Stantec

# Flood Risk Assessment - Addendum

Hampton Park, Littlehampton
Local Centre and Phase 6b Reserve Matters Application

November 2025

Prepared for:
**Persimmon Homes**

Prepared by:
**Richard Fisher**

Project Number:
**332612579**

| Revision | Description | Author | Date | Quality Check | Date | Independent Review | Date |
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| - | First Issue | RMF | 27/11/25 | EE | 27/11/25 | SK | 27/11/25 |
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# Contents



# Figures



# Tables



# Appendices

# 1 Scope of Report

1.1.1 This Flood Risk Assessment (FRA) Addendum report has been prepared by Stantec for Persimmon Homes in relation to the delivery of the 'Local Centre and Phase 6b' Reserve Matters Application (RMA) for the Hampton Park development site at Littlehampton.

1.1.2 Stantec has many years of experience in, amongst other areas, the assessment of flood risk, hydrology, flood defence and river engineering. The authors and reviewers of the document are all experienced engineers, and the reviewers are members of chartered institutions such as the Chartered Institution of Water and Environmental Management (CIWEM) or the Institution of Civil Engineers (ICE).

1.1.3 The RMA seeks to deliver a Local Centre comprising 1472sqm of retail floor space, 418sqm of community centre floor space, 94 residential dwellings, open space and a community car park. 17 residential dwelling will also be provided on Phase 6b, and a LEAP / NEAP is proposed on the former Community Facilities Land use parcel.

1.1.4 Design principles for the development were established through the Littlehampton Outline Planning Application (OPA), approved by Arun District Council (ADC) in January 2013 under planning reference LU/47/11. This OPA was accompanied by a 2011 Flood Risk Assessment (FRA) produced by Peter Brett Associates (PBA, now Stantec).

1.1.5 The baseline flood risk data for the site was supplemented by subsequent documents to address preceding RMAs, with the associated design parameters updated as new flood data became available.

1.1.6 This report considers the Local Centre and Phase 6b RMA proposals and assesses these against the above, to demonstrate it meets the criteria established under the original OPA, with due consideration of the subsequent updates to information and associated agreements.

# 2 Consented Outline Scheme

2.1.1 The Littlehampton Outline Planning Application (OPA) was approved by Arun District Council (ADC) in January 2013 under planning reference LU/47/11.

2.1.2 This application was for a sustainable urban extension to Littlehampton based on a mixed-use development masterplan envisaging 1,260 dwellings, school, commercial, employment and retail uses, and wider landscape and transport improvements – see **Figure 2-1**.

2.1.3 This OPA was accompanied by a 2011 FRA produced by PBA, now Stantec, and the flood risk data for the site was supplemented by subsequent documents to address RMAs, with the design criteria updated as new flood data became available.

2.1.4 The main residential development platform is elevated outside the floodplain to minimise risk to the future occupants, with mitigation for floodplain capacity provided through ground lowering across the central wetland amenity area and over the playing fields/sports pitches area to the east.

**Figure 2-1: Outline Application - Illustrative Masterplan (December 2010)**

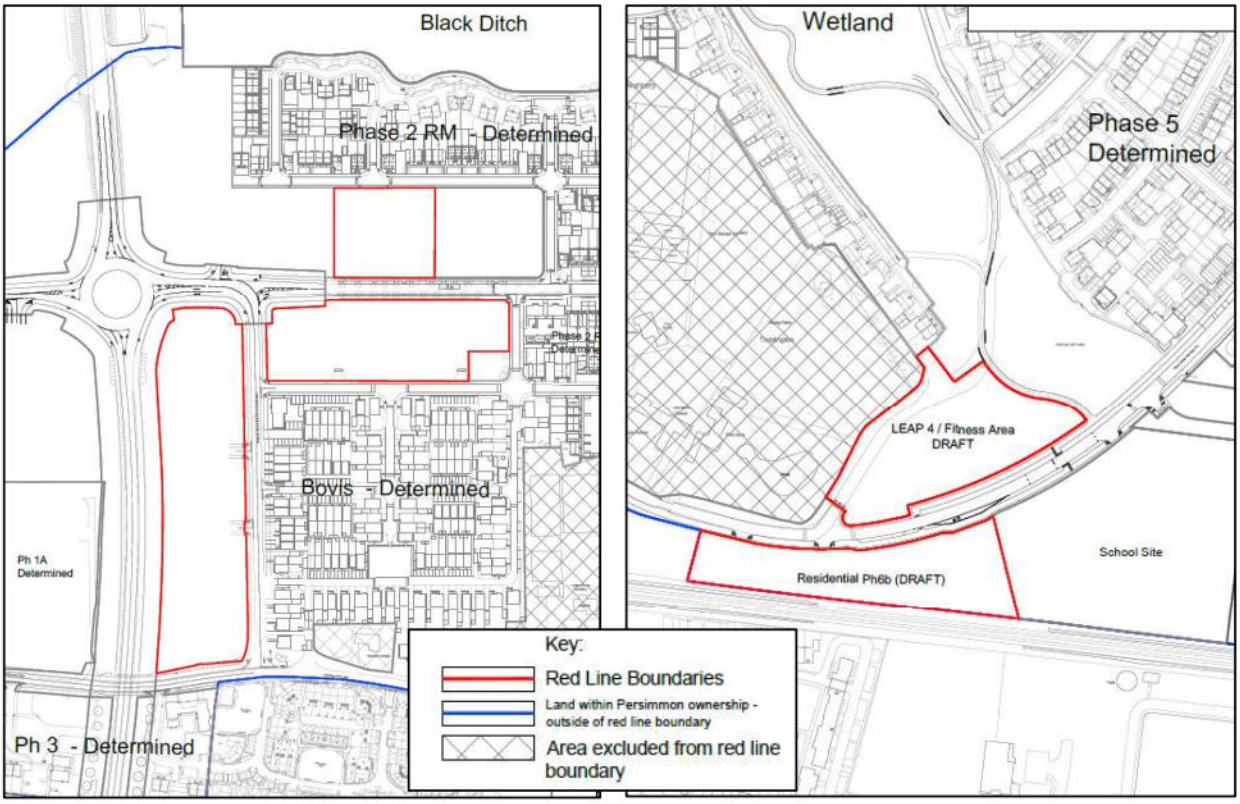
2.1.5 The current state of development over the site is that western parcels have been approved via RMAs, along with the central wetland feature, and have been built out. Phase 5 is under construction, and the remaining elements on the eastern side of the site – i.e. residential parcel Phase 6a, local centre, Phase 6b, and the open space/sports pitches, facilities and allotments, are remaining to complete.

