



Client	Redrow Homes		
Project Title	Neddy Lane, Billington	Project No	20023
File Reference	20023/docs/civils/planning/discon/TN01		
Prepared By	S.Marshall, BSc(Hons) MCIWEM	Date	09 February 2023
Subject	Discharge of RVBC 3/2021/0205 Condition 21 – Compensatory Storage	Revision	-

### Introduction

This Technical Note summarises the methodology followed to calculate compensatory floodplain volumes associated with the 36-dwelling scheme on land at Neddy Lane in Billington and describes how the scheme functions.

Matters relating to legal agreements to secure the land as floodplain compensation for the lifetime of the development and details of future management are addressed separately.

### Floodplain Compensation Scheme Design

LiDAR data tiles and Topographic Survey data was used to create an existing digital terrain model of the area of interest (i.e. the area around the proposed development platform, the proposed floodplain compensation area and the adjoining River Calder floodplain).

Environment Agency Product 4 data (Wider Calder 2017) was used to define the design flood level. In the absence of suitable modelling data for the 1% plus climate change annual exceedance probability event the modelled 0.1% annual exceedance probability event was used as a proxy. The Environment Agency confirmed this was a satisfactory approach in this location.

The design floodplain level was overlaid within the digital terrain model and the floodplain extent delineated.

A digital terrain model of the proposed development platform was created, and a cut/fill analysis performed to calculate the volume of floodplain lost at 0.2m level increments.

Potential floodplain compensation areas on land outside of the floodplain were then identified. The relevant parties agreed upon the final solution presented herein.

A further digital terrain model of the proposed compensation area was created and iteratively adjusted to ensure the compensatory volume was achieved on a level for level basis.

Level (mAOD)	Depth (m)	Volume (m <sup>3</sup> )		
		Lost	Compensated	Difference
42.98 – 43.18	0.2	20.6	21.0	0.4
43.18 – 43.38	0.2	92.6	96.2	3.6
43.38 – 43.58	0.2	234.9	280.3	45.4
43.58 – 43.78	0.2	314.1	320.7	6.6
43.78 – 43.98	0.2	417.6	431.6	14.0
43.98 – 44.18	0.2	521.1	525.4	4.3
44.18 – 44.38	0.2	626.8	646.9	20.1
44.38 – 44.58	0.2	712.6	718.4	5.8
Total	1.6	2940.3	3040.5	100.2

**Table 1:** Floodplain Volumes

Scheme drawings are included within Appendix A.



**Floodplain Compensation Scheme Functionality**

Whilst the floodplain compensation area adjoins the design floodplain (i.e the 0.1% annual exceedance probability event floodplain) the compensatory area will become operational during lesser events. Based upon the Wider Calder 2017 model output, the compensatory area will not however be operational during the 4% annual exceedance probability event (1 in 25 year return period).

An engineered channel links the compensatory area to the more frequently inundated floodplain to ensure floodwater can flow into and out of the compensatory area on a level for level basis.

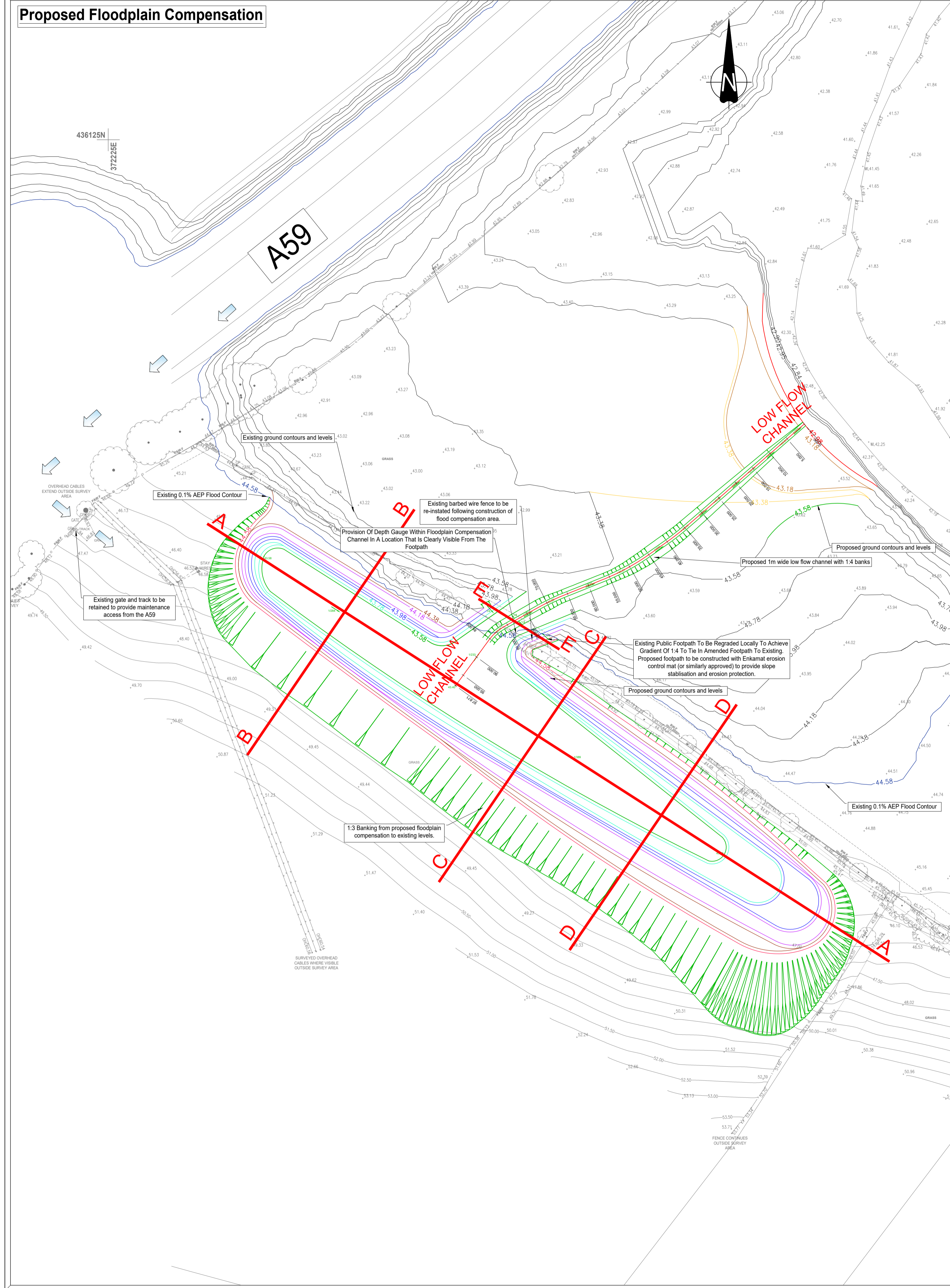
The compensatory area will gradually fill and empty in a manner commensurate with the wider floodplain; there will be no rapid inundation during either the filling or emptying phases.

