

# MIDDLESBROUGH COUNCIL

## Preliminary Flood Risk Assessment



## **Executive Summary**

Flooding is a natural phenomenon. It results from a variety of sources including heavy rainfall causing surface water run off, ordinary watercourses, groundwater, and from surcharging sewers. When flooding occurs it can cause damage to property and harm people and communities

The purpose of this Preliminary Flood Risk Assessment (PFRA) is to carry out a strategic assessment of local flood risk. It will take into account historical flood events and will look at the potential for future flood events that may have a significant adverse consequence on human health, the environment, cultural heritage and economic activity. This information will be used to prioritise future flood risk management measures. It will also consider how flood risk will be affected by climate change.

The PFRA is a high level screening tool which requires no new data or significant analysis. It has used relevant information

- which is in the possession of the Middlesbrough Council;
- which is in the possession of our partners, including Environment Agency and Northumbrian Water Limited;

most of which is available to the public.

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# 1 Introduction

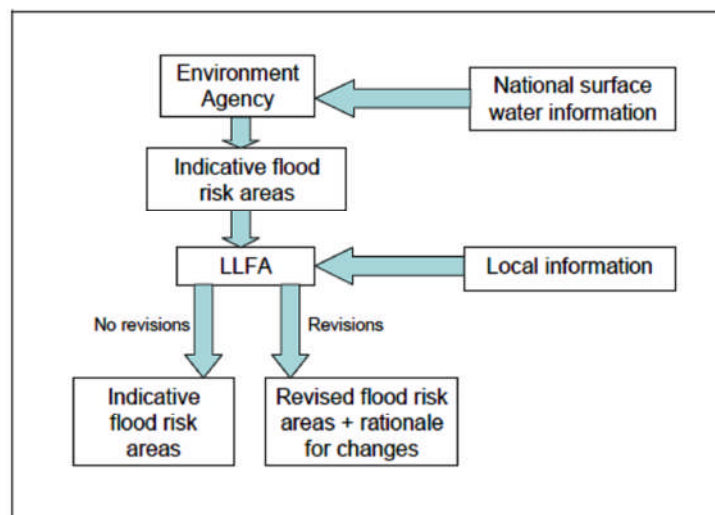
It is a requirement of the Flood Risk Regulations 2009 for Local Lead Flood Authorities (LLFA) to carry out a Preliminary Flood Risk Assessment (PFRA) for their area. However as a LLFA Middlesbrough Council is only required to undertake a PFRA for local sources of flooding. It is necessary to give consideration to any interaction between local sources and flooding from the sea, main rivers or reservoirs. Middlesbrough Council is responsible for assessing flood risk from local sources of flooding in particular this includes surface runoff, groundwater and ordinary watercourses and any interaction these have with drainage systems and other sources of flooding including sewers. The Environment Agency are also responsible for assessing flood risk in Middlesbrough, however this is only from main river and reservoirs.

The Regulations require LLFAs to determine whether there is a significant risk in their area based on local flooding and to identify the part of the area affected by the risk i.e. the Flood Risk Area. The criteria used to determine 'significant risk' was supplied by DEFRA and takes into account

- Human Health
- Economic activity
- Environment (including cultural heritage)

The process for this is summarised in the following Fig 1

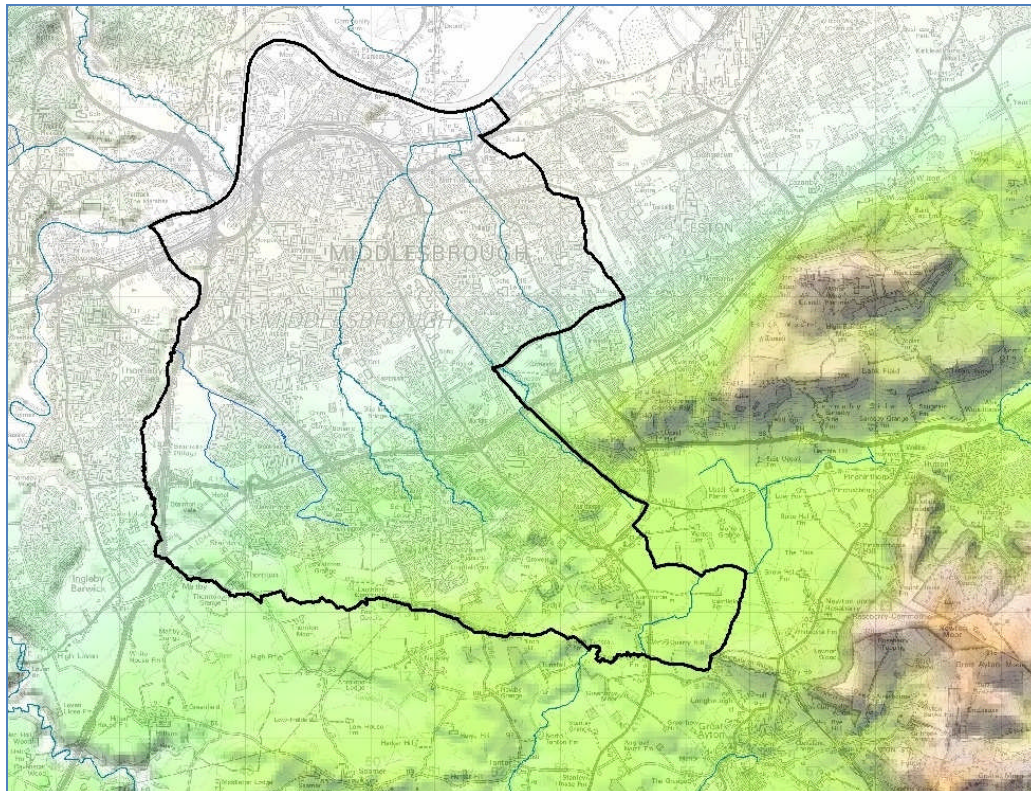
Fig 1.



Information from the PFRA process will also feed into other assessments including Middlesbrough Council's local strategy. By developing a local strategy it will enable flood risk in our area to be managed effectively.

The report will cover the whole of Middlesbrough Council's area as depicted in Fig. 2. Middlesbrough is located in the Tees Valley, which is in the south of the Northumbria River Basin District.

Fig. 2



## **2 LOCAL LEAD FLOOD AUTHORITY RESPONSIBILITIES**

Middlesbrough Council is a unitary authority and the management role of the LLFA within the Council lies with Highway and Transportation Services in the Environment Department. This Service area also carries out the management role of Highway Authority. There is a close working relationship with other Council Services including Regeneration, Development Control and Streetscene Services.

### **2.1 FORUMS**

There are a number of forums that we partake in along with our partners and other Tees Valley Authorities. These include

#### ***Tees Valley Authorities Flood Risk Group***

Other attendees include Darlington Council, Redcar and Cleveland Council, Hartlepool Council, Stockton Council, Northumbrian Water Limited (NWL), Environment Agency (EA), Tees Valley Unlimited (TVU) and Cleveland Emergency Planning Unit (CEPU)

#### ***Local Resilience Forum, (LRF)***

The LRF is the body that oversees emergency planning and civil contingencies across the four unitary local authority areas of Hartlepool, Stockton, Redcar and Cleveland and Middlesbrough. It is coterminous with the boundary of Cleveland Police and Cleveland Fire Brigade. The LRF is responsible for Risk assessment and the production of a Community Risk Register in relation to hazards and threats that might give rise to an emergency

The LRF has a number of Groups and Sub-Groups that concentrate on particular aspects of preparedness for the 'Cleveland' area including flood risk.

#### ***NWL quarterly liaison meetings***

Chaired by NWL and attended by a number of council service areas including Regeneration, Community Protection and Development Control.

#### ***Middlesbrough Becks Steering Group***

The group's remit is to support initiatives that will enhance all of the beck valleys within Middlesbrough. This is linked with the broader ambitions to

enhance the towns “urban countryside”. These initiatives also include any issues relating to flood risk. The group includes representatives from Middlesbrough Council, who chair meetings, Northumbrian Water, Environment Agency, Tees Valley Wildlife Trust, Middlesbrough Environment City and various Friends Groups.

Less formal liaison meetings also take place on a regular basis as with the EA and NWL to discuss detail and specific issues.

