

## TECHNICAL NOTE

**Job Name:** North Littlehampton  
**Job No:** 39878  
**Note No:** TN003 Rev. A  
**Date:** 29.09.21  
**Prepared By:** Alex Wray  
**Subject:** **Site-Wide Flood Compensation**

---

### 1. Introduction

This technical note and accompanying drawings available in Appendix A provides evidence to facilitate the discharging of relevant planning conditions pertaining to the compensatory flood storage and flood risk for the entire North Littlehampton development.

The relevant outline planning conditions relating to the flood risk and flood compensation are 7(vii) and 9, as follows:

#### **Condition 7 (vii)**

*The appearance, landscaping and layout particulars to be submitted in accordance with Condition 1 for any phase or sub phase shall include (insofar as they are relevant to that phase or sub phase):*

- vii. The detailed design of the flood compensation measures including the wetland, including levels and profiles and a programme for construction;*

#### **Condition 9**

*The development permitted by this planning permission shall only be carried out in accordance with the approved Flood Risk Assessment (FRA) dated February 2011 and the following mitigation measures detailed within the FRA:*

- *Compensatory flood storage shall be provided on/or in the vicinity of the site to the design flood levels specified within the approved FRA;*
- *Finished floor levels shall be set no lower than 500mm above the design flood level within the approved FRA.*

The above conditions have been previously discharged for parcels C1, C2, B2 and B4 on the western side of the Central Wetland Area (CWA), the boundary of which is shown on drawing 39878/4001/008 available in Appendix A.

This note details the total volume of flood storage lost due to the proposed earthworks required to enable the construction of the development and the flood storage gained through the demolition of the existing buildings and reprofiling / landscaping of the open areas in the CWA.

It demonstrates how the delivery of this phase accords with the approved Flood Risk Assessment (FRA), February 2011, and that the proposals for this phase can be delivered and provide betterment within the development.

For masterplan details and on-plot levels refer to Mayer Brown drawings within condition discharge pack.

## TECHNICAL NOTE

### 2. Flood Levels

Stantec completed a Flood Risk Assessment (FRA) of the North Littlehampton Urban Extension works between 2009-2011 based on modelling within the Arun District SFRA (2008). This FRA identified that part of the Masterplan lay within the 1 in 100-year plus climate change flood extent and subsequently a flood compensation scheme was prepared to facilitate planning permission.

The 2011 FRA developed a compensation scheme based on the 100-year with a 20% allowance for climate change level, levels ranging from ~3.0 to 3.6m AOD.

Since the preparation of the 2011 FRA the Environment Agency (EA) have updated their modelling in this location (Lower Tidal River Arun Strategy Model) and their climate change guidance and recommendations for setting of design levels for schemes.

The EA's latest modelled information and levels is included in Appendix B.

Whilst the latest flood levels have reduced, the EA's requirements for design of the compensation scheme have become more stringent due to the new climate change guidance, recommending that mitigation is designed to the 100-year with a 45% allowance for climate change (compared to the 20% allowance under the previous guidance used in the 2011 FRA).

Discussions have been held with the EA to confirm the levels and agree the design parameters. Appendix C provides a summary of the correspondence.

Due to the absence of an available flood level for the 100-year with a 45% allowance for climate event in the latest modelling information, the EA has accepted that the extreme 1000-year defended fluvial flood level (2.38m AOD) can be used as a conservative proxy.

This change equates to a reduction in flood level of between 0.6-1.2m when compared against the compensation scheme proposed in the 2011 FRA. This updated scenario has been used in the latest flood compensation exercise.

An overview drawing of the compensation scheme is included in Appendix A, and discussed further in the following sections.

As part of the discussions with the EA it was also agreed that the FFLs will be set based on the undefended 1000-year level of 2.90m AOD.

### 3. Flood Compensation and Finished Floor Levels

A compensation scheme for the proposed development has been developed based on the latest agreed flood levels and Masterplan. The compensation scheme is delivered by a reduction in existing levels within the CWA to the west of the southern water pipe with the residual delivered in the location of the playing fields to the east of the development.

Stantec drawing 39878/4001/008, Appendix A, shows a plan of the extent of ground re-profiling which delivers a scheme that provides a net increase in flood storage across the site. Table 1 below gives a summary of the band-by-band flood storage gains showing an overall volumetric gain in flood storage across the site.

Whilst there are a number of existing site constraints, including the Southern Water water main and surrounding infrastructure, an overall volumetric increase in flood storage has been provided. The proposed compensation scheme provides an increased flood storage volume available during the lower, more frequent, flood events.

## TECHNICAL NOTE

The upper top 4 bands all show level-for-level losses from the 1 in 1000 year defended flood level. As stated in the previous section, the 1 in 100 year plus climate change level provided within the product 4 data is approximately 560mm below this level and if it were used for compensation then there would be no losses in the upper bands. As any event above the 100 year plus climate change level holds very low probability and that there are overall volumetric gains provided up to the 1000-year level, the level-for-level losses in the top 4 bands will be less impactful.

It is noted that at the lower bands, generally below 1000mm below the flood level, there is some net loss in flood storage, however this is due to a number of existing field drains and isolated ponds within the CWA and are below the normal level of the Black Ditch. These do not provide active storage and do not significantly contribute to the existing flood storage on the site.

**Table 1 - Flood Compensation up to the 1000-year flood level**

| LEVEL BAND<br>BELOW FLOOD<br>LEVEL (mm) | EXISTING<br>STORAGE (m <sup>3</sup> ) | PROPOSED<br>STORAGE (m <sup>3</sup> ) | PER BAND NET<br>GAIN/LOSS (m <sup>3</sup> ) | CUMULATIVE<br>FLOOD STORAGE<br>BALANCE (m <sup>3</sup> ) |
|-----------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------------|----------------------------------------------------------|
| 0-100                                   | 36092                                 | 33978                                 | -2114                                       | 324                                                      |
| 100-200                                 | 34921                                 | 33410                                 | -1511                                       | 2438                                                     |
| 200-300                                 | 33873                                 | 32823                                 | -1050                                       | 3949                                                     |
| 300-400                                 | 32815                                 | 32238                                 | -577                                        | 4999                                                     |
| 400-500                                 | 31559                                 | 31596                                 | 37                                          | 5576                                                     |
| 500-600                                 | 30062                                 | 30863                                 | 801                                         | 5539                                                     |
| 600-700                                 | 28255                                 | 29756                                 | 1501                                        | 4738                                                     |
| 700-800                                 | 25539                                 | 27711                                 | 2172                                        | 3237                                                     |
| 800-900                                 | 20842                                 | 22088                                 | 1246                                        | 1065                                                     |
| 900-1000                                | 15267                                 | 16148                                 | 881                                         | -181                                                     |
| 1000-1100                               | 9520                                  | 8873                                  | -647                                        | -1062                                                    |
| 1100-1200                               | 4667                                  | 4406                                  | -261                                        | -415                                                     |
| 1200-1300                               | 1867                                  | 1771                                  | -96                                         | -154                                                     |
| 1300-1400                               | 657                                   | 599                                   | -58                                         | -58                                                      |

Table 1 above shows that the proposed flood compensation scheme provides a net increase in flood compensation of 324m<sup>3</sup> up to the 1000-year event.

The scheme re-profiles the whole of the CWA west of the water main to a level of 1.38m AOD with a profile to allow flood waters to drain back towards the Black Ditch to the north. These levels would result in ground lowering of between 0.5m-1.5m across the CWA. The land to the east of the water main will be re-profiled to a level of 1.60m AOD to provide sufficient cover to the pipe through an 8m corridor along the pipe's alignment.

