



BANNERS GATE
CIVIL, STRUCTURAL AND
TRANSPORTATION ENGINEERS

**Flood Risk Assessment for Proposed Development of
Land off Withies Park, Midsomer Norton, Somerset**

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PPS25 Flood Risk Assessment

Contents

1	Introduction
2	Requirements of the Flood Risk Assessment
3	Site Location
4	Site Levels
5	Ground Conditions
6	Existing Flood Protection Measures
7	Sources of Flooding
8	Effects on Flood Plain Storage Volume
9	Impact on Fluvial Morphology
10	Overland Flow
11	Land Drainage
12	Existing Foul Sewers
13	Existing Surface Water Sewers
14	Climate Change Impact
15	Residual Risk Assessment and Mitigation
16	Access and Egress
17	Proposed Development Drainage
18	Conclusions

Appendices

- Appendix A Site Location Plan
- Appendix B Aerial Photograph of Site
- Appendix C Environment Agency Flood Risk Map
- Appendix D Large Scale Flood Risk Map with Flood Levels
- Appendix E Wessex Water letter of 23 June 2009 and Sewer Records
- Appendix F Greenfield Run-off Calculations
- Appendix G Storm Sewer Calculations and Simulations
- Appendix H Topographical Survey
- Appendix J Trial Pit Logs
- Appendix K Planning Layout
- Appendix L Preliminary Drainage Layout.

1. Introduction

- 1.1 Banners Gate Limited is acting on behalf of David Wilson Homes South West in respect of the proposed development of a greenfield site with a gross site area of approximately 3.45 hectares at off Withies Park, Midsomer Norton, Somerset (see Site Location Plan in Appendix A).
- 1.2 Proposed development involves the construction of approximately 112 domestic dwellings with vehicular access from Withies Park.
- 1.3 This flood risk assessment (FRA) has been prepared to accompany a planning application for the development of the site to be submitted by David Wilson Homes South West.
- 1.4 Communities and Local Government Planning Policy Statement 25 (PPS 25) published in December 2006 requires that a flood risk assessment should be carried out to the appropriate degree at all levels of the planning process, to assess the risks of all forms of flooding to and from development taking climate change into account and to inform the application of the sequential approach.
- 1.5 Where applicable the Communities and Local Government Code for Sustainable Homes sets minimum standards for surface water run-off (SUR 1) and flood risk (SUR 2).

The Code requires that peak surface water run-off rates and annual volumes of run-off will be no greater than the previous conditions of development. Credit is given where sustainable drainage systems are used to attenuate flow from hard surfaces and roofs. The Code requires the provision of areas of porous paving and the use of soakaways where ground conditions are suitable.

Credit is given where the development is located in an area of low annual probability of flooding (PPS25 Zone 1) or where appropriate measures are employed to mitigate the effect of flooding where planning consent is given in areas of medium/high annual probability of flooding (PPS25 Zones 2, 3a and 3b).

- 1.6 This report has been commissioned to identify the likely flooding issues associated with the above site and the possible constraints that could be imposed on the development. This report proposes a strategy for not increasing and where practical reducing surface water run-off from the site in order to minimise the impact of the development upon properties and watercourses situated downstream in accordance with PPS25.

2. **Assessment of Flood Risk**

2.1 PPS25: Annex E: The Assessment of Flood Risk: General Principles: states that at all stages of the planning process, the minimum requirement for flood risk assessments are that they should:

- be proportionate to the risk and appropriate to the scale, nature and location of the development;
- consider the risk of flooding arising from the development in addition to the risk of flooding to the development;
- take the impacts of climate change into account
- be undertaken by competent people, as early as possible in the particular planning process, to avoid misplaced effort and raising landowner expectations where land is unsuitable for development;
- consider both the potential adverse and beneficial effects of flood risk management infrastructure including raised defences, flow channels, flood storage areas and other artificial features together with the consequences of their failure;
- consider the vulnerability of those that could occupy and use the development, taking account of the Sequential and Exceptional Tests and the vulnerability classification, including arrangements for safe access;
- consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that the assessments are fit for the purpose of the decision being made;
- consider the effects of a range of flooding events including extreme events on people, property, and the natural and historic environment and river and coastal processes;
- include the assessment of the remaining (known as 'residual') risk after the risk reduction measures have been taken into account and demonstrate that that this is acceptable for the particular development or land use;
- consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the development may affect drainage systems; and
- Be supported by appropriate data and information, including historical information on previous events.

