Poole Harbour Habitat Creation Scheme

Ridge - Groundwater Preliminary Evaluation
Introduction and objectives

• This presentation is intended to set out our current understanding of drainage and groundwater beneath Ridge and the relationship these may have with our proposed scheme

• We have adapted and developed our investigations according to concerns raised by the community

• This presentation offers a sneak preview of the work carried out and represents an insight into our studies and site investigations to date

• We are continuing to gather data and our interpretation may be expected to evolve further
Surface Drainage

- Hydrological catchment
- Natural “off slope” drainage
- Surface water drainage impacts/intercepts natural overland flow
Surface water drainage catchments

- Road and roof drainage
- Soakaways to western part at top end of SW catchment
- Soakaways capture surface water runoff and recharge underlying shallow aquifer

Area drained primarily by soakaway
# Geology - summary of underlying deposits

## Superficial deposits

<table>
<thead>
<tr>
<th>Unit</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>Thin, widespread</td>
</tr>
<tr>
<td>Made Ground [MGR]</td>
<td>Embankments etc some “disturbed ground” beneath Ridge</td>
</tr>
<tr>
<td>Head [HEAD]</td>
<td>“In situ” product of weathering and erosion... beneath Ridge</td>
</tr>
<tr>
<td>Peat [PEAT]</td>
<td>Beneath Arne Moors only</td>
</tr>
<tr>
<td>Tidal Flat Deposits: granular, non cohesive [TDFG]</td>
<td>Beneath Arne Moors</td>
</tr>
<tr>
<td>Tidal Flat Deposits: cohesive [TDFC]</td>
<td>Beneath Arne Moors</td>
</tr>
</tbody>
</table>

## Bedrock - Poole Formation

<table>
<thead>
<tr>
<th>Unit</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parkstone Clay Member</td>
<td>Not present</td>
</tr>
<tr>
<td>Parkstone Sand Member</td>
<td>To West of Ridge</td>
</tr>
<tr>
<td>Broadstone Clay Member [BRTC]</td>
<td>Widespread beneath Ridge and Arne Moor</td>
</tr>
<tr>
<td>Broadstone Sand Member [BROS]</td>
<td>Beneath Arne Moor May be interbedded and undifferentiated</td>
</tr>
<tr>
<td>Oakdale Clay Member [OAKC]</td>
<td></td>
</tr>
<tr>
<td>Oakdale Sand Member</td>
<td></td>
</tr>
</tbody>
</table>
Hydrogeology - Regional perspective

• Poole Formation - minor aquifer
• Succession of interbedded sands and clays, variable thickness and depth
• Recharge across outcrop to south and within the upper catchment of the Furzebrook
• Discharge northward toward Poole Harbour
• Clay layers “confine” lower parts of the sand aquifer such that water in the lower parts is under pressure
• When clays are “punctured” by boreholes, water under pressure rises to surface
Superficial Deposits
Site topographic sections
Lines of geological cross sections
Initial conceptual understanding (schematic section)
Cross Section B – B’ - S-N, West of Arne Moors Site

Project Title: Poole Harbour Habitat Creation
Location: Arne Moors
Client: Environment Agency

Legend Key
- TOPSOIL
- TDFC
- TDFG
- PEAT
- BROS
- BRTC
- OAKC
- MGR1

Water Strike level after 20 minutes
Water Strike level during boring

Chainage (m) Offset (m) Elevation (mAOD)

0 0 0.00
1 0.40 16.88 151.78 271.68 407.63 544.16 666.39 712.83 726.11
2 0.90 24.62 29.63 60.40 17.19 9.19 26.83 21.79
3 1.50 0.94 0.36 0.63 0.41 0.65 0.00 0.38
4 3.70
5 5.00
6 10.00

Vertical Scale: NTS
Horizontal Scale: NTS
Cross Section G-G’ – South West to North East (Line 1) and North to South (Line 2) in Ridge Village

