



**Proposed Care Home Development at Bollingbroke House, Common Road,  
Brierley, Barnsley, S72 9EA**

*Drainage Strategy*

July 2016

Project No. 2208

**Ward Associates Consulting Engineers**

Rievaulx House  
1 St Marys Court  
York  
YO24 1AH

Tel +44(0)1904 544401  
[enquiries@wa-eng.co.uk](mailto:enquiries@wa-eng.co.uk)

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**Revision History**

<b>Rev</b>	<b>Date</b>	<b>Purpose/Status</b>	<b>Comments</b>
-	July 2016	Information	First Issue

### 1. INTRODUCTION

- 1.1. Ward Associates Consulting Engineers Limited have been commissioned by Magicare Ltd, to prepare a Drainage strategy report for a proposed Care Home development at Bollingbrooke House, Brierley.
- 1.2. The assessment will describe the outline proposals for the disposal of surface water from the site. It will also include preliminary surface water storage calculations that may be required.

### 2. EXISTING SITE DESCRIPTION

- 2.1. Bollingbroke House Care Home occupies a large plot of land on the outskirts of the village of Brierley near Barnsley. The site extends to 0.54 hectare (1.32 acres) being bounded by Common Road to the north and countryside to the east and south with a large residential property to the west.
- 2.2. Bollingbroke House currently provides 28 bedrooms (including 5 shared rooms) over two floors. As one of the larger houses within the village, Bollingbroke House was built soon after World War II. The building was originally utilised as a residence for the owner of nearby brickworks.
- 2.3. In terms of topography, the land of Bollingbroke House slopes sharply from northwest to southeast, with the existing care home building sitting 2 metres below the level of Common Road, and a fall of a further 12 metres down to the rear boundary. Currently, there are significant numbers of trees along with other vegetation occupying the site and providing a natural screening to the existing building from the views of Common Road and neighbouring land. These trees are generally of good quality, providing significant visual amenity both as a group and as individual specimens. The existing trees form an important part of the local character and contribute positively towards the conservation area. Given the sloping nature and the site and the presence of the existing trees and vegetations, Bollingbroke House does not appear to impose significant visual impact on the openness of the greenbelt.
- 2.4. Access to the site is gained from Common Road, with a single unsegregated vehicle/pedestrian access point, located at the northwest corner of the site boundary. At present there is a car park located to the front of the existing building. This car park is unmarked and informally laid out, and have been used by staff and visitors of the existing care home over the years. There is no dedicated turning facility within the existing parking area. All vehicles currently have to utilise unused areas of the car park to manoeuvre.

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## Surface Water Drainage Strategy

2.5. A CCTV survey of the existing site drainage will be required to determine how the foul and surface water is drained.

### 3. THE PROPOSED DEVELOPMENT

3.1. The proposed development is for a bespoke care accommodation in the form of a four storey building to be located to the rear of the existing care home, known as Bollingbroke House. A plan showing the area of the proposed development is shown in figure 1. The proposal is to provide 32 Extra Care Units and development of the existing access road and car parking.

