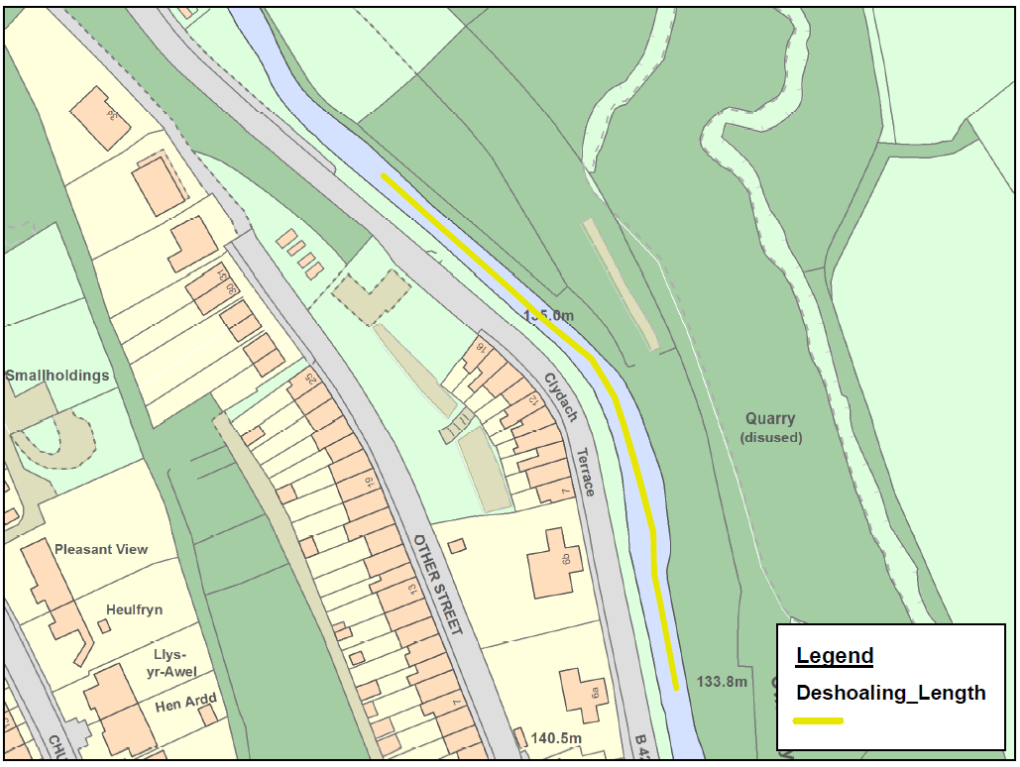
Table 1: Flood history

Date	Properties Affected	Additional Comments
1955	Unknown	6th & 7th June 1955. River flooding of properties and highway. JBATrust data – British Chronology of Flash Floods indicates that a heavy short duration rainfall event occurred on the 6th June 1955. • Pontypridd – 2.92in 40m (74mm) • Merthyr Tydfil – 1.5in 96m (38mm) At Ynysybwl: • *Rain flooded many houses up to the ground floor ceilings. Many residents had to be rescued from upstairs rooms. The road to Pontypridd was blocked by a landslide.*
1960	1	4th December 1960. River flooding of highway, 1 public house. The following rainfall totals were recorded on 3rd December 1960. • Mountain Ash – 5.43in / 137mm. • Clydach Reservoir – 5.4in / 135mm. Records show the Mountain Ash gauge recorded 17.52in / 445mm for the previous month (November 1960).

1979	2	27th December 1979. No7 & No8 Clydach Terrace. Flooded due to river level restricting operation of drains. (Surface Water)
1998	0	22nd to 31st October 1998. No property flooding. Highway was flooded from surface water and potential overtopping from main river.
2020	17	16th Feb 2020 (Storm Dennis). Flood depths ranged from 300mm to 1.9m. No River Telemetry available for this catchment. However, Nant yr Ysfa rain gauge recorded 130.4mm in the 24hrs leading up to 7am 16th February 2020. This equates to 72% of February LTA rainfall at this location. Initial hydrology estimates this to be around 1in30yr rainfall event.

