

NOTE TO FILE

JBA Project Code 2017s5531
 Contract Stockton on Tees Level 1 SFRA
 Client Stockton on Tees Borough Council
 Day, Date and Time 11th April 2017
 Author Mike Williamson, Tasmin Fletcher
 Subject Functional Floodplain



1 Functional Floodplain Definition

1.1 Flood Risk and Coastal Change PPG – Table 1, Paragraph 065

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's [Flood Map for Planning \(Rivers and Sea\)](#), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the [Strategic Flood Risk Assessment](#) when considering location and potential future flood risks to developments and land uses.

1.2 Flood Risk and Coastal Change PPG – Paragraph 015

The definition of Flood Zone 3b in Table 1 explains that local planning authorities should identify areas of functional floodplain in their Strategic Flood Risk Assessments in discussion with the Environment Agency and the lead local flood authority. The identification of functional floodplain **should take account of local circumstances and not be defined solely on rigid probability parameters**. However, land which would naturally flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood (such as a flood attenuation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

A functional floodplain is a very important planning tool in making space for flood waters when flooding occurs. Generally, development should be directed away from these areas using the Environment Agency's catchment flood management plans, shoreline management plans and local flood risk management strategies produced by lead local flood authorities.



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The area identified as functional floodplain **should take into account the effects of defences** and other flood risk management infrastructure. Areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain. If an area is intended to flood, e.g. an upstream flood storage area designed to protect communities further downstream, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often.

2 2010 Functional Floodplain

Text taken from the 2010 Level 1 SFRA:

The Functional Floodplain (Flood Zone 3b) has been defined using modelled 1 in 25 year outlines where available. The modelled outlines were then edited using the following methodology:

- Exclusion of purely tidal areas
- Inclusion of land which provides a function for flood conveyance or flood storage (e.g. washlands)
- Removal of areas benefitting from defences (ABDs)
- Removal of developed (Brownfield) land
- Removal of major transport infrastructure (e.g. motorways and railways)
- Removal of 'dry islands' defined using the 'size standards' within the Environment Agency SFRM Specification for Flood Risk Mapping¹

For those watercourses that have not been modelled, "Candidate Flood Zone 3b" areas have been identified based on the Environment Agency Flood Zone 3 outlines. Greenfield areas within Flood Zone 3 have been identified which should be safeguarded from future development. Storing flood water in these areas during an event could potential reduce risk downstream at urban areas in the future.

However, as these areas have not been explicitly modelled and are partly based on profession judgement, it is important that they are assessed in more detail at a site-specific FRA level if development is planned in the future. However it is recommended in this SFRA that they are left as open greenfield for future flood storage or as flood compensation needed to allow other development.

The data used to define the 2010 functional floodplain and "Candidate Flood Zone 3b" for each watercourse is summarised below:

Watercourse	Extent	Data Source
Cowbridge Beck	1 in 25 year	Cowbridge Beck Flood Mapping Study (2006)
Lustrum Beck	1 in 25 year	Lustrum Beck Data Improvements (Black and Veatch, March 2008)
River Tees (fluvial)	1 in 25 year	River Tees Model Update (2007)
Unnamed watercourses that converge with Lustrum Beck	1 in 25 year	Dales Area Floodplain Mapping (2005)
Remaining locations	1 in 100 year	Candidate Flood Zone 3b areas using Flood Zone 3.