# 3 Proposed Reserve Matters Application

3.1.1 This report is to accompany the RMA for the Local Centre and Phase 6b – see **Figure 3-1**. This phase of development comprises two distinct areas.

- The Local Centre, which located in the western extent of the North Littlehampton Strategic Allocation. It comprises the retail blocks A and B, residential parcels B1, B2 and part C1, the care home area and the parking square.
- Phase 6b, which comprises the former community centre and youth facility land, which are bounded to the north by the Central Wetland Area and the railway line is to the south.

**Figure 3-1: Red Line Plan**




3.1.2 This RMA seeks to secure the following:

- A Local Centre comprising 1,472sqm of retail floor space, 418sqm of community centre floor space, 94 residential dwellings on the Local Centre, open space and a community car park.
- 17 residential dwelling on Phase 6b;
- A LEAP / NEAP on the former Community Facilities Land use parcel

3.1.3 The proposed layouts by Persimmon and SHW are provided in **Appendix A**.

3.1.4 Further details to demonstrate compliance with the OPA are provided in **Section 5**.

# 4 Flood Data – Lower Arun Modelling (2010)

## 4.1 Applicable Hydraulic Model Data

4.1.1 The Black Ditch is the primary source of flood risk to the site, lying to the north and flows west towards the River Arun.

4.1.2 The 2011 FRA and subsequent reference documents utilised data provided by the EA from their Lower Tidal River Arun Strategy (LTRAS) 2010 modelling, which includes both watercourses. The available defended fluvial flood levels and extents from the EA's 2010 LTRAS modelling.

4.1.3 The EA has confirmed that their 2010 Lower Tidal River Arun Strategy (LTRAS) model is still currently the most up-to-date modelling applicable for the area, although an updated flood risk study is currently being carried out (no immediate release date).

4.1.4 When considering reference flood events impacting an area, there are a number of ways that flood magnitudes can be expressed as follows, which all refer to the same severity of flood –

- 1 in 50 (2%) annual probability flood;
- 1 in 50-year flood;
- 50 year return period flood;
- 2% Annual Exceedance Probability (AEP) flood.

4.1.5 For clarity, the report references the event in the form of 'annual probability' ('AP'), to emphasise that there is an equal chance of such an event occurring each and every year.

## 4.2 Consented Position

4.2.1 The 2011 FRA for the OPA was based on the available flood modelling at the time that provides a (then 'reference') 1 in 100 AP +20% climate change allowance flood level of approximately 3.2m AOD over the Phase 6 development area.

4.2.2 By the time RMAs were submitted for the site in 2020 onwards, the reference applicable climate change scenario had changed to +45%. Since the 1 in 100 AP +45% scenario had not been modelled, it was agreed with the EA that the defended 1 in 1000 (0.1%) AP flood level of 2.38mAOD could be used as a conservative proxy for the applicable design event.

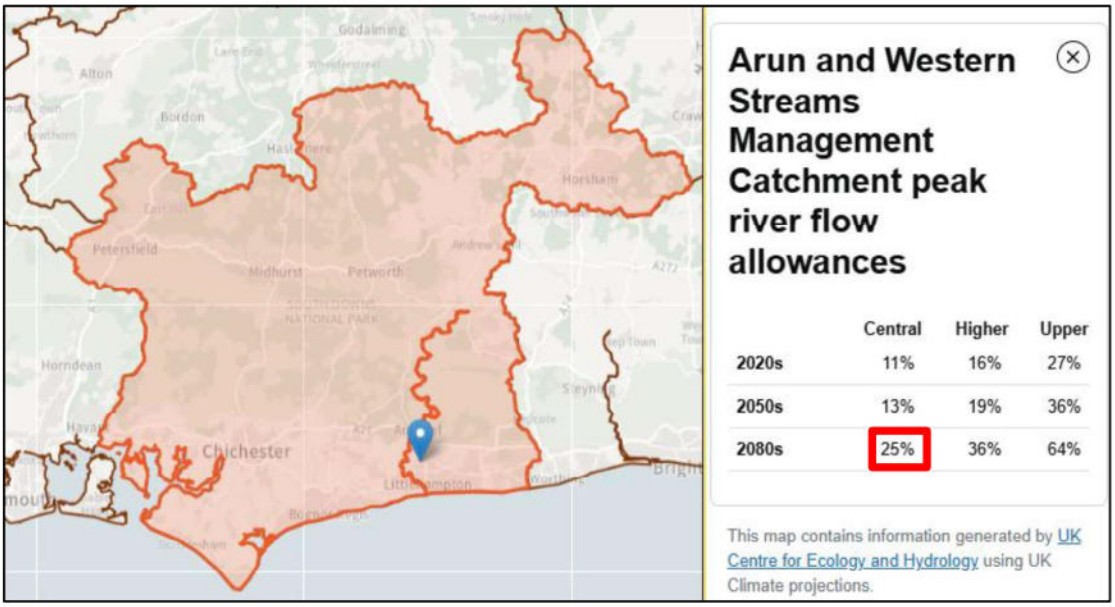
4.2.3 The above was confirmed as part of the RMA for the landscaped wetland corridor (known as the 'Central Wetland Area', which provides the majority of the floodplain capacity) in 2022 (copies of referenced information provided in **Appendix B**) as follows:

- **As part of the EA liaison, it was agreed that Finished Floor Levels (FFLs) across the development would be set a minimum of 500mm freeboard above the 1 in 1000 AP flood level of 2.38m AOD. Since plot levels were proposed at 4.0m AOD or higher, this freeboard was significantly exceeded – see Stantec Technical Note TN003A, September 2021.**
- **A submission was made to the EA in April 2022 (Technical Note TN004), that set out an updated floodplain storage analysis to this flood level, resulting in an overall gain of +8,193.6m$^3$ – see Stantec Drawing reference 39878_4001_008 rev D 'Flood Compensation'.**
- **This was accepted in the EA letter of approval dated 27th May 2022 (EA ref: HA/2022/123851/04-L01).**

## 4.3 Reference Flood Data

4.3.1 The latest relevant climate change allowance for this is area is now +25% (Central 2080s allowance for the 'Arun and Western Streams' management catchment – see **Figure 4-1**) and therefore the 1 in 1000 (0.1%) AP previously used is considered an even more conservative proxy for this new design 1 in 100 (1.0%) AP plus climate change scenario.