Current Standard of Protection and Management Arrangements

No NRW flood risk management asset(s) are currently present at Ynysybwl. NRW and its predecessor bodies have undertaken channel maintenance to remove shoal material from the river channel adjacent to Clydach Terrace. The river is prone to shoaling which reduces the channel capacity which is likely impacting flood risk. Around 500 tonnes of river shoal material has been removed from the channel, as shown below, in July 2020. This work was repeated more recently in March 2023. The positive and negative impacts of this activity will be considered as part of this assessment.



Information gathered in the aftermath of Storm Dennis, February 2020, indicated that prior to overtopping of the highway wall, Clydach Terrace was already experiencing flooding, assumed to be from surface water. Residents suggested to NRW that the highway wall first overtopped at the downstream end of the street. It is possible that the wall is lower at this section or that the culvert downstream surcharged raising water levels upstream.

Therefore, whilst the Catchment Flood Management Plan (CFMP) for the area, seeks to reduce existing actions, conditions experienced at Clydach Terrace both before and during Storm Dennis, **suggest a case for action, which this project proposes to assess.**

Following the aftermath of Storm Dennis, NRW undertook an initial assessment to better understand the likely flood mechanism(s), and possible options to improve flood risk management at Clydach Terrace.

NRW has recently developed a direct rainfall fluvial model for the area, setting the baseline conditions, and undertook a threshold level survey at properties impacted in Storm Dennis. Post flood event investigations included the survey of a wrack mark from Storm Dennis at No7 Clydach Terrace:

- Property Threshold Level – 134.027m AOD
- Storm Dennis Wrack Mark – 135.988m AOD
- Storm Dennis Observed Depth – 1.96m

The 2 photographs below show the observed depths at Clydach Terrace, these serve to illustrate the significant danger posed by the flooding during Storm Dennis.

Without any flood changes to risk management, Clydach Terrace will remain at high risk of flooding.

Unfortunately, local drainage systems appear also to be under capacity to meet current needs and during periods of moderate rainfall, are subject to surcharging causing problems of their own. This project will not seek to assess this source of risk.

Objectives ⓘ

SMART Objective description	
1	**Specific**: Reduce flood risk to 17 properties located at Clydach Terrace **Measurable:** Use direct rainfall model to assess current level of flood risk and appraise options to increase Standard of Protection (SoP) **Achievable:** This will be achieved by procuring consultants from existing supply chain who have the skills, knowledge and experience to produce the model outputs **Realistic:** Increasing the level of protection is a realistic objective given no formal flood management asset(s) currently exist **Timebound:** An initial assessment of long list options will be undertaken by January 2024, implementation of a flood risk management scheme will be delivered by 2029.
2	**Specific**: To avoid service failure and long term OPEX maintenance costs **Measurable:** Use data from the operations team to measure long term maintenance costs associated with de-shoaling and INNS management. Undertake structural assessment of the existing highway wall **Achievable:** This can be achieved through the utilisation of existing information from the operations team, and through procuring supply chain resource to undertake a structural assessment of the highway wall **Realistic:** Reducing OPEX cost is a realistic objective as part of the implementation of any flood management assets **Timebound:** An initial assessment of long list options will be undertaken by January 2024, implementation of a flood risk management scheme will be delivered by 2029.
3	**Specific**: Contribute to the well-being objectives

	Measurable: Option appraisals will be measured against the well-being objectives, seeking to contribute to as many as reasonably practicable **Achievable:** This will be achieved as part of the appraisal process **Realistic:** This is a realistic objective, as any solution will need to demonstrate contribution towards the well-being objectives **Timebound:** An initial assessment of long list options will be undertaken by January 2024, implementation of a flood risk management scheme will be delivered by 2029.
4	**Specific**: Contribute to Sustainable Management of Natural Resources **Measurable:** The principles of sustainable management of natural resources will be embedded throughout the project process and benefit recorded. **Achievable:** This will be achieved by ensuring options consider the SMNR principles, ie maintain and or enhance biodiversity and identify wider opportunities for ecosystem resilience such as Natural Flood Management (NFM). **Realistic:** This is a realistic objective, SMNR has been successful embedded in to the process on previous projects. **Timebound:** An initial assessment of long list options will be undertaken by January 2024, implementation of a flood risk management scheme will be delivered by 2029.

