
10669 Kidlington Cemetery

Technical Note 1 Rv1: Cemetery Assessment Note

18th May 2022

1 Introduction

- 1.1 Brookbanks is appointed by Barwood Development Securities Ltd to complete an initial assessment, in line with the Environmental Agency's (EA) guidance: *Cemeteries and burials: groundwater risk assessments*, on the placement of the proposed cemetery extension in two potential locations.
- 1.2 A cemetery drainage report, produced by Cemetery Development Services (CDS), was submitted to Kidlington Parish Council in March 2018, which conducted a partial Tier 2 assessment of the existing cemetery off Bicester Road in Gosford, Kidlington, as required by the aforementioned criteria set out by the EA. The aim of this report was to assess the contamination risk to groundwater supplies from microbiological and chemical contaminants derived from decomposition processes.
- 1.3 The note discusses the two proposed site locations, to the north and south of Kidlington Cemetery, and outlines any conditions that may make one site more favourable over the other.

2 Background Information

Site Location

- 2.1 The red line boundary can be seen below in **Figure 1-1** for the existing Kidlington Cemetery site occupies an area of circa **1ha**, with the extent of the allotment segment covering an area of circa **0.4ha**, as revealed by aerial photography. The remainder of the site consists primarily of open grassland.
- 2.2 The site is bound to the west by Bicester Road, to the north by a shallow ditch through which a tributary of the River Cherwell flows through, beyond which lie agricultural fields. It is further bound to the east by undeveloped open grassland beyond which lies an existing residential area along Water Eaton Lane, and to the south by similar open fields.
- 2.3 The site locations of the proposed extension to the Cemetery are highlighted in blue. The northern and southern sites will hereinafter be referred to as Site A and Site B, respectively.



Figure 2-1 Site Location

Topography

- 2.4 Within the red line site boundary, the topography is predominantly flat, with gentle falls in a easterly direction from the highest elevation of 63mAOD recorded at the western side of the site, to the lowest point at 62mAOD at the eastern side.
- 2.5 Similarly, Sites A and B are largely flat with an elevation range of 61mAOD to 62mAOD.

Surface Drainage

- 2.6 As mentioned in 2.2, a ditch located north of Kidlington Cemetery runs in an easterly direction and forms part of the River Cherwell system. As revealed by FEH mapping, the sites drains into this watercourse.

3 Geology

Soil Drainage Characteristics

- 3.1 This soil composition can enhance, reduce or even impede the infiltration process in a specific catchment area. With the support of Soilscares mapping it is possible to determine areas according to the drainage capacity.
- 3.2 **Figure 2-2** demonstrates that Kidlington Cemetery and both the proposed sites lie within an area with impeded drainage. Soilscares describe the soil as: *slowly permeable seasonally wet slightly acid but base-rich*

loamy and clayey soils. As a result, with regards to soil properties, there is no differentiation between the two proposed sites for the Cemetery extension.

