TECHNICAL NOTE

JBA Project Code	2023s0200
Contract	Eastbourne Level 1 SFRA update
Client	Eastbourne Borough Council
Day, Date and Time	25 May 2023
Author	E Elwood
Reviewer / Sign-off	A Dale
Subject	Groundwater flood zone methodology

1 Introduction

Groundwater flooding is the term used to describe flood risk caused by unusually high groundwater levels. It occurs as excess water emerges at the ground surface or within manmade underground structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and it can result in significant damage to property.

JBA has developed a range of Groundwater Flood Map products at national scale. The modelling involves simulating groundwater levels for a range of return periods (including 75, 100 and 200-years). The predicted groundwater levels resulting from the flows and pressure in the ground are then compared to surface levels to determine the water "head difference" in metres. The JBA Groundwater Map categorises the head difference (m) into five feature classes based on the results from the 100-year model outputs.

It should be noted that the JBA Groundwater Flood Map is suitable for general broad-scale assessment of the potential for groundwater flood hazard to be present in an area, but is not explicitly designed for the assessment of flood risk at the scale of a single property. As not all emergence will result in flooding, it is not appropriate for use when comparing the comparative risk of flooding, such as required for evidence to support the preparation of the Sequential Test.

Due to the assumptions built into the JBA groundwater flood map, it does not explicitly make any allowance for sea or tide levels that will affect groundwater levels in coastal superficial deposits. An outline investigation has therefore been undertaken to understand whether groundwater could be assessed for the purposes of the SFRA, namely, to identify areas which may be at risk of groundwater flooding (both now and in the future). In areas identified as high risk, a site-specific risk assessment for groundwater flooding is recommended to fully inform on the likelihood of flooding. This matter has now come under greater scrutiny following the introduction of a recommendation to assess groundwater flood risk in the Sequential Test.

2 Groundwater flooding mechanisms

Groundwater flooding in Eastbourne occurs as a result of two main mechanisms:

Groundwater flows through the chalk at Beachy Head before flowing out along spring lines, this can be either at locations where the formation of the chalk varies, or where a different, less permeable geology is found (also referred to as "clearwater" groundwater flooding).

Groundwater rises from the superficial head, alluvial and beach gravel deposits. In Eastbourne, the groundwater levels are influenced by the sea level causing frequent groundwater flooding in low-lying areas which are below sea level (also referred to as "alluvial" groundwater flooding.

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3 Previous works

A Groundwater Conceptual Model was completed by Halcrow in 2010 as part of the Eastbourne Surface Water Management Plan. Mapping including areas at risk of groundwater flooding and possible chalk groundwater flooding was included in this report.

4 Groundwater flood zone methodology

4.1.1 Available data

The datasets considered for delineating the groundwater flood zones are shown in Table 4-1 below.

Table 4-1: Datasets available for groundwater flood map

Dataset	Included	Reason
JBA 5m Groundwater flood map	No	Methodology does not currently account for interactions between superficial deposits and sea, therefore has potential to underestimate groundwater flood risk in coastal areas
BGS Superficial aquifer designation	Yes	Shows where groundwater is likely to be stored
BGS 1:50k Superficial deposits	Yes	Used to confirm the composition of underlying deposits
BGS 1:50k Bedrock deposits	Yes	Used to confirm the composition of bedrock, including points where variability in the composition of the chalk can be seen. This can be used as an indication of where spring lines may form.
EA Coastal Design-Extreme Sea Levels	Partial	200 year (0.5%) present day tidal level of 4.88m AOD used to understand where groundwater flooding may occur in the event of extreme sea levels. Used as validation for the preferred approach. Cannot be used for areas at risk of groundwater flooding from the chalk.
Mean High Water levels (EA- National Tidal and Sea Level Facility)- Newhaven 2008 to 2026	Partial	Average of Mean High Water Springs and Neaps plus 1.2m sea level rise. Used as validation for the preferred approach. Cannot be used for areas at risk of groundwater flooding from the chalk but provides an indication of the potential influence of sea and tide levels in low lying coastal locations.
ESCC historic flood dataset	Yes	Data points flagged as caused by groundwater used as validation for the preferred approach.