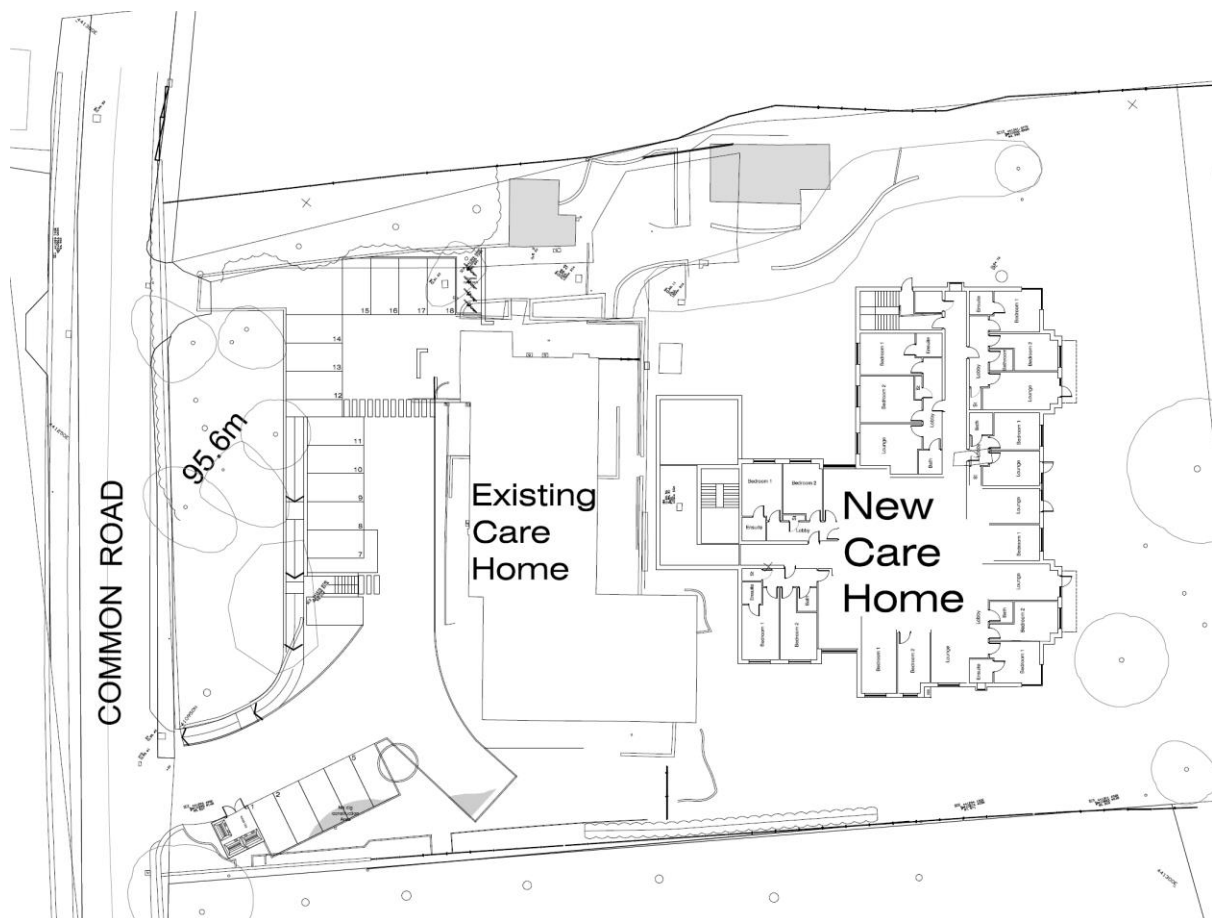


Figure 1: Proposed Site layout



### 4. FLOOD RISK CRITERIA

4.1. The site under consideration is within Zone 1 on the latest version of the indicative Floodplain Map (IFM) produced by the Environment Agency and the area of the site is less than 1 hectare. A copy of the IFM is shown in Figure 3. Zone 1 is Low probability and as land assessed as having less than 1 in 1000 annual probability of river or sea flooding in a year 0.1%.



Figure 3: Flood Risk Map - EA website

4.2. The site is not within a Ground Water Source Protection Zone. The Environment Agency have defined Source Protection Zones (SPZ's) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activity that might cause pollution in the area. The closer the activity, the greater the risk. The Environment

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## Surface Water Drainage Strategy

Agency has developed SPZ maps which show three main zones (inner, outer and total catchment) to each groundwater source. The site is not within any groundwater protection zones. A copy of which is included in Figure 4 for the site area.