The compensation area will only begin to empty when the wider floodplain recedes.

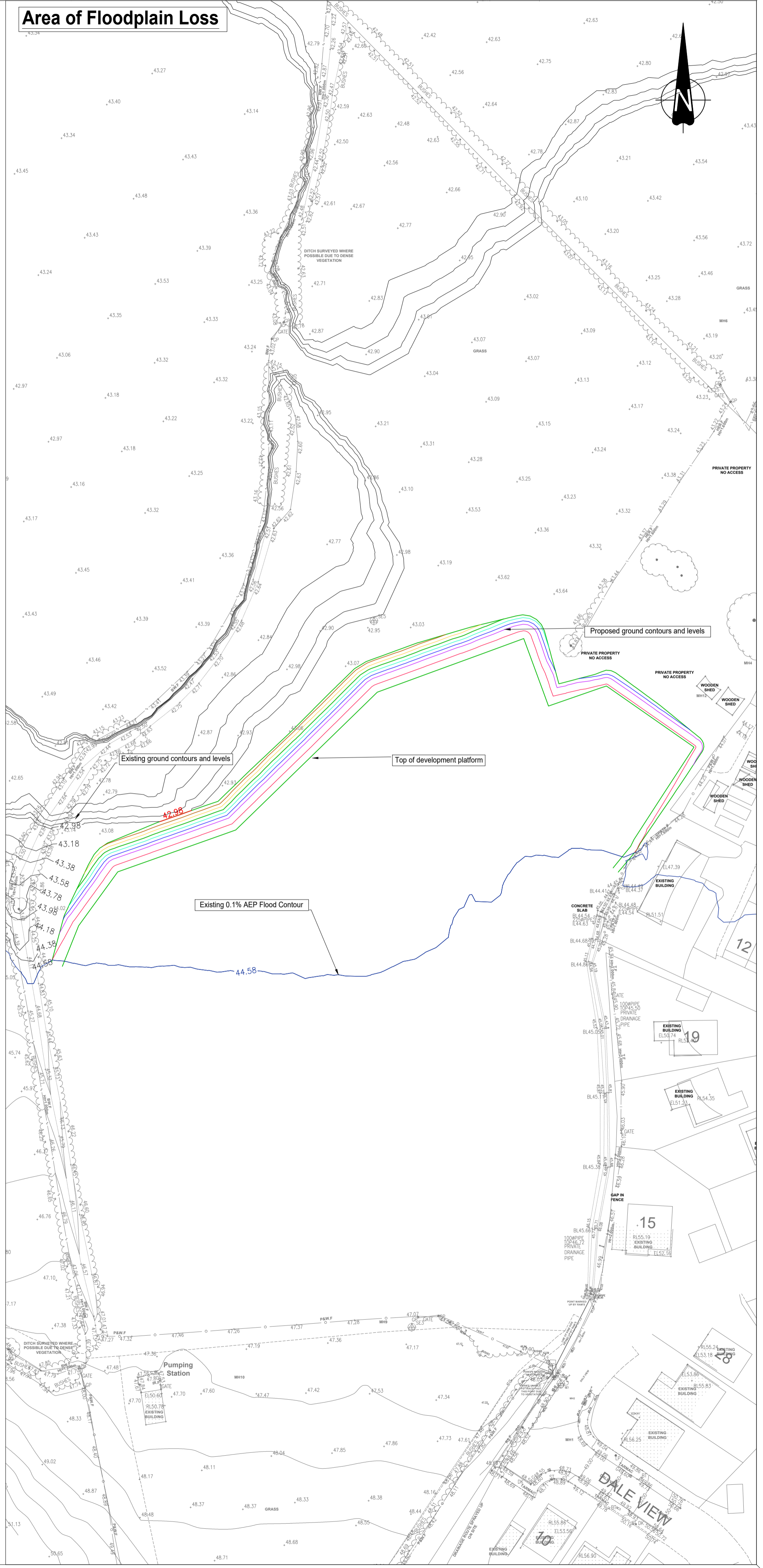
A 'living' Management Plan has been produced by others to ensure the compensatory area remains within its design parameters. The Management Plan should be periodically evaluated to ensure it remains fit-for-purpose.