There will be a slight fall from east to west in this area to aid conveyance for the receding flood waters.

The northern crossing across the CWA has been raised out of the floodplain with a central culvert, 12.8m wide by 1.9m high, that provides the connection between the larger compensation area to the south with the Black Ditch to the north. Details of the crossing and the culvert are available in Appendix A. The existing network of ditches in the land to the north of the development will assist with drainage back to the Black Ditch.

The sports pitches to the east of the development have been re-profiled towards the south and east of the field to provide a constant ground level to tie into the existing 1.54m AOD contour with a slight fall to the ditches to the north and east to facilitate drainage.

## TECHNICAL NOTE

The development platforms will slope down to existing ground levels from the defined masterplan boundaries at a grade of 1:3 from an upper level of approximately 4.0m AOD.

The plot levels are set at or higher than 4.0mAOD, which is a minimum of 1620mm above the design flood level of 2.38mAOD. Condition 9 states that finished floor levels on the plots are to be set a minimum of 500mm above the design flood level, the plot levels show that will be achieved and therefore complies with this condition.

### 4. Conclusion

Based on the above assessment, the proposed masterplan will be able to be delivered whilst providing an overall increase in flood storage on site.

Most of the compensation can be provided in a lowered Central Wetland Area, running between the two development platforms, with the rest being provided through land lowering to the proposed playing fields to the east of the development.

The provision of the flood compensation scheme together with the associated landscape management provides a volumetric net gain of ~324m<sup>3</sup> of flood storage as shown in Table 1 up to the design flood event.

It has been shown that finished floor levels on the plots will be set a minimum of 500mm above the design flood event, in compliance with condition 9.

The updated flood compensation scheme and the proposed plot development delivers the required flood compensation and design criteria required to discharge the parts of planning conditions 7 and 9 as outlined in the introduction.

### DOCUMENT ISSUE RECORD

| Technical Note No | Rev | Date     | Prepared | Checked | Reviewed<br>(Discipline Lead) | Approved<br>(Project Director) |
|-------------------|-----|----------|----------|---------|-------------------------------|--------------------------------|
| 39878/TN003       | -   | 20.12.18 | AW       | RR      |                               |                                |
| 39878/TN003       | A   | 29.09.21 | AW       | RR      |                               |                                |

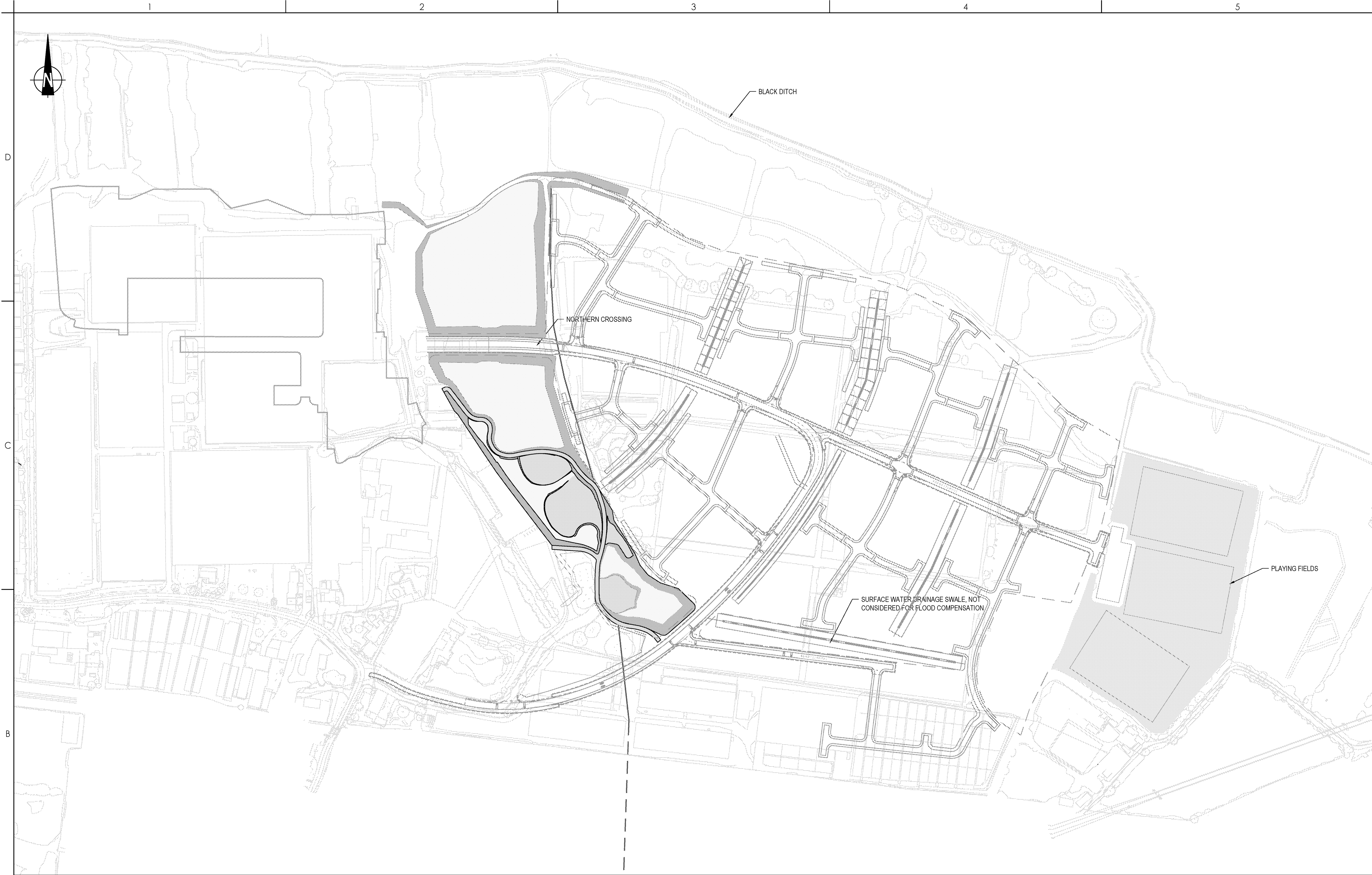
This report has been prepared by Stantec UK Limited ('Stantec') on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which Stantec was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). Stantec accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

## TECHNICAL NOTE

T: +44 (0)118 950 0761 E: [reading.uk@stantec.com](mailto:reading.uk@stantec.com)

### Appendix A

Stantec Drawing 39878/4001/008 Rev. C – Flood Compensation  
Stantec Drawing 35944/1507/003 – Northern Crossing General Arrangement



Copyright Reserved  
The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing  
- any errors or omissions shall be reported to Stantec without delay.  
The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other than that authorized by Stantec is forbidden.

Notes  
UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

|                 |                                                                  |      |          |
|-----------------|------------------------------------------------------------------|------|----------|
| C               | UPDATED WETLAND AREAS                                            | CS   | 29.09.21 |
| B               | PLANNING ISSUE                                                   | JFDS | 20.12.18 |
| A               | INCORPORATION OF NEW CONSERVATION AND PLATFORM LEVEL INFORMATION | AW   | 02.05.18 |
| Issued/Revision |                                                                  | By   | Appd     |
|                 |                                                                  | SMR  | AW       |
|                 |                                                                  | Dwn. | Chkd.    |

Issue Status

**FOR PLANNING**

This document is suitable only for the purpose noted above.  
Use of this document for any other purpose is not permitted.