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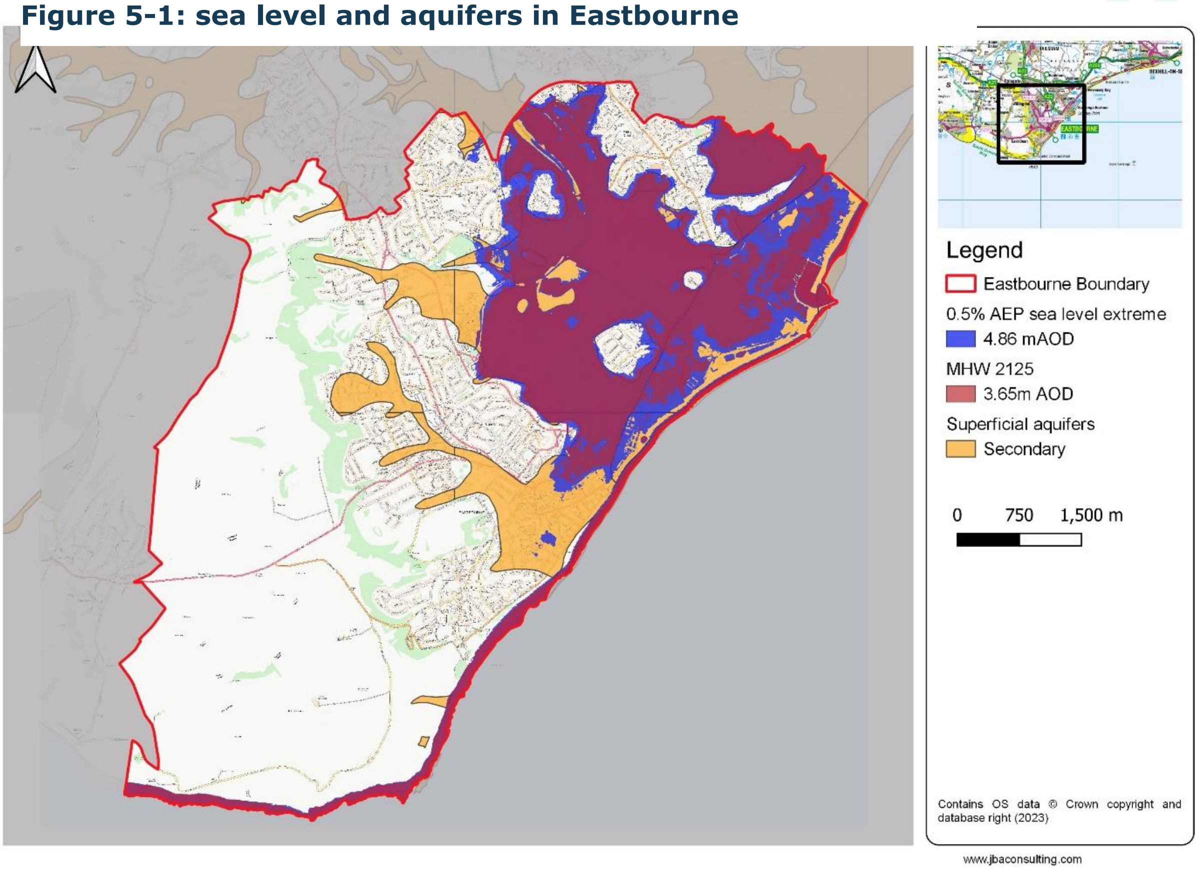
5 Outline Analysis

To prepare a potential high risk zone the 200 year (0.5% annual probability) present day sea level was mapped against the superficial deposits. An average sea level was also evaluated by assessing the Mean High Water Springs (MWHS) and Neaps (MWHN) and adjusted to understand the potential change as a consequence of the predicted sea level rise up to 2125 as shown in Table 6-1 and Figure 6-1. It is likely that the long term changes in mean sea levels will be more influential than infrequent surge tide events, as although the infrequent surge tide levels are much higher, they are relatively short lived and so unlikely to control groundwater levels over a substantial area.

Table 5-1: Mean High Water calculations

Event	Height (m AOD)
MHWS (present day)	3.2
MHWN (present day)	1.7
MHW (average, present day)	2.45
MHW (average, 2125)	3.65

Figure 5-1: sea level and aquifers in Eastbourne



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Along the coastal frontage, the ground levels above the superficial deposits layer are substantially above the 0.5% present day sea level. This area of high land along the margin of the coast provides a barrier between high sea and wave levels and lower areas inland, and groundwater flooding here is probably not influential.

To the north west of Eastbourne, sub-aerial quaternary head deposits of clay, silt, sand and gravel are present, upslope of the floodplain deposits underlying most of Eastbourne. Head deposits are also present west of the A2270 (Willingdon Road) in the headwater of the Bourne Catchment. The extent of superficial deposits in this area is heavily influenced by the topography of the chalk outcrop. Historic flooding was recorded in this area in the Grassington Road area in the winter of 2013/2014. It is therefore probably appropriate that this area is included as potentially being at risk from groundwater flooding.

6 Recommended approach

Based on the outline analysis it is recommended that the superficial aquifer designation layer will be used as an indication of where groundwater flooding may potentially be a risk for the purpose of mapping included in the SFRA. It is noted that areas along the coastal frontage such as Prince William Parade are unlikely to flood due to groundwater as the primary mechanism for flooding in this area will be coastal inundation and a reduction of the groundwater flood zone extent may be considered in this area if necessary.

It is recommended that the superficial deposits are also used as the basis for groundwater flooding from the chalk. Whilst this is likely to be a simplification of the overall flood mechanism, it identifies areas where further monitoring may be required for development to take place in the future. It is noted that Upperton is excluded from this zone through this methodology, however this is representative of the local topography and groundwater flooding is considered unlikely at this localised high point.

With respect to the Sequential Test it is not considered that the data available is competent to be used as the basis for a comparative assessment of risk across the Council area. However, for locations that are identified as being potentially at risk from groundwater flooding it would be appropriate to include further assessment in the Level 2 SFRA to better understand the implications of the actual risk and whether this can be mitigated.