**Appendix A: Compensation Scheme Drawings**

# Proposed Floodplain Compensation



# Area of Floodplain Loss



The Contractor is to check and verify in conjunction with the Architects details of setting out points, building and site dimensions, walls and sewer invert levels at connection points and ensure that they are fully compliant with the contents and requirements of the site investigation report before work starts. The Contractor is to comply in all respects with current building legislation, British Standard Specifications, Building Regulations etc. whether or not specifically stated on this drawing.

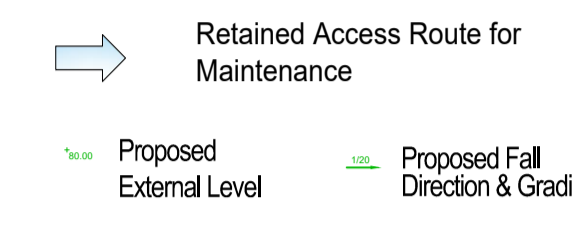
This drawing is not intended to show details of ground conditions or ground commitments. Each area of ground related upon to support any structure depicted (including drainage) must be investigated by the Contractor and a geotechnical report on to be immediately notified to the Engineer, where applicable. Any suspect fluid ground or ground commitments on or within the ground must be further investigated by a suitable expert. Any earthworks shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert. Where existing levels are shown to be retained they should be subject to a full geotechnical inspection for safety. All trees are to be protected in situ to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting.

© TWS 2023 and the building works depicted are the copyright of Banners Gate Ltd and may not be reproduced or amended without written permission. No liability will be accepted for amendments made by other parties.

**Notes:**

- Drawing based on Topographical survey - RH TS 15-F Neddy Lane, Billington and Redrow planning layout PPL-001, Redrow Contract Pan CP-001.
- Flood level data taken from "Wider Calder 2017" and provided by the Environment Agency on 27th January 2020.
- Floodplain compensation assessed against the 0.1% AEP (1 in 1000) level as a proxy for the 1% + climate change level.
- All levels in metres Above Ordnance Datum (mAOD) unless stated otherwise.
- Ground preparation shall include 300mm topsoil/subsoil strip.
- Topsoil to be stockpiled.
- Excavate to 300mm below required profile and provide roll formation. Soft spots to be identified, recorded and reported to the Engineer.
- Roots larger than 50mm diameter to be removed.
- Replace topsoil and seed with a suitable grass seed mix.
- Please refer to drawing 221 for cross section plans A-A to E-E & Low Flow Channel.

## Flood Compensation Legend



Level (mAOD)	Depth (m)	Low Of Floodplain Volume (m³)	Compensatory Floodplain Volume (m³)
42.98-43.18	0.200	20.6	21.0
43.18-43.38	0.200	92.6	96.2
43.38-43.58	0.200	234.9	240.3
43.58-43.78	0.200	314.1	320.7
43.78-43.98	0.200	417.6	431.6
43.98-44.18	0.200	521.1	525.4
44.18-44.38	0.200	626.8	646.9
44.38-44.58	0.200	712.6	718.4
<b>Total</b>		<b>2940.3</b>	<b>3040.5</b>

Environment Agency Modelled Flood Levels		
Return Period	Level (mAOD)	21.0
4% AEP (1 in 25)	42.87	
1% AEP (1 in 100)	43.34	
0.1% AEP (1 in 1000)	44.58	

Rev.	First Issue	Description	Date	By
1	10.01.2023	RA		

**FOR APPROVAL**



**Client**  
Neddy Lane  
Billington

**Project**  
Floodplain Compensation  
General Arrangement

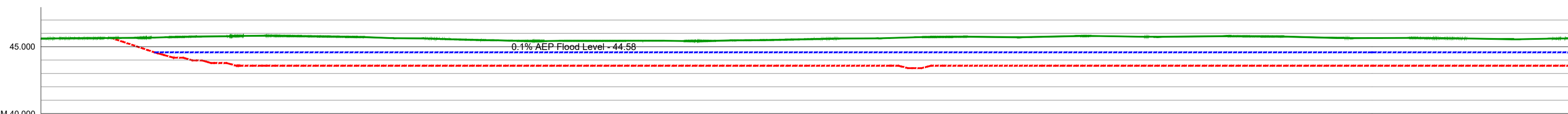
**BANNERS GATE**  
CIVIL, STRUCTURAL & ARCHITECTURAL DESIGN SERVICES  
10-11 Birmingham Street, Halesowen, West Midlands B63 3HN  
Tel: 0121 687 1500 Fax: 0121 687 1501  
E-mail: mail@bannersgate.com

Scale	1:500 @ A1	Drawn	RA
Date	January 2023	Checked	SM
File	2023/dwgs/civil/curent	Drawing	20023 - 101

The Contractor is to check and verify in conjunction with the Architects details of setting out points, building and site dimensions, walls and sewer invert levels at connection points and ensure that they are fully compliant with the contents and requirements of the site investigation report before work starts. The Contractor is to comply in all respects with current building legislation, British Standard Specifications, Building Regulations etc. whether or not specifically stated on this drawing.

