

Stubbins and Ramsbottom Flood Risk Management Scheme

Flood Risk Assessment

August 2013

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Glossary of Terms

Term	Meaning / Definition
AEP	Annual Exceedance Probability
FCDPAG3	Flood and Coastal Defence Project Appraisal Guidance
mAOD	Metres above Ordnance Datum
SoP	Standard of Protection
FRA	Flood Risk Assessment
FRMS	Flood Risk Management Scheme
PPS25	Planning Policy Statement 25: Development and Flood Risk
PAR	Project Appraisal Report
PAB	Project Appraisal Board
DEFRA	Department for Environment, Food and Rural Affairs
NPPF	National Planning Policy Framework

Event Severity

The severities of the events discussed in this report are defined as both Annual Exceedance Probabilities (AEP) and as Return Periods.

The AEP is the probability that there will be an event exceeding a particular severity in any one year. The Return Period is the average duration (in years) between events of a particular severity.

Annual Exceedance Probability	Return Period
50%	1 in 2 years
10%	1 in 10 years
4%	1 in 25 years
2%	1 in 50 years
1.33%	1 in 75 years
1%	1 in 100 years
0.67%	1 in 150 years
0.50%	1 in 200 years

Executive Summary

Following flooding in Ramsbottom from the Irwell and considering the current predictions for the impact of climate change, the Environment Agency commissioned Atkins to undertake a detailed project appraisal to identify the viability of a flood risk management scheme, and the most appropriate option.

The Project Appraisal Report (PAR) process reviewed several options to address flooding issues from the Irwell through Stubbins and Ramsbottom. The preferred option, as identified by the PAR, includes the construction of a line of flood defences to a 0.71% SoP. This represents protection against flooding for a present day 1 in 140 years event, which reduces to a 1 in 75 year event SoP by 2025 when the impact of climate change is considered¹.

This project is in the detailed design phase of the proposed flood defence scheme during the preparation of this FRA.

This report has been prepared to support in the application for planning permission from the Rossendale Borough Council for the proposed flood defence scheme. It takes into consideration flood risk issues in Stubbins and Ramsbottom and any necessary mitigation measures that would be adopted with the proposed flood defence scheme. This flood risk assessment was undertaken in accordance with NPPF (Ref 1). In accordance with the Technical Guidance of the NPPF, the flood zone and vulnerability classification of the proposed development (the flood defence scheme) shows that the proposed site is suitable for development and no Exception Test will be required (Ref 2).

During the 4% AEP (1 in 25 year) event the existing standard of flood protection is not sufficient for Stubbins and Ramsbottom. Flood defence works have previously been undertaken along the River Irwell in the downstream reach of Ramsbottom at Peel Brow where the current SoP is 1% AEP (1 in 100 year) event. These works do not provide any protection further upstream at Stubbins and the Cuba Industrial Estate area, and there is a flood flow path from here towards Ramsbottom. If the existing risk is not addressed, approximately 117 residential houses and 47 non-residential properties are at risk of flooding from a 1% AEP event as shown in the flood extent provided by the Environment Agency.

Impact of Scheme on Flooding from Rivers

In the post scheme scenario, there are minor increases in peak water levels through the study reach and further upstream and downstream of Irwell the scheme has no impact.

Downstream of the scheme, at Peel Brow, there is a slight increase in peak water levels; however, this increase has no impact on the area as water levels stay below the existing defence built in 2000. The impact of the proposed flood defence scheme is considered negligible downstream of Ramsbottom Bridge.

All properties currently at risk of flooding within Stubbins and Ramsbottom will be protected by the scheme for a 0.71% AEP (1 in 140 year) event reducing to at least a 1.33% AEP (1 in 75 year) event following currently predicted levels of climate change. As a result of the proposed scheme, water levels will potentially increase downstream for the 1% AEP (1 in 100 year) event but the impacts of these changes are relatively low, up to a maximum of approximately 130mm, and in areas where either existing defences will not be overtopped or areas that are already flooded during the 1% AEP (1 in 100 year) event. The onset of flooding is not affected in these areas.

¹ Adapting to Climate Change : Advice for Flood and Coastal Erosion Risk Management Authorities, Environment Agency, September 2011, Document reference GEHO0711BTZU-E-E

Impact of Scheme on Surface Water Flooding

There have been some surface water flooding issues along Stubbins Vale Road and Stubbins Lane and through the development area on Dick Field Clough.

As a part of the scheme, the following measures are proposed which would potentially alleviate surface water flooding problems adjacent to the defences:

- Installation of additional drainage to the gardens side of the proposed defence along the rear of Robert Street at locations where existing footpath levels are proposed to be raised
- In Cuba Industrial Estate existing outfalls will be maintained with the addition of outfall flap valves
- Retaining existing surface water drainage at locations where existing defences are to be raised

Impact of Scheme on Groundwater Flooding

There are no groundwater issues reported within the area of the scheme and the potential is considered to be low.

Residual Flood Risk

This study showed that the implementation of this flood defence scheme will protect 117 residential and 47 non-residential properties within Stubbins and Ramsbottom. However, residual flood risk lies in events exceeding 0.71% AEP, which could overtop the proposed scheme defences. If the water levels increase due to the progressing climate change the proposed flood defences can be easily modified to increase the SoP as the design takes this case into consideration.

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1. Introduction

1.1 Background

This Flood Risk Assessment (FRA) has been prepared for the Environment Agency's proposed FRMS in Stubbins and Ramsbottom.

Ramsbottom was subject to severe flood events in 1946, 1954, 1964, 1980, 1992, 1995, 2002, 2004, 2007 and 2009, when on several occasions basements of properties were flooded. More recent events in June and November 2012 resulted in low lying land and roads being affected. The Environment Agency commissioned a study to provide improved standard of protection to the communities of Stubbins and Ramsbottom, and Atkins was then commissioned to produce a Project Appraisal Report. The PAR was approved by the EA Project Appraisal Board (PAB), and Detailed Design for the FRMS is currently ongoing.

1.2 Purpose of Flood Risk Assessment

The benefits of protecting the study area through the construction of a flood defence scheme have been identified by the Environment Agency. The preferred option has been determined in accordance with the Flood and Coastal Erosion Flood Risk Management Appraisal Guidance (FCERM-AG) which was based on its technical, environmental and economic viability.

In accordance with NPPF, proposed development sites greater than 1 hectare and those which fall within either Flood Zone 2 or 3 require the submission of a FRA alongside the planning application. The proposed development (flood defence scheme) in this case lies within Flood Zone 2 and 3a according to the Environment Agency flood mapping and therefore a FRA is required.

This report seeks to support in securing planning permission from Rossendale Borough Council for the proposed flood defence scheme. It takes into consideration flood risk issues in Stubbins and Ramsbottom and any necessary mitigation measures that would be adopted with the proposed flood defence scheme.

As part of the planning process, the overall impacts of proposals need to be assessed. In line with the requirements of NPPF, this FRA will look at:

- An overview of the proposed development;
- Current flood risk;
- Future flood risk, and
- Residual flood risk post development.