¹ Environment Agency (2006) *Strategic Flood Risk Management Specification for Flood Risk Mapping* release 1.2

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3 Functional Floodplain Delineation

Based on the above guidance and definitions provided in the FRCC-PPG, the following models and modelled flood outlines (MFO) were provided by the EA:

Watercourse	Extent	Data Source	Included in Functional Floodplain delineation (Yes/No)
Cowbridge Beck	Wynyard Village to railway line at Cowpen Bewley Country Park	Billingham Cowbridge Beck Modelling Study 2016 – 20 year undefended MFO	Yes
Lustrum Beck	A66 downstream of Hartburn Bridge to the Tees confluence	Lustrum Beck Depth Velocity Study 2013 – 20 year defended MFO	Yes
Lustrum Beck	Downstream of the outfall of the Primrose Hill culvert to the Tees confluence	Lustrum Beck – Billingham Beck Tidal Interactions Study 2014 – 20 year defended	No – tidal areas excluded from functional floodplain
Billingham Beck	Upstream of the A1046 road bridge to the Tees confluence	Lustrum Beck – Billingham Beck Tidal Interactions Study 2014 – 20 year defended	No – tidal areas excluded from functional floodplain
River Leven	Approximately 1.5km section at Leven Bridge	River Leven at Leven Bridge Velocity Depth Study 2014	No – 20 year/25 year outlines not provided in model deliverables
Tidal River Tees	Tees Estuary	Tees Tidal Integrated Flood Risk Modelling Study 2011	No – 20 year/25 year outlines not provided in model deliverables; tidal areas excluded from functional floodplain
Tidal River Tees	Tees Estuary	Tees Tidal Integrated Flood Risk Modelling Study 2015	No – 20 year/25 year outlines not provided in model deliverables; tidal areas excluded from functional floodplain
River Tees	Approximately 2.5km section of meander at Yarm	Yarm Velocity Depth Study 2013	No – 20 year/25 year outlines not provided in model deliverables
Fluvial River Tees	Queen Elizabeth Way to the Tees Barrage	Bowesfield – Boathouse Lane ISIS-TUFLOW model JBA re-run April 2017 - 25 year undefended	Yes

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Further datasets interrogated:

- Functional Floodplain from previous SFRA (2010)
- EA Flood Storage Areas (FSA) – none present
- EA Areas Benefitting from Defences (ABD)
- EA Historic Flood Map (HFM)
- Urban areas - OSOpenMapLocal_Raster (to remove developed areas from functional floodplain)

3.1 GIS Methodology

- The 2010 functional floodplain provided the starting point (FZ3b_1.shp) and was compared to the current Flood Zone 3 of the Flood Map for Planning (version November 2016) to ascertain whether the Flood Map may have been updated since the 2010 FZ3b was finalised. No changes were made where the outlines were consistent with each other (i.e. from the same model), however in several locations the current EA FZ3 is different to the 2010 FZ3b outline, indicating that more recent modelling has been carried out since the 2010 FZ3b was produced. FZ3 was used to update the functional floodplain of the Billingham Beck at Norton, Stainsby Beck, River Tees, River Leven and Saltergill (FZ3b_2.shp), in the absence of any 20 or 25 year outlines from the most recent models. It is also worth noting that, for reasons unknown, the 2010 FZ3b along the River Tees included both the defended and undefended 25 year scenarios from the fluvial Tees Model Update 2007 study. FZ3b for the Tees has now been updated using the current FZ3 of the Flood Map for Planning.
- The 2013 Lustrum Beck 20 year defended MFO was used to update the functional floodplain for parts of the Lustrum Beck, Green’s Beck and Hartburn Beck (FZ3b_3.shp, see table below for locations).
- The 2016 Billingham Cowbridge Beck Modelling Study 20 year undefended MFO was used to update the functional floodplain for parts of the Cowbridge Beck (FZ3b_4.shp, see table below for locations).
- The ABD layer was interrogated and it was found that the defended MFOs reflected the ABDs. It was therefore considered that the ABD layer is up-to-date and the most robust dataset available to aid the removal of areas of the HFM that coincide with the ABD.
- The HFM layer was added but only where MFOs were not provided (FZ3b_5.shp).
- The OS Open Data OSOpenMapLocal_Raster dataset was used to identify urban areas, waterbodies and transport infrastructure to be removed from the functional floodplain (FZ3b_6.shp).
- FZ3b_6.shp was then clipped to the council boundary to give the draft functional floodplain outline (FZ3b_2017_Draft.shp).
- Following discussion with SBC, a re-run of the ISIS-TUFLOW model of the 25 year undefended fluvial Tees was run between Queen Elizabeth Way and the Tees Barrage using LiDAR flown in 2011. The section of FZ3b_2017_Draft covering this section was removed and replaced with the cleaned modelled flood outline. Urban areas and transport infrastructure were again removed (FZ3b_2017_Draft_update).