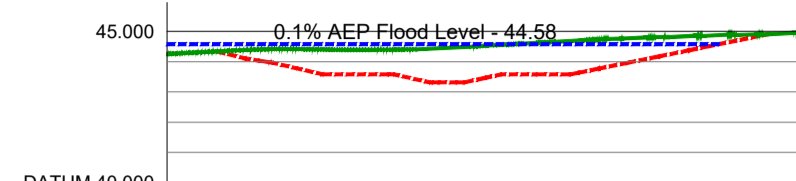
The drawings are not intended to show details of ground conditions or ground contaminants. Each area of ground referred upon to support any structure depicted (including drainage) must be investigated by the Contractor any other of the following methods and procedures which do not conflict with the anticipated conditions as mentioned in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspect fluid ground or ground contaminants on or within the ground should be further investigated by a suitable expert. Any excavations shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert. Where existing trees are shown to be retained they should be subject to a full arboricultural inspection for safety. All trees are to be protected in situ to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

© This drawing and the building works depicted are the copyright of Banners Gate Ltd and may not be reproduced or amended except by written permission. No liability will be accepted for amendments made by other parties.



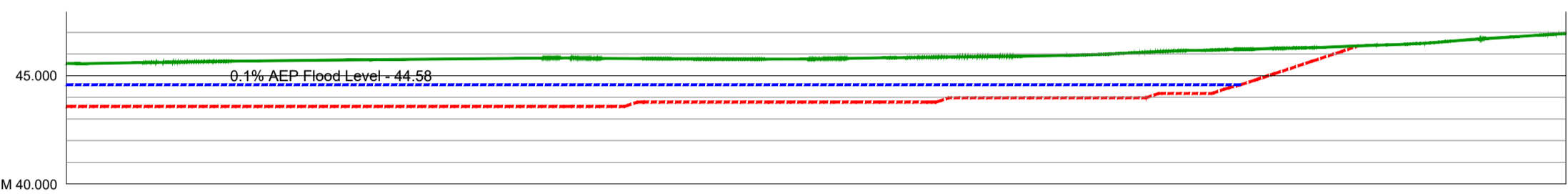
CHAINAGE	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000	75.000	80.000	85.000	90.000	95.000	100.000	105.000	110.000	115.000	
PROPOSED FLOOD COMPENSATION		45.655	44.180	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590
EXISTING GROUND MODEL	45.610	45.651	45.725	46.807	45.785	45.694	45.584	45.461	45.442	45.447	45.434	45.508	45.613	45.688	45.747	45.741	45.789	45.752	45.786	45.718	45.849	45.826	45.586	45.627	45.627

SECTION A-A Part 1 of 2



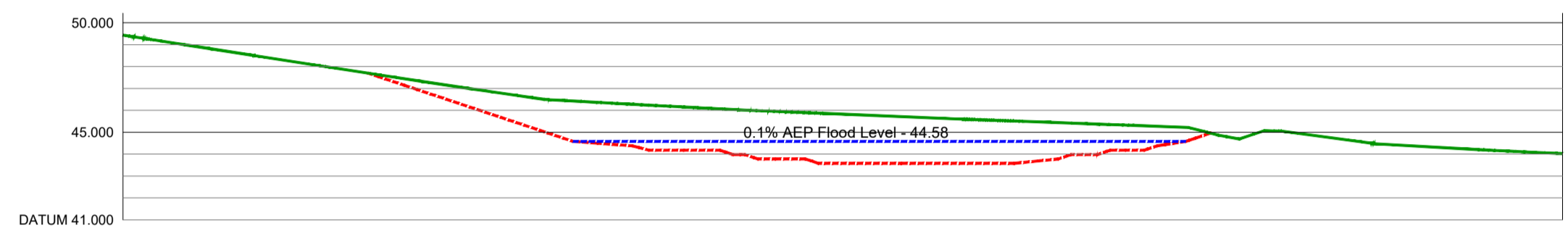
CHAINAGE	0.000	1.648	5.000	10.000	15.000	20.000	21.000
PROPOSED FLOOD COMPENSATION		44.342	43.818	43.352	43.918	44.509	44.941
EXISTING GROUND MODEL	44.259	44.406	44.481	44.701	44.916	44.941	44.941