The purpose of this FRA is to inform the planning process of the above issues, thus enabling a determination to be made.

2. Site Description

2.1 Current Development and Site Layout

Ramsbottom is a Victorian mill town located along the River Irwell, approximately 4 miles north-west of Bury. The town is split between two boroughs of Rossendale and Bury. Stubbins is an industrial village half a mile north from Ramsbottom in Rossendale borough, North West England. At this location the river is fed from the steep uppermost reaches of the catchment (upstream of Irwell Vale), including Rawtenstall, Stacksteads and Bacup as well as from the upstream Calf Hey, Ogden and Holden Wood reservoirs at the confluence with the River Ogden. Ramsbottom has a population of 17,700 and is an area that has developed alongside the River Irwell which has important industrial links to the town.

A location plan is shown in Figure 1. The majority of Stubbins and Ramsbottom town is situated to the west of the Irwell. There is additional development in Ramsbottom to the east of the Irwell, with industrial and residential properties in the Peel Brow area.

There are a number of bridges crossing the Irwell within the study reach; these include the Strongstry Footbridge, the Stubbins Bridge and Ramsbottom Bridge and both of the latter are important transport routes within this area.

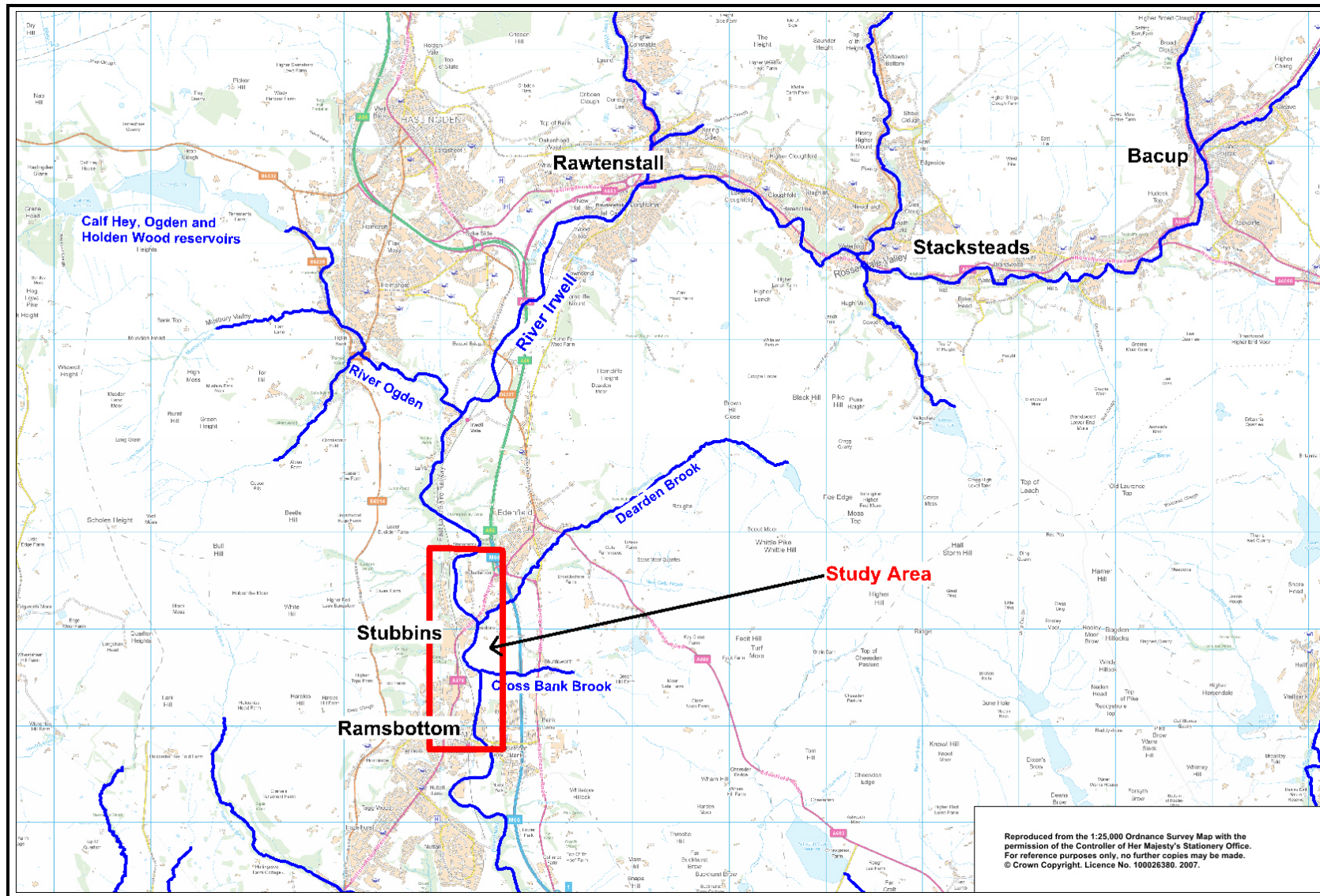


Figure 1 – Location Plan

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2.2 Proposed Development

2.2.1 Overview

The Project Appraisal Report (PAR) reviewed several options to address flooding issues within the study area from the River Irwell. The preferred option, as identified by the PAR, included the construction of a line of flood defences to a 0.71% SoP along the right bank of the River Irwell to reflect conditions in 2025. This represents protection against flooding for a present day SoP of 1 in 140 years event, which is predicted to represent a 1 in 75 year SoP by year 2025 due to climate change impacts.

The proposed scheme has two discrete sections upstream and downstream of Stubbins Bridge. The section upstream is a residential area which is adjacent to the Chatterton Strongstry Conservation Area and has two footpaths through the area which the proposed defences will follow. Immediately downstream of the bridge are two rows of Victorian townhouses beyond which the defence will begin and cross an area of open ground, formalised into gardens not recognised on the Land Registry, before running parallel to the Cuba Industrial Estate boundary where high ground will be reached to the south of the estate.

2.2.2 Scope of Works of Preferred Option

The proposed flood defences provide a 0.71% standard of protection to the Stubbins and Ramsbottom area and comprise:

1. A new, raised flood defence along the Pin Meadow conservation area boundary to Alderway comprising of a wall defence tying into existing railway embankment;
2. Raised footpath levels along Irwell Sculpture Trail to rear of Robert Street.
3. A new flood defence wall along the footpath at rear of Nos.4 and 6 Robert Street and to the front of 2 Robert Street properties, installation of floodgates and flood resilience measures;
4. A new flood defence wall through the Meadow View Memorial Gardens following the boundary line of grass and footpath;
5. A new linear flood defence along the right bank between downstream extent of existing wall next to Stubbins Bridge to downstream extent of Cuba Industrial Estate;

The proposed line of the Flood Defence is shown on Figure 2. The type of defence would be predominantly new retaining walls, incorporating flood proofing of three properties including flood gates and a section of raised footpath on right bank of the River Irwell in Stubbins. The crest level of the defences will be based on 0.71% AEP flood level plus freeboard. A minimum freeboard of 300mm will be incorporated into the final design height. The freeboard provides an allowance for physical and modelling uncertainties only. It does not include an allowance for climate change.