Scope ⓘ

The long-term scope of the project is to meet the desired outcome of reducing flood risk to properties located on Clydach Terrace.

The immediate scope is to develop the SOC and identify viable options, meeting the project Objectives, and seek approval and assurance to progress to OBC. This will be achieved through

- Further developing the long list of options identified at Initial Assessment, to include NFM and upstream storage. Consider combining options where beneficial e.g. wall raising and NFM.

- Undertaking additional hydraulic modelling of any further long list options.

- Engaging with key stakeholders to investigate options identified in the long list.

- Assessing the viability of options identified in the long list.

- Developing a short list of viable options to take forward to OBC.

- Delivering a SOC considering business justification and recommending a preferred way forward.

The SOC will be delivered within the constraints of the project budget allowance and resource availability.

Risks ⓘ

No	Key Risk	Mitigation Plans
1	Public misconception of flood risk	Undertake detailed public engagement sessions at each stage of the project lifecycle, educating people on the process undertaken to develop a flood risk management solution. Produce a detailed communications plan and implement effectively throughout
2	Lack of evidence to support case for change	Produce a number of long list options and use the flood model to evidence benefits for each. Project economics have been assessed in the Initial Assessment and will be reviewed in the SOC to ensure that the scheme is only progressed further if it is economically viable. Be clear about modelling and economic sensitivities and present upper and lower limits where possible.
3	Insufficient funds – Welsh Government Grant in Aid, and Risk Management Authority partnership funding	The project will be submitted to the PMO and FRM Business Board for assurance and to financial approver at each business case stage, with details of finical forecasts which include risk allowances to ensure sufficient funds are available to proceed.
4	Resource availability	NRW PM is a seconded employee (Bough in Service), regular reviews of contracts and internal resources required to deliver the scheme in line with the programme.

		Project resource schedule to be established at SOC stage outlining internal and external resource requirements. NGF framework will assist in providing consultant and contractor resource through PPD.
5	Detriment for which there is no mitigation is not acceptable to property owners, leading to objections to planning application.	Early consultation with property owners affected to assess likelihood of reaching agreement. Or propose mitigation for detriment caused. Early consultation with NRW FRA team. The Flood Consequence Assessment (FCA) for the scheme will be developed and submitted early in the detailed design phase of works.
6	Reputation damage if a scheme is not economically viable - Project has become high profile locally with involvement of MS and there is a keen interest from the community.	A communication strategy will be developed by the project team and the community and key stakeholders will be kept updated with project progress. Project economics have been assessed in the Initial Assessment and will be reviewed in the SOC to ensure that the scheme is only progressed further if it is economically viable.
7	Landowners don't support the short-listed options and agreements can't be reached to take them forward.	Short listing of options will require further consultation to ensure that options are acceptable to affected parties and relevant stakeholders. Compensation estimates will be included in option costs.
8	Residual Flood Risk would need to be assessed and understood for each option	An assessment of the residual flood risk (hazard) will have to be undertaken for exceedance events and for above proposed Standard of Protection to determine if this is at an acceptable level. This would need to be screened against a benchmark model which would incorporate amongst other factors, speed of onset, depth, and velocity.

9	Residual risk to life may remain, associated with many of the below options	Assessments of the residual risk to life will be undertaken across all options, and over all stages of the project.
10	Physical intervention options may not resolve the current level of risk to life, alternative project options such as property purchase may not be viable.	Project process will follow WG guidance to appraise viability of each potential option.
11	Flood risk could be originating from multiple sources such as surface water or sewer overload which could undermine some of the benefits of managing the fluvial risk only.	NRW will work with the Lead Local Flood Authority (LLFA) and utility supplier to better understand the sources of flood risk and any potential options or plans to manage said risk.