SECTION E-E



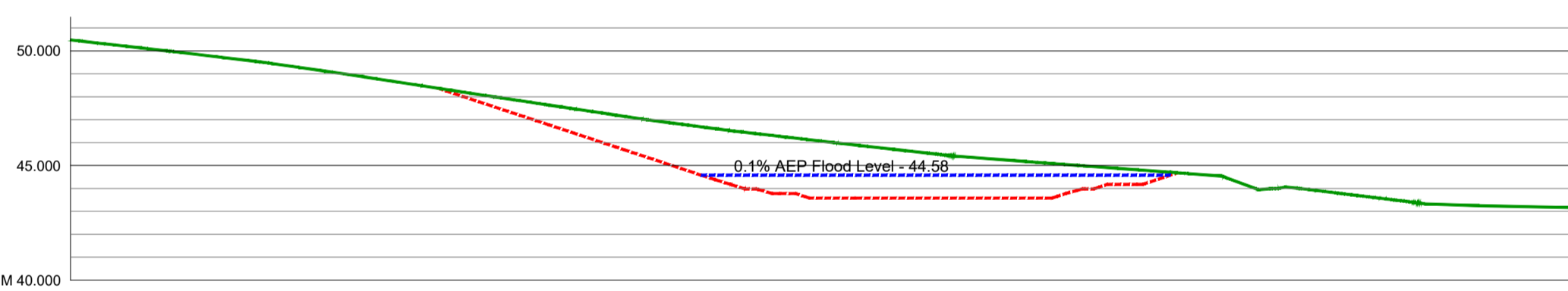
CHAINAGE	115.000	115.000	120.000	125.000	130.000	135.000	140.000	145.000	150.000	155.000	160.000	165.000	169.803	170.000	175.000	179.417
PROPOSED FLOOD COMPENSATION	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590
EXISTING GROUND MODEL	45.960	45.627	45.697	45.750	45.794	45.798	45.770	45.779	45.853	45.913	46.089	46.229	46.384	46.608	46.892	46.892

SECTION A-A Part 2 of 2



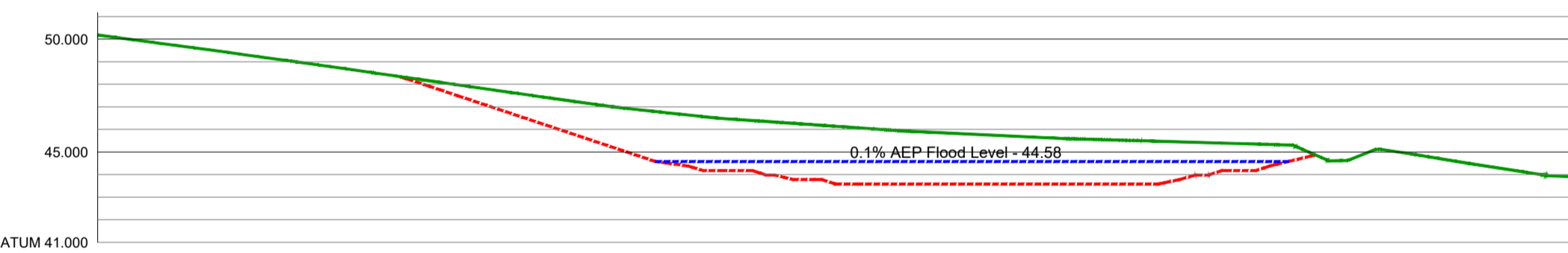
CHAINAGE	0.000	5.000	10.000	11.181	15.000	20.000	25.000	30.000	35.000	40.000	45.000	48.632	50.000	55.000	60.000	65.000	65.000	
PROPOSED FLOOD COMPENSATION			47.700	46.428	44.763	44.180	43.780	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590
EXISTING GROUND MODEL	49.838	48.659	47.883	47.119	46.457	46.105	45.843	45.706	45.538	45.385	44.882	44.882	44.765	44.312	44.085	44.020	44.020	

SECTION D-D



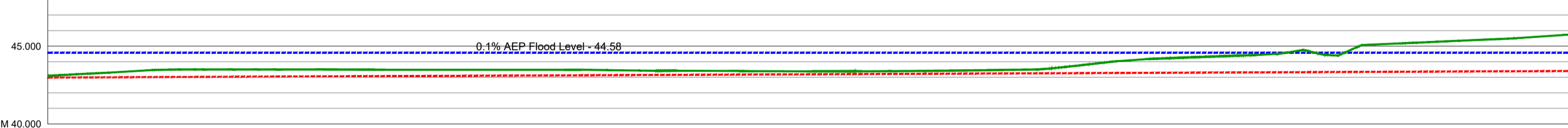
CHAINAGE	0.000	5.000	10.000	15.000	16.014	20.000	25.000	30.000	35.000	40.000	45.000	47.324	50.000	55.000	60.000	65.000	65.000	
PROPOSED FLOOD COMPENSATION				48.371	47.054	45.401	43.943	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590
EXISTING GROUND MODEL	50.480	49.908	49.277	48.527	47.766	47.016	46.377	45.806	45.299	44.823	44.552	44.295	43.771	43.265	43.171	43.156	43.156	

SECTION B-B



CHAINAGE	0.000	5.000	10.000	13.395	15.000	20.000	25.000	30.000	35.000	40.000	45.000	48.632	50.000	50.000	53.878	55.000	60.000	65.000	65.000	
PROPOSED FLOOD COMPENSATION				48.339	47.805	46.139	44.535	43.966	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590	43.590
EXISTING GROUND MODEL	50.185	49.518	48.824	48.109	47.394	46.760	46.324	45.978	45.726	45.534	45.389	44.816	44.004	43.911	43.881	43.881	43.881	43.881	43.881	

SECTION C-C



CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	97.871
PROPOSED FLOOD COMPENSATION	42.880	43.023	43.066	43.109	43.152	43.195	43.237	43.280	43.323	43.366	43.400
EXISTING GROUND MODEL	43.394	43.500	43.481	43.480	43.421	43.382	43.348	44.114	44.823	45.307	45.739