3. Site Location

- 3.1 The site is located approximately 0.8 kilometres south of Midsomer Norton in Somerset at Grid Reference 366000, 153550. The site is bounded to the south and west by residential development, to the north by a cricket ground and to the east by agricultural land.

4. Site Levels

- 4.1 The site to be developed falls from a level of approximately 102.87maOD in the south east to a level of approximately 95.41maOD in the north west part of the site at an average gradient of approximately 1 in 33.
- 4.2 Topographical survey information for the existing site is included in Appendix H.

5. Ground Conditions

- 5.1 The Winter Rain Acceptance Potential map issued by the National Water Council indicates that the soil type in this area is WRAP Class 4 clayey, or loamy over clayey soil with an impermeable layer at shallow depth. Site investigation report issued by T&P Regeneration Ltd in December 2009 indicates that ground within the site comprises sandy silt and soft to firm sandy gravelly clay overlying moderately dense sandstone and concludes that “soakaway drainage is unlikely to represent a viable drainage option”

6. Existing Flood Protection Measures

- 6.1 The Environment Agency Flood Risk Map (see Appendix C) shows two small flood protection measures within the vicinity of the proposed development. Both features are shown at the north side of the River Somer which flows west to east along the north boundary of the site. Starting at a point approximately 36.5m downstream of Withies Park the topographical survey shows a stone filled gabions wall measuring some 10.1m in length constructed along the north bank of the river. The site survey indicates that the top of this wall at its lowest point is 97.62maOD. Some 48.4m downstream from the gabion wall the survey shows a concrete block wall measuring approximately 38.5m in length constructed along the north bank of the river. The site survey indicates that the top of this wall at its lowest point is 95.73maOD. The nearest 1 in 100 year flood level shown on the large scale flood

map provided by the Environment Agency (see Appendix D) at 95.40maOD is below the top of these defences in both cases. It is not expected that the existing flood protection measures will be affected by proposed development.

7. Sources of Flooding

- 7.1 In view of the fact that the lowest ground level anywhere within the site boundary is 95.18maOD the site is not subject to flooding from the sea.
- 7.2 Bath and North East Somerset Strategic Flood Risk Assessment indicates that, due to topography and soil characteristics, there is a low to medium risk of groundwater flooding (flooding from land) in Midsomer Norton. The SFRA states that the Environment Agency does not hold any record of groundwater flooding in the area and does not consider groundwater flooding to be a significant issue in Midsomer Norton.
- 7.3 At present any water running overland towards the site from higher ground in the south is intercepted by the ditch which follows the south boundary of the site and discharges into the River Somer approximately 35.0m downstream of Cautletts Close. This ditch is regarded as an important drainage feature and will be cleaned out and retained. Overland flow from higher ground in the east is intercepted at Withies Lane by an embankment below the hedge which marks the east boundary of the site. Where the embankment adjacent to Withies Lane is discontinuous finished ground levels within the site boundary will be adjusted to ensure that surface water flow from the lane does not flow into the proposed development.
- 7.4 The Strategic Flood Risk Assessment notes that there is a higher than average number of recorded incidents of sewer flooding in the area indicating that the existing sewer infrastructure plays an important part in surface water flooding within Midsomer Norton.
- 7.5 The Strategic Flood Risk Assessment reports that no artificial sources of flooding have been identified in Midsomer Norton.
- 7.6 The nearest significant water feature to the site is the River Somer which flows south west to north east along the north west boundary of the site.
- 7.7 The Environment Agency Flood Risk Map indicates that during extreme events the River Somer floods immediately upstream of the culvert under Withies Park and in low lying areas associated with the river channel immediately downstream of Withies Park. Some localised flooding is also indicated immediately downstream of the proposed development. The map indicates that the developable area of the site itself is not affected by flooding.