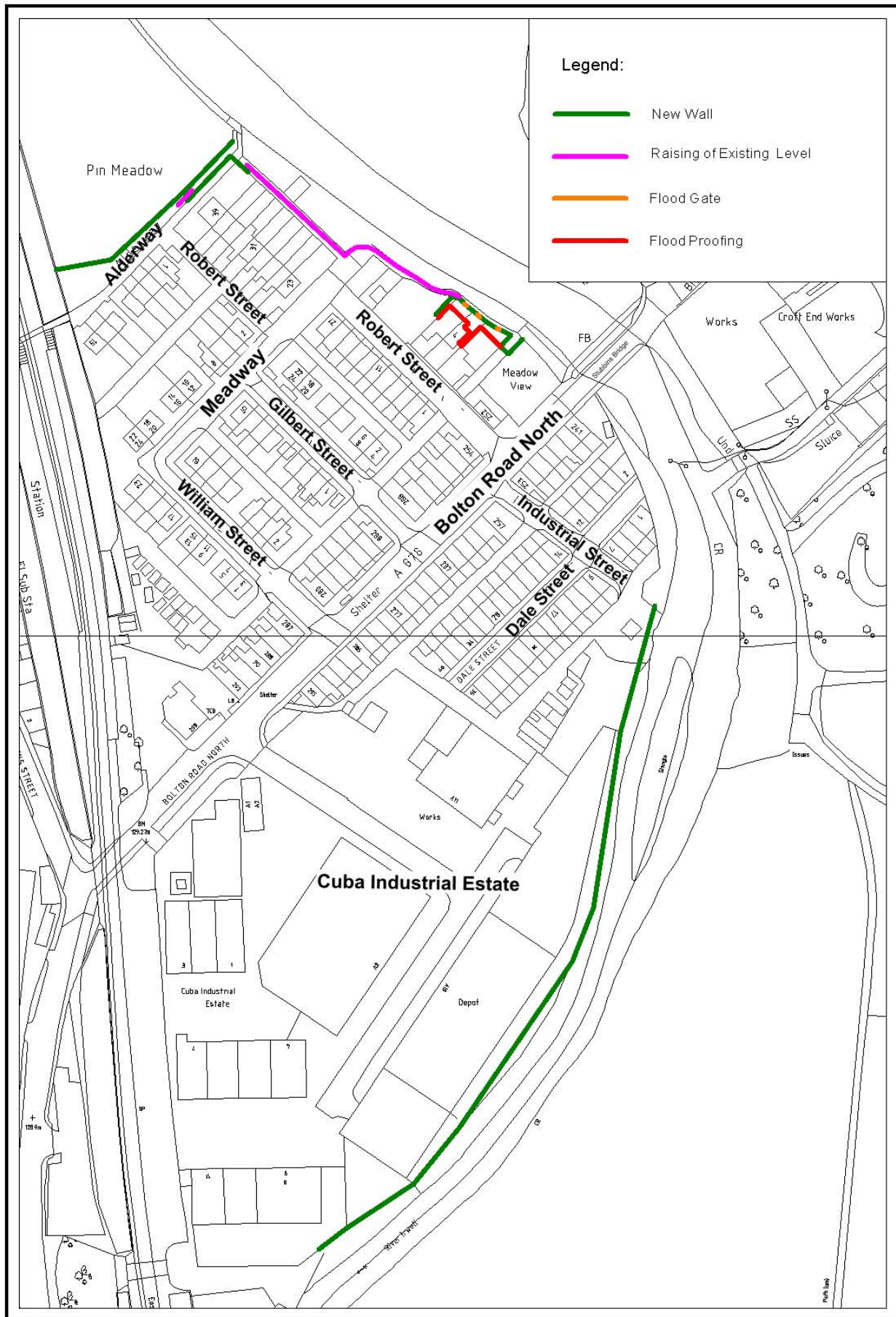


Figure 2 - Alignment of proposed flood defences

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2.2.3 Existing Flood Defences

There is currently one formal flood defence along the left bank of the Irwell through Ramsbottom. Upstream of Ramsbottom Bridge at Peel Brow a stone wall tying into existing informal industrial property infrastructure forms a continuous defence line. The proposed defence will provide a 1.33% AEP (1 in 75 year) event SoP. Further upstream of this defence, downstream of the Stubbins Bridge, is a stone wall along the right bank at the rear of Industrial Street property boundaries which dates back to Victorian times and provides an informal flood defence line.

2.3 Existing Flooding Information

2.3.1 Historical Flooding

There are 12 records of significant flooding since detailed records began in 1946. There are records of flooding of basements in Ramsbottom on Kenyon Street in 1964 and 1992. Lower Kenyon Street and the basements upstream of Ramsbottom Bridge also flooded in January 1995. Flooding occurred prior to the Peel Brow flood defences being constructed in 2000. In 2004, raw sewerage was brought to the surface on Kenyon Street.

2.3.2 Current Flood Risk problems

Based on the results of modelling undertaken for the PAR (see Section 3.1), the existing standard of flood protection with informal defences in place is below 4% AEP. If the existing risk is not addressed, approximately 117 residential houses are at risk of flooding from a 1% AEP event, along with a further 47 non residential properties.

2.4 Flood Zone Definition

According to NPPF, which has superseded the Planning Policy Statement 25, the proposed development lies within Flood Zone 2 and Flood Zone 3a and is classed as 'Water Compatible' as it is a Flood Control Infrastructure. The classification is based on Table 2: Flood Risk Vulnerability Classification, within Technical Guidance to the NPPF. The proposed flood defence alignment lies within Flood Zone 2 (Medium Probability) and Flood Zone 3a (High Probability).

Based on the flood zone and vulnerability classification, the appropriateness of the proposed development was assessed according to Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility' within Technical Guidance to the NPPF. This is included in this FRA as Table 2.1, highlighting the cell that shows the suitability of the proposed development site.

Flood Risk Vulnerability Classification See Table 2 in Technical Guidance to the NPPF		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table 1 in the Technical Guidance to the NPPF)	Zone1 Low Probability	✓	✓	✓	✓	✓
	Zone2 Medium Probability	✓	✓ Proposed Site	Exception Test required	✓	✓
	Zone 3a High Probability	Exception Test required	✓ Proposed Site	x	Exception Test required	✓
	Zone 3b 'Functional Floodplain'	Exception Test required	✓	x	x	x
✓ Development is appropriate x Development should not be permitted						

Table 2.1 - Appropriate Development for each Flood Zone (based on Table 3 of Technical Guidance to the NPPF)

Sequential and Exception Test

Technical Guidance to the NPPF states that the Sequential Test should be carried out when allocating land for development to demonstrate that there are no sites available for development in areas that are at a lower risk from flooding from all sources. In this particular case, the proposed development is classified as Flood Control Infrastructure for Stubbins and Ramsbottom and therefore, as implied by its function, cannot be relocated to an area of lower flood risk.

