

Flood Risk Assessment

FLOOD RISK ASSESSMENT: PHASE 2
DEVELOPMENT LOWFIELD ROAD, BOLTON UPON
DEARNE

- A
- 9 April 2013



Flood Risk Assessment

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Document history and status

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
0	9 th April 2013	M Baines	M Baines	10 th April 2013	Draft

Distribution of copies

Revision	Copy no	Quantity	Issued to
0	1	1	Matt Smith (MSmith@mjgleeson.com)

Printed:	10 April 2013
Last saved:	10 April 2013 12:35 PM
File name:	C:\Users\NCramp\Documents\Bolton on Dearne\Reports\2013 FRA\JL30690-N HY-RP-0001_A Phase2 FRA.docx
Author:	Nick Cramp
Project manager:	Nick Cramp
Name of organisation:	Gleeson Homes & Regeneration
Name of project:	Phase 2 Development
Name of document:	Flood Risk Assessment: Phase 2 Development Lowfield Road, Bolton Upon Dearne
Document version:	A
Project number:	JL30690



Executive Summary

SKM Enviros were commissioned by Gleeson Homes & Regeneration to undertake a Flood Risk Assessment in support of a planning application for the residential redevelopment at a site located off Lowfield Road, Bolton upon Dearne, South Yorkshire. Gleeson Homes & Regeneration have already been granted planning permission for the partial residential redevelopment of the site (Phase1) and are now seeking permission to develop a further 62 residential dwellings on the site (Phase2).

The site is located within Flood Zone 1 and can be considered to have passed the sequential test for the development type. Flooding from all sources has been considered with only fluvial, surface waters and drainage sources considered to pose any risk. The development site is elevated significantly above the River Dearne to the south with the current site ground levels more than 5 m above the modelled 1% AEP flood level and finished flood levels expected to be more than 5 m above the 0.67% AEP modelled flood level. Historically the River Dearne has burst its banks however there is no known historic flooding of the proposed development site itself. As a result the fluvial flood risk is considered to be low.

The potential for flooding from other sources including the drainage infrastructure and surface water runoff has also been considered within this assessment. The risks for all such sources were assessed to be low or less.

The residual flood risks relating to the control of stormwater runoff are to be managed through suitable drainage design and surface water management planning. A separate outline drainage plan has been developed which is included with this application and should be read in parallel to this assessment.



1. Introduction

In March 2013 SKM Enviros were commissioned by Gleeson Homes & Regeneration to prepare this Flood Risk Assessment (FRA) in support of a planning application for further residential redevelopment of land off Lowfield Road, Bolton Upon Dearne.

1.1. Background

Planning permission is being sought for the continued redevelopment of a site formerly occupied by a company called Addspace, for residential use. Gleeson Homes & Regeneration have already been granted planning permission for the partial residential redevelopment of the site (Phase1) and are now seeking permission to develop a further 62 residential dwellings on the site (Phase2).

This report is based upon previous assessments undertaken by Enviros Consulting since 2005 including the FRA submitted in 2011 as part of the Phase 1 development. During this and the previous work the following organisations were contacted in order to obtain information; the Environment Agency, Yorkshire Water and The Dearne and Dove Internal Drainage Board. This report has been based on the previous FRA and where possible any updated information provided by these organisations. Information relating to the Phase 1 and Phase 2 developments has been provided by Gleeson Homes & Regeneration.

1.2. Requirement for a Flood Risk Assessment

The site covers an area of greater than one hectare and therefore a flood risk assessment is required to consider the impact of the development on flooding locally.

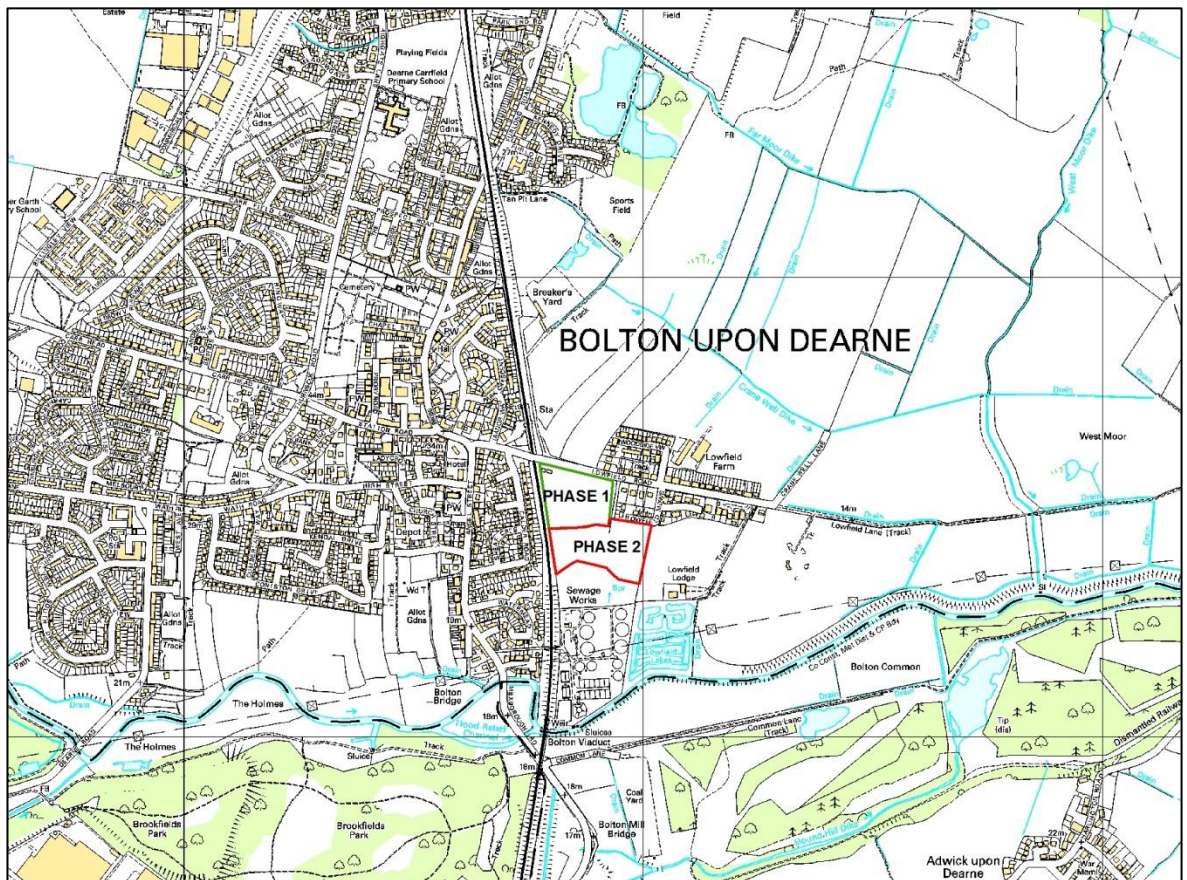
The principal aims of the flood risk assessment are:

- to assess the risk posed to the site from external flood sources;
- to assess the impact of any site development on local flooding; and
- to support a planning application for redevelopment of the site with residential units.

2. Site Description

2.1. Location

The site is located on the southeast boundary of Bolton Upon Dearne, to the north of the River Dearne, to the south of Lowfield Road, east of a railway line and north of a sewage treatment works. The approximate national grid reference of the site is SE 456 023. Figure 2 below shows the location of the Phase 1 and Phase 2 development sites.



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■ Figure 1 Location Map

2.2. Site Description

The development site was formerly used for furniture production and was occupied by two large warehouse units to the north of the site and a number of other smaller buildings, associated car parking and hard standing. All the buildings and infrastructure on the site had been demolished prior to the start of the Phase 1 development.



Land use to the west of the site is dominated by relatively densely spaced residential properties, whilst to the east, flat and drained arable land dominates the landscape, with the exception of a relatively small residential area that extends along Lowfield Road. A sewage treatment works is located down slope of the site between the southern site boundary and the River Dearne. To the east of the sewage treatment works, a recreational pond has been created which is stocked with fish. Water levels in these ponds are maintained through pumping to and from the River Dearne.

An active quarry and a disused waste disposal site occupy a significant proportion of the landscape to the south of the river.

The areas surrounding the site have no specific conservation classification. The River Dearne is the main hydrological feature in the area and is discussed in depth in Section 4 of this report.

2.3. Topography

Site topographic surveys have been undertaken and the current topography of the site is presented in Appendix A.

Current ground levels in the Phase 2 development site range from 21 m to 24.5 m Above Ordnance Datum (AOD) with levels sloping downhill from north west to south east. To the west levels rise up from the site to a railway embankment and to the north levels in the Phase 1 development are proposed to be between 24 m and 25 m AOD when complete. To the south of the site is a sewage treatment works, the ground levels here are significantly higher than the land at the boundary and further to the south. This area is raised, artificially, by up to 5 m at a steep embankment. This is clearly imported material which forms a plateau level with much of the rest of the site. It is assumed that much of the site is underlain by Made Ground.

2.4. Description of Development

Phase 2 development is proposed to occupy a further 1.9 ha of the site south of Phase 1. The southern part of the site is to remain undeveloped. Planning approval is sought for the development of 62 residential dwellings on the site. The properties would be a mix of detached and semi-detached houses with their own gardens. The site would be accessed from Lowfield Road to the north with a new site access road constructed down the eastern development boundary. The development Masterplan is included as Appendix B.

3. National Planning Policy and Flood Risk

The aim of the National Planning Policy Framework (NPPF) in regards to development and flood risk are to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas potentially at risk of flooding. The Policy applies to all risk sources including; rivers and the sea, directly from rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, from reservoirs, canals and lakes and other artificial sources.

Areas at risk of flooding are defined as any land within Flood Zones 2 and 3 or land within Flood Zone 1 which has critical drainage problems and which has been notified to the local planning authority by the Environment Agency.