Outcomes and Benefits

Projects deliver products, which are used to bring about business change. The outcomes are the change brought about by using the project products. The benefit is the measurable improvement resulting from the outcome.

Benefit Description	Benefit Owner
Reduced flood risk for the 17 properties at risk of flooding at Clydach terrace	Tim England – Operations Manager (Flood & Water Management)
Reduced long term OPEX costs and resource demand	Tim England – Operations Manager (Flood & Water Management)
Achieve Biodiversity net gain	Tim England – Operations Manager (Flood & Water Management)

Stakeholders

Stakeholders
Rhondda Cynon Taf County Borough Council (RCTCBC) - Interest: Local Flood Risk Authority (LLFA), Highway Authority and Planning Authority - Opportunities: Collaborate with Highways Department on options appraisal and funding
Local Community Council/Residents of Clydach Terrace - Interest: Residents at risk from flooding

- Opportunities: Community stakeholder group
Welsh Government – Senedd - Chris Bryant MP for Rhondda - Heledd Fychan MS Interest: MP representing their constituents Opportunities: Stakeholder working group, comms lead with residents
Internal consultees o Head of Operations South Central o Flood Risk o Environment Teams o Assets o Integrated Engineering o Forestry o Land Stewardship o Evidence, Policy and Permitting o River Restoration – Freshwater Ecosystems and Fisheries Management
Utilities (DCWW) - Interest: Protection of assets - Opportunities: Improve collaborative working

Knowledge Share

Which similar projects have you identified that provide lessons that have been utilised in the planning of this project – what are those lessons and how have they been applied?

To inform the project brief, we have utilised the PPD project lessons learnt tracker, extracting those which are potentially relevant to this scheme.

Scheme	Topic	Cause	Impact
Pwllheli Flood Risk Management Scheme	Poor feedback received from FRA Team on the hydraulic and hydrological modelling submission.	Lack of direct communication between the Arup's modelling team and NRW's FRA Team.	Delay to programme (circa 4 weeks). Increased costs associated with revisiting modelling work.
Pwllheli Flood Risk Management Scheme	The hydrology element of the modelling was submitted and received at the time as the hydraulic model.	Lack of clear or explicit protocol i.e. confirm agreement of hydrology approach with NRW prior to progressing to hydraulic modelling.	Delay to programme. Duplication of works/effort to retrospectively address the issue.
Porthmadog FRM Project	Production of a template for contacting statutory undertakers about their flood risk.	Flood model update showing infrastructure at greater risk.	Improved communication with third parties to try to influence action.
Wemyss	Email from Stakeholder outlining the need for a narrative document or information of what advice has been taken forward from previous stages of consultation. Consultees are unaware of what they previously said and if it has been	poor communication following stakeholder engagement	Confusion during next phase of consultation. Stakeholders were not sure how their advice had been incorporated or forgot what they had said.

	absorbed into he project.		
Wemyss	Local stakeholders requesting site meeting to review options being consulted on. This has come to light on Pandora where the information shared to stakeholders is not great quality. Farmer is requesting we talk through the options on site so he understands. The technical note has gone through Comms review, to ensure it is a simple to follow as possible.	Partially low-quality documentation. Partially lack of understanding by stakeholder.	Additional cost and time.
Llwynypia	Appraisal, Design, Construction of flood assets adjacent to utilities (DCWW)	Utilities asset immediately adjacent to NRW asset potential to impact scheme viability	Abortive spend
Ammanford FRMS	Flood Risk Modelling	late modelling of short list options to meant potential detriment wasn't well understood nor was time allowed for mitigation to be developed.	Additional time and cost.
Ammanford FRMS	Data	Good understanding of services in locality and sufficient time in programme to allow for diversions. Sufficient time risk	Programme saving.

			allowance in programme for planning consent.	

Economic case

Critical Success Factors

The following Critical Success Factors (CSF) are **indicative** only at this early stage and will be developed during the subsequent appraisal stages. They are provided here to aid understanding of the various options identified at this early stage.