**Figure 4-1: Climate Change Allowances – Arun and Western Streams**




4.3.2 The available defended fluvial flood levels for the eastern area of the site where Phase 6 is located, are shown in **Table 4-1**.

4.3.3 The extreme 1 in 1000 (0.1%) AP event is notably a significant increase of over 500mm from the climate change scenario (and all other levels within a 380mm range).

**Table 4-1: EA Modelled Flood Levels – Black Ditch**

| Modelled Flood Event (Annual Probability (AP)) | Modelled Flood Level (m AOD) |
|---|---|
| **1 in 5 (20%)** | **1.45** |
| **1 in 20 (5%)** | **1.59** |
| **1 in 75 (1.33%)** | **1.72** |
| **1 in 100 (1%)** | **1.75** |
| **1 in 100 plus 20% climate change** | **1.83** |
| 1 in 100 plus 25% climate change *(Extrapolated - applicable level from guidance)* | *1.85* |
| **1 in 1000 (0.1%)** | **2.38** |

# 5 Compliance with OPA

The RMA demonstrates compliance with the original 2011 FRA accompanying the OPA as follows:

## 5.1 Building Floor Levels

5.1.1 The 2011 FRA specified that floor levels of new development would be set a minimum of 500mm above the 1 in 100 AP plus climate change flood level.

5.1.2 As part of the EA liaison on previous RMAs, it was also agreed that Finished Floor Levels (FFLs) across the development would be set a minimum of 500mm freeboard above the 1 in 1000 (0.1%) AP flood level of 2.38m AOD (as proxy for the reference 1 in 100 (1.0%) AP plus climate change flood level).

5.1.3 Since plot levels are proposed at 4.0m AOD or higher, this freeboard is significantly exceeded by over 1.6m for the Local Centre and Phase 6b development.

5.1.4 As noted in **Section 4**, if the current planning guidance for climate change is considered (i.e. +25% peak river flow allowance) then the estimated reference flood level, at 1.85m AOD, would be significantly lower than the agreed design level and the available freeboard would be over 2m.

## 5.2 Floodplain Storage Capacity

5.2.1 Any new development located in the vicinity of a watercourse should be constructed such that it does not detrimentally impact on flow routes or reduce the available floodplain storage over a site; either of which could potentially cause an increase in flood levels on-site or elsewhere. This is considered up to the benchmark of the 1 in 100 (1.0%) AP plus allowance for climate change fluvial flood level.

5.2.2 The 2011 FRA included a flood compensation scheme that demonstrated a gain in storage in accordance with EA requirements up to the then-applicable 1 in 100 (1.0%) AP plus allowance for climate change flood levels over the site

5.2.3 An updated baseline flood storage analysis was undertaken to the latest EA flood data as part of subsequent RMAs for the site in 2022. The approved strategy for floodplain compensation is set out in the Stantec drawing reference 39878_4001_008 rev D 'Flood Compensation' (see **Appendix B**) and demonstrates an improvement in floodplain capacity over the wider site of +8,193.6m$^3$.

5.2.4 This floodplain storage capacity analysis is being refined as part of other RMAs for the wider site, to demonstrate the proposals remain in compliance with requirements. However, In relation to the Local Centre and Phase 6b, the extent of the RMA is fully contained on the approved development platform area and has no bearing on these matters.

## 5.3 Surface Water Management

5.3.1 The surface water management proposals are detailed separately by Mayer Brown. This follows the agreed strategy of the OPA, with on site attenuation to control discharge to local watercourses, designed to the 1 in 100 year plus climate change scenario.

## 5.4 Safe Access

5.4.1 Although not specifically referenced in the 2011 FRA, continuous safe and dry access is provided to Phase 6a, and the wider development, in accordance with current national and local planning guidance.

# 6 Conclusions

6.1.1 This Flood Risk Assessment (FRA) Addendum report has been prepared by Stantec for Persimmon Homes in relation to the delivery of the 'Local Centre and Phase 6b' Reserve Matters Application (RMA) for the Hampton Park development site at Littlehampton.

6.1.2 Design principles for the development were established through the Littlehampton Outline Planning Application (OPA), approved by Arun District Council (ADC) in January 2013 under planning reference LU/47/11, the 2011 Flood Risk Assessment (FRA) produced by Peter Brett Associates (PBA, now Stantec), and with the associated design parameters updated as new flood data became available to address preceding RMAs.

6.1.3 The RMA seeks to deliver a Local Centre comprising 1,472sqm of retail floor space, 418sqm of community centre floor space, 94 residential dwellings on the Local Centre, open space and a community car park. 17 residential dwellings on Phase 6b, and a LEAP / NEAP is proposed on the former Community Facilities Land use parcel.

6.1.4 This report confirms that the RMA remains consistent with the OPA and the subsequent established design parameters as follows:

- Finished Floor Levels (FFLs) across the development are to be a minimum of 500mm freeboard above the extreme 1 in 1000 (0.1%) Annual Probability (AP) flood level of 2.38m AOD (as proxy for the reference 1 in 100 (1.0%) AP plus climate change flood level). As the development platform is a minimum of 4.0m AOD this freeboard will be significantly exceeded;

- The floodplain storage analysis for the OPA has been reappraised to allow for refinements to the scheme delivered through the RMAs. The approved strategy for floodplain compensation over the wider site demonstrates an improvement in floodplain capacity over the wider site of over +8,000m$^3$. While this is being refined as part of other PMAs, the Local Centre and Phase 6b proposals are located within the approved development platform area and will not impact on the flood storage conditions over the site.