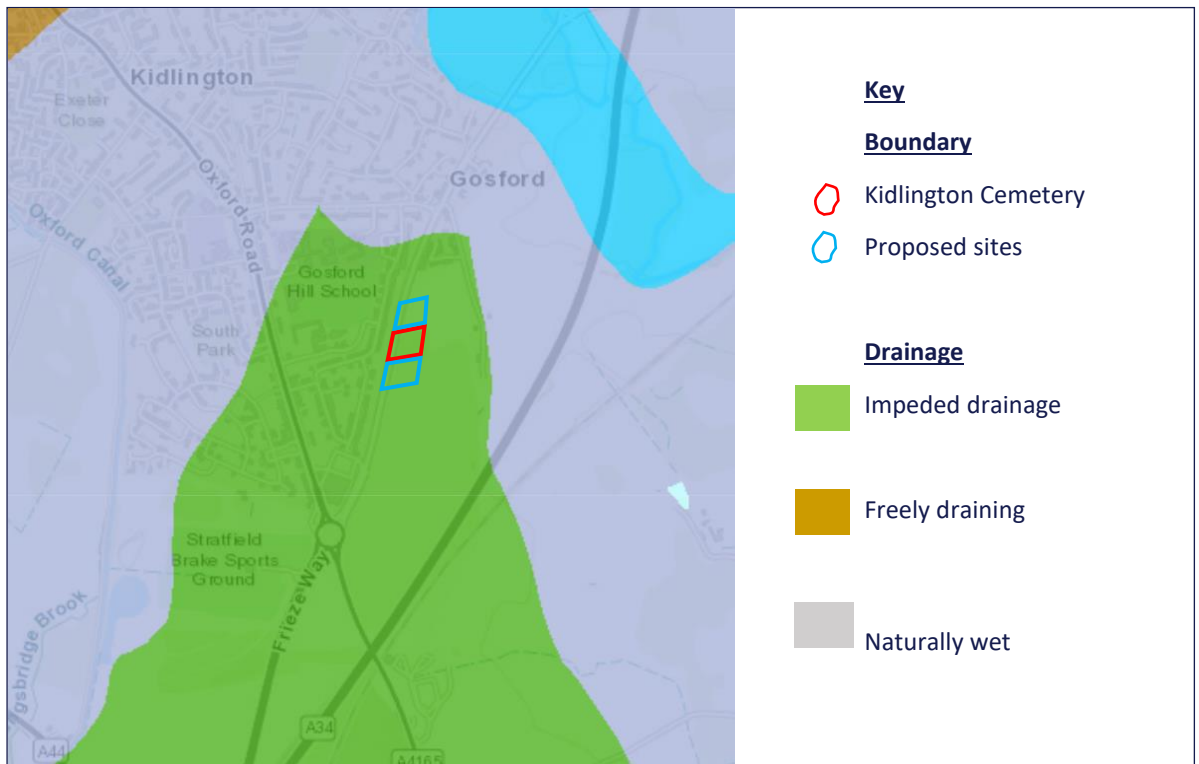


Figure 3-1 Soil Drainage Characteristics Map (MAGIC)

- 3.1 With reference to the BGS map, Kidlington Cemetery and both the proposed sites are shown to be underlain by mudstone of the Oxford Clay Formation and West Walton Formation (Undifferentiated). This is illustrated in Figure 2-4:

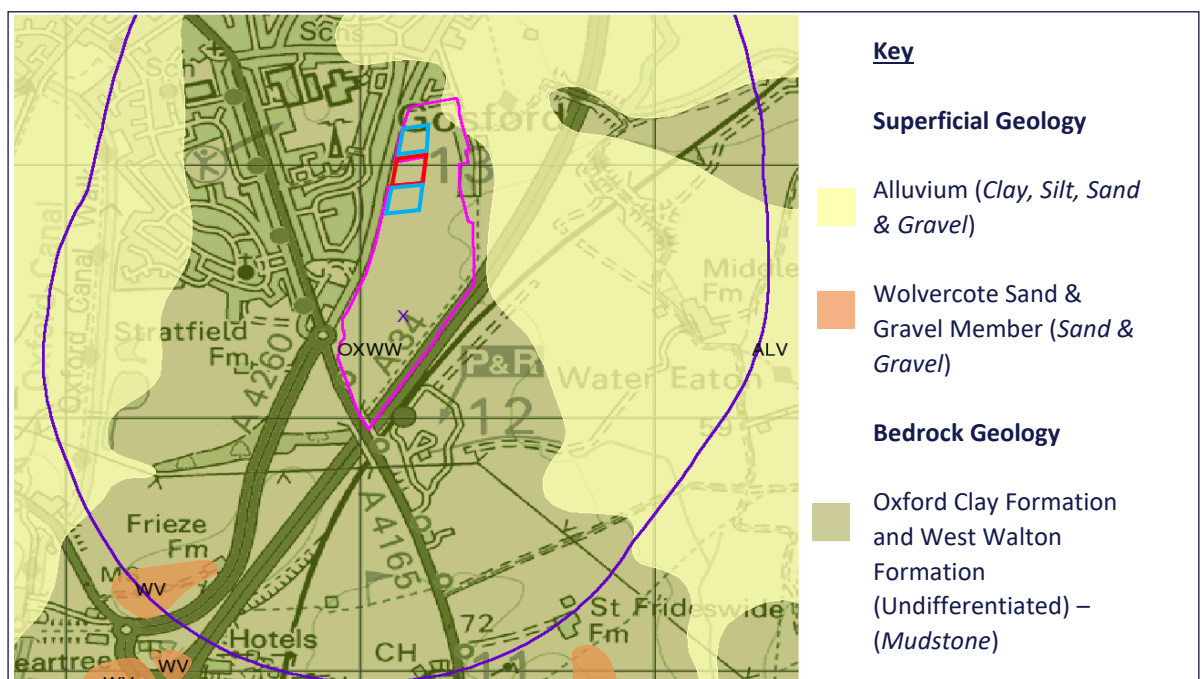


Figure 2-4: BGS Published Combined Geology

4 Hydrology & Hydrogeology

Fluvial Flooding

4.1 **Figure 4-1** illustrates the fluvial flooding extent and shows that all sites are within Flood Zone 1.



Figure 4-1: EA Flood Zone Plan for Fluvial Flooding (Gov.Uk website)

4.2 **Figure 4-2** below shows the surface water flooding extent for the proposed site locations, and demonstrates that all the sites are situated in an area of Very Low Risk.

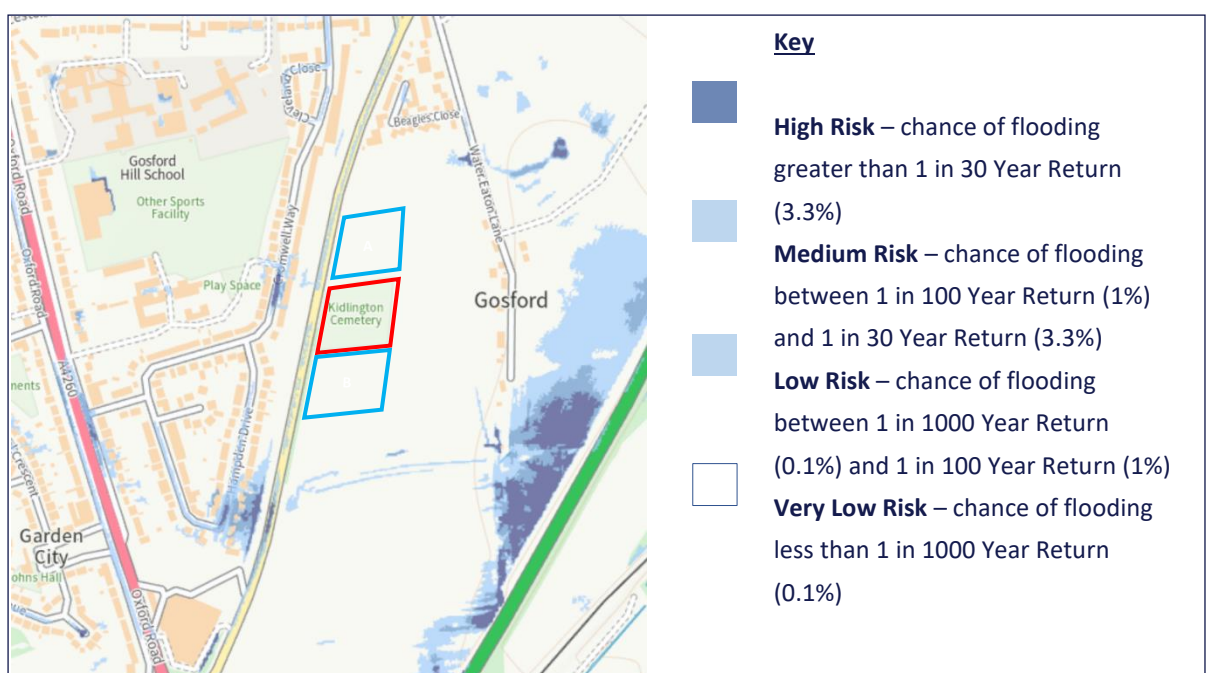


Figure 4-1 EA Long Term Flood Risk Maps – Flood risk from Surface Water (Gov.Uk website)

Groundwater Vulnerability

- 4.3 The groundwater vulnerability mapping from MAGIC is shown above, which reveals that all the sites are located within the same 'unproductive' aquifer designation.