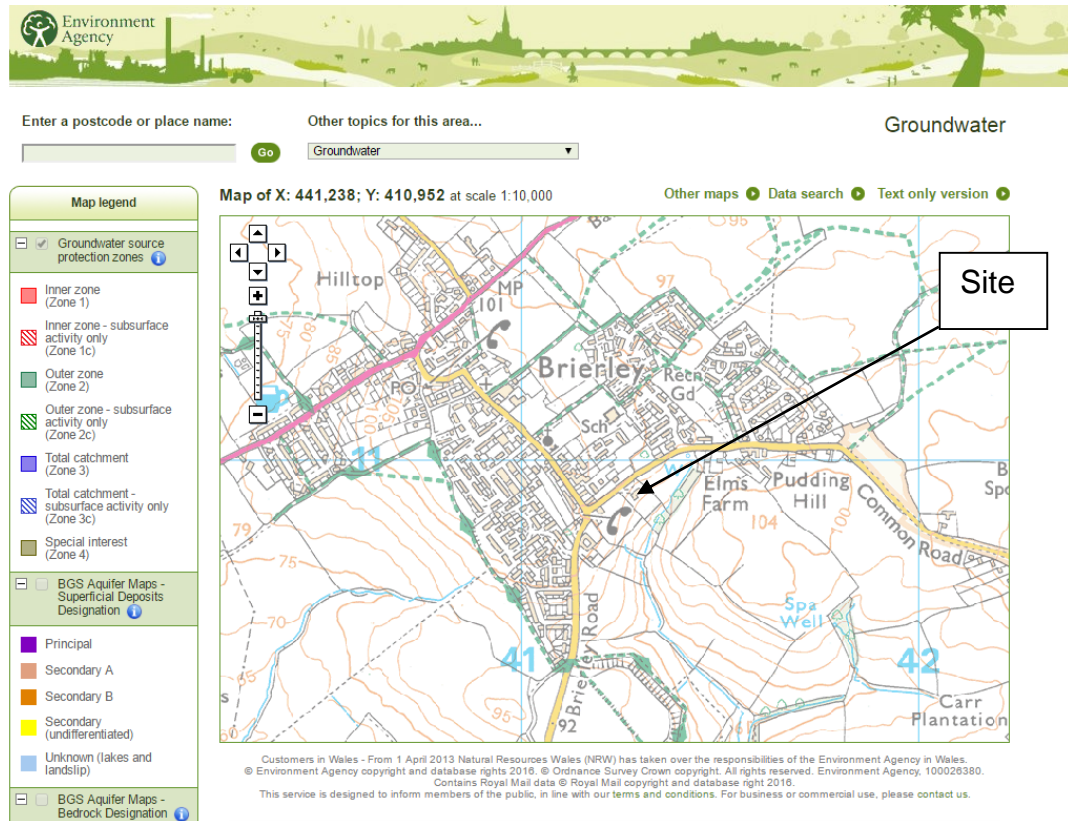


Figure 3: Groundwater source protection zone - EA website

## 5. SEQUENTIAL TEST

5.1. According to NPPF, the aim of a sequential test is to steer new development to areas at the lowest probability of flooding (Zone 1). As the site under consideration is in Flood Zone 1, there are no requirements to carry out a sequential test and as such, an exceptions test will also be unnecessary.

## 6. CRITERIA FOR ASSESSMENT

6.1. The Environmental Agency have advised that for flood risk assessments, the design flood level should be calculated from the level of a 1 in 200 year return period tidal flood event whilst also increasing calculations to take account of the effect of 50 years of climatic warming.

6.2. The recommended criteria for new surface water drainage is to design the system to ensure that no flooding occurs in a 1 in 30 year peak rainfall event and that any

localised flooding of the site during a 1 in 100 year event is retained within the site limits. These calculations should include a 30% allowance for climatic warming.