- 7.8 A larger scale flood risk map provided by the Environment Agency indicates that although water levels in the River Somer upstream of Withies Park may reach 97.5maOD, water levels adjacent to the proposed development are unlikely to exceed 95.4maOD during a 1 in 100 year storm (see Appendix D).
- 7.9 For planning purposes the proposed development is deemed by PPS25: Table D.1 to fall into Low Probability Zone 1.
- 7.10 In PPS25: Table D2 the proposed development (dwelling houses) has a Flood Risk Vulnerability Classification of More Vulnerable.
- 7.11. PPS25; Table D.3 indicates that the proposed development falls into the category Flood Zone 1/More Vulnerable Flood Risk and therefore residential development within the site is appropriate.

8.0 Effects on Flood Plain Storage Volume

- 8.1 The extent of extreme flooding from the River Somer shown in the Environment Agency flood map indicates that the proposed development does not lie within a flood plain and therefore no additional flood plain storage volume is required nor will any storage volume be displaced.

9.0 Impact on Fluvial Morphology

- 9.1 The proposed development is expected to have no detrimental impacts on fluvial morphology.

10.0 Overland Flow

- 10.1 Any overland flow which does occur will tend to flow from higher ground in the south east of the site northwards towards the River Somer.

11.0 Land Drainage

- 11.1 No record of existing land drainage is available. Any land drainage found will be removed or accommodated as part of the development drainage proposals.

12.0 Existing Foul Sewers

- 12.1 Wessex Water sewer records show public foul sewers in Withies Park draining to an existing foul pumping station adjacent to the east side Withies Park some 65.0m south of the River Somer.

13.0 Existing Surface Water Sewers

- 13.1 Wessex Water sewer records indicate that existing public surface water sewers in Withies Park discharging via headwalls into the River Somer.

14.0 Climate Change Impact

- 14.1 Climate change over the next few decades is likely to mean milder wetter winters and hotter drier summers. These factors are expected to lead to an increased risk of flooding within the lifetime of planned developments. In order to allow for climate change and in order to mitigate the risk of flooding both within and downstream of the proposed development an allowance for additional surface water flow resulting from projected climate change is included in surface water flow calculations in accordance with PPS25 Table B.

15.0 Residual Risk Assessment and Mitigation

- 15.1 Provision is to be made to contain on site all surface water flow from all hardstandings within the development during a 1 in 100 year storm plus 30% for climatic change. The route of any overland flow arising from storms of greater intensity than that for adoptable surface water sewers are designed will be considered as part of the detailed design in order to reduce to a minimum the risk to of damage to existing and proposed property downstream.
- 15.2 In order to ensure that new dwellings are not affected by flooding or by overland flow it is recommended that the minimum finished floor level within the proposed development should be 96.90maOD (i.e. 0.60m above the lowest point of the proposed embankment between the proposed storage pond and the River Somer and 1.5m above the 1 in 100year flood level of 95.40maOD) and not less than 0.15m above surrounding finished ground levels.
- 15.3 It may be necessary to raise finished ground levels locally in order to create sufficient cover for services or to provide overland flood routing from surface water sewers during events exceeding standard Sewers for Adoption criteria.

16.0 Access and Egress

16.1 The topographical survey indicates that road channel levels at the junction of the proposed access road and Withies Park is approximately 96.50maOD. In view of this and the fact that the developable area of the site itself is not subject to flooding dry access to the proposed development can be achieved via a new bridge over the River Somer.

17.0 Proposed Development Drainage

17.1. The proposed development is to be provided with separate foul and surface water sewerage systems.

17.2 DETR Circular 03/99 states that when drawing up foul sewerage proposals for any development the first presumption must always be to provide a system of foul drainage discharging to a public sewer.