The NPPF sets out the appropriate uses of land and flood risk requirements in each of the flood zones as outlined below in Table 1.

■ **Table 1 NPPF flood zone and development guidance**

Flood Zone	Annual Probability of Flooding	Appropriate Land Uses
Zone 1 – Low Probability	Less than 1 in 1000 years	All uses of land are appropriate in this zone.
Zone 2 – Medium Probability	Between 1% and 0.1% AEP river flooding and 0.5% and 1% AEP tidal flooding	Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in NPPF.
Zone 3a – High Probability	Greater than 1% AEP river flooding and 0.5% AEP tidal flooding	The water-compatible and less vulnerable uses of land are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.
Zone 3b – functional floodplain	Between 1% and 0.1% AEP river flooding and 0.5% and 1% AEP tidal flooding	Only the water-compatible uses and the essential infrastructure listed in NPPF that has to be there should be permitted in this zone.

3.1. The Sequential and Exemption Tests

The aim of the sequential test is to steer new development to areas of the lowest probability of flooding as described in Table 1 above. The NPPF states that “Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding”.

The sequential test can be considered adequately demonstrated if both the following criteria are met:

1. The sequential test has already been carried out for the site and development type, and is included in the Local Plan, and

2. The development vulnerability is appropriate to the development, as described in Table 1 above.

Where the sequential test requirements cannot be met the development may be permitted following the successful completion of an exception test. Table 2 below is taken from the NPPF technical guidance and describes the situation under which the exception test may be taken.

■ **Table 2 Flood risk vulnerability and flood zone compatibility**

Flood Zone	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Zone 1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
Zone 3a	Exception Test Required	Appropriate	Not Appropriate	Exception Test Required	Appropriate
Zone 3b	Exception Test Required	Appropriate	Not Appropriate	Not Appropriate	Not Appropriate

The exception test is undertaken in conjunction with Local Planning Authorities. A site may be permitted if the exception test can demonstrate;

1. That within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
2. development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.

The NPPF requires any sustainable drainage systems included within the design to be approved by the local authority prior to construction.

4. Flood Risk Assessment

The site covers an area of greater than one hectare and therefore a flood risk assessment is required to consider the impact of the development on flooding locally. In addition to this the site is in proximity to areas classified as flood zone 2/3 and the assessment must also confirm that this zoning is correct and that the site is not likely to be subject to flooding.

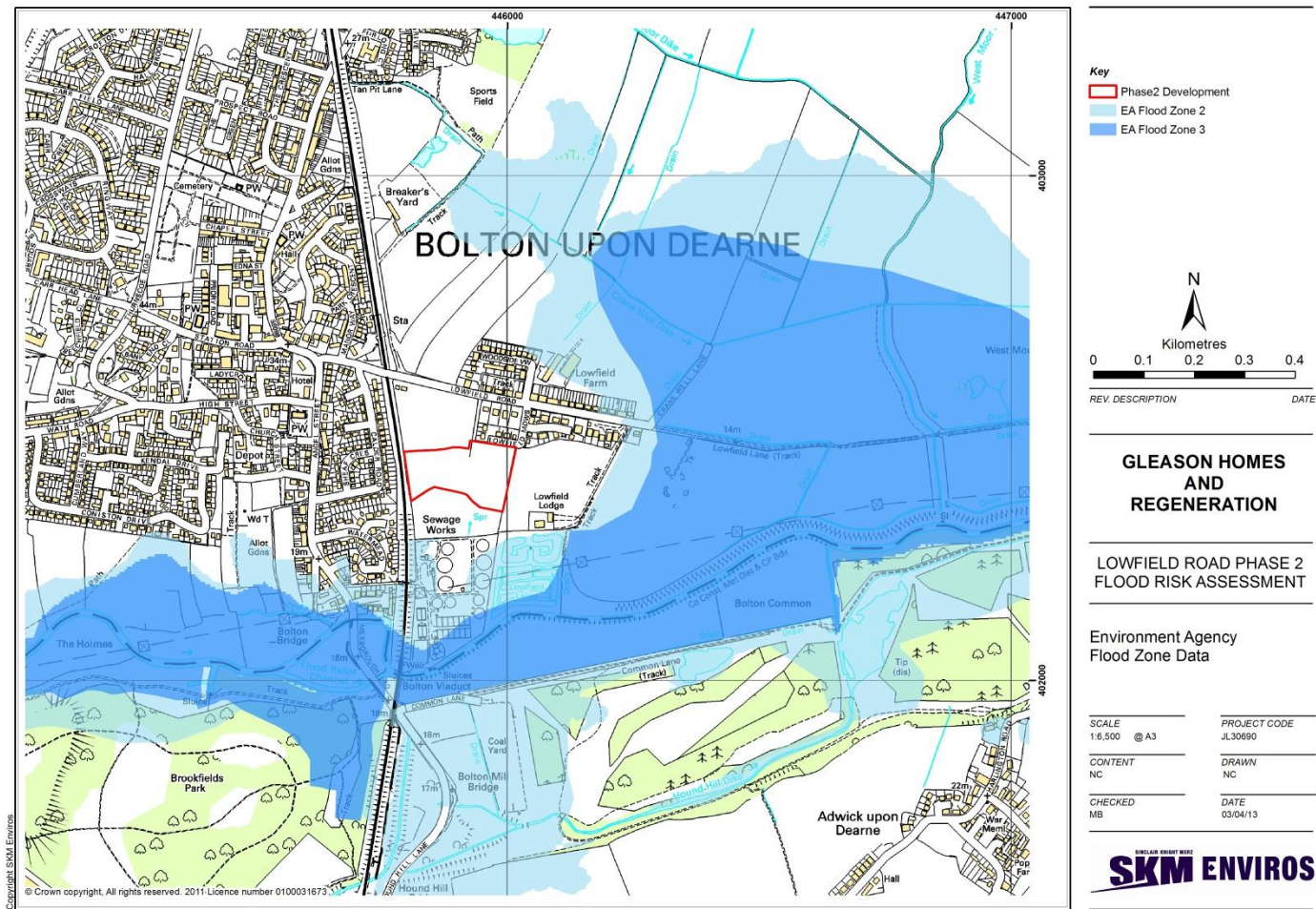
A site walkover was undertaken on the 19th October 2012 and discussions held with key local stakeholders for the Phase 1 FRA. This information is still considered relevant and has been used in the assessment below.

The objectives of this assessment are to:

- Identify sources and mechanisms by which the site could flood;
- Undertake a formal assessment of the risk posed to the development from all identified flood sources and mechanisms;
- Consider the impact the development might have on flood risk elsewhere
- Produce a baseline flood risk assessment compliant with the guidance contained within the NPPF.

4.1. Environment Agency Flood Zone

Data provided by the Environment Agency has been used to categorise the site flood zone and is presented in Appendix C. Figure 2 below shows the mapped flood zones indicating the site to be in zone 1.



■ Figure 2 Environment Agency Flood Map

4.2. External flood sources

Current guidance recommends that a flood risk assessment should consider all possible sources of flooding for a given site. A large number of specific mechanisms exist; however, many of these can be easily discounted. Table 3 summarises a range of potential risks and the possibility that these may be relevant to this site.

■ **Table 3 Summary of potential flood source**

Flood Type	Source	Pathway
Fluvial	River Dearne	Extreme event
Tidal	None	None
Overland flow	Runoff from higher land	Surface water runoff from small section of Lowfield Road
Drainage	Combined sewer	Surcharge
Groundwater	Undifferentiated Middle Coal Measures	None
Other / Artificial	None	None

4.2.1. Fluvial

At the location where the River Dearne passes the site, the watercourse drains a catchment of approximately 300 km². The river rises in the hills of the Pennines to the west of Barnsley and incorporates the whole of that town. As such the river has a relatively flashy response to rainfall for a watercourse of this size and has a history of flooding.

The Environment Agency has provided estimates of the modelled peak flood levels for a range of different extreme events derived in 2004 by Jeremy Benn Associates (JBA). Levels at several cross sections within the vicinity of the site (Table 4) were provided.

■ **Table 4 Flood elevation data**

Cross section	Annual Event Probability (%)		
	2.00	1.00	0.67
	Elevation (m AOD)		
Upstream side of the Bolton Viaduct	17.39	17.74	18.12
Adjacent to centre of site	15.57	16.03	16.49
Adjacent to east boundary	15.55	15.95	16.39

The cross sections are equally spaced, however the flood elevation observed immediately upstream of the viaduct is significantly higher than observed at the other two sections. This suggests that the viaduct has limited conveyance causing flood water to back up, upstream of the viaduct (upstream of the site).

The area that is flooded as a result of the backing up of water is remote from the site. It is therefore more appropriate to use the flood level from the cross section adjacent to the centre of the site. This would suggest that there is a 0.67% chance annually of the flood level adjacent to the site exceeding 16.49 m AOD.

In the light of this the risk posed to the proposed development from flooding along the River Dearne is assessed to be low.

4.2.2. Tidal

Bolton Upon Dearne is very remote from the nearest tidal waters and therefore there is no tidal flood risk posed to the site.

4.2.3. Overland flow

The area draining to the development site is relatively small and is bounded by the railway line to the west and Lowfield Road to the north. The catchment area is unlikely to generate significant volumes of surface runoff due to its size and existing drainage arrangements. For the railway line these drainage arrangements take the form of a highly permeable coarse gravel surface that is unlikely to allow any surface runoff and for Lowfield Road the form of formal road drainage.

A sustainable drainage system is proposed for the phase 1 and phase 2 developments. Any surcharge from the drainage system is likely to drain to the green areas to the south of the site (as it currently does) assuming the existing grade is maintained.

As a result the volume of surface water runoff which could be generated during a high rainfall event is considered to be small and therefore the flood risk posed to the development from overland flows is considered to be low.