The CSF's will be finalised prior to option longlisting, as they are an essential tool for assessing the viability of any options. For an option to remain viable it must have the potential **to meet all** of the CSF's listed in full. An option will not be considered viable if it can meet only some or only partially meet a CSF.

Critical Success Factor (CSF)	**Description of CSF**
Strategic fit and business needs	An option that reduces present day and future flood risk to people and property in Clydach Terrace, Ynysybwl, to improve the quality of life to the local community. An option that aligns with SMNR principles.
Potential value for money	An economically viable option to manage flood risk, with a Benefit Cost Ratio (BCR) greater than one.
Supplier capacity and capability	The option must match the capacity and capabilities of potential suppliers.
Potential affordability	A viable and affordable option, taking into account estimated costs.
Potential achievability	A technically feasible option to manage flood risk, with consideration of site-specific constraints, noting the option must be maintainable.

Options analysis

Options presented below have been assessed at Initial Assessment stage, additional option may be tested during the SOC stage.

For most options, costs have been estimated at a high level using the Environment Agency Long Term Costing Tool.

Some options sit outside the capability of the costing tool, in this case, the assessment method has been explained.

Note: Total costs include an optimism bias of 66%.

Option WA	**Walk away** The “walk away” baseline scenario involves all inspection, maintenance, repair and renewal of existing flood risk management assets, together with those assets whose function influences flood risk throughout the study area, ceasing immediately. There are no existing flood risk management assets in the study area, however de-shoaling of the riverbed is undertaken periodically. This activity would cease.
Cost	£Nil
Advantages	Reduced operational budget requirement as de-shoaling activity would no longer be required.
Disadvantages	17 properties along Clydach Terrace continue to remain at risk from flooding during extreme rainfall events (10% AEP), with potential increase in risk due to de-shoaling stopping.
Assessment against the critical success factors	This does not meet the CSFs.
Conclusion	Whilst economically viable, this option does not meet the CSFs or the objectives of this project therefore is not viable.

Option BAU	**BAU- Channel Maintenance, Maintain Existing Wall & Blockage Removal (current 5%AEP)** This option includes the maintenance of the existing highway wall at Clydach terrace, channel maintenance and blockage removal at the downstream culvert. This wall is not defined as a flood risk management asset but does provide some form of protection.
Cost	Costs for this option include channel maintenance and blockage removal from the river channel and the maintenance of the highway wall. In this option the highway wall is maintained at its current level and type as a flood risk management structure throughout the appraisal period. The cost estimate for this option are based on capital costs required to improve the highway wall and revenue expenditure for the 100year appraisal period. The costs for this option remain viable.

Advantages	Demonstrates commitment to manage risk of flooding at Clydach Terrace and aids to maintain/enhance public relations The highway wall currently provides some form of protection in leu of any flood defence but cannot be relied upon. Reconstructing as a flood risk management structure will provide formal defence 5% AEP for the residence of Clydach terrace. Removing blockages downstream will decreasing the risk of flows backing up the river.
Disadvantages	The wall is a highway asset and therefore requires agreement with local authority RCTCBC. Continued operational costs with limited justification for spend. Residents remain at high risk of flooding. Future maintenance cost of the wall and costs to undertake these works will sit with NRW.
Assessment against the critical success factors	Whilst this option is achievable and meets the capacity and capability of the supply chain, it does not achieve the other CSFs.
Conclusion	This option does not meet the all of the CSFs of this project therefore is not viable.

Option 1	**Do Something - Channel Maintenance, Raise Existing Wall & Blockage Removal (2% AEP)** This option includes improvement and maintenance of the existing highway wall at Clydach terrace, channel maintenance and blockage removal at the downstream culvert.
Cost	Costs for this option include channel maintenance and blockage removal from the river channel and the maintenance of the highway wall. In this option the highway wall is improved (reconstructed) and raised to provide a 2% AEP level of protection and maintained as a flood risk management structure throughout the appraisal period. The cost estimate for this option are based on capital costs required to improve the highway wall and revenue expenditure for the 100year appraisal period. The capital costs have been identified using the EA Long Term Costing Tool. The costs for this option remain viable.