## **7. OUTLINE METHOD FOR PROPOSED SURFACE WATER DRAINAGE**

- 7.1. The general requirement for managing surface water is that "the development should not increase the flood risk elsewhere". To follow the hierarchy of sustainable urban drainage design (SuDS) the site is to be drained by a combination of soakaways and permeable hardstanding solutions.
- 7.2. The impermeable areas from the building will be drained by soakaways. The access road and car parking will be a permeable solution either block paving or permeable tarmac.
- 7.3. Flooding from Groundwater - Groundwater flooding occurs when water levels in the ground rise above surface elevations, particularly in low lying areas and permeable strata. This site is not in a low lying area and there is no history of flooding from ground water. Hence there is no risk of flooding to the development from groundwater.
- 7.4. Flooding from Sewers - There are no records of surface water sewers adjacent the site. There is no record of flooding of the site due to lack of hydraulic capacity of the public sewerage system, and therefore this is not considered to be a significant risk to the site.
- 7.5. The proposal is to drain the building impermeable area by soakaways and utilise a permeable drainage solution for the car park and access road. The design will ensure will ensure no flooding occurs in a 1 in 30 peak rainfall event and that any localised of the site during a 1 in 100 year event is retained within the site limits. These calculations should include a 30% allowance for climatic warming.
- 7.6. All soakaways designed to be a minimum 5m from face of foundations.
- 7.7. It is recommended that soakaways are constructed early in the construction project to provide a drainage point for any surface water arising during construction.
- 7.8. Approval for the use of soakaways from the local authority should be acquired prior to commencing installation on site.
- 7.9. All soakaways should be installed and maintained in line with manufacturers recommendations. No hardstanding areas should be drained into the soakaway without the implementation of a suitable petrol and silt interceptor.

Buildings	854 m <sup>2</sup>
Access Road and Car Parking	623.2 m <sup>2</sup>
Total Impermeable Area	1477.3 m <sup>2</sup>

- 7.10. Due to the site layout and to ensure all soakaways are installed a minimum of 5m from any building foundation it is proposed install one soakaway at the rear of the site. See Appendix A for the proposed surface water drainage layout. The design shown in Appendix A will ensure will ensure no flooding occurs in a 1 in 30 peak rainfall event and that any localised of the site during a 1 in 100 year event is retained within the site limits. These calculations include a 30% allowance for climatic warming. Refer to calculations in Appendix B. These calculations are based on an assumed infiltration rate of  $5 \times 10^{-5}$  m/s. It was noted that surface water at the adjacent site at The Old Quarry, Common Road is drained via soakaways. This assumed infiltration rate is based on the test results from the Old Quarry site investigation undertaken on March 2016.
- 7.11. Site testing will be required to confirm the infiltration rate on site. This should then be used to revise the design accordingly.
- 7.12. It is noted that the drainage system for the existing building should be surveyed and reviewed as part of the development.

## **8. EFFECTS OF DEVELOPMENT ON OTHER SITES**

- 8.1. As detailed previously, we recommend that surface water runoff from the development should be designed to ensure that there is no risk of any flooding during a 1 in 100 year rainfall event plus a 30% allowance for climate change. This will ensure that the risk of flooding to adjacent sites will not be increased.

### **9. CONCLUSIONS AND RECOMMENDATIONS**

- 9.1. Surface water should be drained by a combination of soakaways and permeable solutions. A preliminary layout is indicated in Appendix A. It is noted that the infiltration rate of the existing site will need to be confirmed on site as part of the part of the detailed design.
- 9.2. Subject to the surface water system being tested and designed to ensure that no flooding occurs during a 1 in 30 year rainfall event, and any flooding which may occur during a 1 in 100 year event, plus a 30% allowance for climate change, is contained within the existing site boundaries, then the risk of flooding to adjacent sites will not be significantly increased.
- 9.3. It is recommended that the soakaways and permeable access road and car park are installed early in the construction phase therefore providing drainage facilities throughout construction.
- 9.4. Soakaways to be installed and maintained in line with manufacturers recommendations.