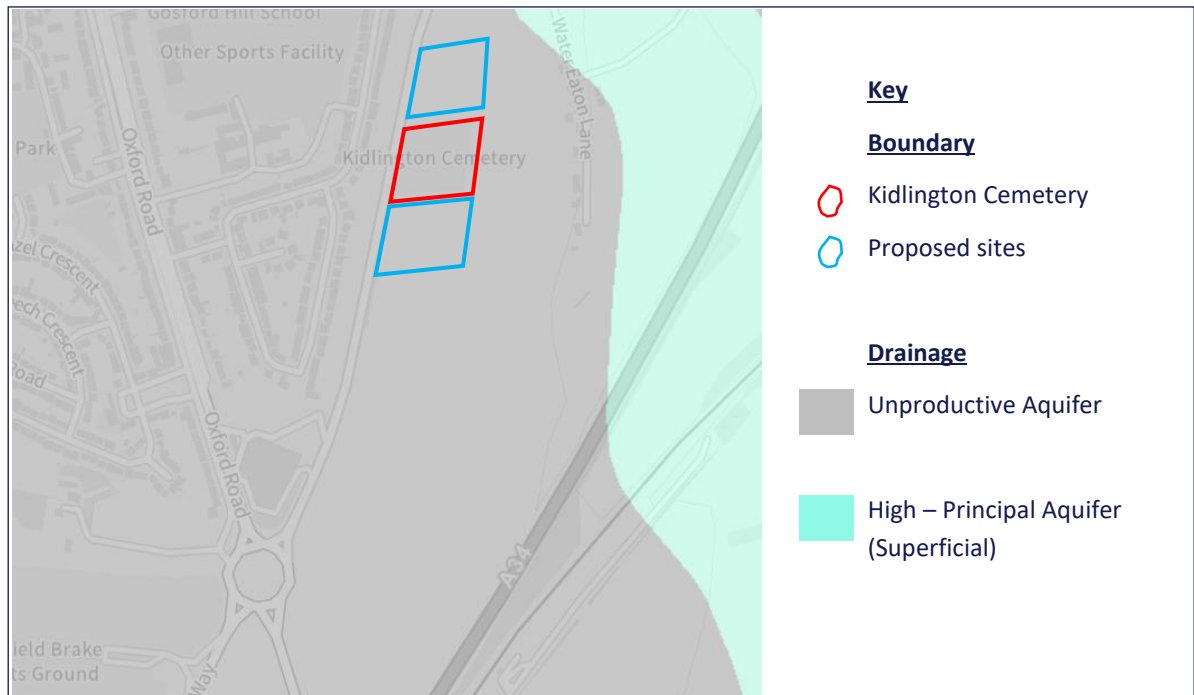


Figure 4-2 Groundwater Vulnerability Map (MAGIC)

Source Protection Zones

- 4.4 MAGIC maps confirm that the sites do not lie within a designated Source Protection Zone (SPZ).

5 Cemetery Risk Assessment

- 5.1 A risk assessment is required as part of a planning application when alterations/extensions are being made to existing cemetery facilities, as in this case, to examine the impact of the burial ground.
- 5.2 A risk assessment (RA) will need to ensure that the following aspects are in compliance:
- hazardous substances have been, or will be, prevented from entering groundwater*
 - any non-hazardous pollutants entering groundwater will be limited so you do not cause pollution*
 - microbiological contaminants will not endanger water resources or drinking water supplies*
- 5.3 The Environment Agency has a tiered approach to their RA, where sites with the highest risk potential need a more detailed RA than those with the lowest risk. Note, the associated size and position will also determine the appropriate Tier RA that is required.