Advantages	Demonstrates commitment to manage risk of flooding at Clydach Terrace and aids to maintain/enhance public relations. Reconstructing as a flood risk management structure will provide formal defence 1:50 AEP for the residence of Clydach terrace. Removing blockages downstream will decreasing the risk of flows backing up the river.
Disadvantages	The wall is a highway asset and therefore requires agreement with local authority RCTCBC. Continued operational costs with limited justification for spend. Residents remain at medium risk of flooding. Future maintenance cost of the wall and costs to undertake these works will sit with NRW.
Assessment against the critical success factors	This option has the potential to meet all CSFs and at least one project objective.
Conclusion	This option is suitable for the Long List and will be considered further during SOC to determine if it should progress to the Short List.

Option 2	**Do Something - Channel Maintenance, Improve Existing Wall & Blockage Removal (1% AEP)** This option includes improvement and maintenance of the existing highway wall at Clydach terrace, channel maintenance and blockage removal at the downstream culvert.
Cost	Costs for this option include channel maintenance and blockage removal from the river channel and the maintenance of the highway wall. In this option the highway wall is improved (reconstructed) and raised to provide a 1%AEP level of protection and maintained as a flood risk management structure throughout the appraisal period. The cost estimate for this option are based on capital costs required to improve the highway wall and revenue expenditure for the 100year appraisal period. The capital costs have been identified using the EA Long Term Costing Tool. The costs for this option remain viable.

Advantages	Demonstrates commitment to manage risk of flooding at Clydach Terrace and aids to maintain/enhance public relations. Reconstructing as a flood risk management structure could provide formal defence 1% AEP for the residence of Clydach terrace. Removing blockages downstream will decreasing the risk of flows backing up the river.
Disadvantages	The wall is a highway asset and therefore requires agreement with local authority RCTCBC. Continued operational costs with limited justification for spend. Future maintenance cost of the wall and costs to undertake these works will sit with NRW.
Assessment against the critical success factors	This option has the potential to meet all CSFs and at least one project objective.
Conclusion	This option is suitable for the Long List and will be considered further during SOC to determine if it should progress to the Short List.

Option 3	**Do Something - Channel Maintenance, Maintain Existing Wall & Blockage Removal and Natural Flood Management (NFM)** Costs for this option include channel maintenance and blockage removal from the river channel, and maintenance of the highway wall as a flood defence structure throughout the appraisal period, along with NFM measures.
Cost	The cost of NFM measures is difficult to estimate at this strategic level of assessment. This assessment used the same methodology based on the Working with Natural Process Evidence Base (Defra, 2017), in particular that woodland-based measures can be approximated by the area planted. The costs for this option remain viable.
Advantages	Demonstrates commitment to manage risk of flooding at Clydach Terrace. Maintain/enhance public relations.

	Maintaining the highway wall as a flood defence structure will provide NRW and residents with a reliable form of defence. Removing blockages downstream will decreasing the risk of flows backing up the river. Incorporating NFM measures will reduce flows into Nant Clydach, providing sustainable engineering solutions, along with potential benefits elsewhere.
Disadvantages	The wall is a highway asset and therefore requires agreement with local authority RCTCBC. Continued OPEX costs without justification for spend.
Assessment against the critical success factors	This option is achievable and meets the capacity and capability of the supply chain, other CSFs remain potentially viable. Flood risk remains at 3.33% (AEP). Maintenance cost and liability to undertake these works remains with NRW.
Conclusion	This option is suitable for the Long List and will be considered further during SOC to determine if it should progress to the Short List.