## Bollingbroke House, Brierley

## Surface Water Drainage Strategy

## APPENDIX - B - PRELIMINARY SURFACE WATER DRAINAGE CALCULATIONS

WARD ASSOCIATES (CC) <b>WARD</b>	Project	BOLLINGBROKE HOUSE	Job No.	2208
		DRAINAGE	Sheet No.	
			Date	JULY 16
			Engineer	GB
			Check	

BASED ON SEARCH RECORDS SURROUNDING SITE DRAINS VIA  
SOAKAWAY EXISTING SITE - ASSUME SOAKAWAY  
↳ FROM ST FROM ADJACENT SITE AT THE OLD QUARRY,  
COMMON RD INFILTRATION - ASSUMED AT  $8 \times 10^{-5}$  m/s

APPLY F.O.S 15  $L = 5. \times 10^{-5}$  m/s

SITE AREA - BUILDING - 854 m<sup>2</sup>

CAR PARK - 623.2 m<sup>2</sup> - PROPOSED  
↳ DESIGN AS PERMEABLE SOLUTION

SITE IN BARANSLEY  $r = 0.36$

FROM TEEPS DESIGN FOR 1:100 YR EVENT  
WITH 30% ALLOWANCE FOR CLIMATE CHANGE

USE 1.2M DEEP UNITS 95% VOLUME FREE  
MIN SIZE - 5m x 8.5m

# Bollingbroke House, Brierley

## Surface Water Drainage Strategy

 <b>Tekla</b> Tedds Ward Associates Rievaulx House 1 St Mary's Court York	Project				Job no.	
	Bolling Brooke House				2208	
	Calcs for				Start page no./Revision	
Soakaway				1		
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
GB	01/07/2016					

### SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.02

#### Design rainfall intensity

Location of catchment area	Sheffield
Impermeable area drained to the system	A = 854.0 m <sup>2</sup>
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.9 mm
Increase of rainfall intensity due to global warming	p <sub>clmax</sub> = 30 %

#### Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = 1200 mm
Width of pit	w = 5000 mm
Length of pit	l = 8499 mm
Percentage free volume	V <sub>free</sub> = 95 %
Soil infiltration rate	f = 50.0 × 10 <sup>-6</sup> m/s
Wetted area of pit 50% full	a <sub>50%</sub> = l × d + w × d = 16198744 mm <sup>2</sup>

#### Table equations

Inflow	I = M100 × A
Outflow	O = a <sub>50%</sub> × f × D
Storage	S = I - O

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m <sup>3</sup> )	Outflow (m <sup>3</sup> )	Storage required (m <sup>3</sup> )
5	0.36	8.8	1.88	16.6	14.22	0.24	13.98
10	0.51	12.5	1.95	24.4	20.87	0.49	20.39
15	0.62	15.2	1.99	30.3	25.91	0.73	25.18
30	0.79	19.4	2.03	39.3	33.57	1.46	32.11
60	1.00	24.6	2.01	49.4	42.21	2.92	39.30
120	1.22	30.0	1.97	59.1	50.44	5.83	44.60
240	1.48	36.4	1.92	69.8	59.60	11.66	47.93
360	1.67	41.0	1.88	77.2	65.94	17.49	48.44
600	1.90	46.7	1.84	85.7	73.22	29.16	44.06
1440	2.42	59.5	1.75	103.8	88.64	69.98	18.66

Required storage volume

$$S_{req} = 48.44 \text{ m}^3$$

Soakaway storage volume

$$S_{sat} = l \times d \times w \times V_{free} = 48.44 \text{ m}^3$$

**PASS - Soakaway storage volume**

Time for emptying soakaway to half volume

$$t_{50} = S_{req} \times 0.5 / (a_{50} \times f) = 8 \text{ hr } 18 \text{ min } 24 \text{ s}$$

**PASS - Soakaway discharge time less than or equal to 24 hours**