Client/Project Logo

Client/Project  
PERSIMMON HOMES  
THAMES WATER

Title  
NORTH LITTLEHAMPTON  
CENTRAL WETLAND AREA

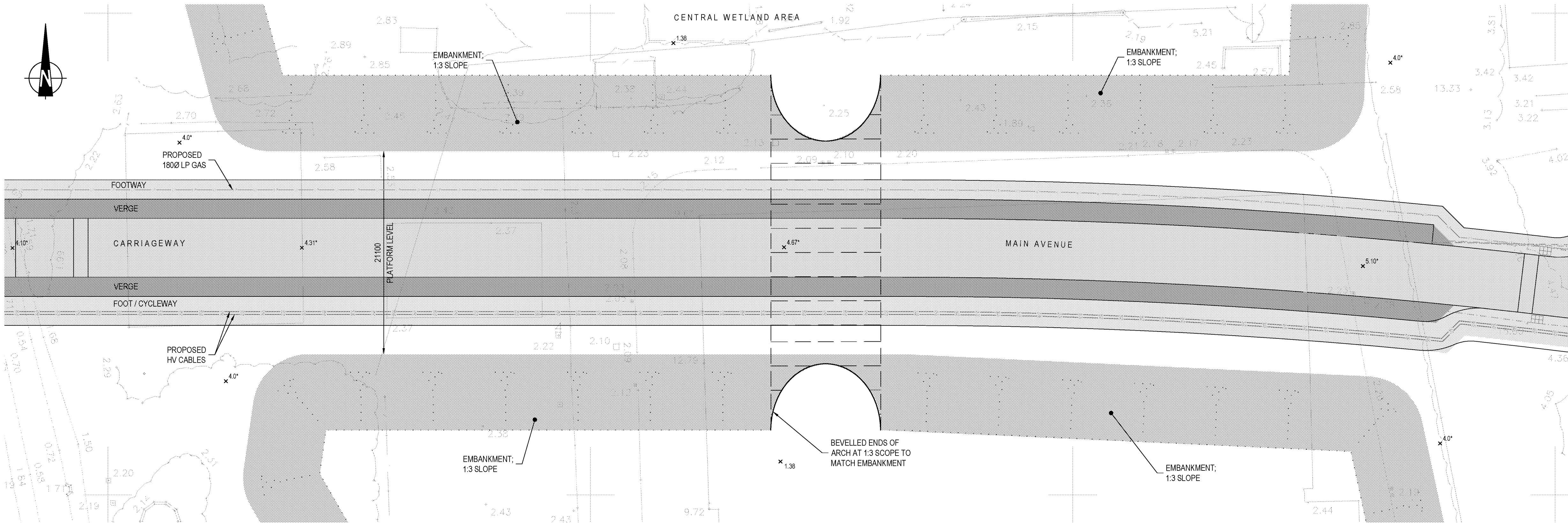
FLOOD COMPENSATION

|             |             |
|-------------|-------------|
| Project No. | Scale       |
| 39878       | 1:2000      |
| Revision    | Drawing No. |
| C           | 4001/008    |

- KEY:
- PROPOSED TOP OF GRADING
  - PROPOSED 1 IN 3 SLOPE
  - LOWER CWA COMPENSATION PLATFORM (AVERAGE LEVEL 1.38m AOD)
  - UPPER CWA COMPENSATION PLATFORM (AVERAGE LEVEL 1.60m AOD)
  - TREE PROTECTION PLATFORM
  - PLAYING FIELDS - TO BE SET AT A OF 1.54m AOD AND GRADED TO EXISTING.
  - FOOTPATHS THROUGH CWA
  - INDICATIVE ALIGNMENT OF CWA DRAINAGE DITCH
  - PREVIOUSLY CONSENTED BOUNDARY (PARCELS C1, C2, B2 AND B4)
  - SURVEYED ALIGNMENT OF SOUTHERN WATER WATER MAIN

- NOTES:
- BASED ON MASTERPLAN INFORMATION PROVIDED BY PERSIMMON DRAWING No. 519\_100 DATED APRIL 2017.
  - CENTRAL WETLAND AREA (CWA) GROUND LEVELS ARE BASED ON 2016 FLOOD LEVELS TAKEN FROM PRODUCT 4 DATA PROVIDED BY THE ENVIRONMENT AGENCY REF: SSD/7430 DATED 11.04.2016.
  - GROUND LEVELS WITHIN CWA TO SLOPE AT A GRADIENT NO STEEPER THAN 1:200 FROM TOE OF EMBANKMENT TO CENTRAL DRAINAGE DITCH.
  - PROPOSED FOOTPATH LAYOUT PROVIDED BY WHITE YOUNG GREEN DRAWING No. A088461 sk.CWA.2[B] DATED JULY 2018.
  - PROPOSED ROAD LAYOUT PROVIDED BY MAYER BROWN DRAWING No. MBSK180409-1-P2 DATED JULY 2018.
  - SEE PBA DRAWINGS 35944/1507/003 AND 35944/1507/010 FOR DETAILS OF NORTHERN AND SOUTHERN CWA CROSSINGS.
  - SEE MAYER BROWN DRAWINGS FOR DETAILS OF PLATFORM LEVELS AND ON-PLATFORM DRAINAGE.
  - SEE WYG DRAWINGS FOR LANDSCAPING DETAILS THROUGH CWA.

| FLOOD STORAGE ANALYSIS                           |                             |                             |                                         |                                       |
|--------------------------------------------------|-----------------------------|-----------------------------|-----------------------------------------|---------------------------------------|
| LEVEL BAND (mm BELOW 1 IN 1000 YEAR FLOOD LEVEL) | EXISTING FLOOD STORAGE (m³) | PROPOSED FLOOD STORAGE (m³) | NET FLOOD STORAGE BALANCE PER BAND (m³) | CUMULATIVE FLOOD STORAGE BALANCE (m³) |
| 0-100                                            | 36091.94                    | 33977.63                    | -2114.31                                | 324.13                                |
| 100-200                                          | 34921.27                    | 33410.18                    | -1511.09                                | 2438.44                               |
| 200-300                                          | 33871.6                     | 32823.46                    | -1048.14                                | 3849.53                               |
| 300-400                                          | 32815.46                    | 32237.67                    | -577.79                                 | 4997.67                               |
| 400-500                                          | 31669.05                    | 31596.05                    | 37                                      | 5675.46                               |
| 500-600                                          | 30062.46                    | 30862.75                    | 800.29                                  | 5638.46                               |
| 600-700                                          | 28256.22                    | 29756.2                     | 1500.98                                 | 4738.17                               |
| 700-800                                          | 25538.74                    | 27711.09                    | 2172.35                                 | 3237.19                               |
| 800-900                                          | 20841.66                    | 22087.61                    | 1245.95                                 | 1064.84                               |
| 900-1000                                         | 15266.62                    | 16148.29                    | 881.67                                  | -181.11                               |
| 1000-1100                                        | 9519.79                     | 8873                        | -646.79                                 | -1062.78                              |
| 1100-1200                                        | 4667.47                     | 4405.73                     | -261.74                                 | -415.99                               |
| 1200-1300                                        | 1866.89                     | 1770.41                     | -96.48                                  | -154.25                               |
| 1300-1400                                        | 656.98                      | 599.21                      | -57.77                                  | -57.77                                |