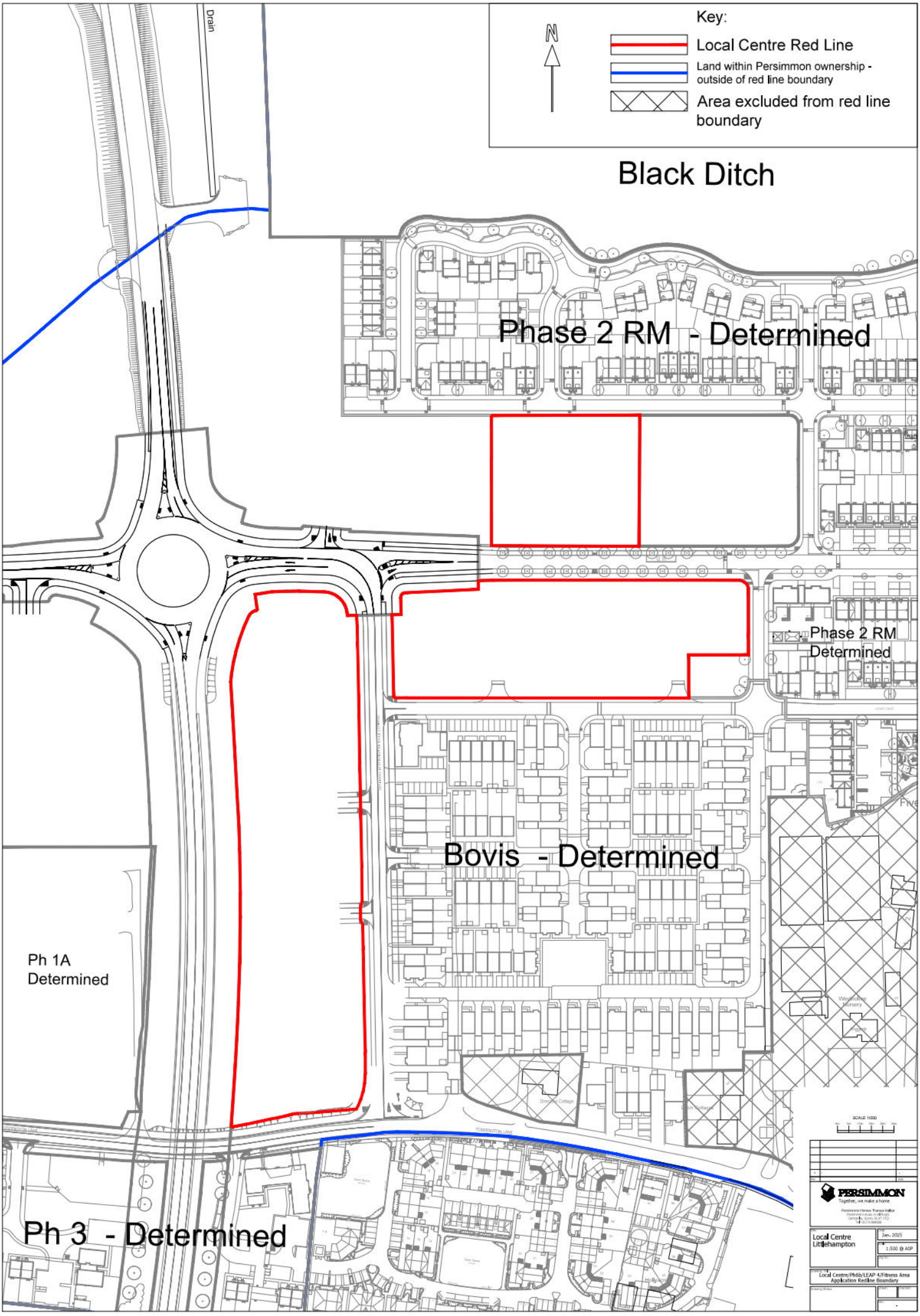
- Surface water management is addressed separately by Mayer Brown. This approach follows the agreed strategy of the OPA, with on site attenuation to control discharge to local watercourses, designed to the 1 in 100 year plus climate change scenario.

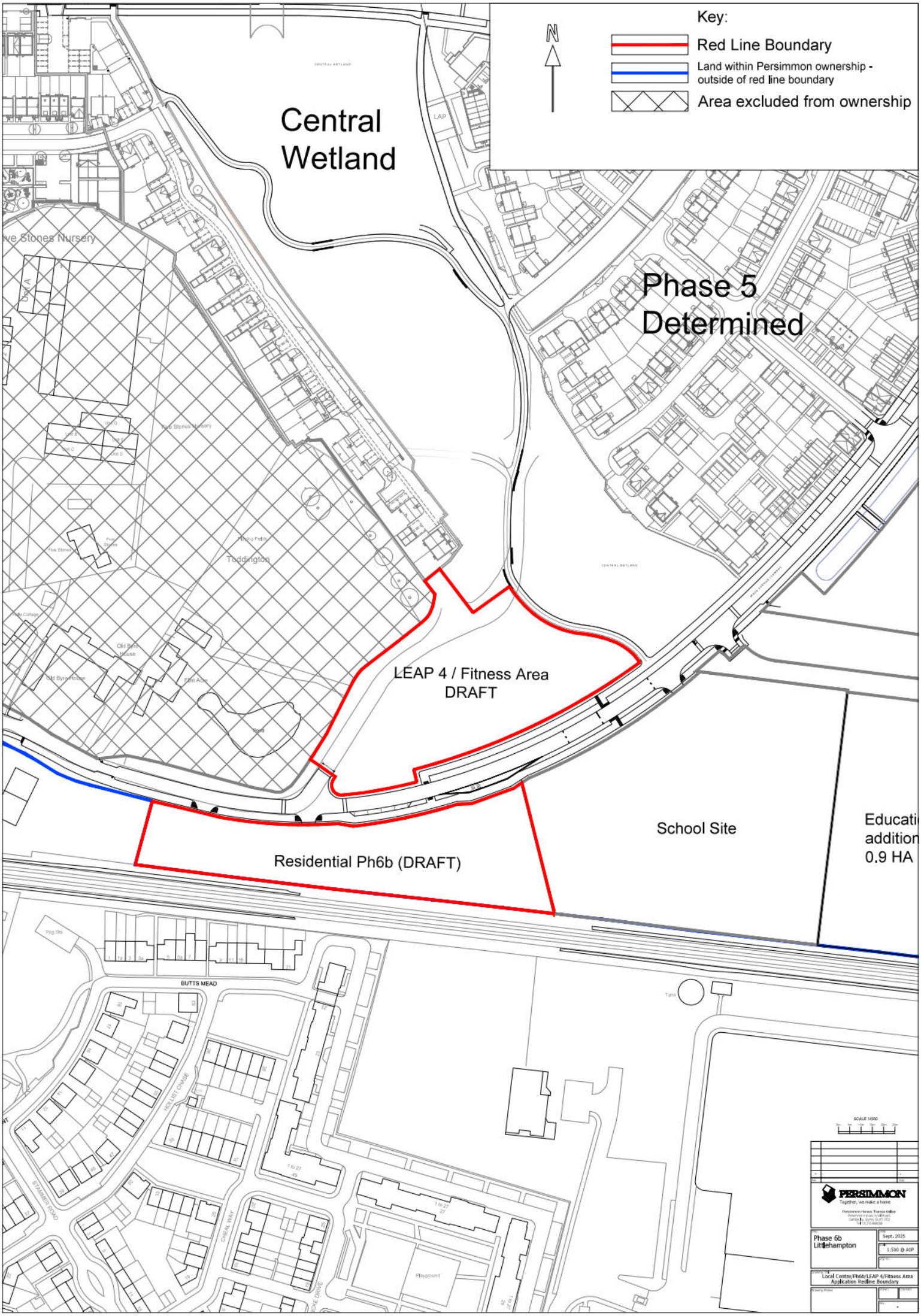
- Continuous safe and dry access is provided to all units across the development.