17.3 It is anticipated that all foul flows arising from proposed development will discharge by gravity to a new foul pumping station to be constructed in the north part of site and that effluent from the new pumping station will be pumped to the existing 225mm diameter public foul sewer in Withies Park. Design foul flow from the proposed development is estimated to be 5.2 litres per second. Network modelling is at present being carried out by Wessex Water in order to ensure that the existing public foul sewerage system has adequate capacity to receive flow from the proposed development (see Wessex Water letter of 23 June 2009 in Appendix E). Some improvements to the existing foul sewer network may be required.

17.4 Part H of the Building Regulations sets out a hierarchy for the disposal of surface water as follows:

- a) An adequate soakaway or some other adequate filtration system: or where that is not reasonably practicable,
- b) A watercourse: or where that is not reasonably practicable,
- c) A sewer

17.5 In view of the fact that ground conditions within the site boundary are generally unsuitable for the use of soakaways it is proposed to discharge all surface water to the River Somer at a rate to be agreed with the Environment Agency. Balancing storage facilities will be required together with control devices to restrict discharge to the river. Wessex Water in their letter of 23 June 2009 agree that "storm flows (from the proposed development) should be discharged direct to the River Somer with the approval of the Environment Agency".

17.6 In order to comply with the requirements of both PPS25 and the Code for Sustainable Homes SUR1 it is proposed that the rate of discharge to the River

Somer during a 1 in 100 year storm plus 30% for climatic change will be no more than that from the undeveloped site during a 1 in 100 year storm.

- 17.7 Calculations indicate that the rate of surface water run-off from the undeveloped (greenfield) site during a 1 in 100year storm is approximately 62.2 litres per second (see Appendix F).
- 17.8 The total impermeable area of the site when fully developed is expected to be in the region of 1.84 hectares (53% of the gross site area).
- 17.9 Based on a total impermeable area of 1.84 hectares and a maximum allowable discharge of 62.2 litres per second during a 1 in 100 year storm (plus 30% for climatic change) calculations indicate that a total balancing storage volume of approximately 632 cubic metres will be required (see Appendix G).
- 17.10 It is proposed to provide the required balancing storage volume in the form of a pond to serve as large a proportion of the development as possible with additional storage in the form of oversized pipes below adoptable roads. Storage in cellular units is not permitted. Storage in the porous sub-base of roads in private areas cannot be included in the management of the 1 in 100 year plus climate change event unless maintenance of these areas can be guaranteed throughout the lifetime of the development.
- 17.11 In order not to exceed the greenfield run-off rates during a 1 year, 30 year and 100 year storm it is proposed to equip the control chamber with two hydrobrakes of differing specifications operating in sequence. In this arrangement outflow from the balancing storage system to the River Somer during a storm of critical duration (120 minutes) is summarised below:

	<u>Greenfield Run-off (l/s)</u>	<u>Proposed Discharge (l/s)</u>
1 year Storm	20.1	19.9
30 year Storm	49.0	26.3
100 year Storm	62.2	60.6

- 17.12 In view of the fact that the outfall to the river is to be constructed 0.45m below the 100 year peak flood level of 94.95maOD the outlet headwall is to be provided with a flap valve in order to preserve available balancing storage volume when the river is in flood. In the unlikely event that the river is already at peak flood level when a 1 in 100 year plus 30% for climate change storm affects the site, the storage culvert will surcharge and water levels in the pond rise by 0.3m, utilising approximately 90 cubic metres of storage available above normal top water level (96.0maOD), before overtopping the river maintenance strip and flowing directly into the River Somer. No flooding is expected to occur within the development.
- 17.13 In view of the fact that water levels in the balancing storage system may under extreme circumstances overtop the lowest point of the embankment (96.3maOD)

between the pond and the river, it is recommended that the minimum floor level for any dwelling within the proposed development should be set at 96.9maOD (i.e. 0.6m above the embankment and 1.5m above the peak 1 in 100 year flood level of 95.4maOD). In order to ensure that property within the development is not affected by any overland flow which may occur, it is recommended that the finished floor levels of all dwellings should be set at least 0.15m above surrounding ground levels.