Based on the suitability of this proposed development as shown in Table 2.1, no Exception Test will be required.

3. Current Flood Risk

3.1 Flooding from Rivers

A hydraulic modelling assessment was undertaken as part of the PAR stage of the scheme to outline flood risk in and around the Stubbins area as part of the Ramsbottom Flood Alleviation Scheme (FAS). The modelling allowed for the flood risk for upstream and downstream of this area to be considered for the current situation, along with the increases in any flood risk caused by the construction of flood defences at Stubbins. The Modelling Report is included in Appendix A.

The new model representing the 'base case' undefended scenario was run for the 5, 10, 25, 50, 75, 100, 100+ climate change and 200 year design events. The results represent the current scenario as the Do Minimum PAR Option (Option 2).

The water levels at key locations in Stubbins, Ramsbottom and adjacent areas were examined, and flood extents determined using LiDAR data and topographic survey. A map identifying the key locations is included as Figure 3. The model results for the existing scenario at these key locations are summarised in Table 3.1 along with a longitudinal section of the water levels through Stubbins and Ramsbottom in Figure 4. Flood Outlines are included in Appendix B in addition to the Environment Agency's Flood Map.

The 1% AEP event flood envelope in Appendix B shows the number of residential properties affected within Stubbins and Ramsbottom is 117 for this event, with a further 47 non residential properties affected.

Flooding takes place by the following mechanisms:

- Overtopping of the bank at the Cuba Industrial Estate located downstream of Stubbins Bridge on the right bank from as low as the 4% AEP event. From a 1% AEP event, and following out of bank flows at Cuba Industrial Estate, the reach immediately downstream of Stubbins Bridge through to Cuba Industrial Estate begins to inundate behind Dale Street followed by the area upstream of the bridge to Pin Meadow at the rear of Robert Street.
- Once out of bank, flow continues generally south westerly along Bolton Road North until it goes beneath the Railway Bridge. At this point the water flows directly south following the path of Stubbins Lane behind the raised railway embankment towards Ramsbottom town centre.

In addition to those areas at risk within Stubbins and Ramsbottom, there is additional flood risk up and downstream of the study area. Upstream there are 24 properties at risk of flooding within Strongstry from a 1% AEP event, whilst 9 properties are at risk in Chatterton. All flood risk here is due to over topping of the banks.

Downstream of the study area, the Georgia Pacific Waste Water Treatment Works is at risk from events as low as the 4% AEP event due to overtopping of the banks. Defences completed in 2000 in the Peel Brow area protect properties in this reach to a 1% AEP Standard of Protection.

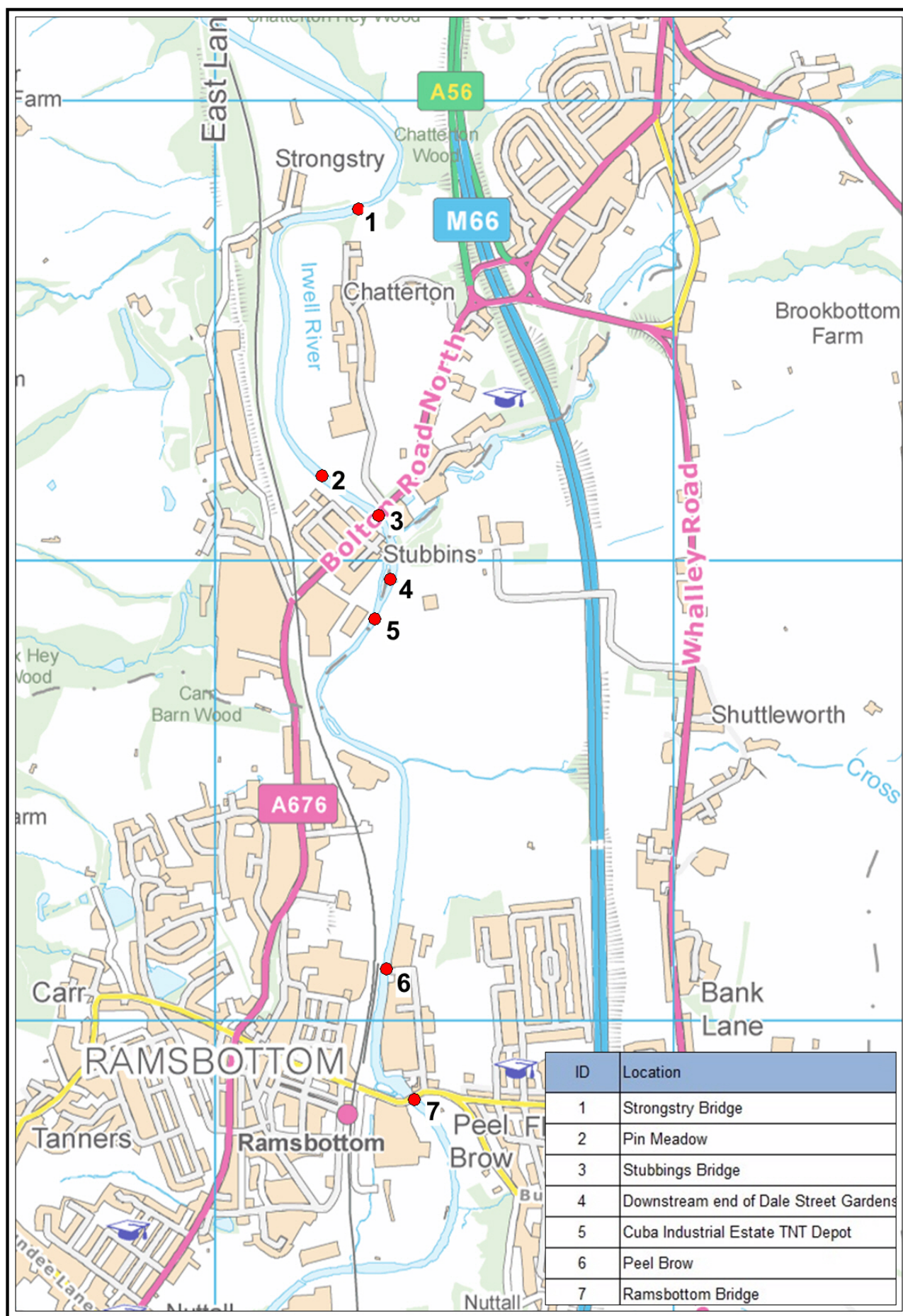


Figure 3 - Key locations for flood level assessment

ID	Location	Event Probability of Occurrence in a Given Year					
		20%	4%	1.33%	1% + CC 2025	1%	0.50%
1	Strongstry Bridge	133.01	133.57	133.90	134.21	133.99	134.20
2	Pin Meadow	130.40	130.88	131.31	131.60	131.45	131.60
3	Stubbins Bridge	130.06	130.54	130.92	131.14	131.05	131.14
4	Downstream end of Dale Street Gardens	129.10	129.38	129.59	129.84	129.65	129.84
5	Cuba Industrial Estate TNT Depot	128.88	129.11	129.33	129.65	129.41	129.64
6	Peel Brow	126.06	126.43	126.73	127.04	126.82	127.05
7	Ramsbottom Bridge	125.198	125.82	126.27	125.78	126.41	126.77