Watercourse	Extent	Data Source
River Tees	SBC boundary at Newsham to the Queen Elizabeth Way	Flood Zone 3
River Tees	Queen Elizabeth Way to the Tees Barrage	Bowesfield – Boathouse Lane ISIS-TUFLOW model JBA re-run April 2017 - 25 year undefended
River Tees	Thornaby-on-Tees south of A66	Historic Flood Map
River Leven	SBC boundary at Middleton-on-Leven to confluence with River Tees	Flood Zone 3
Saltergill Beck	SBC boundary at Long Lane to Saltergill Lane	Flood Zone 3
Nelly Burdon’s Beck	South of A67 to confluence with the River Tees	Flood Zone 3



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Watercourse	Extent	Data Source
Basselton Beck	Ingleby Barwick to confluence with River Tees	Flood Zone 3
Maltby Beck	SBC boundary north of Coldpool to Maltby	Flood Zone 3
Hartburn Beck/Coatham Beck/Burnwood Beck	SBC boundary at Westgate Farm to confluence with Lustrum Beck	Flood Zone 3
Lustrum Beck	A67 to Hartburn village	Flood Zone 3
Lustrum Beck	A66 downstream of Hartburn Bridge to the Tees confluence	Lustrum Beck Depth Velocity Study 2013 – 20 year defended MFO
Goosepool Beck	South of Hardstones Farm	Flood Zone 3
Billingham Beck/Thorpe Beck/Whitton Beck	Whitton to Haverton Hill Road (A1046)	Flood Zone 3
Letch Beck	Carlton to confluence with Whitton Beck	Flood Zone 3
Cowbridge Beck	Wynyard Village to railway line at Cowpen Bewley Country Park	Billingham Cowbridge Beck Modelling Study 2016 – 20 year undefended MFO
Close Beck/North Burn	Whinny Moor Plantation to A19	Flood Zone 3
Brierley Beck	Brierley Wood to confluence with Thorpe Beck	Flood Zone 3
Bishopton Beck	South of Stillington	Flood Zone 3

All other areas not updated as described above remain as the 2010 functional floodplain which is the same as the current Flood Zone 3, excluding built up areas.

As it is critical that the outline for the functional floodplain is as accurate as possible, the true extent of the functional floodplain outline should be assessed in greater detail during a more detailed study such as a Level 2 SFRA or site-specific FRA.

4 Considerations for the EA, LPA and LLFA

- There are areas of the functional floodplain that extends outside of Flood Zone 3 and Flood Zone 2. These are part of the Billingham Cowbridge Beck Modelling Study 2016. It is assumed that the EA Flood Map has not yet been updated for Cowbridge Beck as the model is recent (2016).
- **Can the EA please advise on whether this is the case and whether the Flood Map will be updated in due course?**

5 Datasets Provided to Assist Review

The following ArcGIS datasets have been provided. This will allow for a stepwise review of flood zones 3b.

Datasets:

- FZ3b_1.shp



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- FZ3b_2.shp
- FZ3b_3.shp
- FZ3b_4.shp
- FZ3b_5.shp
- FZ3b_6.shp
- FZ3b_2017_Draft.shp
- FZ3b_2017_Draft_update.shp (draft functional floodplain for review)
- 2017_Fluvial_Tees_25_undef.shp
- 2016_CBR_20_undef.shp
- 2013_LSB_20_def.shp
- SBC_ABD.shp
- SBC_HFM.shp
- SBC_FZ3.shp
- SBC_FZ2.shp
- 2010_FZ3b_Stockton.shp