6.1.5 In conclusion, the future users of the proposed development will be at a low risk of flooding, and the development will not increase flood risk elsewhere. It is demonstrated that the proposal complies with the principles established in the OPA FRA (and subsequent RMA submissions/agreements), and the National Planning Policy Framework (NPPF).

# Appendix A Proposals

- Persimmon Red Line Boundary Drawings
- Persimmon Site Layout Drawing 519_PL_Ph6b_100 rev D
- SHW Architecture Local Centre 'Proposed Site Layout' Drawing 011042


Key:
Local Centre Red Line
Land within Persimmon ownership - outside of red line boundary
Area excluded from red line boundary
N
Drain
Black Ditch
Phase 2 RM - Determined
Phase 2 RM Determined
Bovis - Determined
Ph 1A Determined
Ph 3 - Determined
PERSIMMON
Together, we make a home
Local Centre Littlehampton
Jan. 2025
1:500 @ ADP
Local Centre/Ph5b/LEAP 4/Fitness Area Application Redline Boundary


Key:
Red Line Boundary
Land within Persimmon ownership - outside of red line boundary
Area excluded from ownership
N
Central Wetland
Phase 5 Determined
LEAP 4 / Fitness Area DRAFT
Residential Ph6b (DRAFT)
School Site
Educati addition 0.9 HA
BUTTS MEAD
PERSIMMON
Together, we make a home
Phase 6b Littlehampton
Sept. 2025
1:500 @ AD
Local Centre/Ph6b/LEAP 4/Fitness Area Application Redline Boundary


| Rev. | Description. | Date. |
|---|---|---|
| D | Civils Kerbs, Markings & Tracking updated. Soft Landscaping & LEAP design updated. | 26.11.2025 |
| C | Plots 1 & 2 revised and moved further away from western boundary. Plot 2 now shown as a 5h house type. | 13.11.2025 |
| B | Units reduced to 17 units and parking revised around plots 1 - 3. | 06.11.2025 |
| A | Revisions made to layout to address LA comments regarding parking. | 16.09.2025 |

Drawing Revisions

**Affordable Housing Allocation:**
Phase 6b - 17 unit scheme

- Shared Ownership - 3 No.
- Affordable Rent - 3 No.

Total = 6 units

**Layout Approval**

MD approval Signature: ..... Date: .....

NOTE: RC signature required where house types are chosen from the RC exception list or are not Group Core product (R21/R25). Introducing Persimmon types onto Charles Church sites or vice versa is prohibited.

RC approval Signature: ..... Date: .....

Persimmon

Persimmon House
Knoll Road
Camberley
GU15 3TQ

Phase 6b & LEAP / Fitness Area
Littlehampton

Hampton Park
Toddington Lane

Site Layout - LEAP 4 / Fitness Area / Phase 6b - 17 units

| Date | Scale | Size |
|---|---|---|
| Nov. 2025 | 1:500 @ A1 | A1 |

| Drawing Status | Drawing No. | Rev. |
|---|---|---|
| PLANNING | SHP_PL_PH6b_100 | D |

Proposed Site Plan

**MAKING PROPERTY WORK**
shw.co.uk

Notes:
To scale for planning purposes only. Do not scale for construction.
All dimensions to be confirmed on site. This drawing is to be read in conjunction with other drawings in this series and all relevant consultants drawings and documentation where applicable.
This drawing has been produced for the specific client and project identified below and is not intended for use by any other person or for any other purpose other than indicated on this drawing.
Please report any discrepancy on this drawing to SHW for clarification.


| Rev | Date | Description | Drn | Chk |
|---|---|---|---|---|
| | | | | |

Revision History:

Site Address: Local Centre
Hampton Park
Littlehampton

Project Name: Hampton Park Local Centre

Drawing Title: Proposed Site Plan

Client: Persimmon Homes [Thames Valley]

| | | |
|---|---|---|
| Status: | PLANNING | Rev. - |
| Scale. 1-500 @ A1 | Project No. 011042 | Dwg No. PL - |
| Date: 28.11.2025 | Drawn By. ST | Chk. AS |

SHW Architecture

# Appendix B Consented Floodplain Storage Drawing and Correspondence

- Stantec Technical Note TN003A, September 2021
- Stantec Technical Note TN004, April 2022 (includes Stantec drawing reference 39878_4001_008 rev D 'Flood Compensation')
- EA letter of approval dated 27th May 2022 (EA ref: HA/2022/123851/04-L01)

# 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.

## 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.

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 where 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 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 BELOW FLOOD LEVEL (mm) | EXISTING STORAGE ($m^3$) | PROPOSED STORAGE ($m^3$) | PER BAND NET GAIN/LOSS ($m^3$) | CUMULATIVE FLOOD STORAGE BALANCE ($m^3$) |
|---|---|---|---|---|
| 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 324$m^3$ 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, 11.4m wide by 2.1m 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.

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 ~324m3 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 (Discipline Lead) | Approved (Project Director) |
|---|---|---|---|---|---|---|
| 39878/TN003 | - | 20.12.18 | AW | RR | | |
| 39878/TN003 | A | 29.09.21 | AW | RR | | |

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## Appendix A

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

# TECHNICAL NOTE

**Appendix B**

EA Product 4 Data: April 2016

**Appendix C**

EA – Stantec Correspondence

# TECHNICAL NOTE

**Job Name:** North Littlehampton

**Job No:** 332510715

**Note No:** TN004

**Date:** **April 2022**

**Prepared By:** Alex Wray

**Subject:** **Response to Environment Agency Objection dated 24th January 2022**

This Technical Note (TN) has been prepared to set out the response to the Environment Agency's (EA's) Flood Risk Objection to the *Approval of Reserved Matters Following Outline Consent LU/47/11/ (Amended under LU/182/15/PL) For The Formation Of The Central Wetland Area And The Construction Of The Central Spine Road Running Across The Central Wetland Area, Linking Up Phase 5 And 2B (Also Known As Phase 4). Central Wetland Area Hampton Park Toddington Lane Littlehampton BN17 7PL.* in their letter dated 24th January 2022.