Table 3.1 – Current Situation Peak Flood Levels (mAOD)

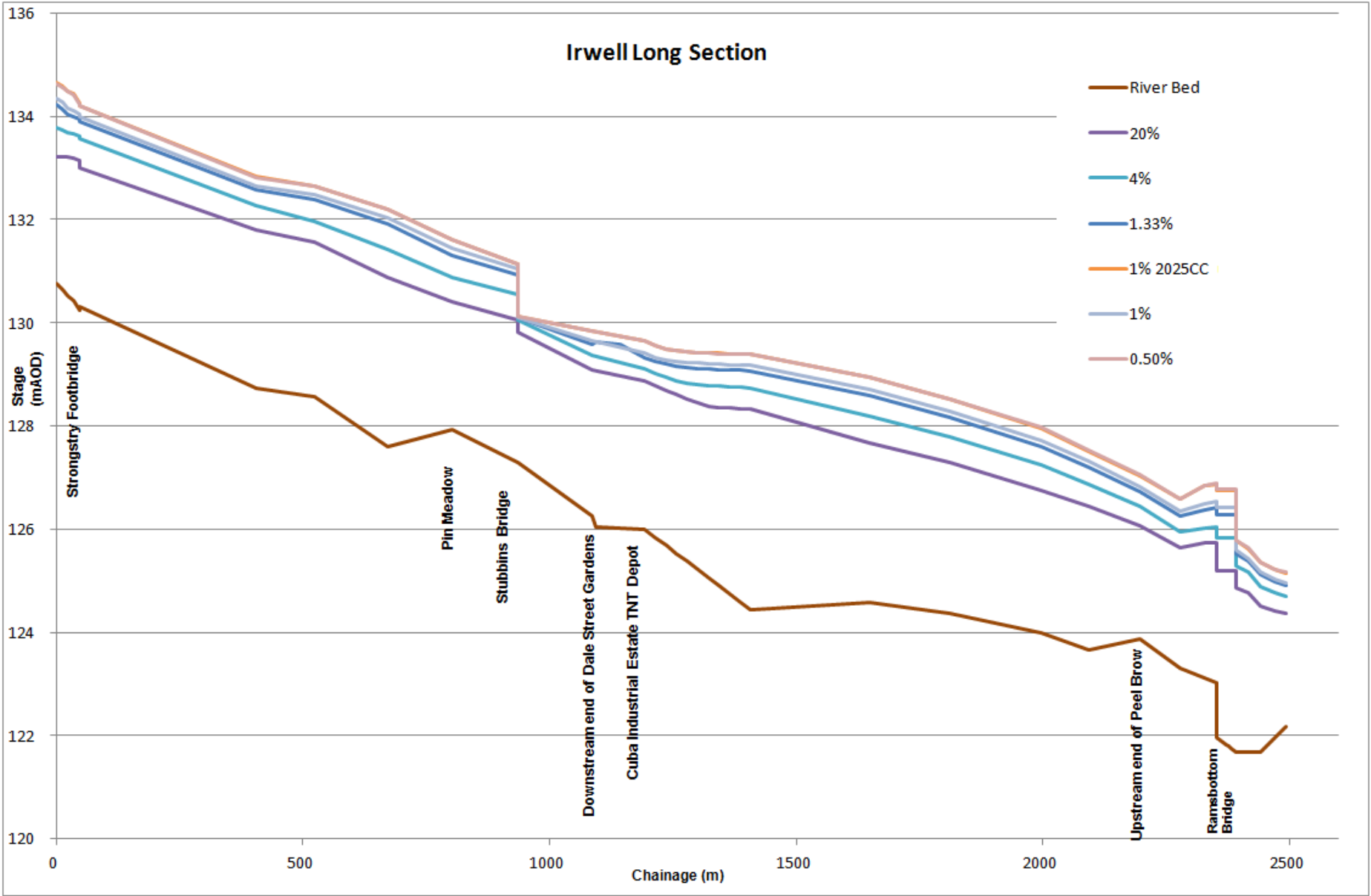


Figure 4 - Longitudinal profile along Irwell

3.2 Flooding from Pluvial/Surface Water

The Environment Agency has no records of Surface Water flooding in Stubbins and Ramsbottom. Surface Water flooding is known to be an issue within central Ramsbottom where surface water flow paths have been identified, and also in Stubbins along the Stubbins Vale Road and Stubbins Lane. Ramsbottom is surrounded by steep hillsides that support water runoff (Ref 5) and is known as a Critical Drainage Area (Ref 4). There are known surface water and highways flooding problems within the Stubbins area but these issues are not exacerbated by fluvial flooding.

3.3 Flooding from Reservoirs, Canals and other Artificial Sources

The Environment Agency's map of Risk of Flooding from Reservoirs shows significant risk areas within the Irwell Valley through Strongstry, Stubbins and Ramsbottom. An Environment Agency map of flood risk from reservoirs is included in Figure 5.

3.4 Flooding from Groundwater

3.4.1 Location and geological setting

Stubbins is situated in the Rossendale Valley and Ramsbottom in the West Pennine Moors, both along the River Irwell. The River Irwell has its confluence with the Dearden Brook downstream of Stubbins. The solid geology of this area comprises Helmshore Grit, Fletcher Bank Grit and Rossendale and Marsden Formation consisting of Sandstone, Mudstone and Siltstone. The superficial geology is dominated by till, sand and river terrace deposits, overlain by alluvium in the valley bottom. Alluvium typically contains more fine-grained material (silt and clay) than the river terrace sands and gravels and generally has a lower permeability as a result.

There is one principal aquifer beneath the site and in the surrounding area. The Environment Agency website indicates that the shallow alluvial strata beneath the site are classified as a Secondary A Aquifer as are the river terrace deposits adjacent to the alluvial strata. The bedrock strata are classified also as a Secondary A Aquifer. The shallow alluvial aquifer is likely to provide base-flow to the River Irwell.

This geological setting of permeable, water-bearing deposits overlaying rocks with low permeability in a valley-bottom is one in which there is potential for groundwater flooding. However, it is important to note that the risk of groundwater flooding is, typically, highly variable and depends not only on the local geology but also on the topography, the weather conditions and local management of drainage and the river system. As a result of these variables, it is difficult to make confident predictions of when and where groundwater flooding will occur, particularly as groundwater level data are usually too sparse to characterise local issues.