## 2.2 PUBLIC INFORMATION

With regards to informing the public about flood risk Middlesbrough Council, in collaboration with the Environment Agency, have sent out information packs to approximately 4000 properties considered to be at greatest risk, regarding flood awareness. These properties all lie within flood zones 2 and 3. We have also created dedicated flood advice pages on the council's website <http://www.middlesbrough.gov.uk/ccm/navigation/environment/preparing-for-emergencies/adverse-weather/flooding/>

## 2.3 SCRUTINY AND REVIEW

Scrutiny in Middlesbrough is currently carried out by an Overview and Scrutiny Board (OSB) and 7 scrutiny panels, including a panel that covers Environment. In line with recommendations from the Pitt Review, a report on progress made throughout the year and future proposed actions is considered by the panel each spring.

### **3 METHODOLOGY AND DATA REVIEW.**

#### **3.1 INFORMATION GATHERING**

As part of the PFRA information has been gathered from a variety of sources, the sources and information are listed below: -

##### **Middlesbrough Council**

###### *Tees Valley Strategic Flood Risk Assessment 2007*

JBA Consultants undertook the SFRA in collaboration with our colleagues in the other Tees Valley Authorities. Its aim was to ensure that the requirements of PPS25 were fully addressed within the Local Development Framework. To carry out the SFRA it was necessary to collect and review existing information. This included known or perceived flood risk issues, development pressures, historical records, Critical Ordinary Watercourse (COW) designations and Catchment topography.

###### *Strategic Surface Water Flooding Study 2010*

This strategic surface water study was completed as a partial update to the Strategic Flood Risk Assessment (2007).

The data used in formulating the study included,

- Historic flooding information
- NWL provided strategic sewer flood risk information at drainage area level. This included the level of sewer flood risk at each drainage area categorised as high, medium or low flood risk. These categories were derived using the total number of internal and external DG5 and DG10 records within each drainage area i.e. the number of properties which have historically suffered flooding from sewer network.
- Environment Agency's Areas Susceptible to Surface Water Flooding maps

All of the above data was combined and mapped in a GIS interface and assessed in order to identify Critical Drainage Areas.

###### *Surface Water Management Plan*

The Surface Water Management Plan is still under consideration however information has already been gathered which helped to inform this assessment.



### *Historical Data*

This is mainly data collated by Council Officers during their duties.

## **Environment Agency**

### *Catchment Flood Management Plans (CFMPs)*

A Catchment Flood Management Plan (CFMP) is a high level strategic plan that identifies the need for sustainable inland flood risk management over the next 100 years. The aim in producing this document is to set the overall direction of flood risk management considering the whole catchment as a single unit, regardless of boundaries.

### *Flood Maps*

The Flood Maps are available on the Environment Agencies website. It is a multi-layered map which provides information on flooding from rivers and the sea for England and Wales. The Flood Map also has information on flood defences and the areas benefiting from those flood defences.

The layers of information include

- Flooding from rivers or sea without defences - the natural flood plain area that could be affected in the event of flooding from rivers and the sea.  
(For flooding from rivers the map indicates the extent of a flood with a 1% (1 in 100) or greater chance of happening each year)
- Extent of extreme flood - the extent of a flood with a 0.1% (1 in 1000) or greater chance of happening each year
- Flood defences - flood defences such as embankments and walls, and flood storage areas (which are areas of land designed and operated to store flood water)
- Areas benefiting from flood defences.
- Main rivers - these are usually statutory designated watercourses that pose the greatest flood risk.

### *Areas Susceptible to Surface Water Maps*

These maps shows areas that are susceptible to surface water flooding. Each map provides three bandings, indicating 'less' to 'more' susceptible to surface

water flooding. The 'more' band will be useful to help identify areas that have a natural vulnerability to:

- flood first;
- flood deepest;
- and/or flood for relatively frequent, less extreme events (when compared to the other bands).

#### *Flood Map for Surface Water*

This identifies land naturally vulnerable to surface water or "pluvial" flooding. following extreme rainfall events, it also takes into account the drainage system by taking off 12mm/hr from the 200 yr rainfall intensity.

#### *Groundwater Vulnerability Maps*

These maps show areas that are susceptible to groundwater flooding

#### *Historical Data*

This dataset is a compilation of mainly point data submitted to the Environment Agency by fire services, local authorities and water companies. They will also include Environment Agency's own data.

#### *LiDAR*

Airborne laser mapping technique producing precise elevation data

#### *National Receptor Dataset*

The National Receptor Dataset (NRD) is a collection of risk receptors primarily intended for use in flood and coastal erosion risk management. It is available for use by Local Planning Authorities, Environment Agency and their contractors

#### *Reservoir Inundation Maps*

Middlesbrough has one large raised reservoir that we are responsible for, Hemlington Lake. An inundation mapping exercise was carried out by the Environment Agency in relation to this lake.

### **Northumbrian Water Limited**

As some of the information Northumbrian Water hold is sensitive there is a data sharing protocol in place.

#### *Sewer flooding locations*

This data set is of sewer flooding locations where there are properties on DG5 sewer flooding (1 in 10, 2 in 10 and 1 in 20 year) registers. This information was forwarded as a spreadsheet showing 100m grid references so that no single property could be identified..

#### *Sewer Flooding Pipe Length*

These refer to pipe lengths where hydraulic incapacity has been identified in storm conditions, however none were identified in Middlesbrough.

### **Cleveland Emergency Planning Unit**

#### *Cleveland LRF Flood Plan*

This plan outlines the combined responses to flooding. It is intended to provide a basis for all category 1 and 2 responders responding to flooding. The plan based on community level assessments of flooding from rivers, groundwater, surface water and defences being overtopped or failing.

The partners concerned readily supplied all the information listed above, the majority of it being available to the public.

### **3.2 DATA STORAGE, QUALITY AND RESTRICTIONS**

The data is shared as mapping overlays using Cartology, our corporate Geographical Information System (GIS). All the data is stored on a secure file server, with access being limited to only those on the domain with the necessary permissions. The server is backed up nightly allowing data to be readily restored in case of emergency.

This scenario will continue in the future, however it will be reviewed as technology continues to improve.

We are considering using the Environment Agency's National Flood Coastal Defence Database (NFCDD) for recording our flood assets on.

As some of the information has been supplied by our partners it is assumed that it is correct and "fit for purpose". However the majority of the information is being regularly reviewed and updated where required.

The providers license some of the information, mainly The Environment Agency they also have the following disclaimer

*"We do not promise that the information supplied to you will always be accurate, complete or up to date or that the information will provide any particular facilities or functions or be suitable for any particular purpose".*

There is also a data user licence being agreed with Northumbrian Water Limited (NWL). The information supplied by NWL is classed as sensitive and therefore not available to the public

## **4 PAST FLOOD RISK**

### **4.1 HISTORIC FLOOD EVENTS**

This section describes past flood events that have had significant harmful consequences for human health, economic activity, cultural heritage and the environment.

#### Ormesby Beck

This flooding is predominantly due to overtopping of Ormesby Beck, however culvert restrictions under the Middlesbrough to Whitby railway line prevented water being passed through.

In November 2000 there was severe flooding to several properties in Kentmere Road.

In August 2008 6 properties in Stanhope Gardens and 3 properties in Kentmere Road were flooded to depths of between 200mm and 270mm.

In July 2009 6 properties Stanhope Gardens reported being flooded to depths of between 50mm and 270mm, along with 3 properties in Kentmere Road. These instances were recorded on the Council Contact system and verified by Environment Agency staff who attended the scene. The Environment Agency are now responsible for Ormesby Beck which is now classed as main river.

#### Marion West Beck

Following intense period of heavy rainfall flows from heavily developed areas upstream make their way downstream, where Marion West Beck becomes critical and surcharges. This has resulted in 230 homes becoming flooded. Marion West Beck is classified as a Rapid Response Catchment. Subsidiary flooding added to the event due to the sewerage system being overwhelmed during flooding, causing further surcharging.

These occurrences, happened in Summer/Autumn 2000 and Summer 2002. A number of properties were flooded as a result of the overtopping along Marion West Beck. These included;

Marion Rd / Talbot St / Park Vale Rd / St.Johns Gate / Borough Rd - 230 properties

Valley Rd / Aspen Dr. -75 properties

Ravenscroft Ave / Emmerson Ave / Glendale Rd, 15 properties. The latter location was also prone to flooding from combined sewer surcharges, however mitigation works, carried out by NWL, have now taken place to alleviate this.

Following the floods in 2000 a major project was instigated to incorporate over 20,000m<sup>3</sup> of additional storm water storage capacity in Albert Park Lake. This will provide storage for excess flows in Marton West Beck and therefore reduce the flood risk downstream of Park Road North.