4.2.4. Drainage

All major local drainage networks are either located down slope of the site or on the far side of either the railway or Lowfield Road embankments.



The pumped sewer system that runs across the site is sealed and there are no manholes on or up gradient of the site and so there is minimal potential for this system to surcharge and flood the site.

A 225 mm combined sewer is located down slope of the site running from east to west adjacent to the northern boundary of the sewage treatment works site boundary. This system almost certainly receives runoff from the site area. Any excess flows above the capacity of the works would discharge via a surface water overflow down to the River Dearne.

Both the Phase1 and Phase 2 developments will include sustainable drainage designed to mitigate the impacts of the development by reducing and delaying the discharge of rainfall runoff to watercourses and public sewers, thereby not increasing third party flood risk. Any surcharging from the phase 1 and 2 drainage systems during high rainfall events is likely to be shallow and limited due to the local topography. Any flooding is expected drain to the green areas to the south of the site as it currently does, assuming the existing grade is maintained. Greenfield runoff rates are to be maintained through drainage design.

The Yorkshire Water and Phase 1 drainage plan is include in Appendix D. The Phase 2 conceptual drainage design is include in Appendix E.

In the light of the available drainage information the risk posed by this flood source is assessed to be low.

4.2.5. Groundwater

As previously stated much of the site is underlain by Made Ground, the nature of which has not been confirmed. The Geological map indicates that this is underlain by undifferentiated Middle Coal Measures, comprising mudstones, sandstones and siltstones. The Coal Measures are regarded as a Minor Aquifer by the Environment Agency and are relatively permeable. The risk of flooding from groundwater is considered to be low.

4.2.6. Other/ Artificial Flood Sources

No other sources of flooding have been identified for the using the information available.

4.2.7. Flood History

A level gauge is located at Bolton Viaduct on the River Dearne, just upstream of the site. Peak flood elevations at this gauge for a number of high flow events on the River Dearne have been provided by the Environment Agency (Appendix F). These records stretch back to 1958.

The most significant event for which a flood level has been obtained occurred in May 1967, where flood levels upstream of the viaduct peaked at 17.71 m AOD. On the downstream side of the viaduct, adjacent to the site, the largest recorded events occurred in July 1958 and November 1968. Peak level for these events was recorded at 16.98 m AOD.

It must be noted that level data is not available for what are believed to be the largest local flood events. These occurred in 1947, 2000 and 2007. Appendix J illustrates the predicted extent of the 1947 and 2000 floods and photographs of the extent of the 2007 flooding. The map showing the



extent of the 2007 flooding has been produced by SKM Enviros based on aerial photographs taken during the flooding on both the 16th and the 26th of June 2007.

None of the data obtained suggests that flooding locally from the River Dearne has ever approached anywhere near the minimum site level.

4.2.8. Climate change

It is widely accepted that climate change has the potential to cause more prolonged and more intense rainfall. NPPF recommends that an allowance of 20% is made when studying peak river flows to account for this. Climate change has been taken into account when considering the above flood sources and risks and has been included in any modelling undertaken.

4.3. Sequential Test

The proposed development can be considered to have passed the sequential test based on following information;

1. The sequential test has already been carried out for this site at a strategic level. Barnsley metropolitan Borough Council Planning and Regulatory Service letter dated 24th January 2013 describes the site location as follows; "The site is located in the Goldthorpe (Dearne Towns) Principle Town Area. It would therefore be classified to be within an appropriate and sustainable location for housing development in Core Strategy terms".
2. The development falls within Flood Zone 1 and therefore the type of development is considered appropriate.

As the sequential test has been passed there is no requirement to undertake the exception test.

4.4. Residual flood risk

The residual flood risk of the site is considered to be low and will be management through the implementation of suitable surface water management and drainage design.



5. Conclusions

The above flood risk assessment has been carried out for the Phase 2 development at Lowfield Road in accordance with NPPF and has concluded the following;

- 1) The site is situated wholly within flood zone 1 and as such is considered to pass the Sequential Test and potentially be appropriate for any type of development.
- 2) To our knowledge the site has never been impacted by flooding, including the June 2007 flood events.
- 3) The existing levels within the development area are between 21 m and 24.5 m AOD. The current site ground levels are more than 5 m above the modelled 1% AEP flood level and finished flood levels are expected to be more than 5 m above the 0.67 %AEP modelled flood level. In light of this the risk posed by this flood source to the site is considered to be low.
- 4) Other flood sources including overland flows and drainage infrastructure have been considered and all potential risks identified have been assessed to be low.
- 5) Any residual flood risk relating to Phase 1 and Phase 2 surface water and drainage are to be managed during detailed design using a suitable drainage and surface water design plan.



6. References

SKM Enviros, April 2013, Conceptual Drainage Design, Phase 2 Development Lowfield Road, Bolton Upon Dearne. Report No. JL30690_ Surface Water Drainage Assessment.docx

SKM Enviros, June 2011, Flood Risk Assessment Lowfield Road, Bolton Upon Dearne. Report No. JL30370_ Lowfield Road FRA_final.docx

Department of Communities and Local Government, March 2012, National Planning Policy Framework

Department of Communities and Local Government, March 2012, Technical guidance to the National Planning Policy Framework

Environment Agency, April 2012, Demonstrating the flood risk Sequential Test for Planning Applications

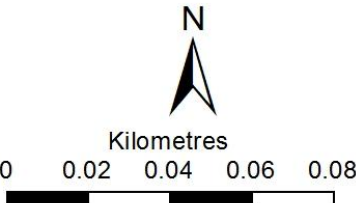
Topographical survey (2012), supplied by the client



Appendix A Site Topography



- Key**
- * Pre Development Elevations
 - Phase2 Development
 - Phase1 Development