Option 4	**Do Something - Remove People & Property at High Risk of Flooding from Risk Area**
Cost	Costs for this option will include a valuation of the properties purchased and the cost of demolition. There will be no other costs associated with this option. The regional average property values per property type from the House Price Index (Land Registry) will be used for the properties to be purchased. The costs for this option remain viable.
Advantages	Removes risk of flooding to the properties at Clydach Terrace.
Disadvantages	A solution not favoured by all residents, some of which want to remain at Clydach Terrace, damaging organisational reputation. Not all residents may be willing to sell*. *Compulsory Purchase Orders are seen as a last resort, not a solution. Area will continue to be at risk from flooding.

Assessment against the critical success factors	The cost currently outweighs the scale of response required. Further evidence would be required to demonstrate this is an economically viable option. Whilst residents will no longer be at risk, flood risk for the area remains at 3.33% (AEP). It is worth noting that Clydach Terrace is currently the highway and access to 2 detached properties also.
Conclusion	This option will be considered further at SOC.

Option 5	**Do Something – Introduce flood warning system**
Cost	Costs for this option include channel maintenance and blockage removal from the river channel and the maintenance of the highway wall. In this option the highway wall is improved (reconstructed) at its current level and type and maintained as a flood defence structure throughout the appraisal period. Therefore, the cost estimate for this option are based on capital costs required to improve the highway wall and revenue expenditure for the 100year appraisal period. The capital costs have been identified using the EA Long Term Costing Tool. Costs for this option will also include the installation of ground and river gauges, however the annual revenue costs associated with maintaining these assets have not been identified. At this stage, the capital costs have been estimated using the EA Long Term Costing Tool – Flood Warning Section. The costs for this option remain viable.
Advantages	Demonstrates commitment to manage risk of flooding at Clydach Terrace. Maintain/enhance public relations. Reconstructing the highway wall as a flood defence structure will provide NRW and residents with a reliable form of defence.
Disadvantages	Ongoing maintenance commitments. Known challenges associated with flood warning systems due to flashy nature of river channel limiting benefits. The wall is a highway asset and therefore requires agreement with local authority RCTCBC.

	Flood risk level remains the same.
Assessment against the critical success factors	Whilst this option is potentially achievable (depending on consideration and assessment of what level of service would be provided) and meets the capacity and capability of the supply chain, it does not achieve the other CSFs. Flood risk remains at 3.33% (AEP). Maintenance cost and liability to undertake these works remains with NRW.
Conclusion	This option is not suitable for the Long List as a standalone, however it will be considered alongside other options.

Option 6	**Do Something - Remove Downstream Culvert**
Cost	There is not enough information available to assess the costs associated with this option at this stage and further investigation (geomorphology & hydraulic modelling) is required.
Advantages	TBC
Disadvantages	TBC
Assessment against the critical success factors	TBC
Conclusion	TBC

Option 7	**Do Something – Offline flood storage/reconnecting the flood plain**
Cost	There is not enough information available to assess the costs associated with this option at this stage and further investigation (hydraulic modelling) is required.
Advantages	TBC
Disadvantages	TBC
Assessment against the	TBC

critical success factors	
Conclusion	TBC
Option 8	**Do Something – Property Flood Resilience (PFR)**
Cost	Costs for this option include channel maintenance and blockage removal from the river channel and the maintenance of the highway wall. In this option the highway wall is improved (reconstructed) at its current level and type and maintained as a flood defence structure throughout the appraisal period. Therefore, the cost estimate for the is option are based on capital costs required to improve the highway wall and revenue expenditure for the 100year appraisal period. The capital costs have been identified using the EA Long Term Costing Tool. Costs for this option will also include the installation of Property Flood Resilience measures, costs associated with these measures have been taken from “Establishing the Cost Effectiveness of Property Flood Protection: FD2657” (Defra, July 2012). A design life of 25 years has been assumed for the PFR measures; therefore, a capital expenditure is forecast in years 1, 26, 51 and 76. A total of 17 properties have been found to flood to depths below 600mm in varying return periods, 7 of these are along Clydach Terrace in the 3.33% AEP event whereas a further 9 are downstream of Clydach Terrace in the 0.5% AEP event. For this assessment the cost of providing 17 properties with PFR measures will be estimated, this could then be used to consider whether it would be appropriate to provide the 17 properties at high risk of flooding along Clydach Terrace with PFR or to provide it to those properties where flood depths mean it would be effective. The costs for this option remain viable.
Advantages	Relatively low-cost option. Demonstrates commitment to manage risk of flooding at Clydach Terrace. Maintain/enhance public relations. Reconstructing the highway wall as a flood defence structure will provide NRW and residents with a reliable form of defence. Provides greater resilience during low level flood events.