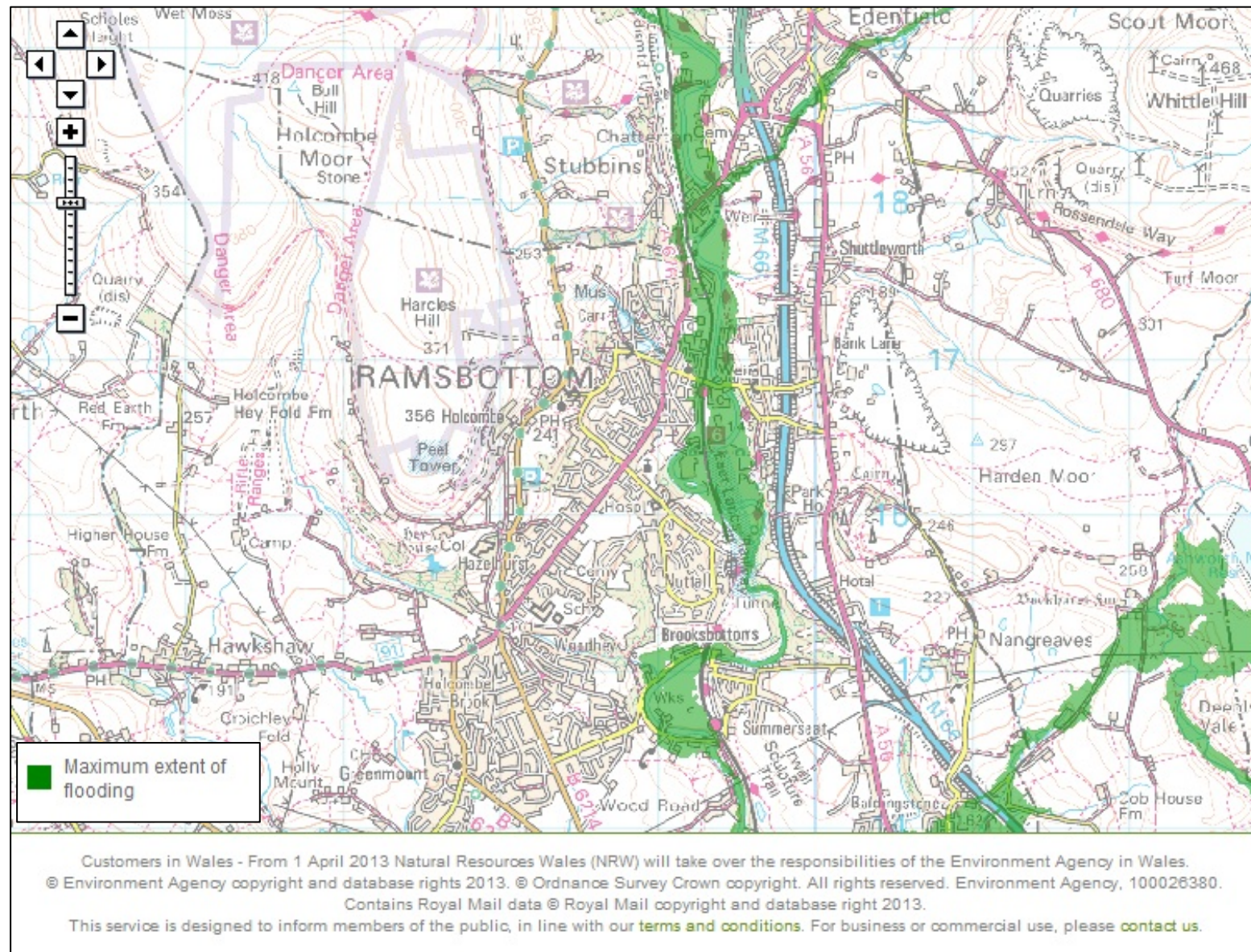


Figure 5 – Environment Agency Map – Risk of Flooding from Reservoirs

3.4.2 Instances of groundwater flooding and availability of data

The Environment Agency does not have any detailed records of groundwater flooding in the area although the Environment Agency's map of groundwater flooding indicates potential risk across the areas as a whole.

Bury Metropolitan Council is aware of groundwater flooding risks in the area of Peel Brow due to flood defences along the River Irwell that could elevate the river levels above the flood plain. However, there are no specific locations recorded that experience problems with groundwater flooding.

The potential effects of climate change on groundwater levels are uncertain. Greater seasonality in groundwater level fluctuation is a potential outcome under a pattern of higher winter rainfall and lower summer rainfall. The former is more likely to lead to a greater risk of groundwater flooding.

In the UK, groundwater flooding was experienced following the wet winters of 2000-01 and 2007-08, but also as a result of the prolonged rainfall of summers 2007, 2009 and 2012. Broad predictions of the impacts of climate change on groundwater levels are difficult to make at the present time.

3.4.3 Current groundwater flood risk

There is no reported groundwater flooding in Stubbins and Ramsbottom, however the flood defences constructed in 2000 at Peel Brow elevate the river levels above the floodplain resulting in the possibility that alluvial groundwater flooding could occur in this area (Ref.4).

3.5 Flooding from Sewers

There are two reported incidents of sewer flooding in Ramsbottom. In 1995 minor damage was reportedly caused at the lower end of Kenyon Street due to backflow of surface water drainage and in 2004 raw sewerage was brought to the surface at the same location as a result of a heavy rainfall event (Ref 3).

3.6 Failure of Flood Defence Infrastructure

As detailed in section 2.2.3, there is one formal flood defence on the left bank of the Irwell at Peel Brow in Ramsbottom. This flood defence was constructed in 2000 to a design standard of 1% AEP (1 in 100 year) event. Failure or overtopping of this defence would result in the light industrial and commercial properties beyond being affected. An informal defence is located downstream of Stubbins Bridge; failure of this defence would lead to localised flooding to residential gardens and potentially isolated residential properties.

3.7 Flood Risk Due to Climate Change

3.7.1 Fluvial Flood Risk

Climate change scenarios were developed to assess future economic cases in accordance with the latest Defra guidance. Scaling factors for this catchment are 15% for 2025, 20% for 2055 and 30% for 2090. Inflows to the model were adjusted to apply these scaling factors.

Climate Change Scenarios were run for the 'base case' and 'defended' models in order to determine the existing standard of protection and increases in required defence levels in Stubbins and Ramsbottom for the years 2025, 2055 and 2090.

4. Flood Risk with Scheme

4.1 Flood Risk Management Option

The proposed development comprises flood defences along the right bank of the River Irwell through Stubbins. This line of defences will cut off the flow path into Ramsbottom caused by overtopping of the River Irwell at Stubbins. The proposed flood mitigation measures will offer an increased SoP of 0.71% AEP to properties currently at risk of flooding. This represents protection against flooding for a present day SoP of 1 in 140 years event, which would reduce to a SoP of 1 in 75 year event by 2025 taking into consideration the current predictions for impact of climate change. The details of the hydraulic modelling undertaken for this scheme are given in Appendix A.

4.2 Flooding from Rivers

Additional modelling has been undertaken with the scheme in place using flows for a 0.71% AEP (1 in 140 yr) event to determine whether the scheme impacts upon the peak water levels within Stubbins and Ramsbottom, and on upstream and downstream extents. The resulting flood outlines for the 0.71% AEP event are shown in the Appendix B and modelling results can be provided on request.