The EA's letter of objection (24/01/22) is included in **Appendix A**.

A meeting was held with the EA on the 15th March 2022 to discuss the objection in more detail and to provide an initial responses on the points made.

The six specific flood risk points put forward by the EA together with the comments made during the meeting with the EA are addressed separately below.

It is noted that Stantec's Technical Note 39878/TN003 Rev A (dated 29th September 2021) and associated Central Wetland Area (CWA) design, reviewed by the EA as part of this application, was developed to discharge the existing conditions for an outline planning application. It is not a FRA, however it supports the previous FRA dated February 2011.

## Item 1: Confirmation of Data Used

### EA Comment

*The defended 0.1% AEP flood level has been used to calculate flood plain compensation, instead of the undefended level, which is best practice; especially considering the modelling used is over 10 years old and no additional modelling has been undertaken to establish the impacts of climate change. We would therefore request to use the undefended 0.1% AEP flood level of 2.90m AOD for the flood plain compensation calculations.*

### Project Team Response

The use of this data was justified within Stantec's TN003, which identified that the EA had been consulted on the approach and data used to develop the CWA. Following the meeting with the EA, further clarification was requested from the Project Team.

Stantec's TN003 which was submitted and reviewed as part of the EA's response above.

Appendix C, within the TN003, details the 2017 liaison between Peter Brett Associates (PBA), now Stantec, and the EA regarding the appropriate flood levels to use for the floodplain compensation at the site.

During this liaison, the EA confirmed that provided the defended 1 in 100 plus climate change scenario was used within the originally approved Feb 2011 Flood Risk Assessment (FRA) calculations then the defended 1 in 1000 year would be appropriate for the assessment in the current proposals, in the absence of suitable climate change flood levels (+45% as per the guidance at the time) available from the EA's 2010 modelling.

PBA confirmed that the defended 1 in 100 plus climate change scenario was indeed used in the original analysis.

During the meeting of the 15th March 2022, the EA requested that it be confirmed if the 2011 FRA used the defended flood levels.

Stantec have completed a further review of the flood levels used in the 2011 FRA.

The 2011 FRA states that the defended 1 in 100 plus climate change scenario was used to support the analysis. This has been identified by comparing the 2011 modelling outputs with the levels identified in the text of the 2011 FRA.

Based on this proposed defended 1 in 1000 year flood level of 2.38mAOD is deemed to be agreed with the EA (as per the 2017 liaison) as an appropriate flood level to assess the flood compensation scheme.

In accordance with the EA's comments during the meeting of the 15th March 2022, it is considered that the response is suitable for the EA to remove the objection and this comment to be resolved.

It should be noted that the EA's latest climate change guidance (October 2021) recommends a 2080s Central allowance of +25% for the River Arun / Black Ditch, lower than the +45% allowance agreed in 2017 .

In summary, the defended 1 in 1000 year flood level of 2.38mAOD is the agreed design flood level to use in the flood compensation analysis.

## Item 2: Difference between overall CWA Storage Volume

### EA Comment

*The flood plain compensation proposed with this planning application will only create 324m3 additional storage, which is considerably lower than the 27,300m3 proposed at the outline planning application, which was one of the reasons of the removal of the Environment Agency (EA) initial objection.*

### Project Team Response

The proposals in TN003 demonstrate that they provide an overall net increase in floodplain capacity, and therefore are in accordance with the requirements of the NPPF.

The reduction in overall flood plain compensation from the original FRA has been driven by the amendment of the design flood level (see response to point 1), which reflected significant gains at the upper bands, and the natural iteration of the masterplan following the outline planning application.

During the meeting 15/03/22, the EA requested further confirmation on change between the 2011 FRA and the latest proposals.

Since the discussions held on 15th March a review of the latest ground model has been completed. In particular, this focussed on the low-level ditches which had previously not been included in the volumetric analysis as their design had not been finalised.

The recent review of the latest proposals has allowed the refinement of the analysis to include the final CWA form, including the free-flowing low-level drainage ditches. Within this analysis, minor corrections to the triangulation within the ground model have been made to better reflect the proposals has been made.

The recent review of the latest proposals has allowed the refinement of the analysis to include the final CWA form, including the free-flowing low-level drainage ditches. This analysis also identified that there were minor corrections to be made to the triangulation of the ground model. The result of this has now been included in the table below as well as on our revised drawing 39878/4001/008 Rev. D and identifies modifications at all bands.

*Table 1 - Revised Flood Compensation Table*

| Level Band (mm below 1 in 1000 year flood level) | Volumes as previously submitted ($m^3$) | Final volumes with CWA ditches included ($m^3$) |
|---|---|---|
| 0-100 | -2114.31 | -1403.22 |
| 100-200 | -1511.09 | -772.41 |
| 200-300 | -1048.14 | -288.5 |
| 300-400 | -577.79 | 174.76 |
| 400-500 | 37 | 691.67 |
| 500-600 | 800.29 | 1352.76 |
| 600-700 | 1500.98 | 2074.41 |
| 700-800 | 2172.35 | 2754.89 |
| 800-900 | 1245.95 | 1784.16 |
| 900-1000 | 881.67 | 1404.56 |
| 1000-1100 | -646.79 | -214.54 |
| 1100-1200 | -261.74 | 122.01 |
| 1200-1300 | -96.48 | 257.71 |
| 1300-1400 | -57.77 | 255.38 |

As a result of the update, the current design shows significant overall gains in storage of 8193m3 across the site, which is closer to the original FRA figure.

## Item 3: Location of Flood Compensation

### EA Comment

*It looks like the majority of the compensatory storage area is within Flood Zones 2 and 3. This is an inappropriate location for a compensatory storage area as this land would be expected to flood in the design event. Digging down into this land would not provide the designed compensation volume as the soil would be saturated and area would be expected to fill with water anyway. Compensatory storage areas should be providing flood storage outside of design flood extent.*

### Stantec Response

The majority of the compensatory storage area is within the proposed central wetland area (CWA) and proposed playing field area which is not currently within the defended Flood Zones 2 or 3.

The Product 4 data provided in Appendix B of TN003 extracted on 11th April 2016 shows Flood Zone 2 and 3 flooding to the playing fields, not the CWA. This has been accounted for within the calculations

Where there is compensatory storage proposed within the existing flood zones, these ground levels are being reduced. This does provide compensatory storage volume and is commonly accepted by the EA.

During the meeting of the 15th March 2022, the EA confirmed that they were satisfied with the project team's response.