REV. DESCRIPTION DATE

GLEASON HOMES AND REGENERATION

LOWFIELD ROAD PHASE 2 FLOOD RISK ASSESSMENT

Topography
Pre development Elevations

SCALE
1:1,500 @ A3

PROJECT CODE
JL30690

CONTENT
NC

DRAWN
NC

CHECKED
MB

DATE
03/04/13





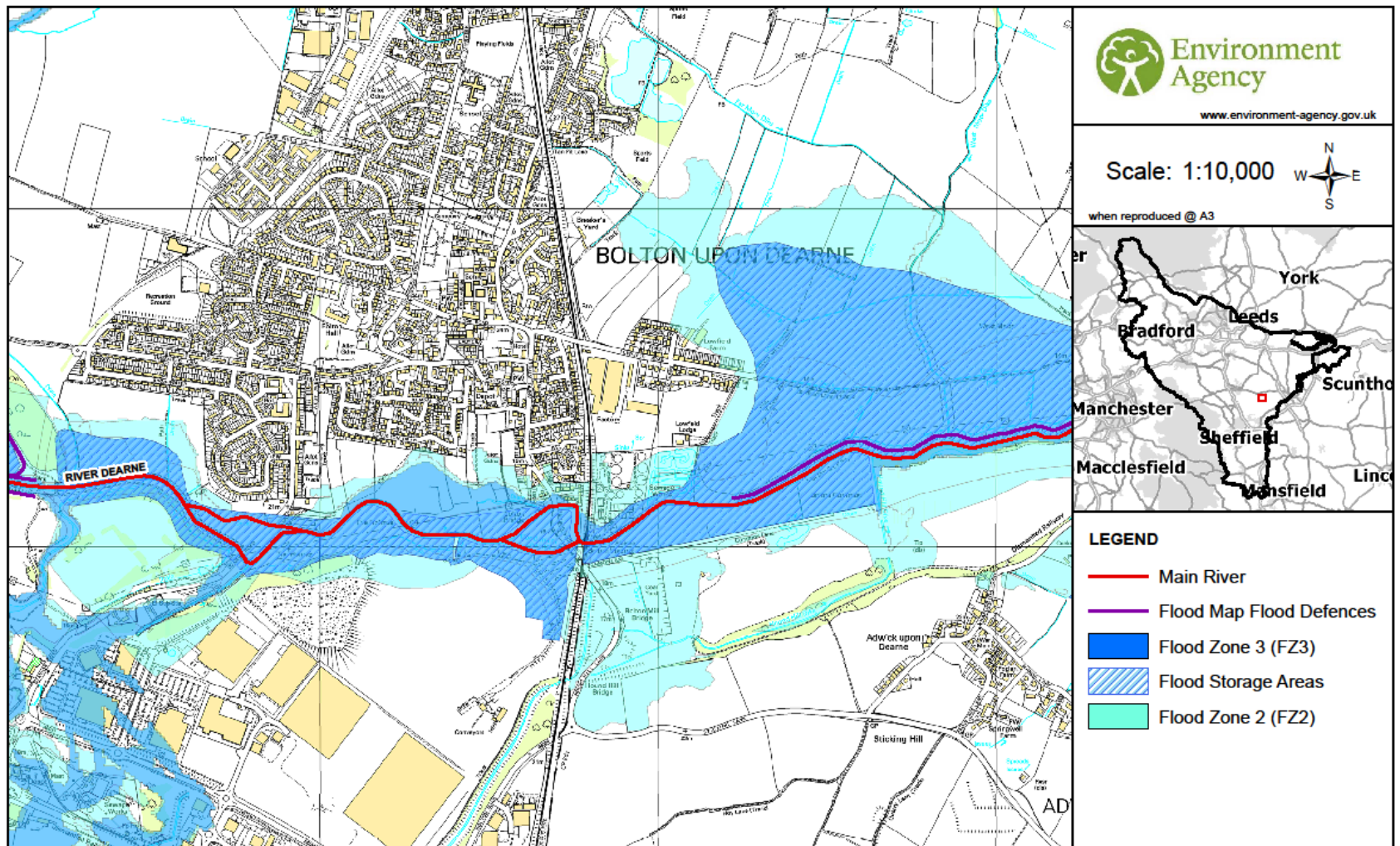
Appendix B Development Master Plans





Appendix C Environment Agency Consultation Response

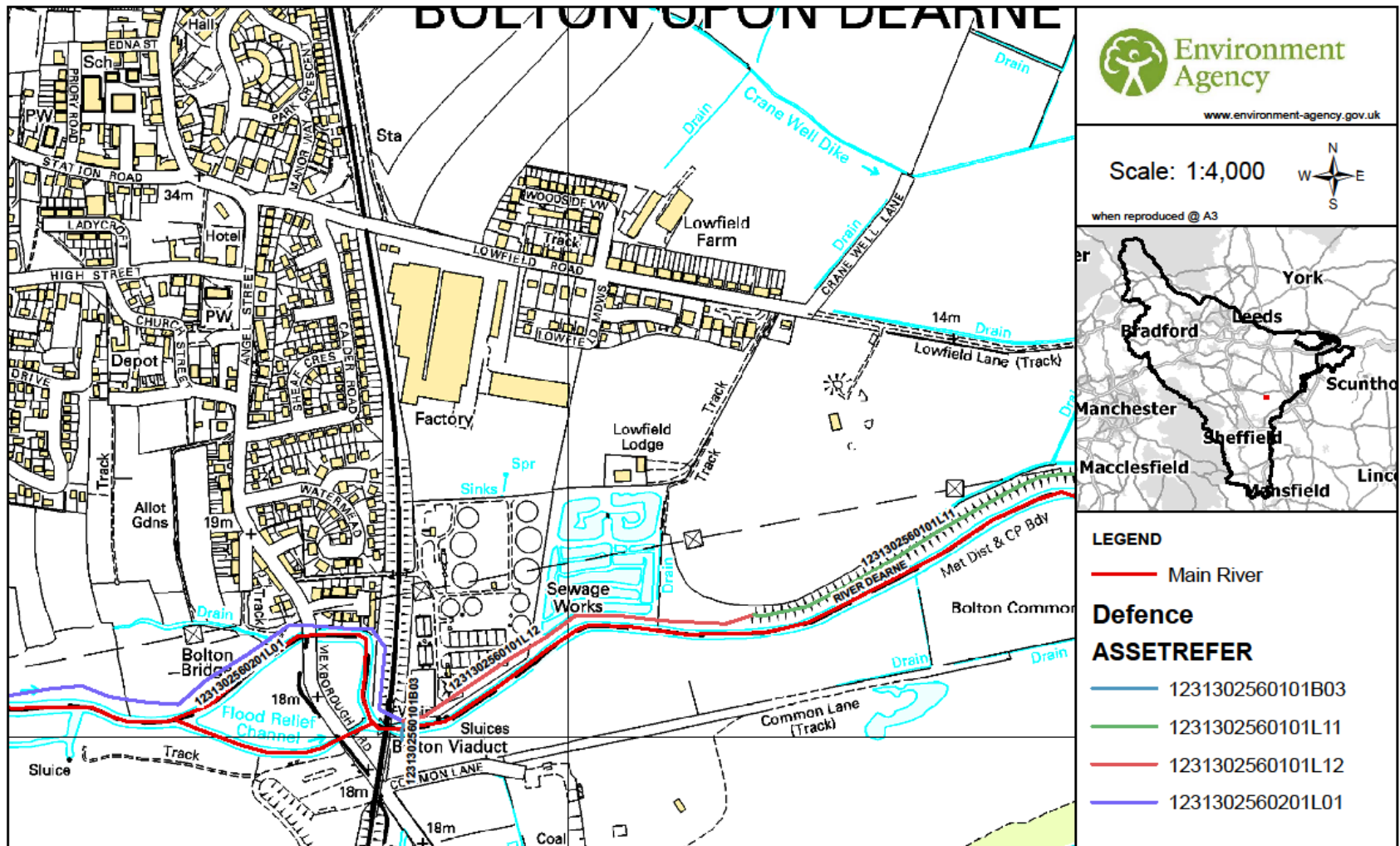
Flood Map centered on Bolton - Upon - Dearne - Date Created: 05/04/2013 [Ref: 25415]



SKM Enviros

JL30690-N HY-RP-0001_A Phase2 FRA.docx

Asset Location Map - Bolton- Upon- Dearne - Date Created: 05/04/2013 [Ref: 25415]



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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S80 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

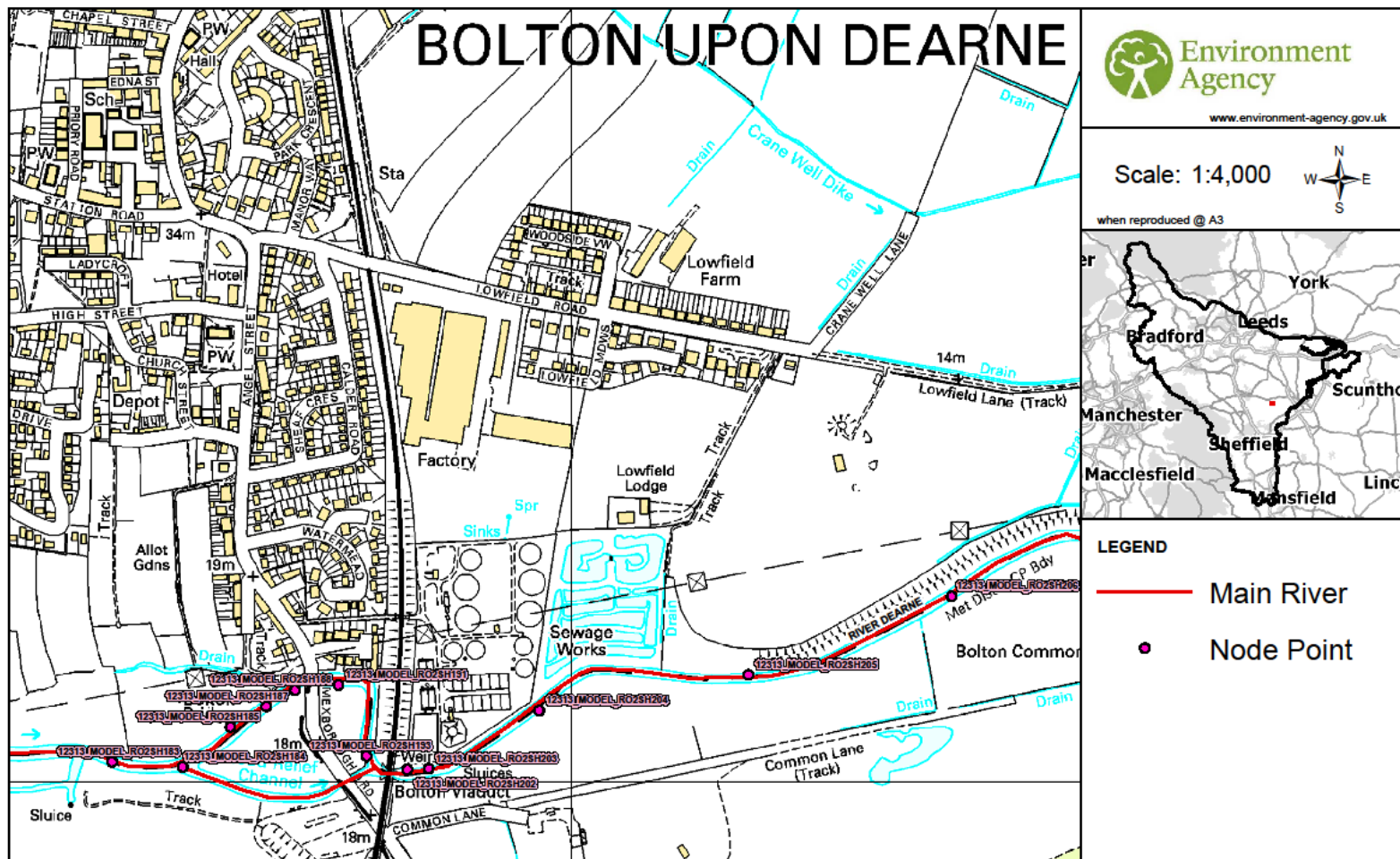
Flood Risk Assessment: Phase 2 Development Lowfield Road, Bolton Upon Dearne