SECTION LOW FLOW CHANNEL

Rev.	1	First Issue	10.01.2023	RA
------	---	-------------	------------	----

Drawing Status

**FOR APPROVAL**

Client  
**REDROW**

Project  
Neddy Lane  
Billington

Title  
Floodplain Compensation  
Cross Sections

**BANNERS GATE**  
CIVIL, STRUCTURAL & ARCHITECTURAL DESIGN SERVICES  
10-11 Birmingham Street, Halesowen, West Midlands B63 3HN  
Tel: 0121 687 1500 Fax: 0121 687 1501  
E-mail: mail@bannersgate.com

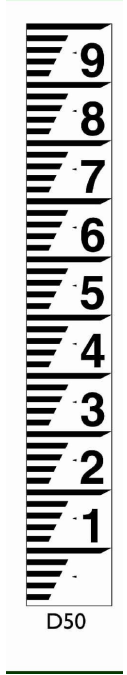
Scale	1:250 @ A1	Drawn	RA
Date	January 2023	Checked	SM
File	20023\dwgscivil/curent	Drawing	20023 - 221

Structural Calculation Details

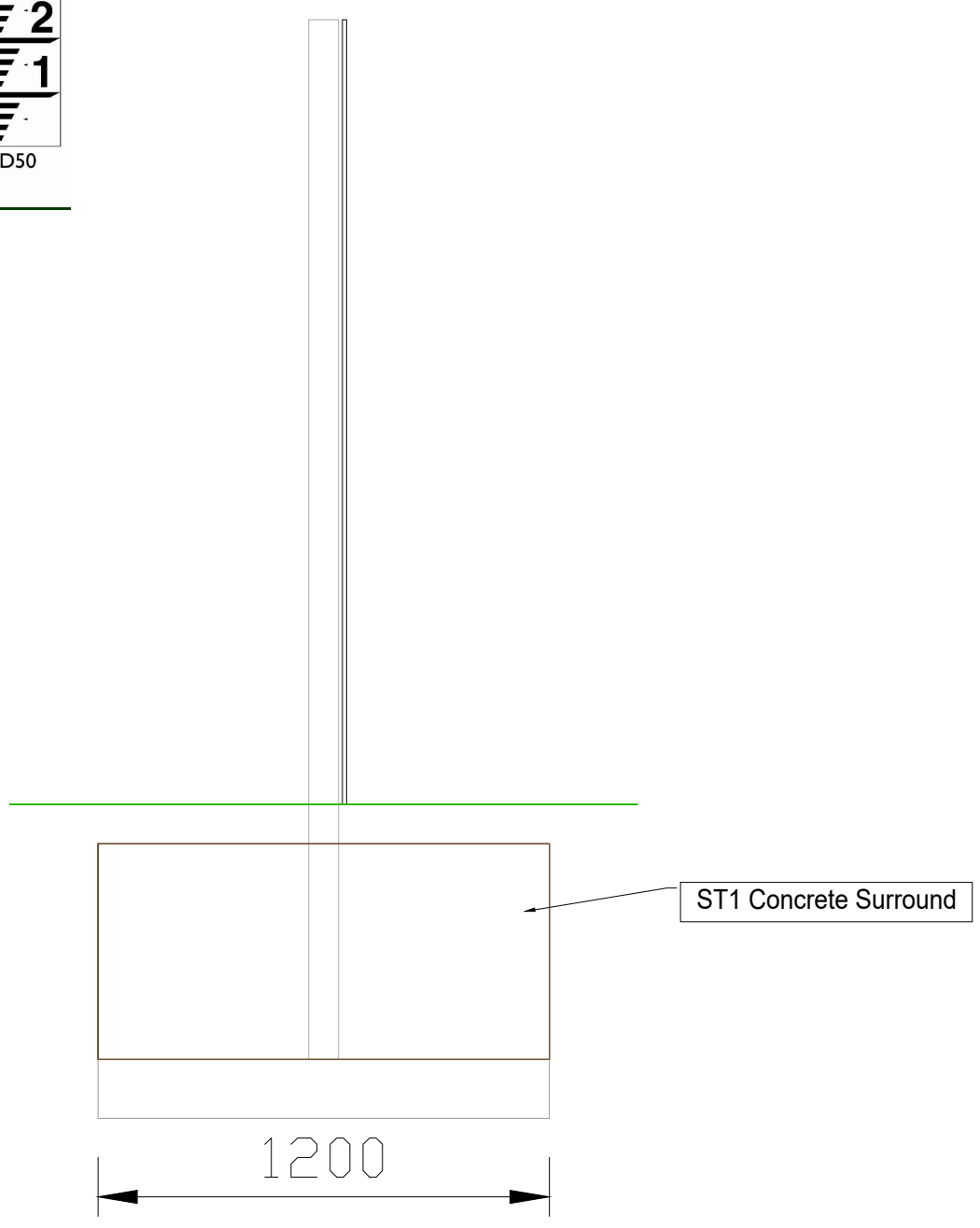
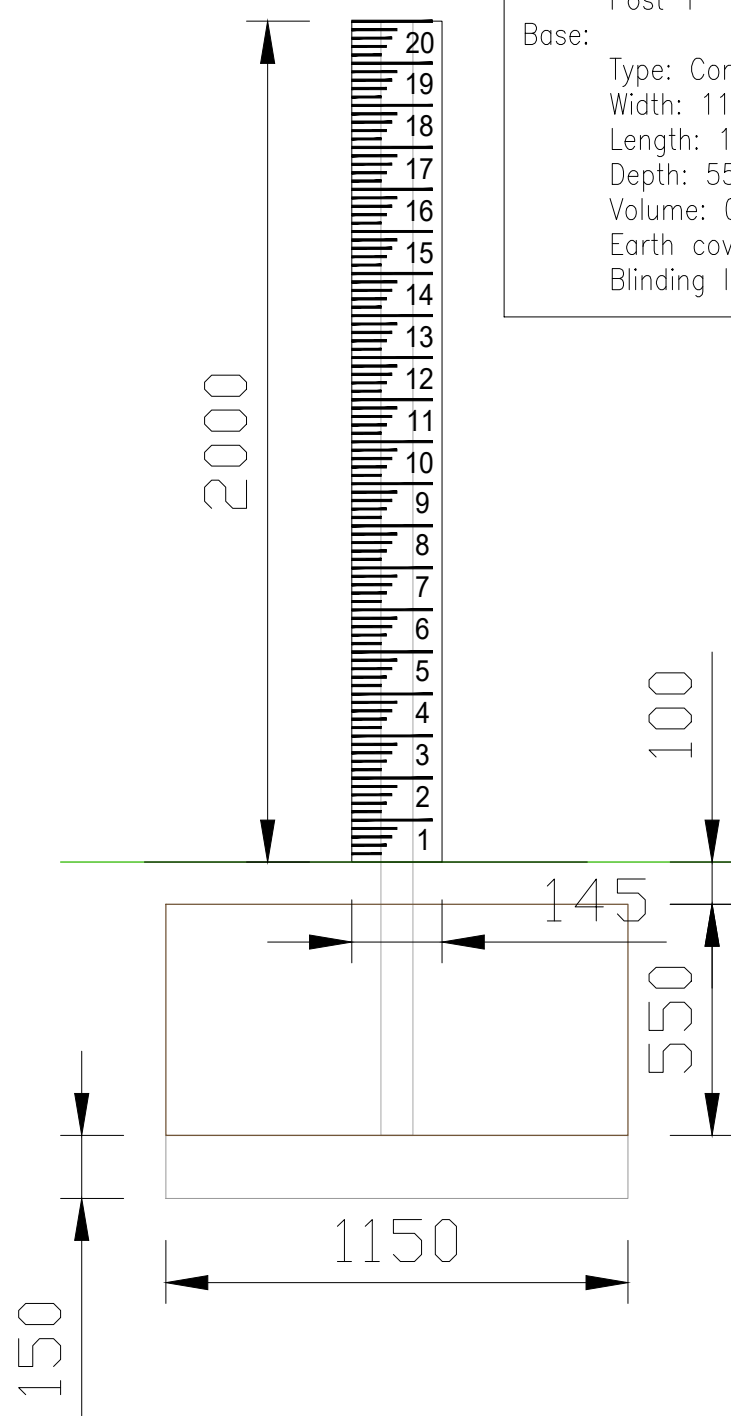
Signs:  
 Reference: Sign 1  
 Width: 145mm, Height: 2000mm  
 Shape: Rectangle  
 Orientation: Facing front  
 Mounted on posts: 1  
 Mounting height: 0mm, at post