## Item 4: Level-for-Level compensation

### EA Comment

*The calculations provided in table 1 of the Technical Note show loss of storage at the lower and higher levels. To be an acceptable compensation scheme, the volume of flood gained in each particular slice should be greater than the volume lost for that same slice.*

### Stantec Response

Please refer to Table 1 in Section 2 of this report.

Following the review of the ground model and proposals outlined in our response to point 2 above, the level-for-level losses at the low levels have been updated. With regards to the principal concern at the lower levels, the revised analysis shows gains in the lowest bands with a small loss within a single band. Table 2 below shows the cumulative flood storage for all bands as a result of the flood compensation, demonstrating positive storage throughout.

*Table 2 - Cumulative Flood Storage*

| Level Band (mm below 1 in 1000 year flood level) | Final volumes with CWA ditches included ($m^3$) | Cumulative Flood Storage ($m^3$) |
|---|---|---|
| 0-100 | -1403.22 | +8193.64 |
| 100-200 | -772.41 | +9596.86 |
| 200-300 | -288.5 | +10369.27 |
| 300-400 | 174.76 | +10657.77 |
| 400-500 | 691.67 | +10483.01 |
| 500-600 | 1352.76 | +9791.34 |
| 600-700 | 2074.41 | +8438.58 |
| 700-800 | 2754.89 | +6364.17 |
| 800-900 | 1784.16 | +3609.28 |
| 900-1000 | 1404.56 | +1825.12 |
| 1000-1100 | -214.54 | +420.56 |
| 1100-1200 | 122.01 | +635.1 |
| 1200-1300 | 257.71 | +513.09 |
| 1300-1400 | 255.38 | +255.38 |

.As discussed in the call on the 15th March, the original FRA was accepted on the basis that it did not provide a level-for-level compensation scheme. We have eliminated all but one band of loss within the lower bands and have reduced the losses at the lower risk higher bands significantly.

We would also note that all of these higher band losses fall between the levels of 1.83 and 2.38mAOD abut that at these higher band levels there is a significant cumulative net gain in storage of over 8000$m^3$.

## Item 5: Freely draining proposals

### EA Comment

*The compensation area should be completely free filling and draining and should not use culverted or piped entry routes. This is to ensure the compensation area can fill and drain under gravity and so will be available should back to back flood events occur. It is not clear how the proposed flood compensation area will fill and drain.*

### Stantec Response

As discussed in meeting on 4th February 2022, design team should review lowering upstream footpath and provision of boardwalks in discrete locations to replace culverts to the south of the CWA.

During the meeting of the 15th March 2022, the EA confirmed that they were satisfied with the project team's approach.

Example boardwalk bridges / crossings for the CWA were sent to Arun DC / EA on the 17th February 2022.

## Item 6: CWA Crossings

### EA Comment

*Unsatisfactory information in regard to the watercourse crossings have been submitted.*

*In our previous responses we stated that the EA will always request road crossings to be of a clear span variety, for the purposes of flood flow. Also, the soffit level should be set at least 600mm above the undefended 1% AEP plus the appropriate allowance for climate change. In this case it appears that defended levels have been considered. Furthermore, culvers have been proposed as a means of crossing for the footpaths which are against EA policy. It'll also be useful if evidence of discussions about the arch crossing can be provided to confirm this was agreed as an appropriate means of crossing.*

**Stantec Response**

Road Bridge Crossing

Within EA permitting for clear span bridges they define a clear span bridge as 'a clear span bridge, being a bridge that requires no bed or bank reinforcement and no support in the watercourse'. We would argue that the precast arch solution proposed meets this description

Drawing 39878_4001_001B provided in Appendix B of TN003 shows the soffit of the road crossing is currently shown 1100mm above the defended 0.1% AEP flood level (2.38m AOD). If the modelled undefended 1% + CC level (2.47m AOD) was used then this reduces to 1010mm.