The Environment Agency are now responsible for Marton West Beck which is now classed as main river.

#### Moortown Road, Sunningdale Road

Following intense rain in the Autumn 2001, the culvert taking surface water run off from adjacent playing fields surcharged. This caused a number of properties to be flooded as the water passed overground, overwhelming sewer systems.

#### Croft Avenue

During severe rainfall events sewer surcharges results in several properties either side of number 16 being flooded. This was first recorded in Autumn 2002, but reoccurrences have also been noted since

#### Holbeck Road

Flooding to 1-15 Holbeck Avenue during times of intense rain. Surface Water run off comes from surrounding roads which all fall down towards Holbeck Avenue. Existing sewer systems can not cope with the volume of water.

#### Middlebeck (Town Farm)

The watercourse has overflowed on a number of occasions including Autumn 2000, mainly due to restrictions caused by the highway culverts. This has led to properties being flooded in Courtney Walk and Kelfield Avenue.

#### Hemlington 'B's

Surface Water culvert surcharging due to capacity restraints led to a number of properties flooding. Modifications have since taken place to the culvert entrance and ditch.

#### Blairgowrie

A number of properties were flooded during periods of intense rainfall during October 2006 and May 2007. The ordinary watercourse which runs adjacent to these properties was diverted and turns 90° into a culvert. This can not cope with the flow of water around this bend, leading to it overtopping bank sides, and flooding adjacent properties.

Detailed records of these floods can be found in a spreadsheet in annex 1  
Summary maps can be found in annex 6.

#### 4.2 CONSEQUENCES

The consequences of flooding can be adverse (harmful) or positive. It may include consequences for human health, the social and economic welfare of individuals and communities, infrastructure, and the environment (including cultural heritage). The Regulations require consideration of significant harmful consequences on:

- Human health
- Economic activity
- Environment (including cultural heritage).

**Whilst the flood occurrences listed in the past risk spreadsheet (annex 1) have had significant consequences for those involved on a number of occasions they are not significant in line with the definition of significant provided by DEFRA.**

The definition of 'significant' as required for EU reporting purposes is explained on page 24 under 'Identification of Flood Risk areas'. From a local stance a flood is deemed significant if 5 or more properties, 1 or more critical infrastructure, are flooded or a transport link for more than 10 hours is flooded.

There is a vast distinction between what is being reported by the Environment Agency/DEFRA to the EU and local significant floods, they are none the less important to ourselves as LLFA. We have compiled a spreadsheet of all reported flood incidents in Middlesbrough and this can be found in Annex 6

## **5 FUTURE FLOOD RISK**

### **5.1 SUMMARY**

A number of scenarios have been produced by the Environment Agency to encompass future flood risks. These are as follows.

Areas Susceptible to Surface Water Flooding (AStSWF) – Less, this identifies areas which are 'less susceptible' to surface water flooding. 13,300 residential properties in Middlesbrough could be affected along with 2,400 non residential properties

Areas Susceptible to Surface Water Flooding (AStSWF) – Intermediate, this identifies areas with 'intermediate susceptibility' to surface water flooding. 4,700 residential properties in Middlesbrough could be affected along with 1,000 non residential properties

Areas Susceptible to Surface Water Flooding (AStSWF) – More. This identifies areas which are 'more susceptible' to surface water flooding

Flood Map for Surface Water (FMfSW) - 1 in 30 -This refers to the probability of the rainfall event, in this case producing flooding of greater than 0.1m depth

Flood Map for Surface Water (FMfSW) - 1 in 30 deep - This refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth

Flood Map for Surface Water (FMfSW) - 1 in 200. This refers to the probability of the rainfall event, in this case producing flooding of greater than 0.1m depth. 8,600 residential properties in Middlesbrough could be affected along with 1,500 non residential properties.

Flood Map for Surface Water (FMfSW) - 1 in 200 deep. This refers to the probability of the rainfall event, in this case producing flooding of greater than 0.3m depth. 1,600 residential properties in Middlesbrough could be affected along with 300 non residential properties.



Areas Susceptible to Groundwater Flooding (AStGWF) -Shows places where groundwater emergence more likely to occur

Flood Map (for rivers and sea) - Flood Zone 3 shows areas of land with an annual probability of flooding of 1.0% or greater from rivers, and 0.5% or greater from the sea

Flood Map (for rivers and sea) - Flood Zone 2 shows areas of land with an annual probability of flooding of 0.1% or greater from rivers and the sea, but with an annual probability of flooding of less than 1% from rivers or 0.5% from the sea.

The following scenarios have emerged from the Surface Water Management Plan, which is being developed by Middlesbrough Council. Some of the predictions use those scenarios listed above but are more specific in location.

Areas Susceptible to Surface Water Flooding (AStSWF) – Less. The main source of flooding would be surface water run off caused by natural exceedance. The areas affected are Marton Road, Talbot Street, Park Vale Road, St Johns Gate, and Borough Road

Areas Susceptible to Surface Water Flooding (AStSWF) – Intermediate. The main source of flooding would be surface water run off caused by natural exceedance. The areas affected are Valley Road, Aspen Drive

Areas Susceptible to Surface Water Flooding (AStSWF) – More. The main source of flooding would be surface water run off caused by natural exceedance. The areas affected are Ravenscroft Avenue, Emmerson Avenue, and Glendale Road

Flood Map for Surface Water (FMfSW) - 1 in 30. The main source of flooding would be surface water run off caused by natural exceedance. The areas affected are Moortown Road, Sunningdale Road

Flood Map for Surface Water (FMfSW) - 1 in 30 deep. The main source of flooding would be surface water run off caused by natural exceedance. The area affected is Croft Avenue

Flood Map for Surface Water (FMfSW) - 1 in 200. The main source of flooding would be surface water run off caused by natural exceedance. The areas affected are Kentmere Road and Stanhope Gardens, both of which have now received property level flood protection measures.

Flood Map for Surface Water (FMfSW) - 1 in 200 deep. The main source of flooding would be surface water run off caused by natural exceedance. The area affected is Holbeck Road

Areas Susceptible to Groundwater Flooding (AStGWF). The main source would be from groundwater and the areas affected are Middle Beck, Town Farm

Flood Map (for rivers and sea) - flood zone 3. The main source of flooding would be from ordinary watercourses and caused by natural exceedance. The area affected is Blairgowrie

Flood Map (for rivers and sea) - flood zone 2. The main source of flooding would be from ordinary watercourses and caused by natural exceedance. The area affected is Hemlington 'B's

Whilst all sources of information have been used to identify the scenarios above following discussions with our partners, as detailed in the next section, it was decided that the Areas Susceptible to Surface Water maps best represents local conditions and will be used in the consideration of future flood risk management.

The following predictions are derived directly from detailed surface water mapping carried out during the SWMP. The main source of flooding would be surface water run off caused by natural exceedance

The areas affected are

Longlands Road/Cargo Fleet Lane, North Ormesby, 109 residential properties and 7 non residential properties could be affected

Ridgeway/Stainton Way, Coulby Newham, 12 Non residential properties, 2 Critical and 1 non residential could be affected

Acklam Green, 48 residential properties could be affected.

Parliament Road, 1 critical property and 5 non residential properties could be affected.

## 5.2 LOCALLY AGREED SURFACE WATER INFORMATION

The extent of flooding is often topographically defined (i.e. dependent on the height of the land), we can make assumptions about the extent of flooding from surface runoff and small ordinary watercourses, which is likely to be similar in many cases.

Two sets of maps have been provided by the Environment Agency

### *Flood Map for Surface Water*

This identifies land naturally vulnerable to surface water or “pluvial” flooding. following extreme rainfall events The 1 in 200 year event used in modelling for the map would overwhelm even the most modern drainage system and so any impact from the drainage system can be ignored and is not accounted for in the model

### *Areas Susceptible to Surface Water*

This map shows areas that are susceptible to surface water flooding, with three bandings, indicating ‘Less’ to ‘More’ susceptible to surface water flooding.

The map has been produced using a simplified method that ignores urban sewerage and drainage systems, ignores buildings, and uses a single rainfall event – therefore it only provides a general indication of areas which may be more likely to suffer from surface water flooding.

After reviewing both these maps with Environment Agency representative it was decided that Areas Susceptible to Surface Water best represents local conditions and will be used in the consideration of future flood risk management. Detailed records of future floods and their possible consequences can be found in the spreadsheet (annex 2)

Fig 3, Areas Susceptible to Surface Water



Head of Service:	Ref:
Service Area:	Scale:
Created by:	Date: 25th January 2011

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## 5.3 THE IMPACTS OF CLIMATE CHANGE

### **The Evidence**

There is clear scientific evidence that global climate change is happening now. It cannot be ignored. Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation, however the broad trends are in line with projections from climate models.

Greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in future. Past GHG emissions mean some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

We have enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we can't be sure about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day). It is plausible that the amount of rain in extreme storms (with a 1 in 5 annual chance, or rarer) could increase locally by 40%.

### **Key Projections for Northumbria River Basin District**

If emissions follow a medium future scenario, UKCP09 projected changes by the 2050s relative to the recent past are

- Winter precipitation increases of around 10% (very likely to be between 0 and 23%)
- Precipitation on the wettest day in winter up by around 11% (very unlikely to be more than 24%)
- Relative sea level at Tynemouth very likely to be up between 7 and 38cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- Peak river flows in a typical catchment likely to increase between 8 and 13%

Increases in rain are projected to be greater near the coast than inland.

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability.

Wetter winters and more of this rain falling in wet spells may increase river flooding in both rural and heavily urbanised catchments. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected.

Rising sea or river levels may increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses. Where appropriate, we need local studies to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and drainage will help us adapt to climate change and manage the risk of damaging floods in future.

### **Adapting to Change**

Past emission means some climate change is inevitable. It is essential we respond by planning ahead. We can prepare by understanding our current and future vulnerability to flooding, developing plans for increased resilience and building the capacity to adapt. Regular review and adherence to these plans is key to achieving long-term, sustainable benefits.

Although the broad climate change picture is clear, we have to make local decisions in a climate of uncertainty. We will therefore consider a range of measures and retain flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help to ensure that we do not increase our vulnerability to flooding.

### **5.4 LONG TERM DEVELOPMENTS**

It is possible that long term developments might affect the occurrence and significance of flooding. However current planning policy aims to prevent new development from increasing flood risk.

In England, Planning Policy Statement 25 (PPS25) on development and flood risk aims to "ensure that flood risk is taken into account at all stages in the

planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall."

Adherence to Government policy ensures that new development does not increase local flood risk. However, in exceptional circumstances the Local Planning Authority may accept that flood risk can be increased contrary to Government policy, usually because of the wider benefits of a new or proposed major development. Any exceptions would not be expected to increase risk to levels which are "significant" (in terms of the Government's criteria).

#### 5.5 RELEVANT LOCAL INFORMATION

The North East Climate Change Adaptation Study (2008) made use of assessments from the Environment Agency's Rainfall and Weather Impact Generator (EARWIG) for ten locations across the North East region to determine the climate changes projected by the 2050s. Key findings from this assessment across the North East region are:

- a. Annual rainfall is projected to reduce throughout the region by up to 10%.
- b. Rainfall is projected to show increased seasonality with increases of up to around 21% in winter and reductions of up to around 37% in summer.
- c. There is projected variability in extreme rainfall events, but increases of up to around 20% will be felt in some areas.

#### 5.6 FUTURE MAJOR DEVELOPMENTS

There are a number of major developments proposed with in the Authorities area these are listed as follows.

Hemlington Grange	NZ5014	Cannon Park	NZ4820
Dixons Bank	NZ5313	Middlehaven	NZ4920
Stainton Hall Farm	NZ4715	Grove Hill	NZ4918
Strait Lane	NZ4714	Gresham	NZ4919
Old Police HQ	NZ5015		

Middlesbrough Council are also reviewing the Strategic Housing Land Availability Assessment (SHLAA). The purpose of this is to identify potential sites to meet housing requirements over the next 15 years.



## 6 IDENTIFICATION OF FLOOD RISK AREAS

### 6.1 OVERVIEW

The criteria for assessing whether the risk of flooding is 'significant', as required by regulation 14 of the Flood Risk Regulations 2009 was developed by DEFRA

Flood Risk Thresholds which are 1km grid squares of places where flood risk may be an issue were identified. These show wherever at least 200 people or 20 businesses or more than 1 critical service might be flooded to a depth of 0.3 metres by a rainfall event, with a chance of 1 in 200 of occurring in any given year.

Indicative flood risk areas were based on clusters formed from all 3km x 3km squares that contain 5 or more places above the Flood Risk Thresholds (1km squares) that are touching. Indicative flood risk areas were labeled with their location and the number of people at risk. **Clusters with fewer than 30,000 people at risk have not been designated as indicative flood risk areas, as designated by European Union guidance.**

Using the AStSWF maps Middlesbrough has 8 1km squares within the authorities boundary with 5 touching however these are all linear so therefore does not fall within a 3km x 3km square. Teesside in general has 19385 people at risk of flooding from Surface Water run off along with 118 critical services and 2063 non-residential properties. This will not therefore be reported to the EU by the EA under the Flood Risk Regulations 2009.

## 7 NEXT STEPS

To continue to fulfil the role as LLFA it is a requirement to investigate future flood events and to ensure that information is collected, assessed and stored. In this role we have started to use a spreadsheet similar to the PFRA spreadsheet (the spreadsheet that will be used for reporting significant flood risk to the EU) to record flood incidents. Future recording of flood incidents will follow the principles given in the INSPIRE European Directive

However it is being proposed that our neighbouring authority, Stockton Borough Council, take a lead authority role for the Tees Valley authorities ourselves included. Discussions are being held to finalise the exact details but the collecting and storing of the information will be included. These discussions will also help formulate Middlesbrough's Local Flood Strategy.

## **References**

Tees Valley Strategic Flood Risk Assessment 2007	JBA Consulting
Strategic Surface Water Flooding Study 2010	JBA Consulting
Tees Catchment Flood Management Plans 2009	Environment Agency
Flood Maps	<a href="http://www.environment-agency.gov.uk">http://www.environment-agency.gov.uk</a>
Areas Susceptible to Surface Water Maps	Environment Agency
Flood Map for Surface Water	Environment Agency
Cleveland LRF Flood Plan 2010	Cleveland LRF

## Annex 1 - Records of past floods and their significant consequences

Please refer to Annex 1 of the Preliminary Assessment Spreadsheet which has been supplied alongside this report

## Annex 2 - Records of future floods and their consequences

Please refer to Annex 2 of the Preliminary Assessment Spreadsheet which has been supplied alongside this report

Annex 3 - Records of Flood Risk Areas and their rationale  
(preliminary assessment report spreadsheet)

Not Required

## Annex 4 - Review checklist

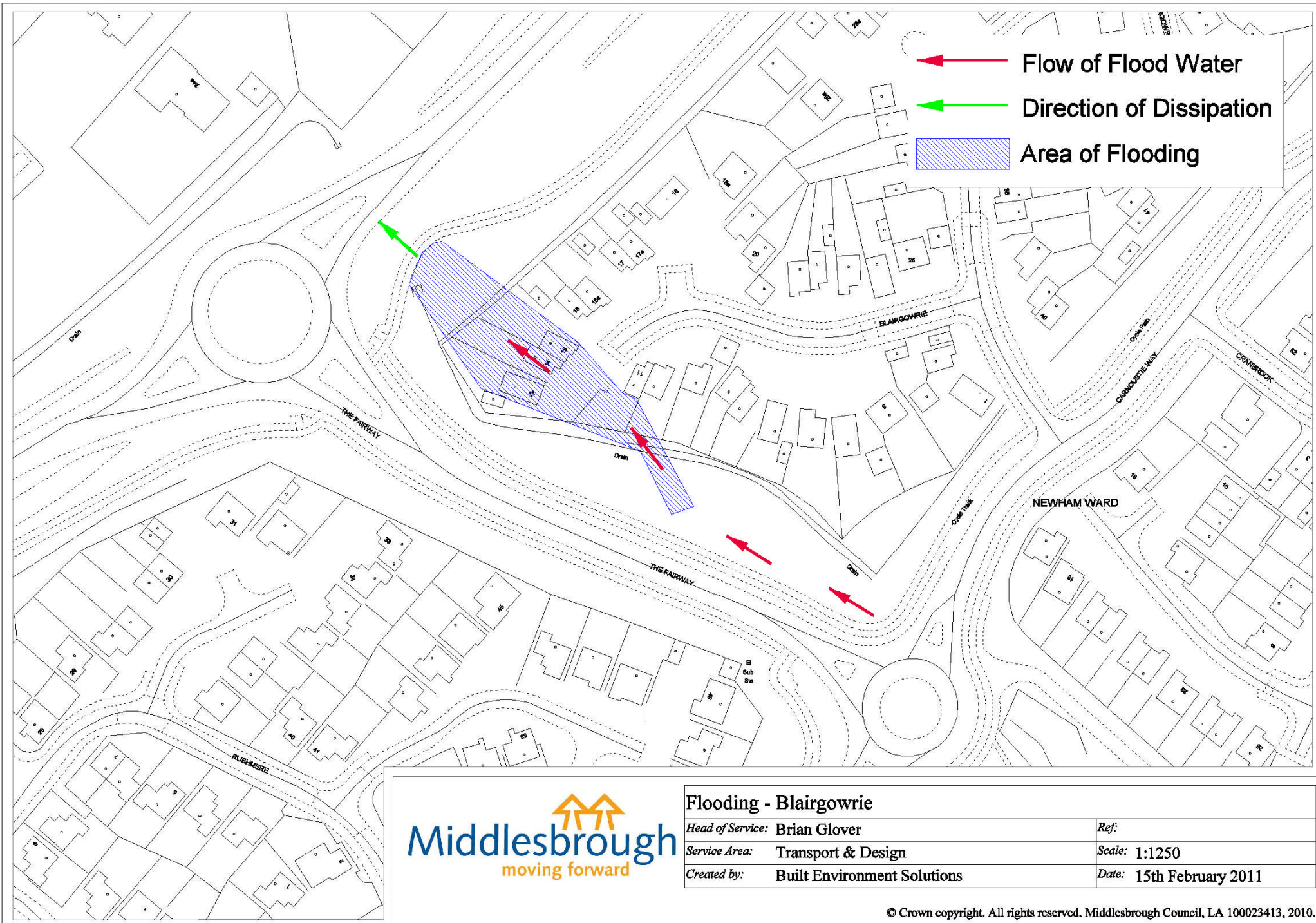
Please refer to PFRA review checklist which has been supplied alongside this report