The modelling shows that with the scheme in place, flooding to Stubbins and Ramsbottom from the Irwell will occur for events exceeding the 0.71% AEP (1 in 140 yr) event. The results for 1% AEP event for the scheme are summarised in Table 4.1. These show the Existing Scenario and With Scheme option flood levels, change in peak levels, and a comparison between flood levels for the 1 % AEP design event and three climate change scenarios for 1% AEP design event. In addition to this table, a long section of the 1% AEP event profile for both the simulations is shown in Figure 6.

The results summary in Table 4.1 and long section in Figure 6 shows increases in peak water levels through Stubbins and Ramsbottom, and upstream and downstream of this area. There are increases in flood levels throughout Stubbins and Ramsbottom itself, whilst increases upstream of Stubbins and downstream of Ramsbottom town are negligible. The flood envelope for the 0.71% AEP event 'with scheme' (Appendix B) shows minimal additional flood risk to other properties due to the proposed implementation of the flood defences.

ID	Location	Event Probability of Occurrence in a Given Year and Level Differences								
		Undefended 1%	With scheme 1%	1% Level differences	Climate Change With Scheme					
					1%+2025 CC	1% and 1% +2025 CC Level differences	1% + 2055 CC	1% and 1% + 2055 CC Level differences	1% +2090 CC	1% and 1% + 2090 CC Level differences
1	Strongstry Bridge	134.00	134.00	0.00	134.21	0.21	134.28	0.28	134.41	0.41
2	Pin Meadow	131.45	131.60	0.15	131.98	0.38	132.10	0.50	132.34	0.74
3	Stubbins Bridge	131.05	131.28	0.24	131.67	0.39	131.81	0.52	132.07	0.79
4	Downstream end of Dale Street Gardens	129.65	129.67	0.02	129.83	0.16	129.89	0.22	130.00	0.33
5	Cuba Industrial Estate TNT Depot	129.41	129.54	0.13	129.76	0.22	129.83	0.29	129.97	0.43
6	Peel Brow	126.82	126.90	0.08	127.16	0.26	127.24	0.34	127.43	0.52
7	Ramsbottom Bridge	125.59	125.62	0.03	125.79	0.17	125.82	0.20	125.88	0.26

Table 4.1 – Comparison of flood levels between the Existing Scenario and the Flood Defence Scheme and Climate Change

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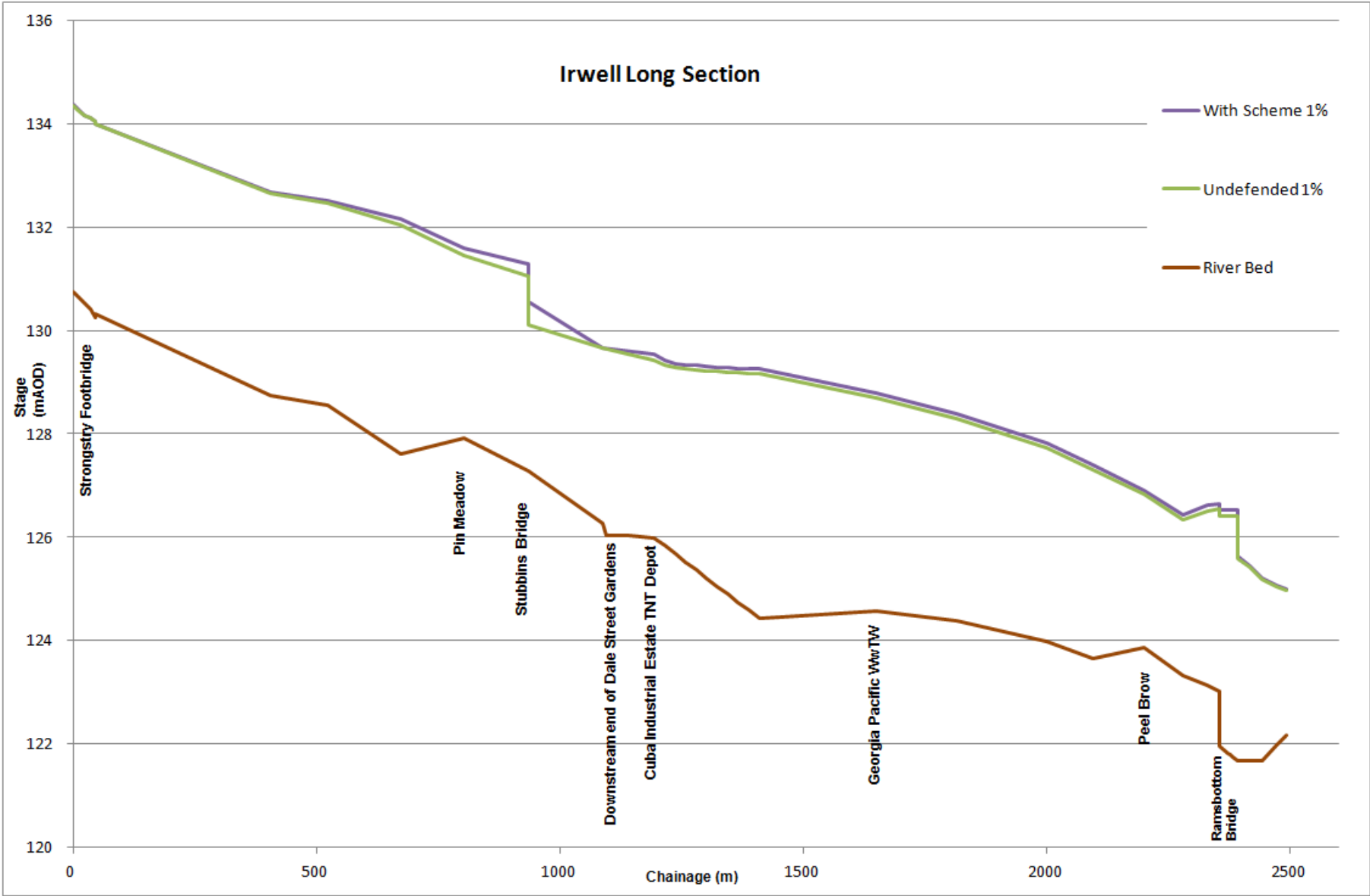


Figure 6 - Longitudinal profile showing impacts of the 1% AEP event with scheme on the Irwell

4.2.1 Increased Flooding due to Climate Change

The With Scheme model results for the 1% plus climate change event for 2025 in Table 4.1 shows changes in peak flood levels between 160 and 390mm compared to a 1% AEP design event.

4.2.2 Surface Water Flooding

There are several drainage issues within Stubbins and Ramsbottom and the circumstances of some of these are still unknown. There is an issue with ponding of water at Stubbins Lane during extreme rainfall events.

To mitigate additional surface water issues following the construction of the defences, several measures are proposed as part of the scheme. To the rear gardens of Robert Street, where raising of the footpath level is proposed, the garden side of the defence will be supplemented by additional drainage. In Cuba Industrial Estate existing outfalls will be maintained with the addition of outfall non return valves.