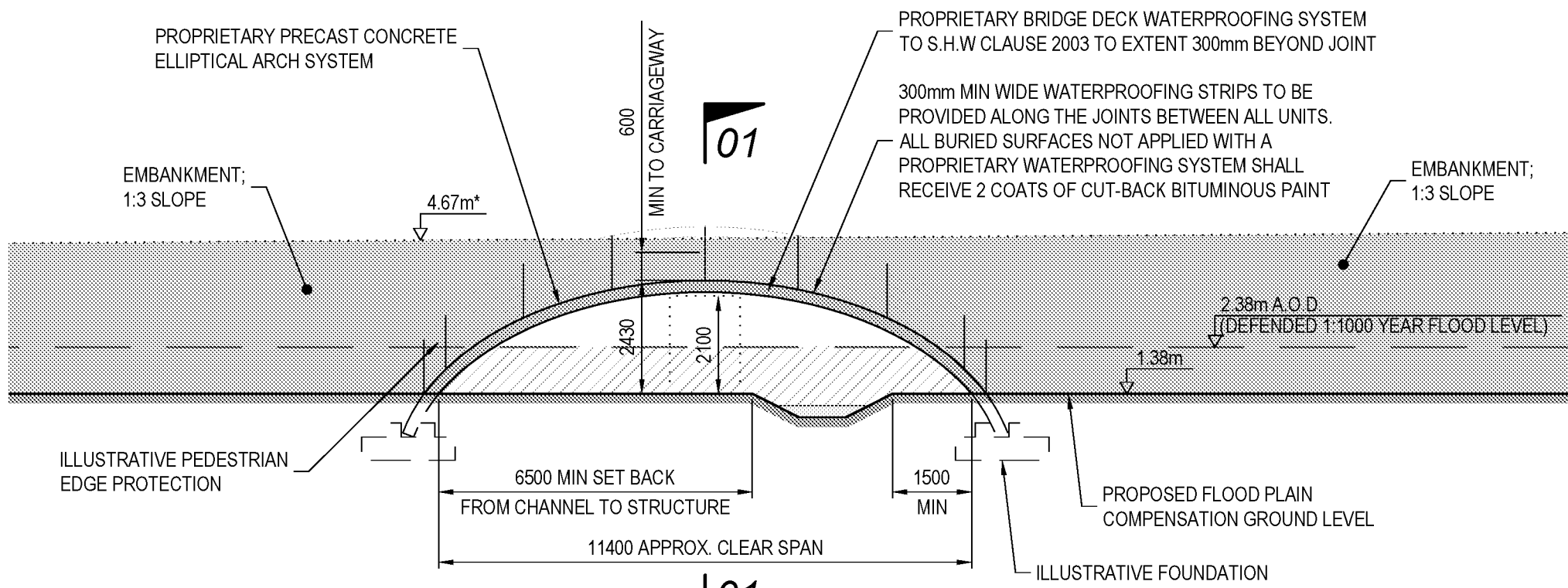


SCHEMATIC PLAN

1:250

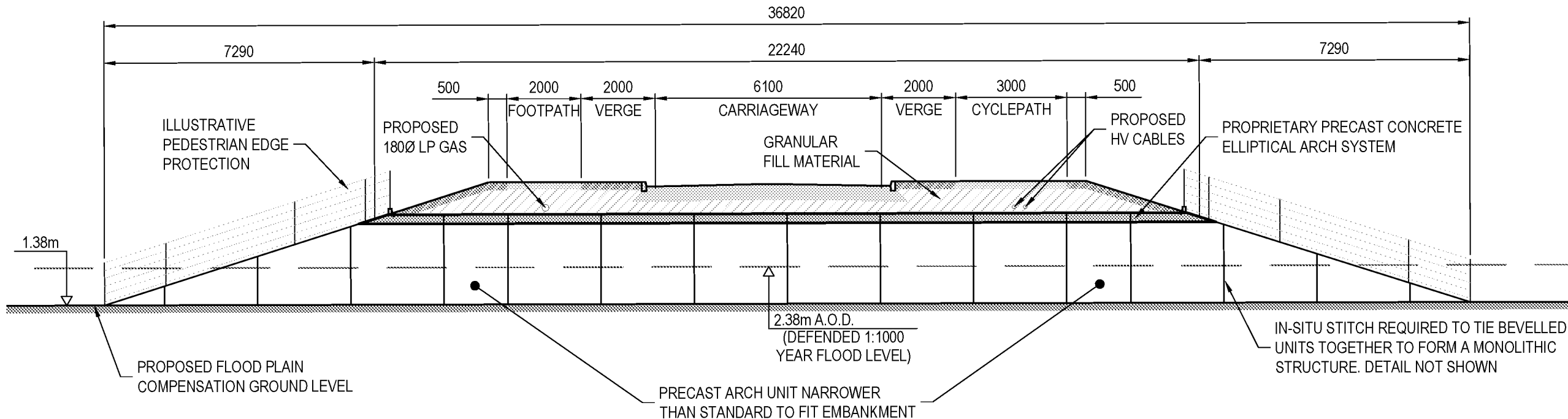
WEST

EAST



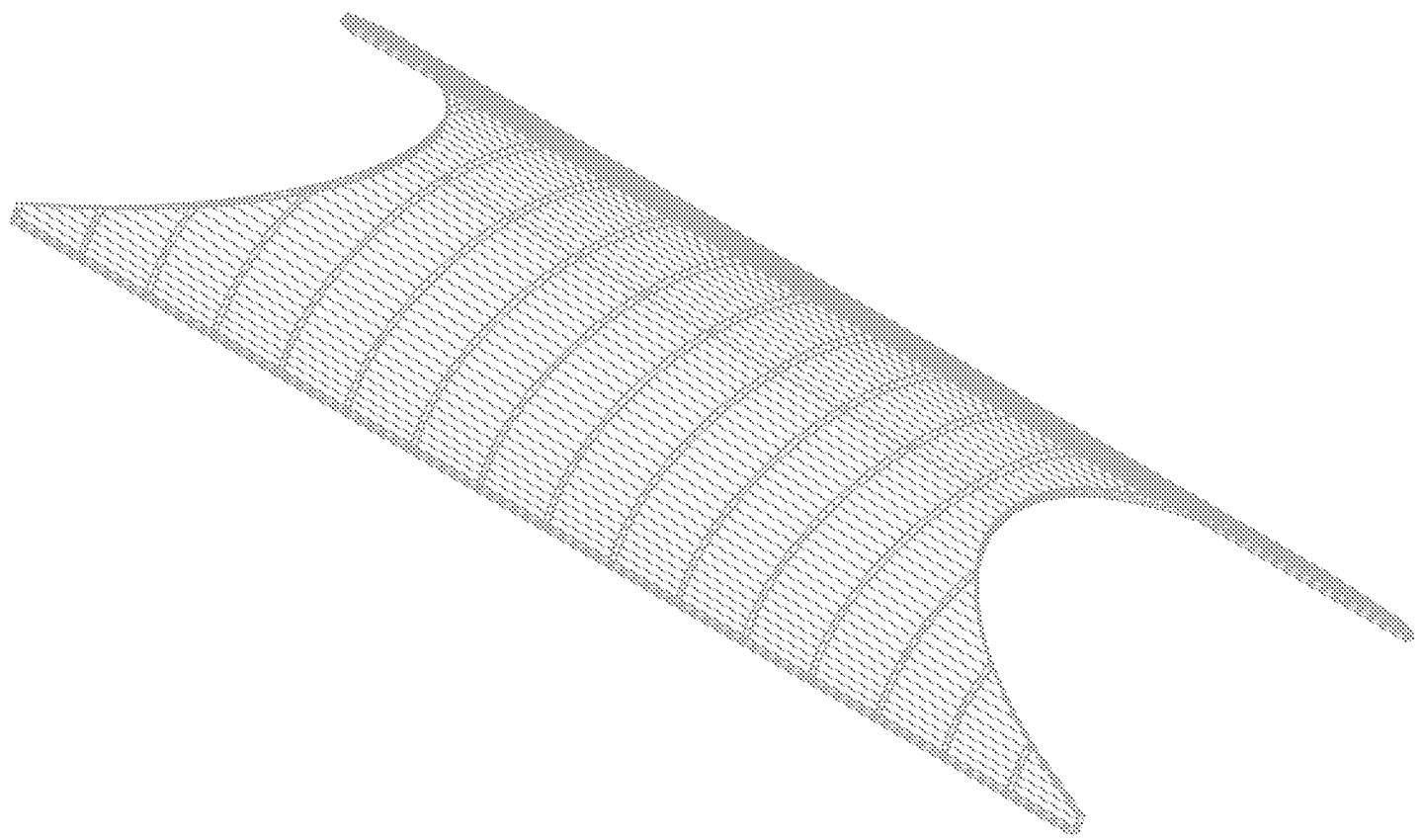
ELEVATION SINGLE SPAN

1:125

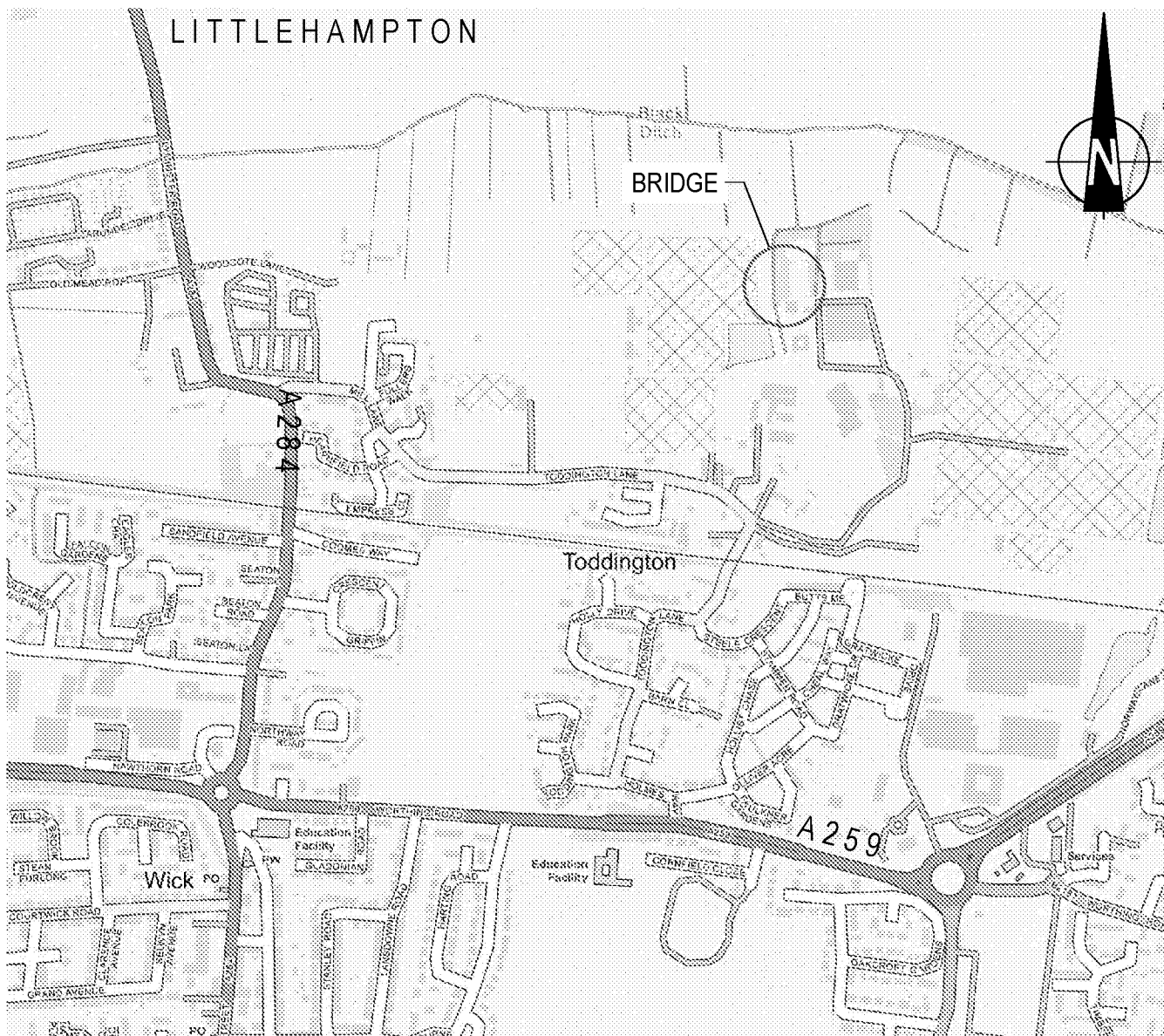


SECTION 01-01. ILLUSTRATIVE BRIDGE CROSS SECTION

1:125



3D MODEL VIEW OF ARCH STRUCTURE



LOCATION PLAN

NOTES

GENERAL

- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- ALL LEVELS ARE IN METRES AND RELATIVE TO ORDNANCE DATUM (NEWLYN).
- THIS DRAWING IS BASED UPON THE FOLLOWING SUPPLIED DIGITAL INFORMATION:
  - ORIGINAL SURVEY INFORMATION COMMISSIONED BY WYG AND CARRIED OUT BY DG YEATMAN SURVEYING AND ENGINEERING LTD, DATED JULY 2008. LOCALISED UPDATES TO THE SURVEY HAVE BEEN CARRIED SINCE AND COMBINED WITH THE ORIGINAL SURVEY.
  - ROAD ALIGNMENT AND LEVELS BY MAYER BROWN, DRAWING REFERENCE MBSK180309-01.P1. LEVELS ON DRAWING DENOTED WITH \*.
  - PROPOSED CWA GROUND MODEL BY PBA, REFERENCE '35944\_FLOOD COMPENSATION SCHEME.dwg'
- THE STRUCTURE SHOWN IS BASED ON THE E-420 ELLIPTICAL BEBO ARCH SYSTEM SUPPLIED IN THE UK BY ASSET INTERNATIONAL.
- SPECIFICATION SHALL BE IN ACCORDANCE WITH THE DEPARTMENT FOR TRANSPORT/ HIGHWAYS ENGLAND SPECIFICATION FOR HIGHWAY WORKS INCLUDING REVISIONS UP TO MAY 2018.
- ALL PROPRIETARY PRODUCTS TO BE PLACED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
- REFER TO APPROVAL IN PRINCIPLE DOCUMENT 35944/1507/AIP 001 FOR STRUCTURAL MATERIALS AND FINISHED (I.E. CONCRETE GRADES, CONCRETE FINISHT, ETC.)
- UTILITY SERVICE POSITIONS SHOWN INDICATIVELY.