RFI - no: 25415 Asset Information

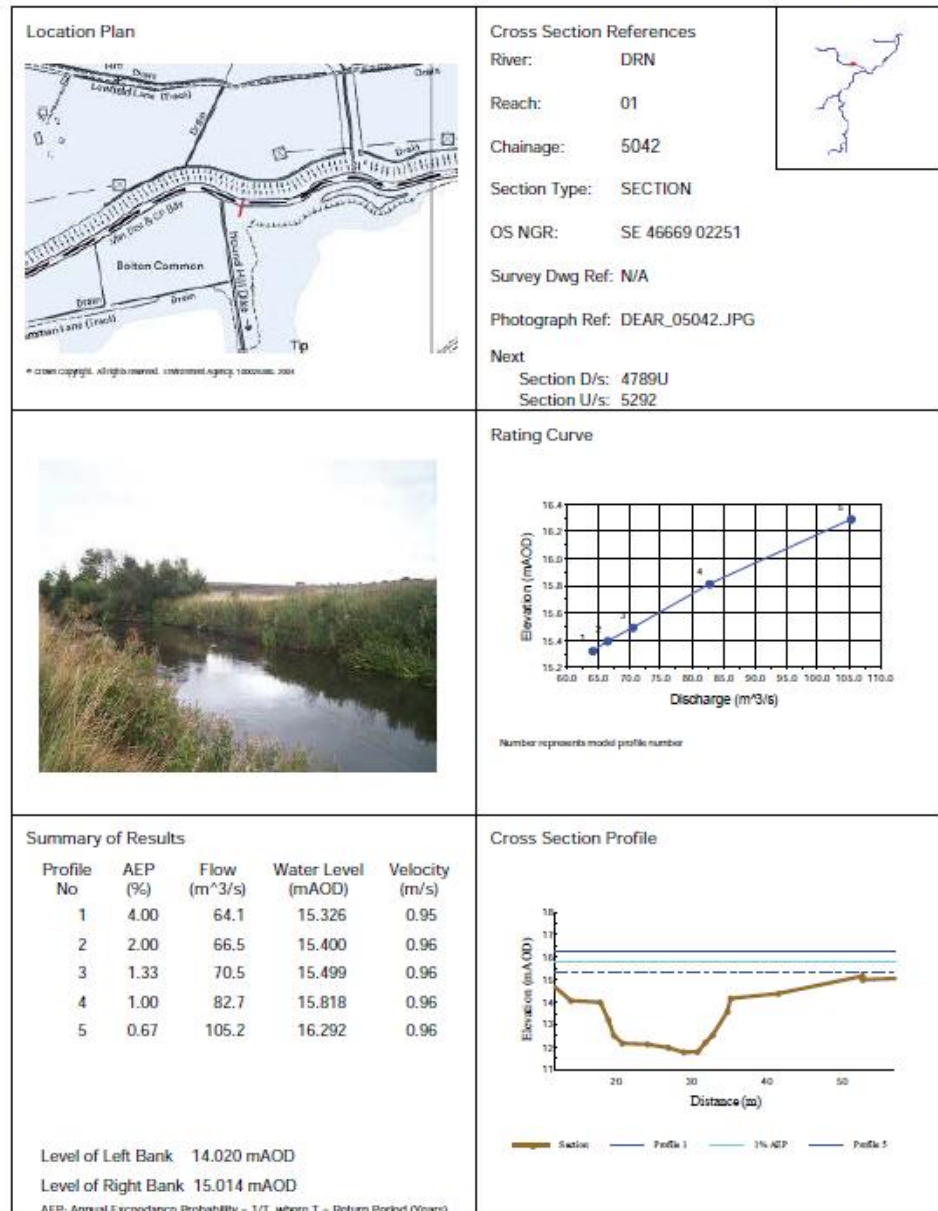
Asset Reference	Asset Type	Maintainer	Asset Protection Type	Asset Description	Asset Location	Estimated Design Standard	Bank	Actual Downstream Crest Level	Actual Upstream Crest Level	Overall Condition
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1231302560101B03	non-flood defence structure	private	fluvial	WEIR	BOLTON VIADUCT	No Data	both	No Data	No Data	2
1231302560101L12	maintained channel	private	fluvial	NATURAL GROUND	D/S OF BOLTON BRIDGE	50	left	No Data	No Data	3
1231302560101L11	raised defence (man-made)	Environment Agency	fluvial	EMBANKMENT	U/S OF ADWICK BRIDGE	50	left	15.98	16.12	2

Node Point Location Map - Bolton - Upon - Dearne - Date Created: 05/04/2013

[Ref: 25415]

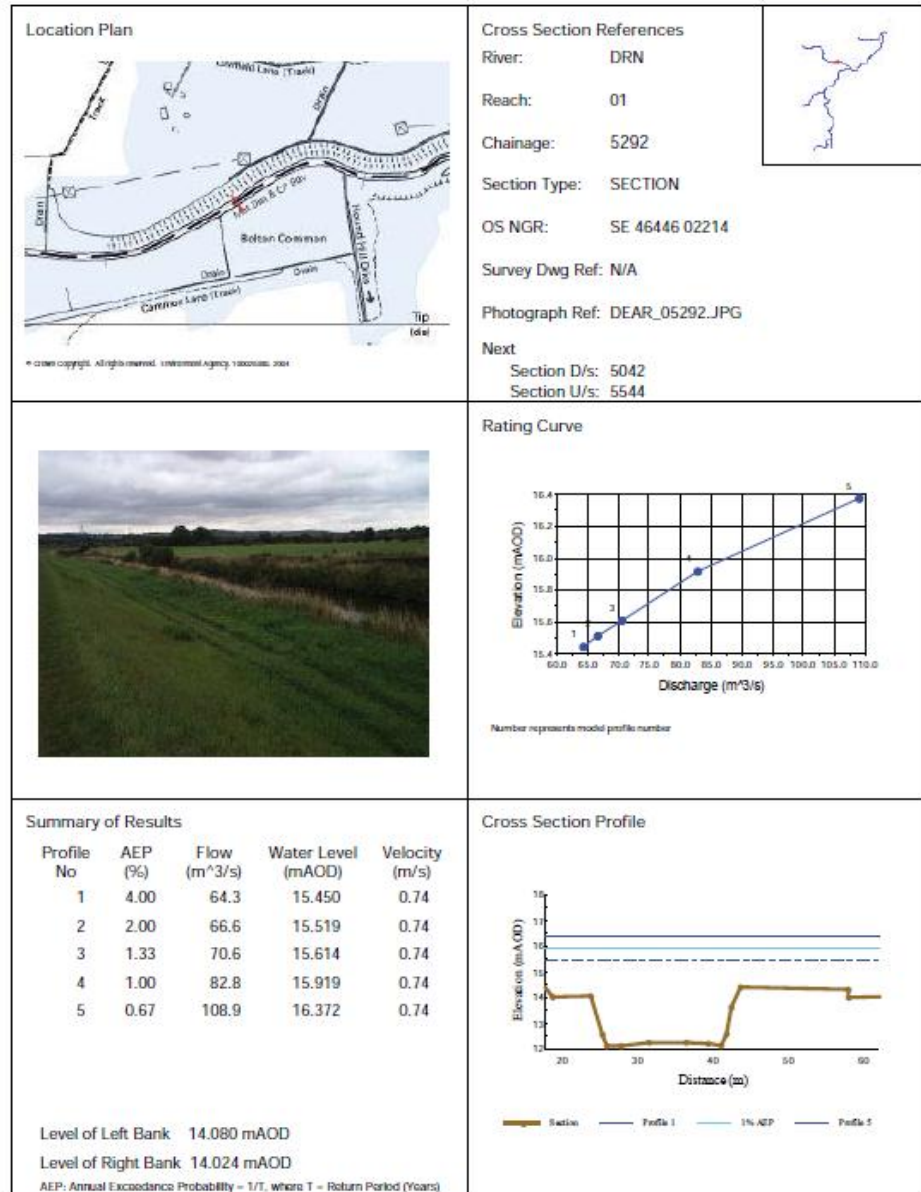


Environment Agency - North East Region
Re-working of the River Don Model
ISIS Hydraulic Model Summary Sheet



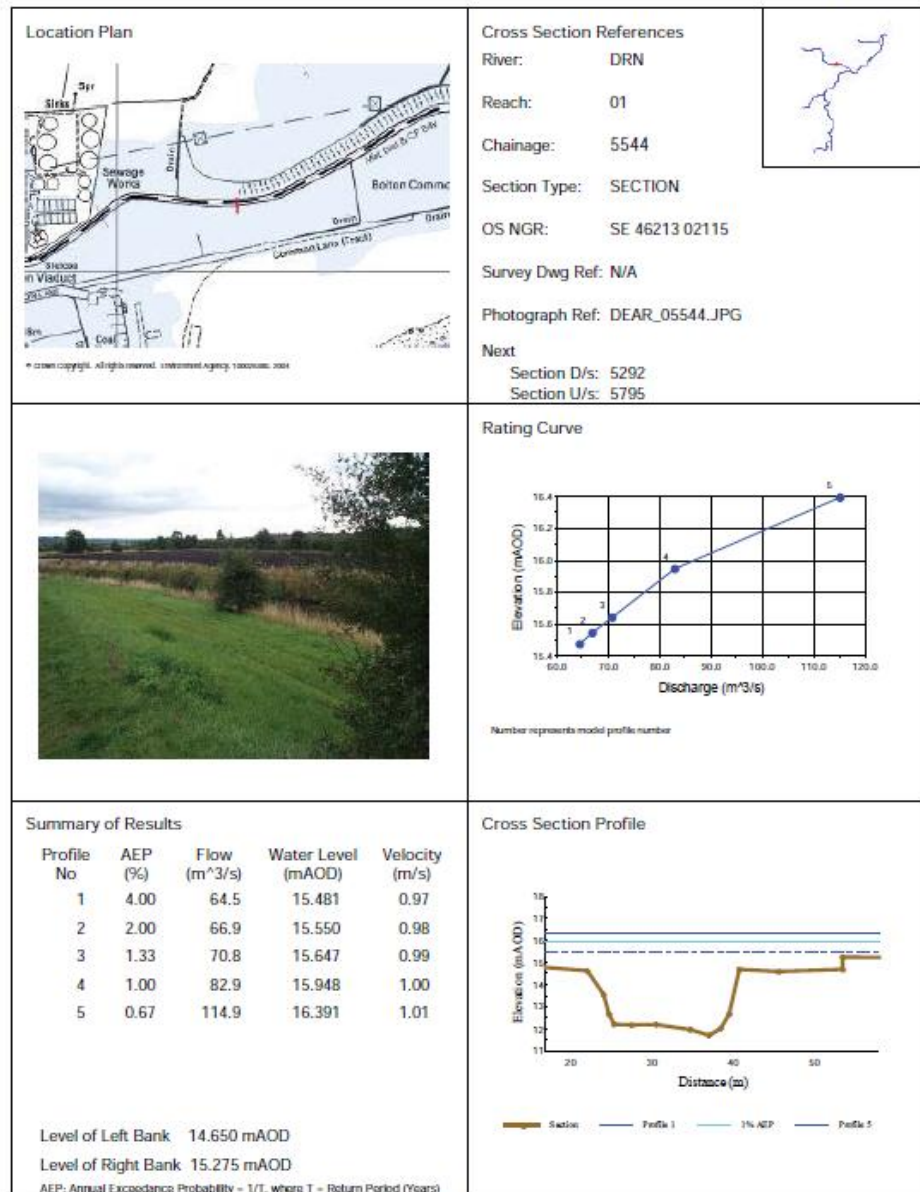
DRN: 01: CROSS SECTION NUMBER 5042

Environment Agency - North East Region
Re-working of the River Don Model
ISIS Hydraulic Model Summary Sheet



