Drift Filled Hollows of the Kennet Valley
potential processes, form and
implications for risk assessment

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Buried Hollows in the London Basin & Surrounds
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Outline

• Questions about hollows
• Context of the Kennet features
• Locations
• Findings and implications
• Outstanding questions
What?

Where?

How big?

Age?

Active/passive?

Origin(s) ?!
Known drift filled hollows in the Kennet Valley

Red star = under Beenham Grange terrace
Yellow star = beneath floodplain
Known drift filled hollows in the Kennet Valley

- Beenham Grange
- Reading
Beenham Grange

Key to photograph
1 stripped top of gravel
2 upper planar bedded gravel
3 bench 2
4 bench 1
5 lower 'tilted' gravel
6 sloping London Clay rockhead

Hill 1985
Known drift filled hollows in the Kennet Valley

Woolhampton

Reading
Closed rockhead depression, Woolhampton. Collins et al. 2006
The Woolhampton Hollow (Late Devensian Lateglacial infill)
• Infilling over <10,000 years (top 4-6 m in ~1,000 years)
• End of MOIS 2 (periglacial-temperate-periglacial)
• Tilted bed (dark in photo), parallel to surface of London Clay
Known drift filled hollows in the Kennet Valley
Ashford Hill:
2m Lidar data (Environment Agency, OGL)
25cm contour
Ashford Hill: existing boreholes

(Hawkins 1953, Hill 1985)
<table>
<thead>
<tr>
<th>Layer</th>
<th>Depth</th>
<th>O.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasty soil</td>
<td>(a.)</td>
<td></td>
</tr>
<tr>
<td>1st 0&quot;</td>
<td></td>
<td>212.5</td>
</tr>
<tr>
<td>Kettle sandy loam</td>
<td>5th 0&quot;</td>
<td>207.5</td>
</tr>
<tr>
<td>9th 6&quot;</td>
<td></td>
<td>203</td>
</tr>
<tr>
<td>Dark-brown peaty clay</td>
<td>12th 0&quot;</td>
<td>200.5</td>
</tr>
<tr>
<td>15th 0&quot;</td>
<td></td>
<td>197.5</td>
</tr>
<tr>
<td>Clayey and peaty sand</td>
<td>22th 0&quot;</td>
<td>190.5</td>
</tr>
<tr>
<td>7th 0&quot;</td>
<td></td>
<td>187</td>
</tr>
<tr>
<td>Dark-brown peaty sand</td>
<td>25th 6&quot;</td>
<td>182.5</td>
</tr>
<tr>
<td>30th 0&quot;</td>
<td></td>
<td>178</td>
</tr>
<tr>
<td>Black angular gravel</td>
<td>35th 0&quot;</td>
<td>172.5</td>
</tr>
<tr>
<td>Coarse brownish gravel</td>
<td>42th 6&quot;</td>
<td>170</td>
</tr>
<tr>
<td>7th 6&quot;</td>
<td></td>
<td>167</td>
</tr>
<tr>
<td>Breen sandy gravel</td>
<td>78th 6&quot;</td>
<td>134</td>
</tr>
<tr>
<td>Rubbly and peaty Chalk (Marpites)</td>
<td>85th 6&quot;</td>
<td>127</td>
</tr>
<tr>
<td>Slightly finer Chalk (Marpites)</td>
<td></td>
<td></td>
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</table>

Large flintless flint at about 62" down.
Ashford Hill: along valley section of superficial deposits

Hill 1985
Ashford Hill Conceptual Ground Model...

...and what we actually have borehole evidence of
Ashford Hill, ERT profiles (Raines et al. 2015)

Unit electrode spacing 2.50 m

Unit electrode spacing 1.25 m
Ashford Hill: Tromino survey parallel to valley axis, impedance (H/V) vs depth

BGS©NERC. 2015. (Raines et al. 2015)
Spring line
300 m
1. Fracturing of Chalk
2. Injection of Chalk putty and breccia
3. Heave of Reading Beds & London Clay
4. Subsidence

To understand how this happened, a time sequence would be useful:

- Cold stage(s)
- Mid-Late Devensian (?)
- Late Devensian Lateglacial (to present?)
## Ashford Hill - chronology

<table>
<thead>
<tr>
<th>Phase</th>
<th>Timing</th>
<th>Dates</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late subsidence</td>
<td>18(^{th})C to present</td>
<td>~1700AD to now</td>
<td>Pond, peat, clay pipe</td>
</tr>
<tr>
<td>Stability?</td>
<td>Holocene</td>
<td>~11.5-0.3ka BP</td>
<td>Floodplain deposits</td>
</tr>
<tr>
<td>Main subsidence</td>
<td>Late Devensian</td>
<td>After ~20kaBP Before Holocene</td>
<td>Disrupted laminated silts, gravel Warped strata</td>
</tr>
<tr>
<td>Diapir emplacement</td>
<td>Late Devensian?</td>
<td>After ~30-20kaBP Before Holocene (?)</td>
<td>Back-tilted(?) terrace</td>
</tr>
<tr>
<td>Chalk brecciation</td>
<td>Quaternary</td>
<td>Unknown, probably one or more stadials</td>
<td>Likely to reflect deep freeze-thaw (permafrost)</td>
</tr>
<tr>
<td>Valley formation</td>
<td>Anglian to present</td>
<td>~450ka BP - present</td>
<td>Morphostratigraphy</td>
</tr>
</tbody>
</table>
Findings

• Hollow infills reflect different time periods
• Infilling, where datable, occurred under cold and warm conditions
• Depth of infill enabled by episodic (?) synsedimentary subsidence
• The ‘hollows’ at Woolhampton and Ashford Hill cannot be adequately dated by the surface age or basal unconformity – they are diachronous
• Hollow location at Ashford Hill linked to Chalk diapir
• Possibly tilted landforms may indicate emplacement after c. 30-20 k BP
• No diagnostic evidence for pingos
Outstanding questions

• Are the Kennet hollows analogues for some of those in London?
• What was the mechanism for Chalk diapirism?
• Did geological faults/joints play a role?
• Is subsidence purely due to dissolution? (could dewatering be involved?)
• Are any of the hollows still forming?
• Could ‘passive’ features be reactivated to present an active hazard?