|      |                                  |          |       |      |      |
|------|----------------------------------|----------|-------|------|------|
| P04  | ISSUED TO TAA                    | 28.09.18 | AJA   | TOSG | JWS  |
| P03  | ISSUE FOR PLANNING               | 21.09.18 | CRD   | TOSG | JWS  |
| P02  | CHANNEL SET BACK DIMENSION ADDED | 17.07.18 | GCP   | TOSG | JWS  |
| P01  | FIRST ISSUE                      | 06.06.18 | CRD   | JWS  | JWS  |
| Mark | Revision                         | Date     | Drawn | Chkd | Appd |

SCALING NOTE: Do not scale from this drawing. If in doubt, ask.  
UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Drawing Issue Status  
**FOR APPROVAL**

**NORTH LITTLEHAMPTON  
CENTRAL WETLAND AREA  
NORTH CROSSING  
GENERAL ARRANGEMENT**

|                   |          |          |                                                                                                                                            |  |  |
|-------------------|----------|----------|--------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Client            |          |          | <br><br>Offices throughout the UK and Europe<br><b>www.peterbrett.com</b><br>© Peter Brett Associates LLP<br>READING<br>Tel: 01189 500 761 |  |  |
| Date of 1st Issue | Designed | Drawn    |                                                                                                                                            |  |  |
| 06.06.2018        | TOSG     | CRD      |                                                                                                                                            |  |  |
| A1 Scale          | Checked  | Approved |                                                                                                                                            |  |  |
| AS SHOWN          | JWS      | JWS      |                                                                                                                                            |  |  |
| Drawing Number    |          | Revision |                                                                                                                                            |  |  |
| 35944/1507/003    |          | P04      |                                                                                                                                            |  |  |

## TECHNICAL NOTE

### Appendix B

EA Product 4 Data: April 2016

# Fluvial Defended Modelled Outlines Centered on Black Ditch North of Littlehampton - Created 11/04/2016 [Ref: SSD/7430]

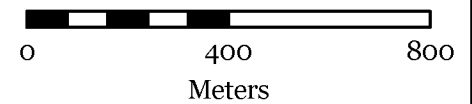


## Legend

- Main River
- 1in75 Fluvial Def
- 1in100 Fluvial Def
- 1in100 Fluvial Def +CC
- 1in1000 Fluvial Def

1:15,000 \*

\*when printed at A4.



Environment Agency copyright and / or database rights 2012. All rights reserved. C Crown Copyright and database right. All rights reserved. Environment Agency, 100026380, 2012.

**Contact Us:** National Customer Contact Centre, PO BOX 544, Rotherham, S60 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). Email: [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)

# Fluvial Undefended Modelled Outlines Centered on Black Ditch North of Littlehampton - Created 11/04/2016 [Ref: SSD/7430]



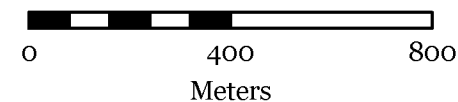
Environment  
Agency

## Legend

- Main River
- 1in20 Fluvial Undef
- 1in100 Fluvial Undef
- 1in100 Fluvial Undef +CC
- 1in1000 Fluvial Undef

1:15,000 \*

\*when printed at A4.



Environment Agency copyright and / or database rights 2012. All rights reserved. C Crown Copyright and database right. All rights reserved. Environment Agency, 100026380, 2012.

Contact Us: National Customer Contact Centre, PO BOX 544, Rotherham, S60 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). Email: [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)

Modelled Levels and Depths taken from 2D Black Ditch submodel from 2010 Infoworks Lower Tidal River Arun Strategy Model

| Node Point | Easting | Northing | Tidal depths taken from 2010 Infoworks model (m) |                        |                         |                            |                     |                        |                        |                         |                            |  |
|------------|---------|----------|--------------------------------------------------|------------------------|-------------------------|----------------------------|---------------------|------------------------|------------------------|-------------------------|----------------------------|--|
|            |         |          | UNDEFENDED                                       |                        |                         |                            |                     | DEFENDED               |                        |                         |                            |  |
|            |         |          | 5% AEP<br>{1in20yr}                              | 0.5% AEP<br>{1in200yr} | 0.1% AEP<br>{1in1000yr} | 0.5% AEP<br>{1in200yr} +CC | 5% AEP<br>{1in20yr} | 1.33% AEP<br>{1in75yr} | 0.5% AEP<br>{1in200yr} | 0.1% AEP<br>{1in1000yr} | 0.5% AEP<br>{1in200yr} +CC |  |
| 1          | 501711  | 104322   | 1.15                                             | 1.29                   | 1.31                    | 1.78                       | Null                | Null                   | Null                   | Null                    | 1.91                       |  |
| 2          | 502250  | 104279   | 0.88                                             | 1.02                   | 1.04                    | 1.52                       | Null                | Null                   | Null                   | Null                    | 1.66                       |  |
| 3          | 502658  | 104331   | 0.86                                             | 1.00                   | 1.03                    | 1.51                       | Null                | Null                   | Null                   | Null                    | 1.65                       |  |
| 4          | 503039  | 104294   | 1.20                                             | 1.34                   | 1.37                    | 1.86                       | Null                | Null                   | Null                   | Null                    | 1.99                       |  |
| 5          | 503441  | 104377   | 1.04                                             | 1.18                   | 1.21                    | 1.69                       | Null                | Null                   | Null                   | Null                    | 1.81                       |  |
| 6          | 503594  | 104215   | 0.26                                             | 0.41                   | 0.43                    | 1.46                       | Null                | Null                   | Null                   | Null                    | 1.21                       |  |
| 7          | 503612  | 103984   | Null                                             | 0.44                   | 0.56                    | 1.11                       | Null                | Null                   | Null                   | Null                    | 1.34                       |  |
| 8          | 503847  | 104240   | 0.25                                             | 0.40                   | 0.42                    | 0.91                       | Null                | Null                   | Null                   | Null                    | 0.68                       |  |
| 9          | 504142  | 104163   | 0.89                                             | 1.03                   | 1.06                    | 1.54                       | Null                | Null                   | Null                   | Null                    | 1.67                       |  |
| 10         | 504319  | 104063   | 0.74                                             | 0.89                   | 0.91                    | 1.40                       | Null                | Null                   | Null                   | Null                    | 1.53                       |  |

| Node Point | Easting | Northing | Tidal levels taken from 2010 Infoworks model (mAOD) |                        |                         |                            |                     |                        |                        |                         |                            |  |
|------------|---------|----------|-----------------------------------------------------|------------------------|-------------------------|----------------------------|---------------------|------------------------|------------------------|-------------------------|----------------------------|--|
|            |         |          | UNDEFENDED                                          |                        |                         |                            |                     | DEFENDED               |                        |                         |                            |  |
|            |         |          | 5% AEP<br>{1in20yr}                                 | 0.5% AEP<br>{1in200yr} | 0.1% AEP<br>{1in1000yr} | 0.5% AEP<br>{1in200yr} +CC | 5% AEP<br>{1in20yr} | 1.33% AEP<br>{1in75yr} | 0.5% AEP<br>{1in200yr} | 0.1% AEP<br>{1in1000yr} | 0.5% AEP<br>{1in200yr} +CC |  |
| 1          | 501711  | 104322   | 2.36                                                | 2.50                   | 2.53                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |
| 2          | 502250  | 104279   | 2.34                                                | 2.49                   | 2.51                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |
| 3          | 502658  | 104331   | 2.34                                                | 2.48                   | 2.51                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |
| 4          | 503039  | 104294   | 2.34                                                | 2.48                   | 2.51                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |
| 5          | 503441  | 104377   | 2.34                                                | 2.48                   | 2.51                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |
| 6          | 503594  | 104215   | 2.34                                                | 2.48                   | 2.51                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |
| 7          | 503612  | 103984   | Null                                                | 2.32                   | 2.44                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |
| 8          | 503847  | 104240   | 2.34                                                | 2.48                   | 2.51                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |
| 9          | 504142  | 104163   | 2.34                                                | 2.49                   | 2.51                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |
| 10         | 504319  | 104063   | 2.34                                                | 2.49                   | 2.51                    | 2.99                       | Null                | Null                   | Null                   | Null                    | 3.13                       |  |