In all other locations, existing surface water drainage is to be retained. Ground levels fall away from the proposed flood defences and as such there will be no impact from these structures on existing drainage due to water ponding behind them.

4.2.3 Groundwater Flooding

The proposed flood defence downstream of Stubbins Bridge consists of a sheet pile wall through the made ground, alluvial sands and gravels and into the Alluvial Clay Formation along the right bank downstream of Stubbins Bridge to downstream of Cuba Industrial Estate. This will modify the response of groundwater to a rise in river stage in the immediate vicinity of the structure. It is unlikely that the scheme will have any impact on groundwater flooding due to the topography of the site as mentioned above.

5. Residual Flood Risk

5.1 Overview

The proposed flood defence scheme will offer an increased SoP to 117 residential properties in Stubbins and Ramsbottom as shown in the 0.71% AEP flood extent (With Scheme) in Appendix B.

There are some additional properties currently at risk of flooding which are outside of the extents of the scheme. Upstream of the scheme, in Chatterton there are 9 properties and in Strongstry 24 properties at risk of flooding from the 1% AEP flood extent; however, the increase in water levels when comparing with the non defended scenario are small, being around 40mm at Chatterton and less than 10mm at Strongstry. This is well within modelling tolerances, and does not cause additional risk to further properties. Increases in water levels due to the scheme are negligible upstream of Strongstry Bridge and as such the scheme has no effect on flood risk beyond this point.

Georgia Pacific Waste Water Treatment Works is currently at risk of flooding for events as low as the 4% AEP (1 in 25 year) event. The Stubbins and Ramsbottom scheme does not provide protection to this works, and results in a 100mm increase in peak water levels at this location for a 1% AEP event. However, there is no change in the onset of flooding, with the increase in peak water levels for a 4% AEP event just 30mm. Further downstream, a flood defence wall completed in 2000 protects properties at Peel Brow. This was designed to levels based on a 1% AEP. At this location the increase of 80mm in water levels does not have any impact as further examination of this location has shown this increase to be below the existing defence level so there is no change to Standard of Protection provided. There are no additional properties at risk of flooding from the Irwell downstream of Ramsbottom Bridge.

5.2 Managing Residual Flood Risk

Although all of the properties at risk from flooding in Stubbins and Ramsbottom will be protected to at least a 1% SoP by the proposed scheme, there will be residual risk to properties from events in excess of 0.71% AEP due to overtopping at Stubbins and Ramsbottom. An improved flood warning service would be provided given the consistent Standard of Protection and public awareness campaigns should be undertaken to encourage the public to sign up for flood warnings. These would be utilised in the case where flood defences are overtopped.

The mitigation measures described in the previous section help to maintain the channel capacity, which will reduce peak flood levels for events in excess of the SoP, thus reducing residual risk.

The design of the proposed sustainable flood defences allows them to be easily modified if the water levels increase due to the climate change.

6. Conclusions

6.1 Conclusions

This study showed that the implementation of this flood defence scheme will protect 164 properties from incurring damages within Stubbins and Ramsbottom on the right bank of the River Irwell. The current SoP of the affected properties with informal defences is below 4% AEP. The proposed flood mitigation measures will offer an increased SoP of 0.71% AEP. This represents protection against flooding for a present day SoP of 1 in 140 years event, reducing to the 1 in 75 year event in 2025 taking into consideration the currently predicted impacts of climate change.

6.1.1 Impact of Scheme on Flooding from Rivers

In the post scheme scenario, there are minor increases in peak water levels through Stubbins and Ramsbottom and further upstream and downstream of the Irwell the scheme has a negligible impact. There is a minor rise in peak levels at Chatterton upstream of the scheme but no additional properties are flooded. From Strongstry Bridge the scheme has no additional impact on the upstream locations.

Downstream of the scheme, at Peel Brow there is an 80mm increase in peak water levels. This increase has no impact on the standard of protection afforded to the area as the peak water levels are below the height of the existing flood defence built in 2000. The impact of the flood defence downstream of the study area is negligible by the time flows reach downstream of Ramsbottom Bridge.

All properties currently at risk of flooding within Stubbins and Ramsbottom will be protected by the scheme for at least a 1% AEP event with the majority protected for a 0.71% AEP. There are some properties upstream or downstream of the town which are adversely affected by the impacts of the scheme on water levels, however these impacts are minimal.

The With Scheme model results for the 1% + 2025 CC event shows increases in peak flood levels between 170 and 390mm compared to 1% design event.

6.1.2 Impact of Scheme on Flooding from other sources

Surface Water

There has been some surface water flooding issues through the development area on Dick Field Clough, but these have all been remote from the proposed works and will not be impacted by the scheme. There are also issues with the surface water during extreme rainfall events along Stubbins Vale Road and Stubbins Lane.

As a part of the scheme, it is proposed to install additional drainage to the gardens side of the proposed defence along the rear of Robert Street at locations where existing footpath levels are proposed to be raised. In Cuba Industrial Estate existing outfalls will be maintained with the addition of outfall flap valves.

In all other locations, existing surface water drainage is to be retained. There will be no impact on this existing infrastructure from the scheme as the topography indicates that ground levels fall away from the proposed defences structures and water will not pond behind them.

Groundwater

There are no groundwater issues reported within the area of the scheme and the potential is considered to be low.

6.1.3 Climate Change

The With Scheme model results for the 1% + 15% climate change event shows increases in peak flood levels between 170 and 390mm when compared with the 1% AEP design event. This is

envisaged to come in place in 2025 and can be offset by increases to the height of the proposed flood defences, which are designed to be easily modified for this purpose.

6.1.4 Residual Flood Risk to Properties

There are no additional properties within Stubbins and Ramsbottom at risk of river flooding which are not protected by the scheme. Residual risk lies in events which exceed the 0.71% SoP offered by the scheme.

6.1.5 Managing Residual Flood Risk

All properties at risk of flooding in Stubbins and Ramsbottom will be protected by the proposed scheme. However, there will be residual risk to properties in Stubbins and Ramsbottom due to overtopping and breaching at extreme events exceeding the 0.71% AEP event.

If the water levels increase due to the progressing climate change the proposed flood defences can be easily modified to increase SoP as the design takes this case into consideration.

The Environment Agency has existing flood warning areas in place for Stubbins and Ramsbottom.

7. References

1. National Planning Policy Framework; March 2012; Department of Communities and Local Government
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3. The Environment Agency – NW Region (South Area); Strategic Flood Risk Management Framework; River Irwell model Review and Update – Volume II Modelling Report; March 2007; JBA
4. Bury Rochdale and Oldham Strategic Flood Risk Assessment; Volume II – Level 1 SFRA; November 2009, JBA
5. Bury Rochdale and Oldham Strategic Flood Risk Assessment; Volume III – Level 2 SFRA; November 2009, JBA
6. <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>; 2013; NERC
7. Bury Council preliminary Flood Risk Assessment; May 2011; JBA

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Appendix A : Hydraulic Modelling

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Appendix B : Flood Outlines