DRN: 01: CROSS SECTION NUMBER 5292

Environment Agency - North East Region
Re-working of the River Don Model
ISIS Hydraulic Model Summary Sheet



DRN: 01: CROSS SECTION NUMBER 5544

Environment Agency - North East Region
Re-working of the River Don Model
ISIS Hydraulic Model Summary Sheet



Location Plan

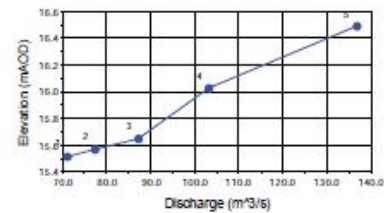


Cross Section References

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Next
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Section U/s: 6014U



Rating Curve



Number represents model profile number

Summary of Results

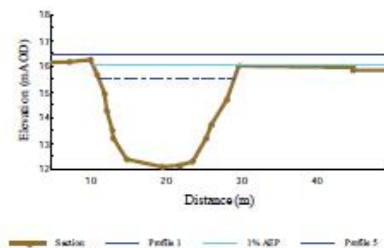
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1	4.00	71.1	15.521	1.57
2	2.00	77.3	15.576	1.65
3	1.33	87.2	15.654	1.78
4	1.00	103.1	16.031	1.89
5	0.67	136.5	16.493	1.90

Level of Left Bank 16.260 mAOD

Level of Right Bank 15.850 mAOD

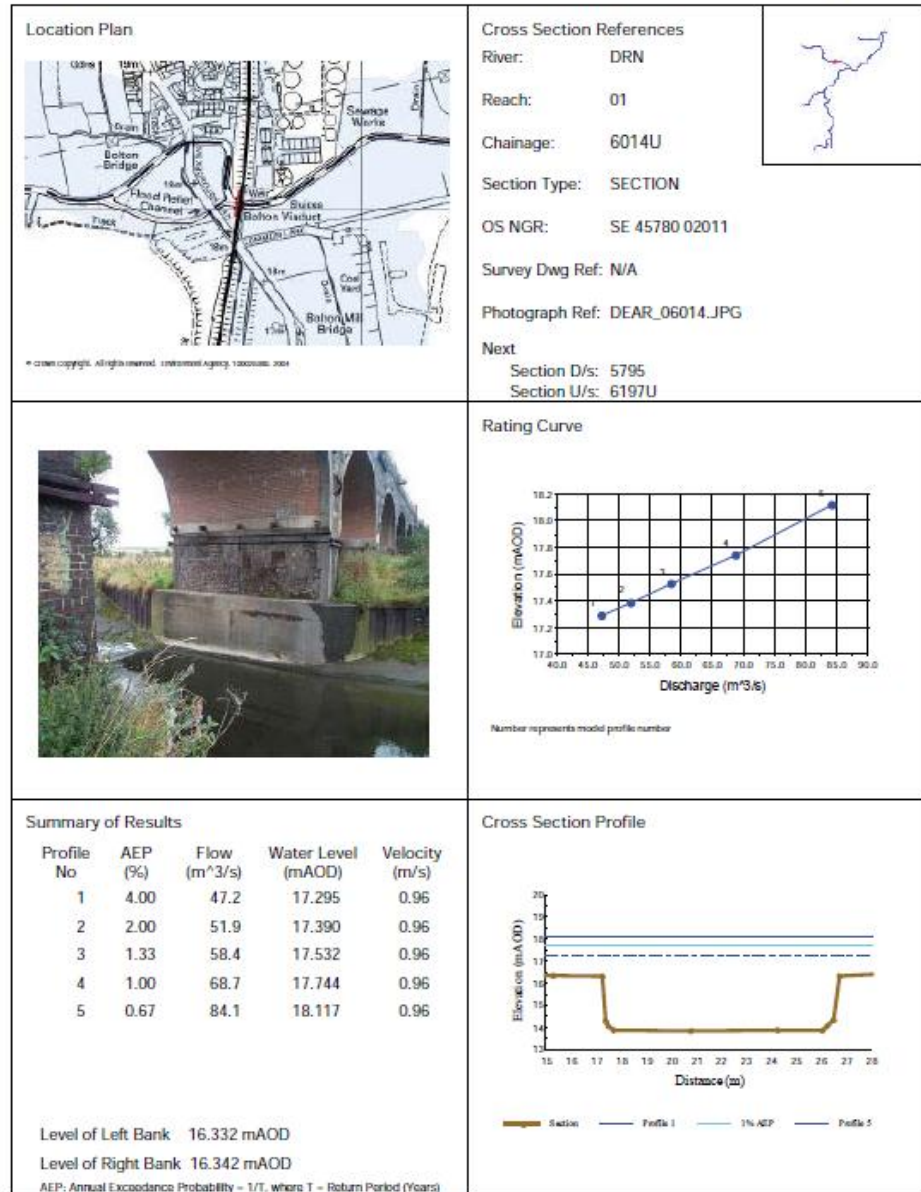
AEP: Annual Exceedance Probability = 1/T, where T = Return Period (Years)

Cross Section Profile



DRN: 01: CROSS SECTION NUMBER 5795

Environment Agency - North East Region
Re-working of the River Don Model
ISIS Hydraulic Model Summary Sheet



Environment Agency - North East Region
Re-working of the River Don Model
ISIS Hydraulic Model Summary Sheet



Location Plan



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Cross Section References

River: DRN
Reach: 01
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Survey Dwg Ref: N/A
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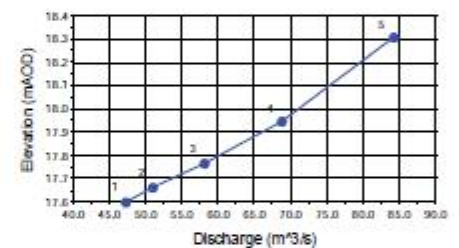


Next

Section D/s: 6014U
Section U/s: 6301



Rating Curve



Number represents model profile number

Summary of Results

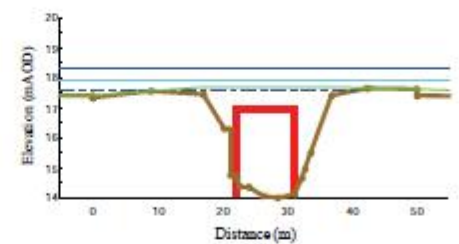
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1	4.00	47.2	17.604	0.91
2	2.00	51.0	17.667	0.91
3	1.33	58.1	17.770	0.91
4	1.00	68.7	17.949	0.91
5	0.67	84.1	18.307	0.92

Level of Left Bank 17.350 mAOD

Level of Right Bank 17.412 mAOD

AEP: Annual Exceedance Probability = 1/T, where T = Return Period (Years)