Posts:  
 Quantity: 1  
 Type: 76.1 x 3.2 CHS  
 Spacing: N/A  
 Post 1 Length: 2650mm

Base:  
 Type: Combined  
 Width: 1150mm  
 Length: 1200mm  
 Depth: 550mm  
 Volume: 0.76cu.m  
 Earth cover: 100mm  
 Blinding layer: 150mm



Shelley Sign Inland Design Board - D50 Style Gauge  
 Board - Or similarly Approved  
 To BS EN ISO 4373:2008 "Hydrometry. Water level  
 measuring devices" & BS 3680:Part 7 : 2000  
 "Measurement of Liquid flow in open channels."



The Contractor is to check and verify in conjunction with the Architects details all setting out points, building and site dimensions, levels and sewer invert levels at connection points and ensure that they are fully conversant with the contents and requirements of the site investigation report before work starts. The Contractor is to comply in all respects with the relevant design specifications, Building Regulations and other applicable codes of practice. The Contractor is to investigate any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structures which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspect fluid ground or ground contaminants on the site should be investigated by the Contractor. The Contractor is to ensure that the minimum safe distance of 3 metres from drainage and any other structures is maintained. The Contractor is to ensure that the minimum safe distance of 3 metres from drainage and any other structures is maintained. The Contractor is to ensure that the minimum safe distance of 3 metres from drainage and any other structures is maintained. The Contractor is to ensure that the minimum safe distance of 3 metres from drainage and any other structures is maintained.

- GENERAL NOTES**
- This drawing is to be read in conjunction with relevant architectural and engineering drawings.
  - Levels indicated in blocks are Finished floor levels and are 150mm above adjacent finished ground levels unless otherwise shown.
  - Levels of the existing road at the point of tie-in with proposed site road must be checked prior to commencement of works.
  - Any discrepancies between the details shown and actual on site conditions to be reported immediately to the engineer prior to commencement of works.