Legend Key
- TOPSOIL
- HEAD
- BRTL
- BRTC
- BROS
- MGR

Water Strike level after 20 minutes

Chainage (m)  Offset (m)  Elevation (mAOD)
0 0 0
2.00 0.30 0.28
3.00 1.12 1.15
4.00 2.85 2.85
5.33 0.40 0.79
8.78 3.83 6.28
Ground Investigation - Monitoring well locations

Installed water level loggers
Well Hydrograph-Ridge

- Logger recorded groundwater levels response
- 3 months data
- We are continuing to capture data
- Water levels within 0.3m from surface

Typical groundwater recession curve
Well Hydrograph

Ridge vs Swanage rainfall (mm)

Smaller rainfall events (< c.5mm) little impact

Larger or cumulative events. Rapid response in groundwater levels

Significant and sudden rise, little rainfall.... Snowmelt
Groundwater response vs, tidal cycles

Spring and neap tidal cycles exert no apparent pattern of response in the well hydrograph.
Ground Investigation - well hydrographs - detail (one week of data)

- Is there a diurnal influence at Ridge
- Wareham tidal range typically 1-1.2m
- No evident tidal effect at Ridge WS17
Ground Investigation - well hydrographs- detail (one week)

- Is there a tidal effect further on to Arne Moor?
- Possible minor tidal effect (1-2 cm?) at BH16
- Relationship appears to be inverse (i.e. a tidal low results in an increase in water level)
- This is suggestive of a pressure response not direct connectivity
- BH16 close to tidal channel/ harbour
- Response zone at 2-4m depth in “upper aquifer”
Is there a tidal effect elsewhere on Arne Moor?

Data over 1 week suggests little influence on any of the well hydrographs (vs a tidal range of 1-1.2m)

Response zones are:

- BH 04 0.5-9.5m
- BH 13 1.5 – 10m
- BH 18 3.5 – 9m

Note: All these are in the “lower” aquifer. A separate upper aquifer does not occur in these locations
Initial conceptual understanding section (schematic)
We are examining this understanding, gathering more detailed information on the groundwater regime.
Summary (1)

• Our investigations at Ridge are ongoing, these are preliminary findings only
• The geology beneath Ridge broadly comprises a layered system of superficial “Head” deposits overlying Broadstone Clay of the Poole Formation, in turn overlying Broadston sand
• Younger units (Parkstone Sand Member) of the Poole Formation are exposed in the high ground West of Ridge village
• Beneath Arne Moors, layered geological systems also occur comprising near surface superficial deposits of Tidal Flat deposits (both clays and sands/ gravels), with some peat further into the Moor
• Poole Formation strata (Broadstone Clay over Broadstone/ Oakdale Sands) occur beneath the superficial deposits beneath Arne Moors
Summary (2)

- Groundwater beneath Ridge is locally recharged by rainfall, flow from the higher ground, soakaways and possibly leaking drainage.
- Groundwater occurs in the superficial deposits of “Head” at shallow depth.
- Its downward movement is constrained by layers of clay and it tends to move laterally, perhaps discharging at the foot of slopes (e.g. to the north where) it may be collected by surface drains.
- Connectivity with the deeper aquifer beneath Ridge is limited by the underlying Broadstone Clay.
Summary (3)

• Groundwater monitoring at Ridge shows groundwater at shallow depth, with a rapid response to rainfall recharge
• Groundwater beneath Arne Moors, in part, comprises a two layer system (upper, lower) separated by clay and/or peat
• The lower (Broadstone sand) aquifer, confined by the overlying clay is “pressurised” from regional recharge
• When penetrated by boreholes the groundwater rises, sometimes to above the surface (artesian conditions)
• The groundwater response of both upper and lower aquifers beneath Arne Moors is markedly more muted than the response at Ridge
• There is no currently no significant evidence to suggest that groundwater beneath Ridge is hydraulically “connected” to groundwater beneath Arne Moors
• We are gathering further evidence (continued monitoring with loggers, water quality data etc.) to further clarify our understanding of the groundwater and drainage regime
Thank You

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