Disadvantages	PFR provides property benefits only, with protection up to 600mm. Requires continued CAPEX costs to replace systems every 25yrs. Requires residents to implement flood protection systems. Does not protect properties during high level flood events, which are of most concern to the residents.
Assessment against the critical success factors	Whilst this option is achievable and meets the capacity and capability of the supply chain, it does not achieve the other CSFs. Flood risk remains at 3.33% (AEP). Maintenance cost and liability to undertake these works remains with NRW.
Conclusion	This option is not suitable for the Long List as a standalone option, however it will be considered further alongside other options during SOC.

Recommended Option

Each of the options listed provide a Benefit to Cost Ratio >1 relative to the walkaway option. However each option varies in both its flood risk and wider (eg through NFM measures) benefits. It should also be highlighted that uncertainties remain in relation to the achievability of CSF's relative to some of the options mentioned, which still reach the same conclusion. These will need further consideration at SOC stage.

No preferred option has been identified at this stage, additional hydraulic modelling is required to provide a true representation of risks for all options assessed, noting all options other than option 6 result in people and property remaining at risk. It should also be noted that the impact of climate change has not been assessed at this stage but will need to be considered with shortlisting options.

At project brief stage, **the recommended option is progress to strategic outline case stage** to assess the long list of options and develop a short list of options for detailed appraisal.

Management Case

Milestones

Milestones	Date	Comment
Gateway 0 – Initiation	30/06/2023	Project brief approval and procurement of key supply chain
Gateway 1 – Options Short listing	01/03/2024	SOC
Gateway 2 – Options Selection	31/01/2025	OBC
Gateway 3 – Approved for delivery	31/12/2026	FBC
Gateway 4 – Delivery Handover Completion	31/03/2028	Construction
Gateway 5 – Project Closure	31/03/2029	12 months defects period

Based on original project milestone forecast

Benefits Delivery

Benefits will be investigated, tracked and reported on throughout the project. Benefits will be maximised at optioneering stage including community benefits directly resulting from this project, working with our supply chain partners.

Risk Management

This project is managed via the NRW Project Delivery project management process. Project delivery follow the NRW tailored risk management principles of the PRINCE2 Project Management Process, stage controlled in delivery and funding approval.

The risk management process includes a number of stages:

1. identifying and describing risks; Project Manager risk registers

2. agreeing ownership of individual risks; assigning risk ownership in internal risk register and consultant stage risk register/task trackers

3. defining responses to risks; outlining mitigation - reduce, prevent, contingency, transfer, accept. Risk reduction meetings

4. developing robust budgets and programmes; item specific project cost estimates and programmes with project specific optimum bias calculators are created reviewed and scrutinised by Project Executive. Profiled spend is reviewed and scrutinised by Project

Executive and Programme Analyst on monthly basis via the PPMT tool. Changes to variance, outstanding profiled spend and risk are flagged, questioned and comments added for any changes.

5. managing and communicating. The contract, task trackers, monthly and biweekly project meetings. Highlight reports, risk reduction meetings triggered by early warnings within the contract.

During project conception risk is managed by: assembling a project team with key specialisms to ensure adequate management of key risks, agreeing a brief with the senior user to ensure CSFs are clear. A procurement strategy is created and maintained to highlight requirement and risk to procurement. During procurement work area specific frameworks are utilised. Cost are reviewed by a cost consultant.

Day to day risk management is coordinated by the Project Manager with assistance of project manager tools listed above with support from the Project Executive. NEC contract risk registers to include pertinent risks. Contract specific risk register to be maintained by each supplier.