**Annex 5 - GIS layer of flood risk area(s)**

**Not Required**

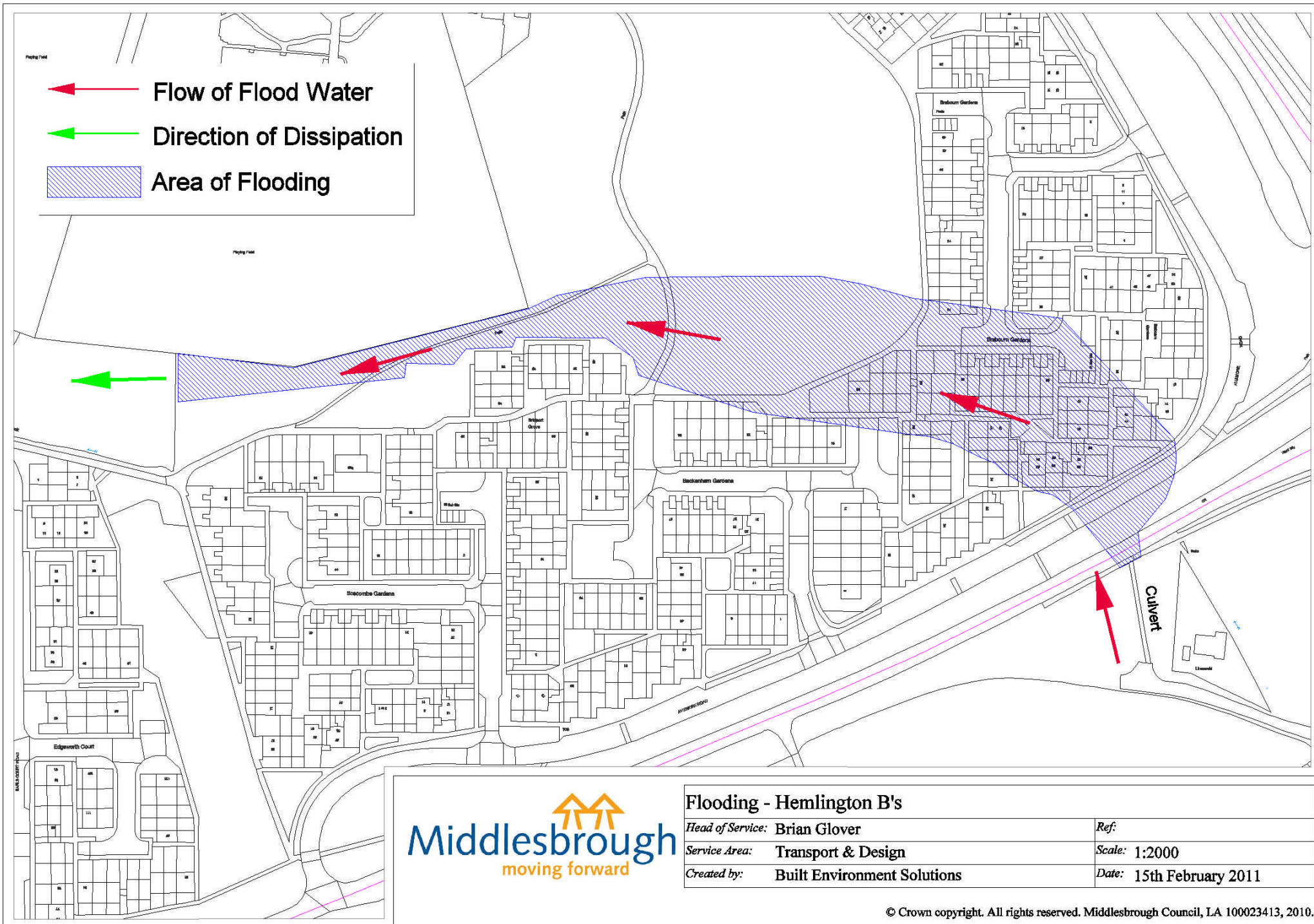
## Annex 6 - Summary Maps for Past Floods





**Flooding - Blairgowrie**

Head of Service: Brian Glover	Ref:
Service Area: Transport & Design	Scale: 1:1250
Created by: Built Environment Solutions	Date: 15th February 2011