| Node Point | Easting | Northing | Fluvial depths taken from 2010 Infoworks model (m) |                      |                         |                            |                     |                        |                      |                         |                            |  |
|------------|---------|----------|----------------------------------------------------|----------------------|-------------------------|----------------------------|---------------------|------------------------|----------------------|-------------------------|----------------------------|--|
|            |         |          | UNDEFENDED                                         |                      |                         |                            |                     | DEFENDED               |                      |                         |                            |  |
|            |         |          | 5% AEP<br>{1in20yr}                                | 1% AEP<br>{1in100yr} | 0.1% AEP<br>{1in1000yr} | 1% AEP {1in100yr} +CC 2115 | 5% AEP<br>{1in20yr} | 1.33% AEP<br>{1in75yr} | 1% AEP<br>{1in100yr} | 0.1% AEP<br>{1in1000yr} | 1% AEP {1in100yr} +CC 2115 |  |
| 1          | 501711  | 104322   | 0.95                                               | 1.00                 | 1.69                    | 1.26                       | 0.35                | 0.42                   | 0.43                 | 1.24                    | 0.58                       |  |
| 2          | 502250  | 104279   | 0.70                                               | 0.75                 | 1.43                    | 1.00                       | 0.04                | 0.11                   | 0.12                 | 0.93                    | 0.27                       |  |
| 3          | 502658  | 104331   | 0.69                                               | 0.74                 | 1.42                    | 1.00                       | 0.01                | 0.14                   | 0.16                 | 0.81                    | 0.25                       |  |
| 4          | 503039  | 104294   | 1.03                                               | 1.08                 | 1.76                    | 1.34                       | 0.48                | 0.61                   | 0.75                 | 1.39                    | 0.83                       |  |
| 5          | 503441  | 104377   | 0.87                                               | 0.92                 | 1.61                    | 1.18                       | 0.18                | 0.32                   | 0.46                 | 1.11                    | 0.54                       |  |
| 6          | 503594  | 104215   | 0.05                                               | 0.10                 | 0.79                    | 0.36                       | Null                | Null                   | Null                 | 0.23                    | Null                       |  |
| 7          | 503612  | 103984   | Null                                               | Null                 | 1.12                    | 0.41                       | Null                | Null                   | Null                 | Null                    | Null                       |  |
| 8          | 503847  | 104240   | Null                                               | Null                 | Null                    | Null                       | Null                | Null                   | Null                 | Null                    | Null                       |  |
| 9          | 504142  | 104163   | 0.71                                               | 0.77                 | 1.45                    | 1.02                       | Null                | 0.13                   | 0.17                 | 0.79                    | 0.25                       |  |
| 10         | 504319  | 104063   | 0.57                                               | 0.62                 | 1.30                    | 0.88                       | 0.02                | 0.15                   | 0.17                 | 0.81                    | 0.26                       |  |

| Node Point | Easting | Northing | Fluvial levels taken from 2010 Infoworks model (mAOD) |                      |                         |                            |                     |                        |                      |                         |                            |  |
|------------|---------|----------|-------------------------------------------------------|----------------------|-------------------------|----------------------------|---------------------|------------------------|----------------------|-------------------------|----------------------------|--|
|            |         |          | UNDEFENDED                                            |                      |                         |                            |                     | DEFENDED               |                      |                         |                            |  |
|            |         |          | 5% AEP<br>{1in20yr}                                   | 1% AEP<br>{1in100yr} | 0.1% AEP<br>{1in1000yr} | 1% AEP {1in100yr} +CC 2115 | 5% AEP<br>{1in20yr} | 1.33% AEP<br>{1in75yr} | 1% AEP<br>{1in100yr} | 0.1% AEP<br>{1in1000yr} | 1% AEP {1in100yr} +CC 2115 |  |
| 1          | 501711  | 104322   | 2.16                                                  | 2.21                 | 2.90                    | 2.47                       | 1.49                | 1.56                   | 1.57                 | 2.38                    | 1.72                       |  |
| 2          | 502250  | 104279   | 2.16                                                  | 2.21                 | 2.90                    | 2.47                       | 1.49                | 1.56                   | 1.57                 | 2.38                    | 1.72                       |  |
| 3          | 502658  | 104331   | 2.17                                                  | 2.22                 | 2.90                    | 2.47                       | 1.58                | 1.71                   | 1.74                 | 2.38                    | 1.82                       |  |
| 4          | 503039  | 104294   | 2.17                                                  | 2.22                 | 2.90                    | 2.47                       | 1.58                | 1.72                   | 1.74                 | 2.38                    | 1.82                       |  |
| 5          | 503441  | 104377   | 2.17                                                  | 2.22                 | 2.90                    | 2.47                       | 1.59                | 1.72                   | 1.74                 | 2.38                    | 1.83                       |  |
| 6          | 503594  | 104215   | 2.17                                                  | 2.22                 | 2.90                    | 2.47                       | Null                | Null                   | Null                 | 2.38                    | Null                       |  |
| 7          | 503612  | 103984   | Null                                                  | Null                 | 2.90                    | 2.20                       | Null                | Null                   | Null                 | Null                    | Null                       |  |
| 8          | 503847  | 104240   | Null                                                  | Null                 | Null                    | Null                       | Null                | Null                   | Null                 | Null                    | Null                       |  |
| 9          | 504142  | 104163   | 2.17                                                  | 2.22                 | 2.90                    | 2.47                       | Null                | 1.72                   | 1.75                 | 2.38                    | 1.83                       |  |
| 10         | 504319  | 104063   | 2.17                                                  | 2.22                 | 2.90                    | 2.47                       | 1.59                | 1.72                   | 1.75                 | 2.38                    | 1.83                       |  |

# 2D Node Points from 2010 Infoworks Model Centered on Black Ditch North of Littlehampton - Created 11/04/2016 [Ref: SSD/7430]



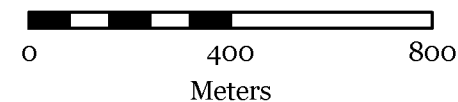
Environment  
Agency

## Legend

+ 1 Node Point

1:15,000 \*

\*when printed at A4.



Environment Agency copyright and / or database rights 2012. All rights reserved. C Crown Copyright and database right. All rights reserved. Environment Agency, 100026380, 2012.

Contact Us: National Customer Contact Centre, PO BOX 544, Rotherham, S60 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). Email: [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)

## TECHNICAL NOTE

### Appendix C

EA – Stantec Correspondence

## Robert Riddington

---

**From:** Robert Riddington  
**Sent:** 30 July 2017 10:57  
**To:** 'Jackson, Adrian'; Lax, Laura  
**Cc:** Alex Wray  
**Subject:** RE: Land North Toddington Lane, Littlehampton Flood Review

Dear Laura and Adrian,

Many thanks for your response, and apologies for not replying sooner.