Tier 1

5.4 A desktop study along with a qualitative risk assessment is required to determine whether the site is deemed as a low, medium or high risk; for medium to high risks, a Tier 2 and Tier 3 RA is required, respectively. To minimise pollution risk, the following practical guidelines were presented in the cemetery drainage report:

- *250m distance from groundwater supply*
- *30m minimum distance from groundwater or spring*
- *10m distance from field drains*
- *No burials in standing water*

Tiers 2 and 3

5.5 For tier 2 and 3 assessments, information gathered from the tier 1 assessment will need to be built upon and the conceptual model will need to be refined.

5.6 If the risks are not clearly defined by the tier 1 assessment, then further investigation may be required in the form of fields studies to monitor groundwater possibly through the implementation of trial pits and up to three boreholes.

5.7 If the risk is considered high, i.e. the annual burial rate exceeds 1000, a full audit is necessary, which will comprise of a detailed site investigation including monthly monitoring and boreholes. In the case of Kidlington Cemetery, only 18 full burials and 2 ashes were recorded in 2021, which is considerably below this threshold.

CDS - Trial Pits and Borehole Data

5.8 On 5th March 2018, CDS carried out a site investigation following a request from Kidlington Parish Council, where three investigation pits were dug on the Kidlington Cemetery Site.

5.9 The Trial Pits were dug to a depth of 3m, which is 1m below the burial depth, and in accordance with EA guidelines. All pits had a similar depth profile: ~400mm of saturated top soil sitting above 'dry' clay.

5.10 It was observed that the 400mm saturated top soil that sat above the clay had high levels of water seepage, but no evidence of further water intrusion was evident below the 400mm depth. In addition, no groundwater was detected at a depth of 3.1m. However, water could be seen trickling down the wall of the trial pit. In addition, it was concluded that grave flooding was unlikely to be a result of groundwater flooding, but rather due to perched water from the top soil, as during excavation, the grave is likely to fill up.

5.11 Local borehole data in the region, in particular along the A34 located to the east of Kidlington Cemetery, exhibited similar results, with no reported incidence of groundwater flooding within the Oxford Clay bedrock.

5.12 More than 25 local boreholes have been identified within 1km of Kidlington Cemetery, which comprise of data recorded for depths ranging from 2m to 56.4m, mainly between the years of 1981 and 1986. The closest borehole is located circa 200m west of Kidlington Cemetery (449930, 212990) and is dated to 1985, with a borehole depth of 56.38m. The data identified '*soft orange brown silty clay and topsoil*' within the top ~1.5m (Alluvium), which sat on top of increasingly stiff Oxford Clay.

6 Proposed Cemetery Locations

- 6.1** With regards to the proposed site locations, to the north on the other side of the ditch (Site A) and to the south (Site B), it has been sufficiently demonstrated that there are no differentiating factors in terms of topography, ground geology, hydrology and hydrogeology. Consequently, each site would be equally suitable in regard to these matters, to accommodate a cemetery extension.
- 6.2** Furthermore, the trial pits and borehole data from CDS demonstrate that the Kidlington Cemetery and surrounding area are similar from a ground investigation's perspective. In addition, all of the above concurs with the geology data presented in Section 3.
- 6.3** This means that the proposed sites regardless of choice A or B, will to require the same Tier Risk Assessment to be carried out in accordance with EA guidelines.
- 6.4** However, considering the fact that the location of the Site A lies adjacent to the watercourse / ditch, it is our opinion that Site A is more preferable due to its proximity to the water course. This will allow any discharge from the proposed cemetery site to be drained into the watercourse more easily than Site B, which is located at a further distance south. This is especially important given the CDS data on perched water in the topsoil and therefore any drainage system to cope with this would be more practical the sooner it can connect to an appropriate outfall.

Limitations

- 6.5** The conclusions and recommendations contained herein are limited to those given the general availability of background information and the planned usage of the site.
- 6.6** Third party information has been used in the preparation of this report, which Brookbanks, by necessity assumes is correct at the time of writing. While all reasonable checks have been made on data sources and the accuracy of data, Brookbanks accepts no liability for same.
- 6.7** The benefits of this report are provided solely to Barwood Development Securities Ltd for the proposed cemetery extension at Gosford, Kidlington.
- 6.8** Brookbanks excludes third party rights for the information contained in the report.