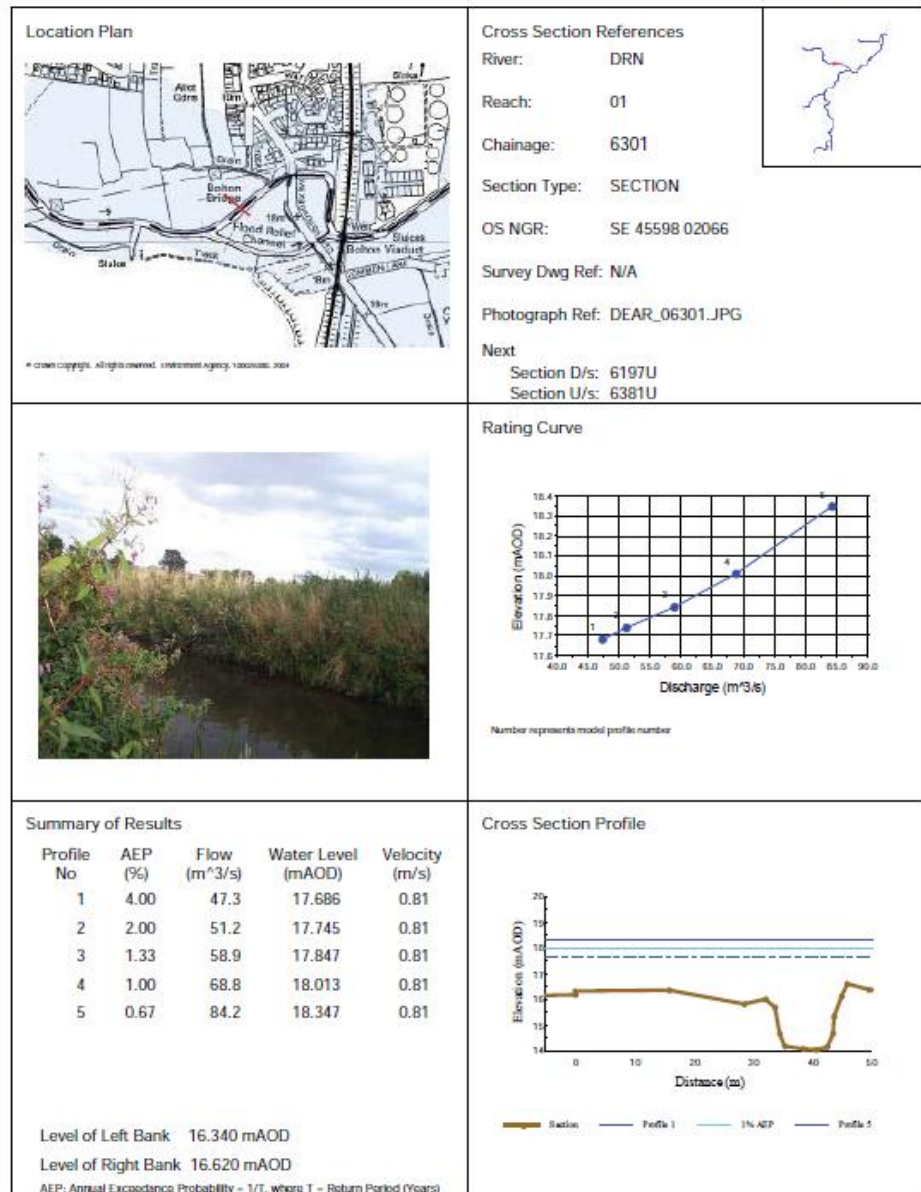
Cross Section Profile



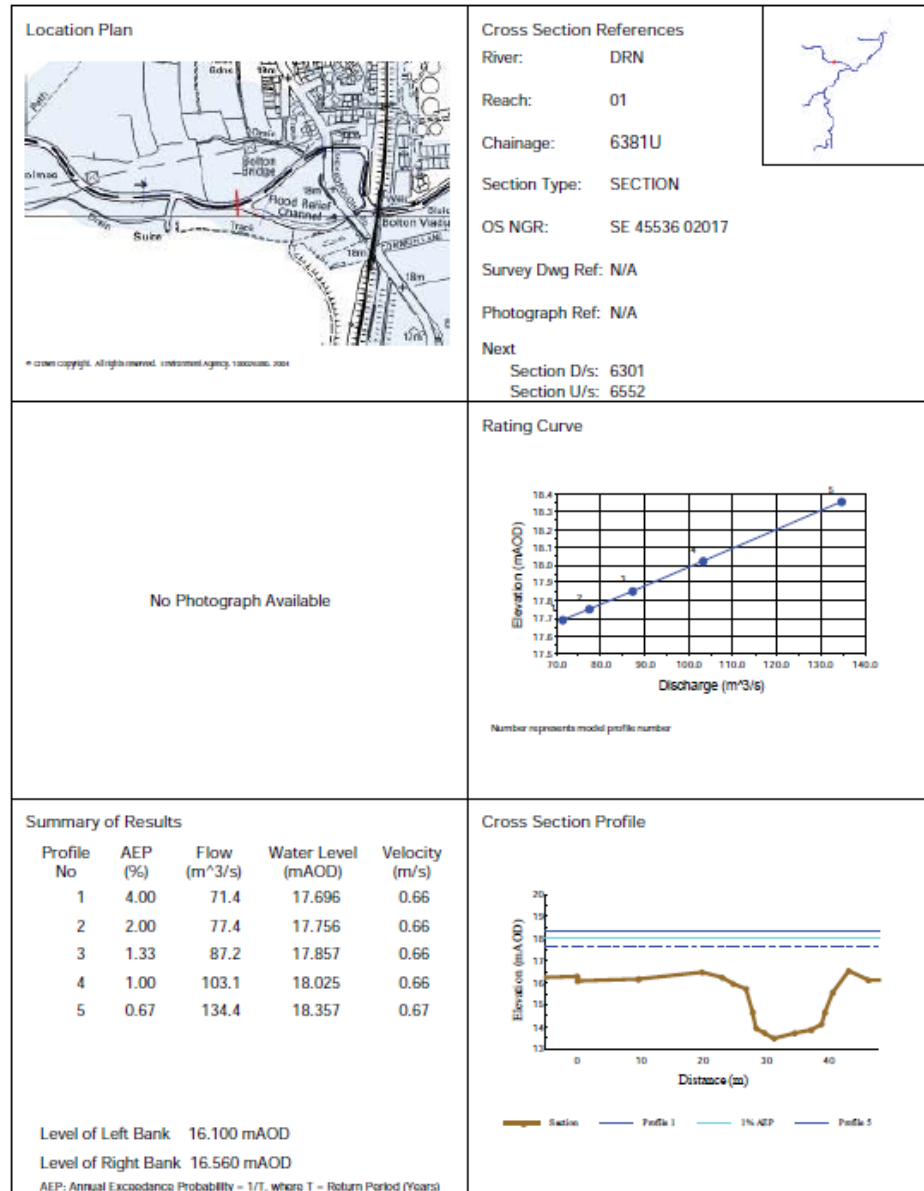
Bridge 1% AEP Section Profile 1 Spill Level

DRN: 01: CROSS SECTION NUMBER 6197U

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Re-working of the River Don Model
ISIS Hydraulic Model Summary Sheet

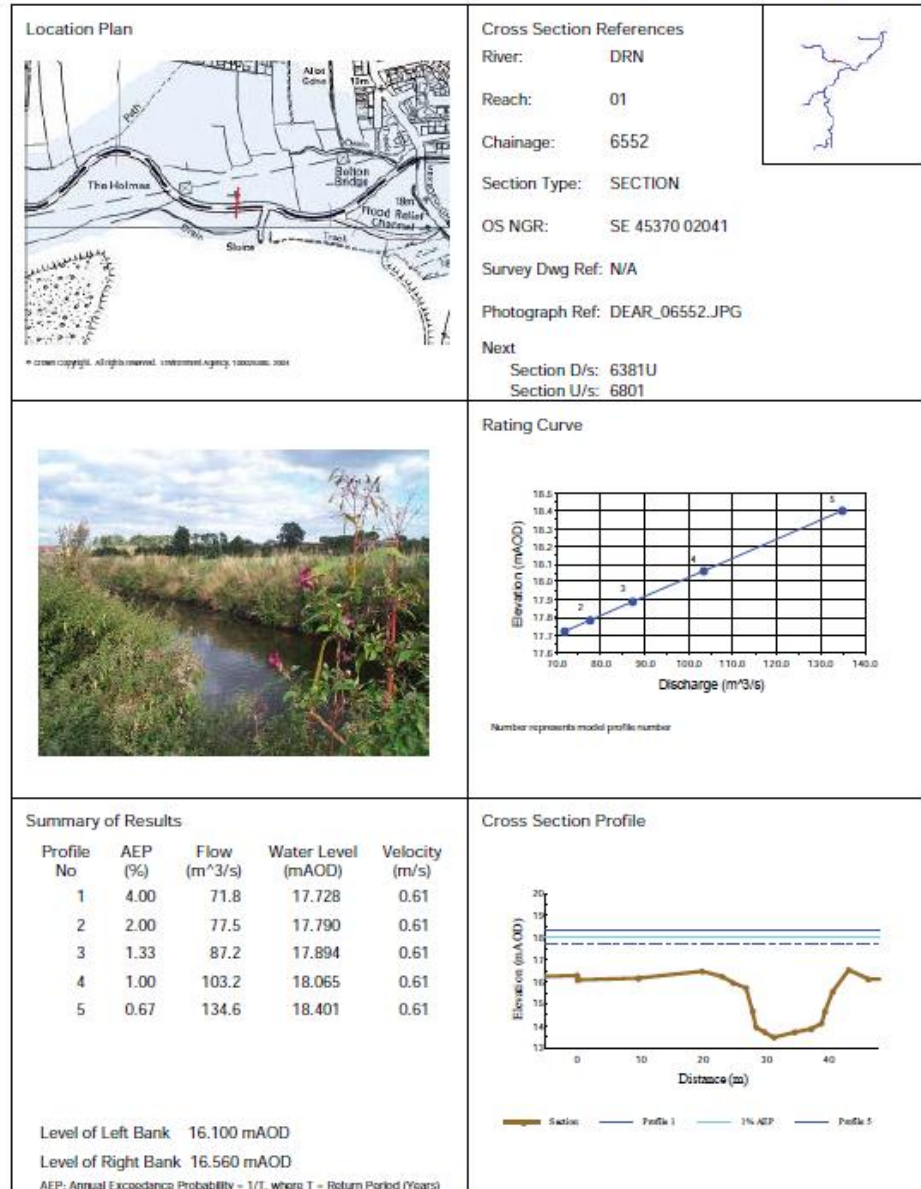


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ISIS Hydraulic Model Summary Sheet



DRN: 01: CROSS SECTION NUMBER 6381U

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Re-working of the River Don Model
ISIS Hydraulic Model Summary Sheet



DRN: 01: CROSS SECTION NUMBER 6552



Appendix D Existing Site Drainage





General notes :