- 17.14 The balancing storage pond will provide a green open space within a compact residential development and will help improve water quality by allowing settlement to occur and a limited amount of percolation into the ground to take place before surface water discharge to the river.
- 17.15 It is proposed that all adoptable sewers serving the proposed development shall be designed in accordance with Sewers for Adoption 7th Edition and all sewers elsewhere within the development in accordance with the Building Regulations part H 2002.

18.0 Conclusions

- 18.1 Banners Gate Ltd is acting on behalf of David Wilson homes South West in respect of a proposed development of a greenfield site off Withies Park, Midsomer Norton, Somerset.
- 18.2 Proposed development involves the construction of approximately 112 domestic dwellings with vehicular access from Withies Park.
- 18.3 It is anticipated that all foul flows arising from proposed development will discharge by gravity to a new foul pumping station to be constructed in the north western part of the site adjacent to Midsomer Norton Cricket Club and that effluent from the new pumping station will be pumped to an existing 225mm diameter public foul sewer in Withies Park. Network modelling is at present being undertaken by Wessex Water in order to ensure that the existing public foul sewerage system has adequate capacity to receive flow from the proposed development. Some improvements to the existing foul sewer network may be required.
- 18.4 The Environment Agency flood map identifies two flood protection measures within the vicinity of the proposed development. It is not expected that either of these measures will be affected by proposed development.
- 18.5 A large scale map provided by the Environment Agency indicates that water levels adjacent to the proposed development downstream of Withies Park are unlikely to exceed 95.4maOD during a 1 in 100 year storm.

- 18.6 In order to ensure that new dwellings are not affected by flooding or by overland flow it is recommended that the minimum finished floor level within the proposed development should be 96.9maOD not less than 0.15m above surrounding finished ground levels.
- 18.7 In view of the fact that ground conditions are deemed unsuitable for the use of soakaways it is proposed to discharge all surface water to the River Somer at rates to be agreed with the Environment Agency. Balancing storage facilities will be required together with control devices to restrict discharge to the river.
- 18.8 Calculations indicate that the rate of surface water run-off from the undeveloped (greenfield) site during a 1 in 100 year storm is approximately 62.2 litres per second
- 18.9 A total balancing storage volume of approximately 632 cubic metres is required in order to restrict discharge to the River Somer during a 1 in 100 year storm (plus an allowance of 30% for climate change) to a rate no more than the run-off from the undeveloped site during a 1 in 100 year storm.
- 18.10 It is proposed to provide the required balancing storage volume in the form of a pond to serve as large a proportion of the development as possible with additional storage in the form of oversized pipes below adoptable roads. Storage in cellular units is not permitted. Storage in the porous sub-base of roads in private areas cannot be included in the management of the 1 in 100 year plus climate change event unless maintenance of these areas can be guaranteed throughout the lifetime of the development.
- 18.11 In order not to exceed the green field run-off rate during a 1 year, 30 year and 100 year storm it is proposed to equip the control chamber with two hydrobrakes of differing specifications operating in sequence.
- 18.12 The balancing storage pond will provide a green open space within a compact development and will improve water quality by allowing settlement to occur and a limited amount of percolation into the ground to take place before surface water discharge to the river.
- 18.13 It is proposed that all sewers serving the proposed development shall be designed and constructed in accordance with Sewers for Adoption 7th edition of Part H of the Building regulations 2002 as appropriate.
- 18.14 For planning purposes the proposed development is deemed by PPS25: Table D.1 to fall into Low Probability Zone 1. Provided that the minimum finished floor levels of all property constructed within the development is set at or above 96.90maOD then all homes within the proposed development will have a low annual probability of flooding and will comply with the requirement of the Code for Sustainable Homes SUR2.

- 18.15 In PPS25: Table D.2 the proposed development (dwelling houses) has a Flood Risk Vulnerability classification of More Vulnerable.
- 18.16 PPS25: Table D.3 indicates that the proposed development falls into the category Flood Zone 1/More Vulnerable Flood Risk and therefore residential development within the site is appropriate.
- 18.17 Surface water management within the proposed development will be designed to sustainable principles with the aim of not increasing and where practical reducing surface water run-off from the site as the result of development. The site is therefore presented as sustainable in terms of flood risk.