We can confirm that the assumptions you have detailed below are correct and will therefore proceed on this basis.

I anticipate that we will prepare an updated flood compensation scheme based on these details and will summarise for the LPA and EA's information and acceptance.

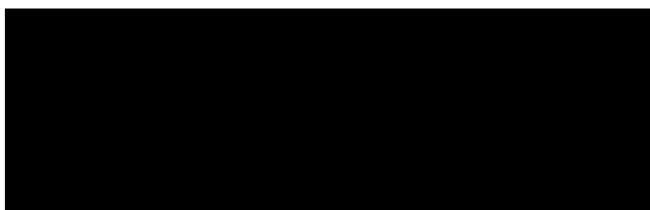
All the best,

Rob

Robert Riddington

Senior Associate

For and on behalf of Peter Brett Associates LLP - [Reading](#)



---

**From:** Jackson, Adrian [mailto:adrian.jackson@arundistrictcouncil.gov.uk]  
**Sent:** 07 July 2017 14:05  
**To:** Lax, Laura <la.lax@environment-agency.gov.uk>; Robert Riddington <rob.riddington@peterbrett.co.uk>  
**Subject:** RE: Land North Toddington Lane, Littlehampton Flood Review

Dear Robert

Assuming the original calculations were based on a 1 in 100 plus climate change defended scenario we would accept the defended fluvial 1 in 1000 year to analyse the flood compensation for the proposed development

With regards to the residual risk in determining finished floor levels, again it is assumed that you are referring to the 1 in 1000year undefended. If this can be confirmed we would accept the findings/amendments

However if the above is not the case we would not be in a position to approve the revisions

Many thanks -- adrian

---

**From:** Robert Riddington [mailto:rob.riddington@peterbrett.co.uk]  
**Sent:** 27 June 2017 16:52  
**To:** Lax, Laura <la.lax@environment-agency.gov.uk>  
**Cc:** Alex Wray <alex.wray@peterbrett.co.uk>  
**Subject:** Littlehampton Flood Review

Dear Laura,

Thank you for our conversation earlier today.

As discussed, we are working on behalf of Persimmon Homes and are supporting them to discharge the conditions for the development North of Toddington Lane, Littlehampton. As per your attached letter (12/05/17), you confirmed that you were satisfied with our review for part of the development site (Parcels B2, B4, C1 & C2) and had no objections.

The analysis that we completed for these parcels was based on the FRA prepared in 2011 and draft model level information.

At the time we were also aware that the flood levels had been updated since the production of the FRA. We received these in 2016 (attached) and recently confirmed with the EA that these are still the latest version. However, whilst the latest levels were lower than those used in the FRA, due to programme constraints the Client requested that we continue to use the 2011 levels in our submission for the consented site.

As per your letter, you recognised that the 2011 FRA was based on levels using the +20% guidance, rather than the more recent +45% guidance. However you recognised that the FRA was already accepted, and therefore confirmed your acceptance.

We are now in the process of reviewing the wider site and have agreed with the Client to review the potential to use the latest information.

The information provided in 2016 included the 100-yr, 100-yr+20% and 1000-yr level information. Whilst this did not include the 100-yr+45% level information, we anticipate that this is likely to be lower than the 1000-yr level.

| Node Point | Easting | Northing | Flood Levels Taken from 2016 Floodworks Model (m) |                      |                         |                               |                     |                        |
|------------|---------|----------|---------------------------------------------------|----------------------|-------------------------|-------------------------------|---------------------|------------------------|
|            |         |          | UNDEFENDED                                        |                      |                         |                               |                     |                        |
|            |         |          | 5% AEP<br>(1in20yr)                               | 1% AEP<br>(1in100yr) | 0.1% AEP<br>(1in1000yr) | 1% AEP (1in100yr)<br>+CC 2115 | 5% AEP<br>(1in20yr) | 1.33% AEP<br>(1in75yr) |
| 1          | 501711  | 104322   | 2.16                                              | 2.21                 | 2.90                    | 2.47                          | 1.49                | 1.56                   |
| 2          | 502280  | 104279   | 2.16                                              | 2.21                 | 2.90                    | 2.47                          | 1.49                | 1.56                   |
| 3          | 502658  | 104331   | 2.17                                              | 2.22                 | 2.90                    | 2.47                          | 1.58                | 1.71                   |
| 4          | 503039  | 104294   | 2.17                                              | 2.22                 | 2.90                    | 2.47                          | 1.58                | 1.72                   |
| 5          | 503441  | 104377   | 2.17                                              | 2.22                 | 2.90                    | 2.47                          | 1.59                | 1.72                   |
| 6          | 503594  | 104215   | 2.17                                              | 2.22                 | 2.90                    | 2.47                          | Null                | Null                   |
| 7          | 503612  | 103984   | Null                                              | Null                 | 2.90                    | 2.20                          | Null                | Null                   |
| 8          | 503647  | 104240   | Null                                              | Null                 | Null                    | Null                          | Null                | Null                   |
| 9          | 504142  | 104163   | 2.17                                              | 2.22                 | 2.90                    | 2.47                          | Null                | 1.72                   |
| 10         | 504319  | 104053   | 2.17                                              | 2.22                 | 2.90                    | 2.47                          | 1.59                | 1.72                   |

On the understanding that the 100-yr+45% is not available, we would propose that the Defended Fluvial 1 in 1000-yr (0.1% AEP) level, be used as a conservative assessment. This would be used to analyse the flood compensation for the proposed development site.

To address the residual risk we would propose that we would utilise the undefended levels to set finished floor levels.

If you are able to confirm that you are happy with the above approach we would then be able to discuss the implications and advise our Client. I would also be grateful if you could advise on any specific requirements that you would require for our submission, i.e. Flood Risk Technical Note/FRA addendum letter and compensation information.

I hope that the above is clear, however please feel free to call to discuss on the number below. As discussed, I believe that a short 10 minute conversation with the relevant flood risk officer would be beneficial and allow us to review and advise on the best course of action.

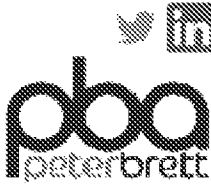
All the best,

Rob

Robert Riddington

Senior Associate

For and on behalf of Peter Brett Associates LLP - Reading



*This email and any attachments are **confidential** and protected by **copyright**. If you receive it in error, please notify us immediately and remove it from your system. Peter Brett Associates LLP (PBA) is a limited liability partnership registered in England and Wales. The terms Partner and Member refer to a member of PBA and a list is open for inspection at its registered office. Registered no: OC334398. VAT no: GB115143456. Registered office: Caversham Bridge House, Waterman Place, Reading, RG1 8DN. T: +44 (0) 0118 950 0761, Email [info@peterbrett.com](mailto:info@peterbrett.com).*

This message has been scanned and no issues were discovered.  
Click [here](#) to report this email as spam

Information in this message may be confidential and may be legally privileged. If you have received this message by mistake, please notify the sender immediately, delete it and do not copy it to anyone else.

We have checked this email and its attachments for viruses. But you should still check any attachment before opening it.

We may have to make this message and any reply to it public if asked to under the Freedom of Information Act, Data Protection Act or for litigation. Email messages and attachments sent to or from any Environment Agency address may also be accessed by someone other than the sender or recipient, for business purposes.

Click [here](#) to report this email as spam

---

This message has been scanned for viruses by [Websense](#)

—