All work to be in accordance with the current Building Regulations.
Drains passing through buildings to be protected with steel cover.
No building to take place within 3.000M of an adoptable sewer.
Minimum pipe size for adoptable purpose to be 150mm with flexible mechanical joints.
Highway construction to be in accordance with British HS2 Highway Department.
Private drainage to be in 100mm dia. plastic pipe with granular bed & surround to the satisfaction of the building control officer. Minimum gradient 1/80.
Road gullies to be in accordance with road construction details drawings.
Levels marked on drawings refer to ground floor level.
----- fast drain
----- surface water drain
Where adoptable pipes have concrete slab protection, all joints to be provided with 18mm thick flexible filler.
Private drainage connections not direct to a manhole one to be made via a 45 degree junction and not eadon.
Minimum gradient of private drainage to be 1 in 10.
NOTE THAT ALL FENCING AND SCREEN WALLING/FENCING DETAILS TO BE AS DEFINED ON PLANNING DRAWING
Sewers must have 5m minimum clearance from trees and hedges, otherwise they must be provided with concrete slab protection and
All filed ground to be filed and consolidated under supervision and to the satisfaction of Yorkshire Water prior to dry sewer works being carried out.
Sewers to be laid in Class 5 bedding (150mm granular bed and surround). Where depth of cover to top of sewer is less than 1.50m in highways and verges, the 150mm concrete slab protection is to be provided.
Lengths that require such protection are identified on Long Sections drawings.
Note that Yorkshire Water policy is not to accept Type C brick manholes and 1000 dia concrete manhole rings. It is preferred to use Type B1 1500 or 1500mm dia concrete manholes with the opening sized centrally over the chamber where depth to pipe invert is between 1.0 - 1.5m.
Main sewers to be laid in accordance with Sewers for Adoption (5th edition) and to the satisfaction of Yorkshire Water and be identified.
All adoptable sewers to be in Class 125 Concrete or 400N/m (1500) 450N/m (2250) with class 5 bedding as specified on Long Sections drawings.
Adoptable manholes to be concrete ring type also as specified in schedule. Manhole covers must/shall have a clear opening of 600mm and shall be Class D400 to BS EN 124. Covers for Highways to have 150mm deep frames.
All filed ground to be filed and consolidated under supervision and to the satisfaction of Yorkshire Water prior to dry sewer works being carried out.
The adoptable sewers should be a minimum of 1m and manholes 0.5m from kerb faces and service margins.
Sewers must have 5m minimum clearance from trees and hedges, otherwise they must be provided with concrete slab protection.
The chamber size of manholes with more than one connection in them may need to be increased to on treatment to accommodate connections and loads.
Yorkshire Water is not obliged to accept filter draw/land drainage run-off into public sewers or adoptable drainage systems (directly or indirectly). An alternative method of disposal of the land drainage run-off will be required to be agreed with the Local Drainage Section.
Cover slides must carry the BS 1582 mark or will be rejected by the Yorkshire Water Inspector. Where the clear opening of the filter/slotted product is different to that of the cover and frame, a load bearing slab should be fitted above the cover slab to bring the slab down to 600mm x 600mm for the Yorkshire Water specified cover size. Please refer to Concrete Pipe Systems Association (CPSA) Technical Bulletin issued January 2004 for alternative cover slab opening sizes.
Sulphide resistance cement (C20-C22) and precast concrete products must be used or a laboratory report provided proving that such precautions are not necessary.

LATERAL MANHOLE SCHEDULE											
REF	EASTING	NORTHING	APP COVER LEVEL	INVERT LEVEL	DEPTH	SIZE	TYPE	PIPE SIZE	PIPE GRADIENT	BACKDROP LEVEL	
FOUL WATER											
PF1	445805.320	402548.137	24.85	23.25	1.60	500	PPIC	150	1/28	23.25	
PF2	445815.666	402548.143	24.60	22.88	1.72	500	PPIC	150	1/90		
PF3	445819.405	402475.583	24.85	23.35	1.60	500	PPIC	150	1/10		
PF4	445828.666	402474.860	24.70	22.72	1.98	500	PPIC	150	1/83		
PF5	445809.516	402513.565	24.80	22.45	2.35	1200	CONC	150	1/10		
PF6	445860.320	402508.979	24.55	22.10	2.45	1200	CONC	150	1/10		
PF7	445864.412	402521.234	24.75	21.81	2.94	1200	CONC	150	1/10		
PF8	445865.894	402512.410	24.65	21.89	2.66	1200	CONC	150	1/10		
PF9	445866.383	402525.271	24.60	21.60	3.00	1200	CONC	150	1/10		
PF10	445820.002	402525.818	24.20	21.90	2.30	1200	CONC	150	1/10		
PF11	445813.628	402463.323	24.10	21.28	2.82	1200	CONC	150	1/10		
SURFACE WATER											
PS1	445833.582	402568.661	24.22	22.96	1.26	500	PPIC	150	1/95	23.60	
PS2	445805.161	402549.558	24.80	22.95	1.95	500	PPIC	150	1/10		
PS3	445817.743	402530.749	24.63	22.75	2.08	1200	CONC	150	1/10		
PS4	445833.515	402462.131	24.60	23.35	1.25	500	PPIC	150	1/82		
PS5	445819.239	402479.950	24.80	23.50	1.90	500	PPIC	150	1/10		
PS6	445825.089	402455.875	24.70	23.30	1.40	500	PPIC	150	1/10		
PS6A	445823.288	402505.347	24.70	23.35	1.35	500	PPIC	150	1/10		
PS7	445810.707	402511.349	24.82	23.50	1.32	500	PPIC	150	1/10		
PS8	445865.253	402509.673	24.60	22.75	1.85	500	PPIC	150	1/10		
PS9	445866.173	402520.848	24.80	22.67	2.13	1200	CONC	150	1/10		
PS10	445894.090	402512.919	24.60	22.50	2.10	1200	CONC	150	1/10		
PS11	445893.429	402524.347	24.70	22.50	2.20	1200	CONC	150	1/10		
PS12	445820.290	402544.094	24.00	23.00	1.00	500	PPIC	150	1/12		
PS13	445820.205	402526.375	24.30	22.88	1.42	500	PPIC	150	1/10		
PS14	445813.909	402464.362	24.10	22.10	2.00	500	PPIC	150	1/10		

- A. 06/08/12 minor off site sewer amendments (10/18)
- B. 21/02/12 off site sewer route amended (2005) highways comments added
- C. 26/04/12 road S amended (C/2008)
- D. 03/01/12 off site SW manhole refs amended to suit D05 CCTV survey (PS/20)
- E. 22/12/11 1W S102 comments/typo's referred to Rev I
- F. 16/11/11 latest manhole pipe gradients added (10/18)
- G. 03/11/11 off site sewer amended/1W comments added
- H. 22/08/11 Rev I amendments & 1W comments incorporated
- I. 28/08/11 Client comments incorporated (15)

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Client:
Gleeson Homes

Site:
Lowfield Road,
Bolton on Dearne.

Title:
Engineering Layout

Date:
Sept 2011

Scales:
1/500

Drawing No.:
11/249/58210



Appendix E Phase 2 Drainage Design

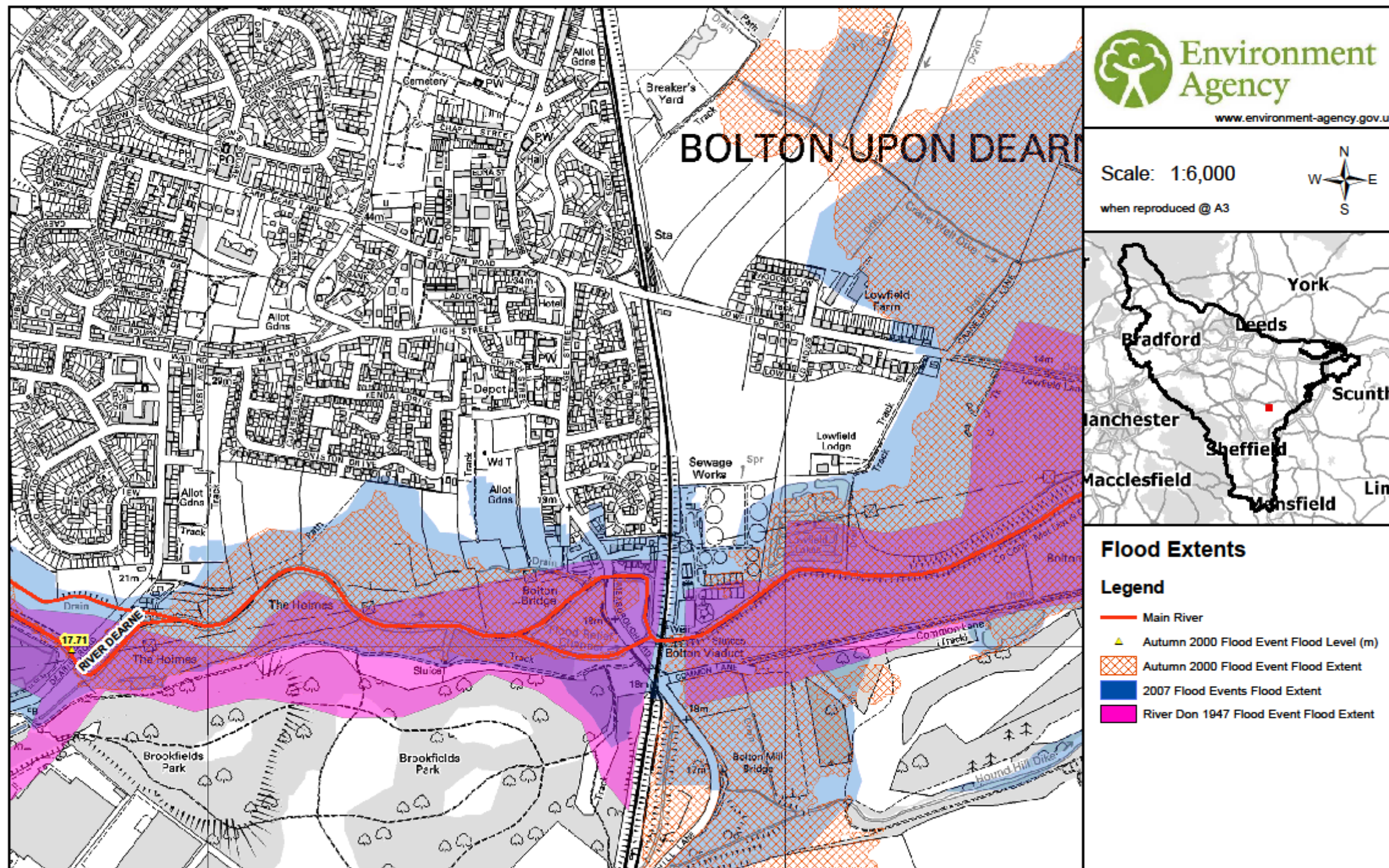






Appendix F Historical Flooding

Flood History Map for Bolton- Upon- Dearne - dated: 05/04/2013 [Ref: 25415]



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