Rev.	Description	Date	By
-	First Issue	10.01.2023	RA

Drawing Status

**FOR APPROVAL**

Client

**REDROW**

Project

Neddy Lane  
Billington

Title

Flood Depth Gauge  
General Arrangement

  
**BANNERS GATE**  
 CIVIL, STRUCTURAL & ARCHITECTURAL DESIGN SERVICES  
 10-11 Birmingham Street, Halesowen, West Midlands B63 3HN  
 Tel: 0121 687 1500 Fax: 0121 687 1501  
 E-mail: mail@bannersgate.com

Scale	NTS @ A3	Drawn	RA
Date	January 2023	Checked	DA
File	20023/dwgs/civils/current	Drawing	20023 - 301

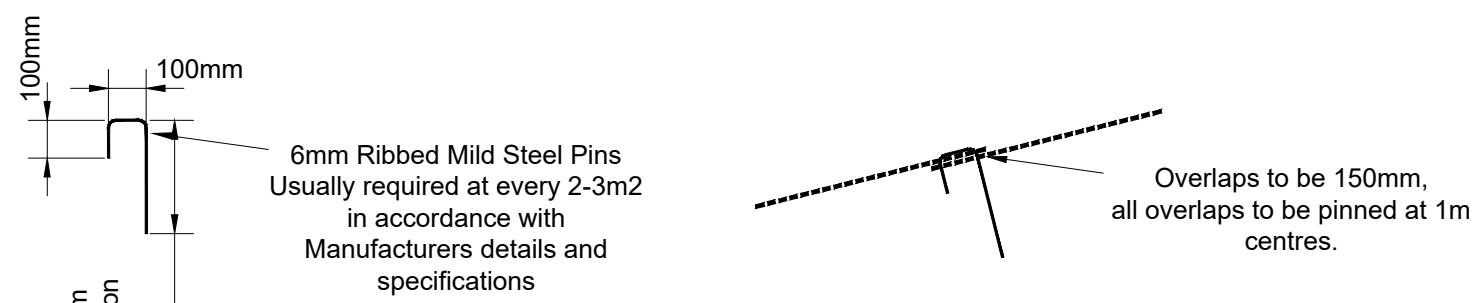
The Contractor is to check and verify in conjunction with the Architects details all setting out points, building and site dimensions, levels and sewer invert levels at connection points and ensure that they are fully conversant with the contents and requirements of the site investigation report before work starts. The Contractor is to comply in all respects with current building legislation, British Standard Specifications, Building Regulations etc., whether or not specifically stated on this drawing.

This drawing is not intended to show details of ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structures which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspect fluid ground or ground contaminants on or within the ground should be further investigated by a suitable expert. Any earthworks shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert.

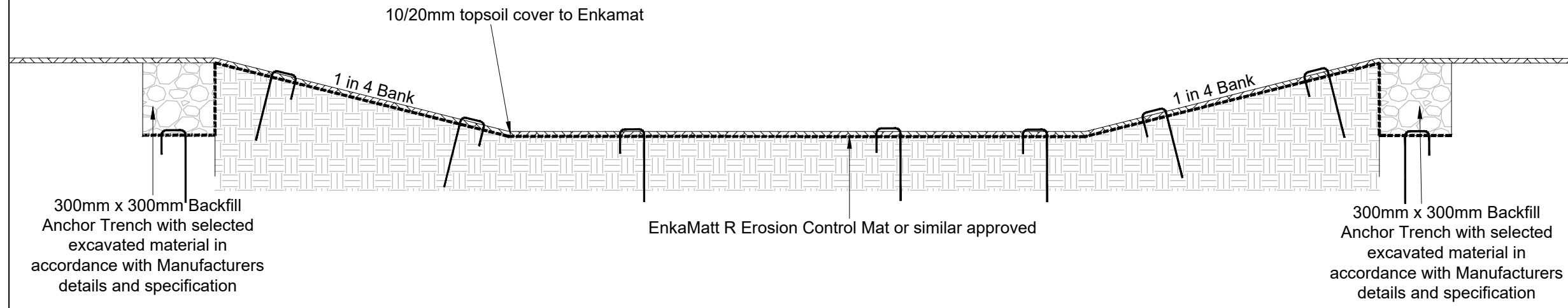
Where existing trees are shown to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

© This drawing and the building works depicted are the copyright of Banners Gate Ltd and may not be reproduced or amended except by written permission. No liability will be accepted for amendments made by other persons.

- GENERAL NOTES**
- This drawing is to be read in conjunction with relevant architectural and engineering drawings.
  - Levels indicated in blocks are Finished floor levels and are 150mm above adjacent finished ground levels unless otherwise shown.
  - Levels of the existing road at the point of tie-in with proposed site road must be checked prior to commencement of works.
  - Any discrepancies between the details shown and actual on site conditions to be reported immediately to the engineer prior to commencement of works.



### Fixings and Securing of Overlaps



### General Arrangement of Public Footpath & Enkamat Erosion Control Mat

Rev.	Description	Date	By
-	First Issue	10.01.2023	RA

Drawing Status

**FOR APPROVAL**

Client

Project

Neddy Lane  
Billington

Title

Floodplain Compensation  
Public Footpath Construction Detail

**BANNERS GATE**

CIVIL, STRUCTURAL & ARCHITECTURAL DESIGN SERVICES  
10-11 Birmingham Street, Halesowen, West Midlands B63 3HN  
Tel: 0121 687 1500 Fax: 0121 687 1501  
E-mail: mail@bannersgate.com

Scale	1:20 @ A3	Drawn	RA
Date	January 2023	Checked	
File	20023/dwgs/civils/current	Drawing	20023 - 302