**Flooding - Hemlington B's**

*Head of Service:* Brian Glover

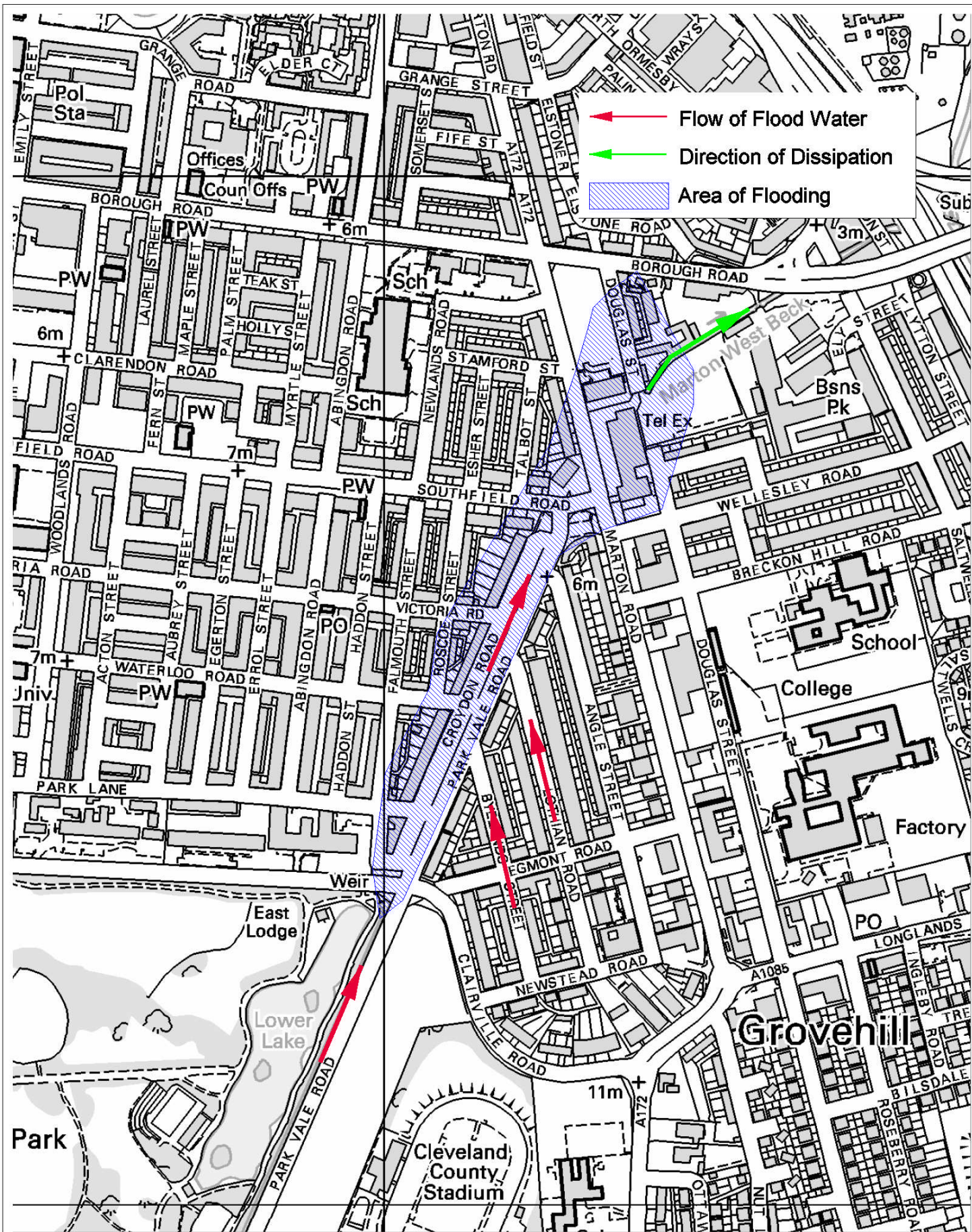
*Ref:*

*Service Area:* Transport & Design

*Scale:* 1:2000

*Created by:* Built Environment Solutions

*Date:* 15th February 2011



**Flooding - Clairville**

Head of Service: Brian Glover

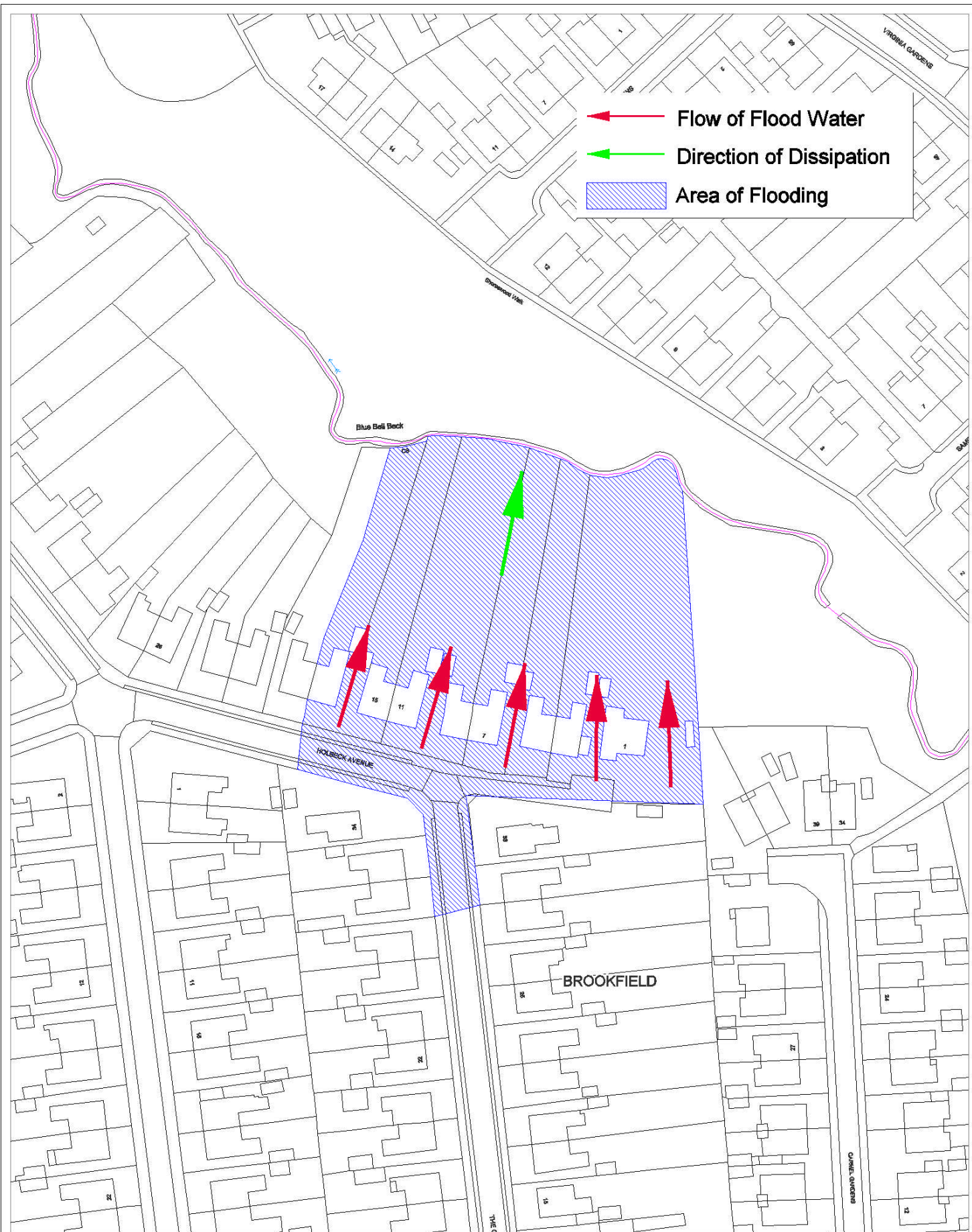
Ref:

Service Area: Transport & Design

Scale: 1:5000

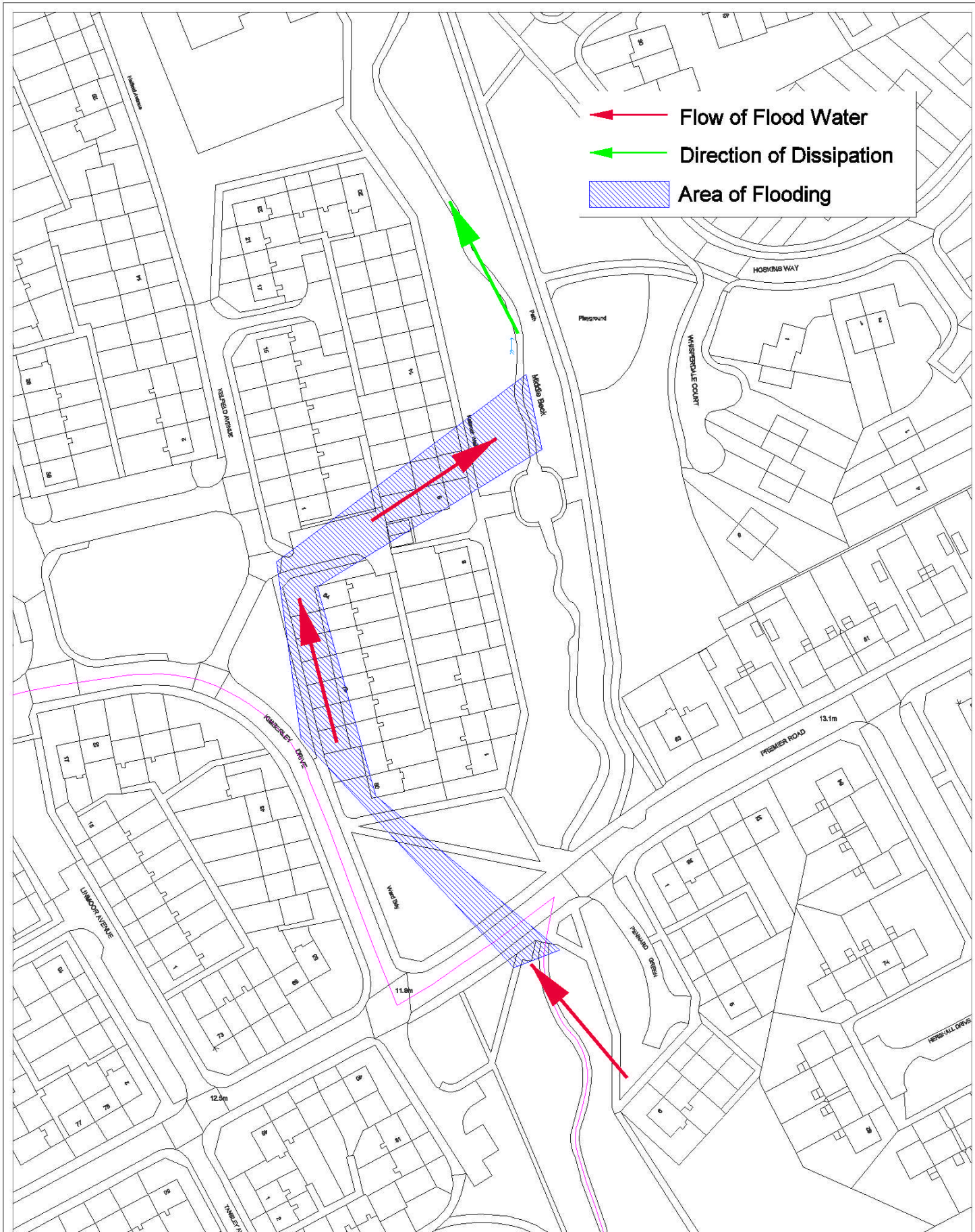
Created by: Built Environment Solutions


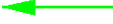

Date: 15th February 2011

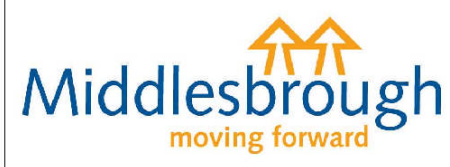


**Flooding - Holbeck Avenue**

Head of Service:	Brian Glover	Ref:
Service Area:	Transport & Design	Scale: 1:1250
Created by:	Built Environment Solutions	Date: 15th February 2011

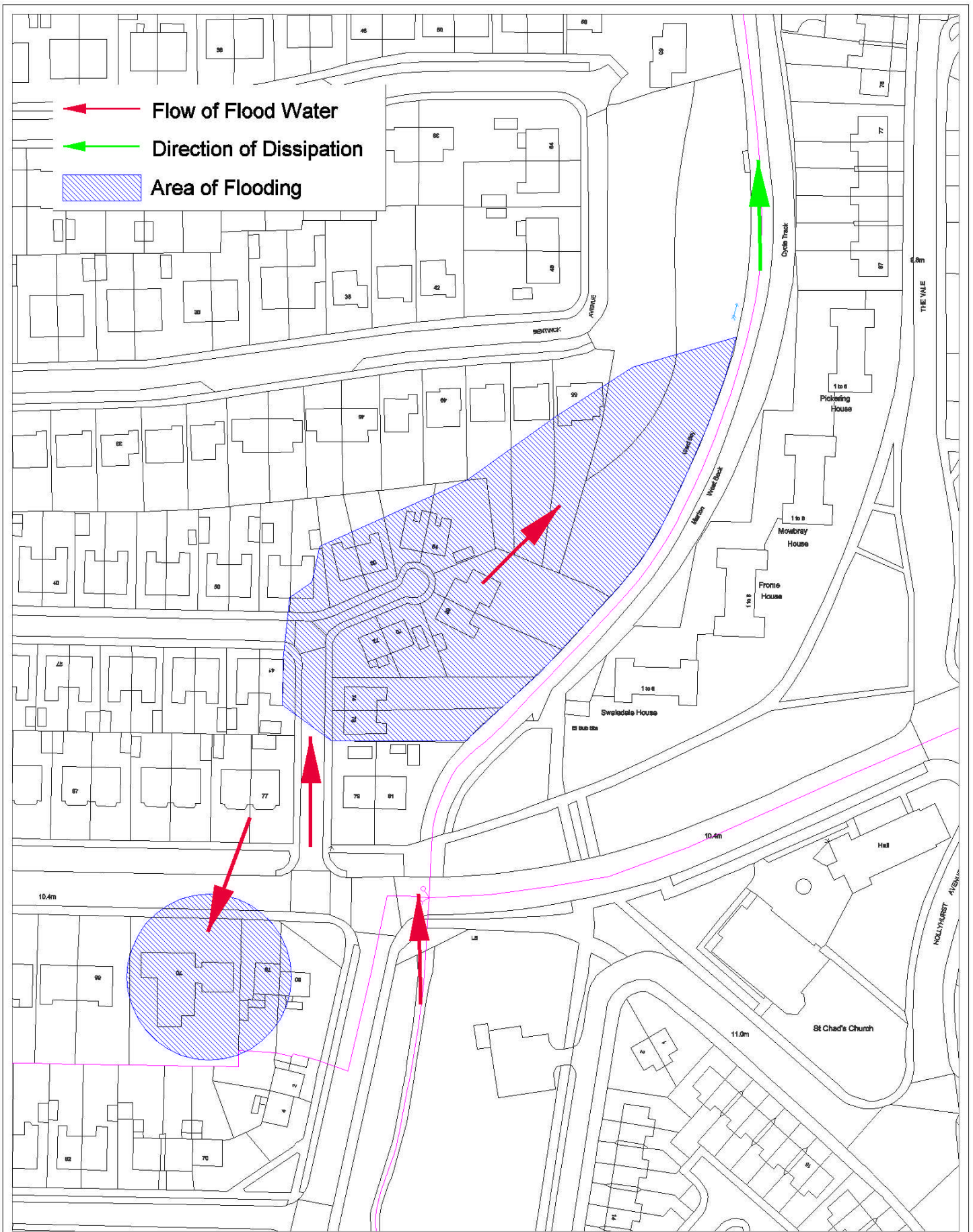


-  Flow of Flood Water
-  Direction of Dissipation
-  Area of Flooding



**Flooding - Premier Road**

Head of Service:	Brian Glover	Ref:
Service Area:	Transport & Design	Scale: 1:1250
Created by:	Built Environment Solutions	Date: 15th February 2011



### Flooding - Ravenscroft Avenue

Head of Service: Brian Glover

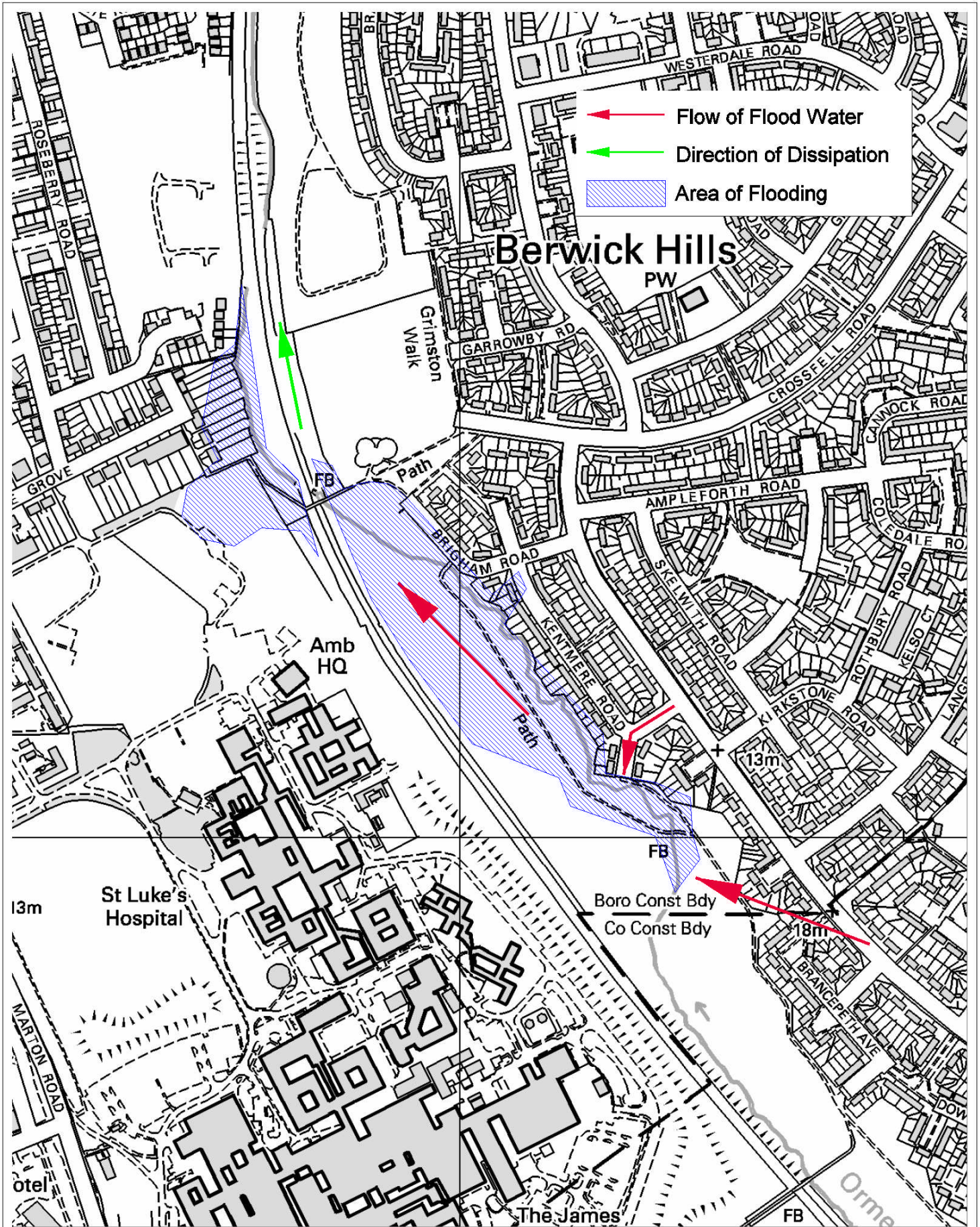
Service Area: Transport & Design

Created by: Built Environment Solutions

Ref:

Scale: 1:1250

Date: 15th February 2011



**Flooding - Stanhope Gardens**

Head of Service: Brian Glover

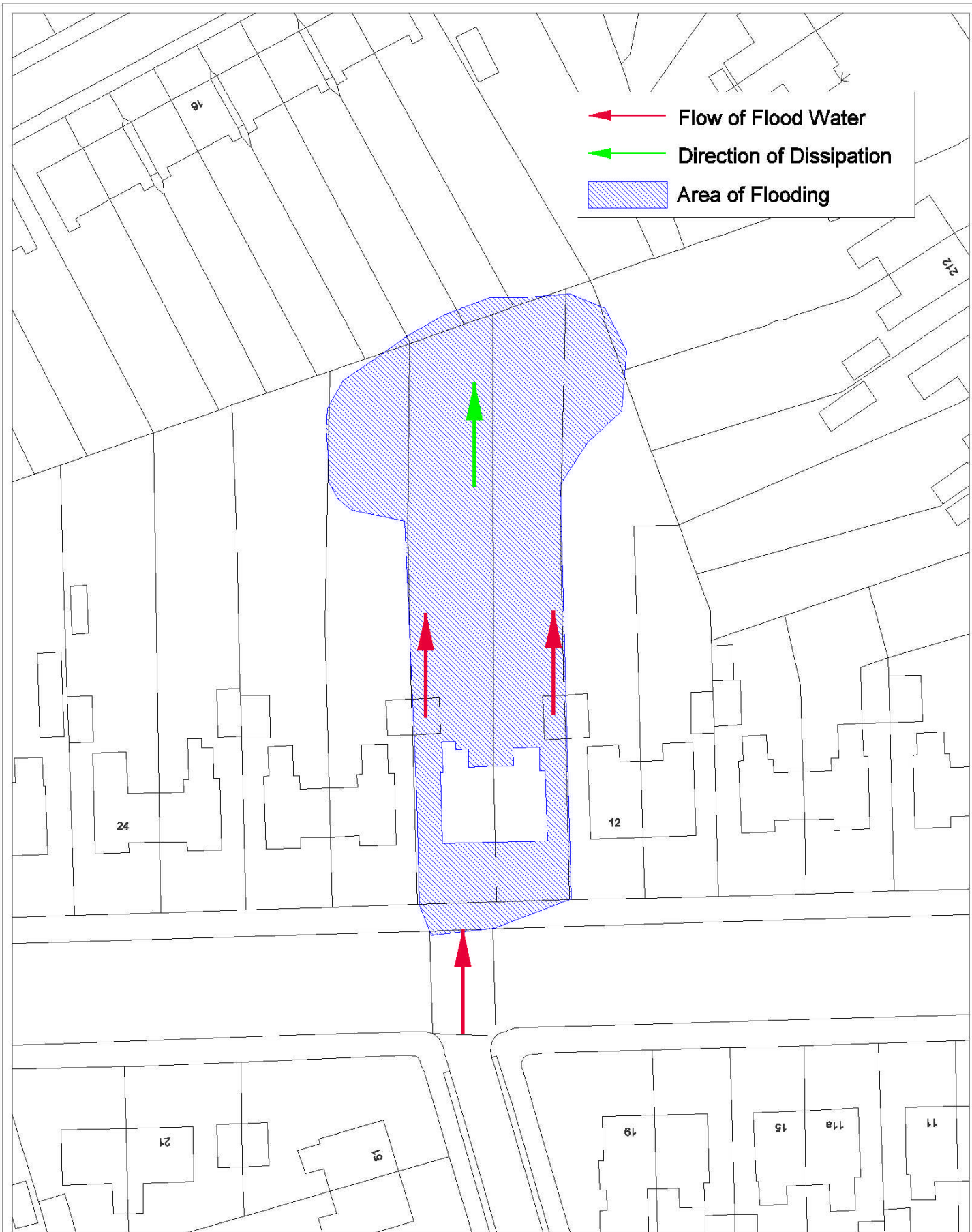
Service Area: Transport & Design

Created by: Built Environment Solutions

Ref:

Scale: 1:5000

Date: 15th February 2011



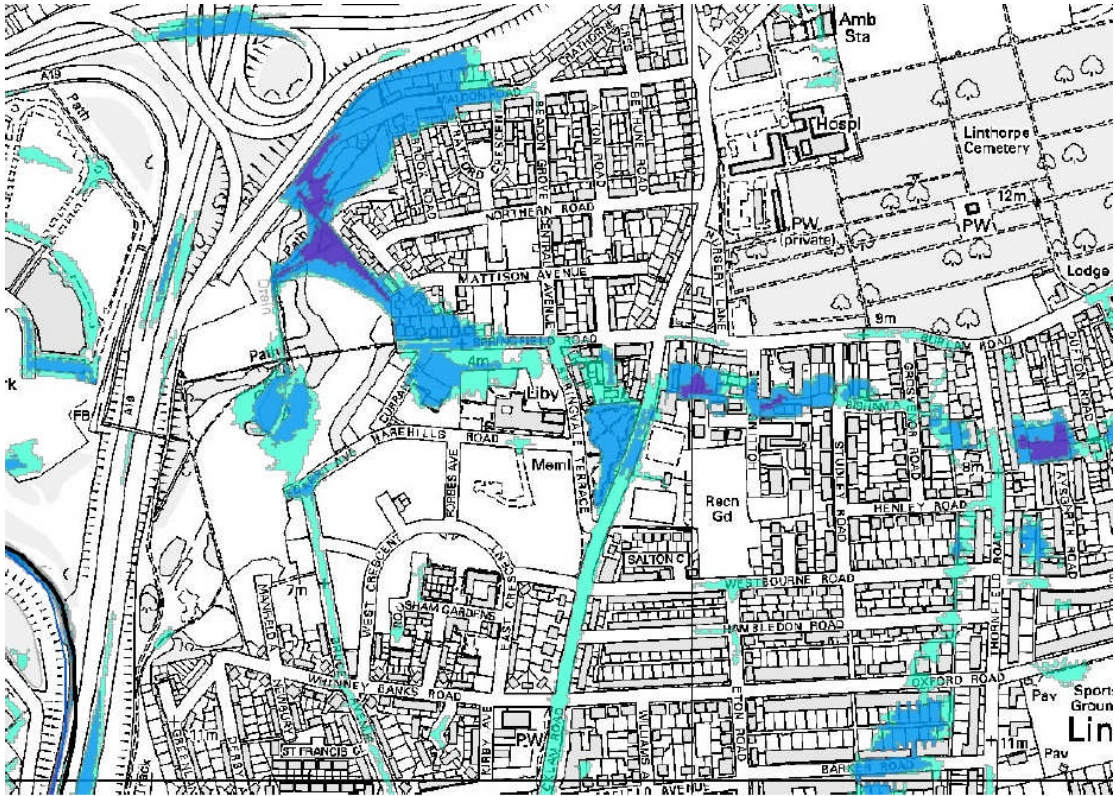
**Flooding - Croft Avenue**

Head of Service: Brian Glover	Ref:
Service Area: Transport & Design	Scale: 1:625
Created by: Built Environment Solutions	Date: 15th February 2011



## Annex 7 - Summary Maps for future floods





Acklam Green



Parliament Road

## Annex 7- All floods spread sheet

Please refer to Annex 1 of the all floods Spreadsheet which has been supplied alongside this report