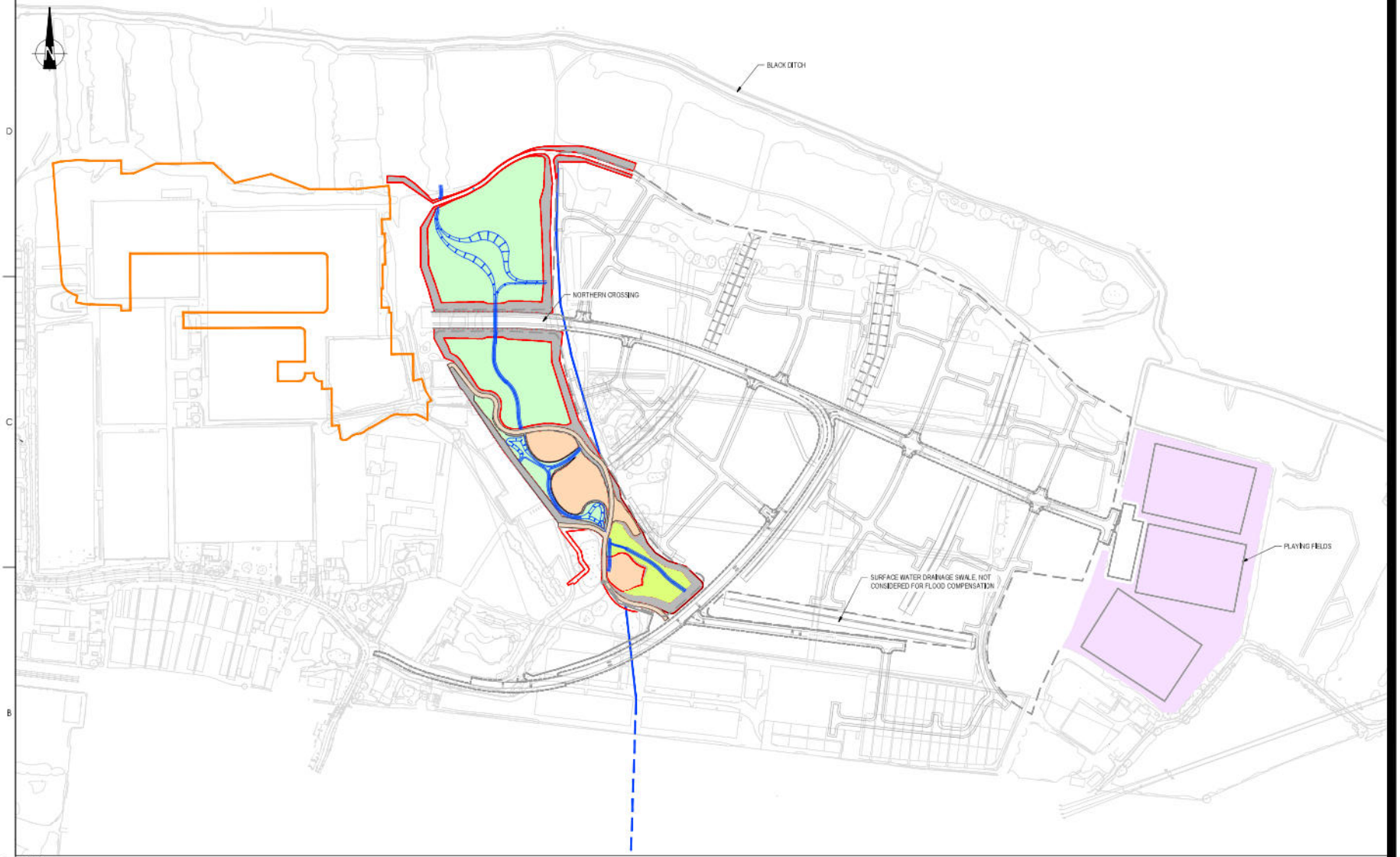
Culvert Crossings

Culvert crossings are to be reviewed in accordance with our response to comment 5 above.

# TECHNICAL NOTE

**Appendix A**

**EA objection letter HA/2022/123851/01-L01 Dated 24th January 2022**




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

1. BASED ON MASTERPLAN INFORMATION PROVIDED BY PERSIMMON DRAWING No. 519_100 DATED APRIL 2017.
2. 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.
3. GROUND LEVELS WITHIN CWA TO SLOPE AT A GRADIENT NO STEEPER THAN 1:200 FROM TOE OF EMBANKMENT TO CENTRAL DRAINAGE DITCH.
4. PROPOSED FOOTPATH LAYOUT PROVIDED BY WHITE YOUNG GREEN DRAWING No. A068461 sk.CWA.2[8] DATED JULY 2018.
5. PROPOSED ROAD LAYOUT PROVIDED BY MAYER BROWN DRAWING No. MBSK180409-1-P2 DATED JULY 2018.
6. SEE PBA DRAWINGS 35944/1507/003 AND 35944/1507/010 FOR DETAILS OF NORTHERN AND SOUTHERN CWA CROSSINGS.
7. SEE MAYER BROWN DRAWINGS FOR DETAILS OF PLATFORM LEVELS AND ON-PLATFORM DRAINAGE.
8. 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 | 35034.73 | 33631.51 | -1403.22 | 8193.64 |
| 100-200 | 33968.51 | 33196.1 | -772.41 | 9586.86 |
| 200-300 | 33003.15 | 32714.65 | -288.5 | 10369.27 |
| 300-400 | 32057.23 | 32231.99 | 174.76 | 10657.77 |
| 400-500 | 31071.81 | 31763.48 | 691.67 | 10483.01 |
| 500-600 | 29840.22 | 31192.98 | 1352.76 | 9791.34 |
| 600-700 | 28125.89 | 30200.3 | 2074.41 | 8438.58 |
| 700-800 | 25503.01 | 28257.9 | 2754.89 | 6364.17 |
| 800-900 | 20686.33 | 22690.49 | 1784.16 | 3609.28 |
| 900-1000 | 15284.79 | 16688.35 | 1404.56 | 1825.12 |
| 1000-1100 | 9388.42 | 9174.88 | -214.54 | 420.56 |
| 1100-1200 | 4330.3 | 4452.31 | 122.01 | 635.1 |
| 1200-1300 | 1540.24 | 1797.95 | 257.71 | 513.09 |
| 1300-1400 | 457.01 | 712.39 | 255.38 | 255.38 |

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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.

| Issued/Revision | By | Appd | YYYY.MM.DD |
|---|---|---|---|
| D DRAINAGE DITCHES ADDED | HY | | 25.03.22 |
| C UPDATED WETLAND AREAS | CS | | 29.09.21 |
| B PLANNING ISSUE | JEDS | | 20.12.18 |
| A | AW | EB | 02.05.18 |
| | SMR | - | AW | 2021.09.30 |
| | Dwn. | Dsgn. | Chkd. | YYYY.MM.DD |

Issue Status

**FOR PLANNING**

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Client/Project
PERSIMMON HOMES
THAMES WATER

Title
NORTH LITTLEHAMPTON
CENTRAL WETLAND AREA

FLOOD COMPENSATION

Project No. 39878
Scale 1:2000
Revision D
Drawing No. 4001/008

Arun District Council
Planning Policy
1, Arun Civic Centre Maltravers Road
Littlehampton
West Sussex
BN17 5LF

**Our ref:** HA/2022/123851/04-L01
**Your ref:** LU/369/21/RES

**Date:** 27 May 2022

Dear Planning Team,

**FURTHER INFORMATION - APPROVAL OF RESERVED MATTERS FOLLOWING OUTLINE CONSENT LU/47/11/ (AMENDED UNDER LU/182/15/PL) FOR THE FORMATION OF THE CENTRAL WETLAND AREA AND THE CONSTRUCTION OF THE CENTRAL SPINE ROAD RUNNING ACROSS THE CENTRAL WETLAND AREA, LINKING UP PHASE 5 AND PHASE 2B (ALSO KNOWN AS PHASE 4).**

**CENTRAL WETLAND AREA HAMPTON PARK TODDINGTON LANE LITTLEHAMPTON BN17 7PL**

Thank you for re-consulting the Environment Agency on the above application.

We have reviewed the additional information that has been submitted and have no further comments to make. Our previous response dated 26 April 2022 (our ref; HA/2022/123851/03) still stands, and this is copied below for ease of reference:

***"Environment Agency Position***

*In light of the additional information provided to address our initial concerns as highlighted in our letter ref. HA/2022/123851/01, and the confirmation of an additional floodplain storage of 8,193m³ as described in the Technical Note "TN004_NthLittlehampton_Response-to-EA_050422" produced by Stantec and received on 05/04/2022, we can remove our objection to this reserved matters application.*

*We have **no objection** to the proposal as submitted."*

Please do not hesitate to contact me using the contact details shown below should you have any queries regarding the above information

Yours faithfully

**Mrs Sophie Brown**
**Sustainable Places Planning Advisor**

[redacted]

Environment Agency
Guildbourne House Chatsworth Road, Worthing, West Sussex, BN11 1LD.
Customer services line: [redacted]
www.gov.uk/environment-agency

Cont/d..

[redacted]

End