

SAMPLE BOREHOLE PROGNOSIS

Water Supply Borehole



By

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SAMPLE BOREHOLE PROGNOSIS

Summary

- Based on the interpretation of the geology and hydrogeology, there is a Good to Very Good chance (60 – 80%) that the maximum required yield of 20m³/day will be obtained from a borehole at this location.
- The borehole should be planned to a depth of 100m targeting the Sherwood Sandstone Group and Yoredale Series Shales. This should be sufficient to allow for seasonal variations and drawdown during pumping. If an insufficient yield is obtained, the borehole should be progressed further into the Yoredale Shales.
- There is a risk that the abstracted water will contain elevated concentrations of sulphate. To reduce this risk the borehole should be sealed to at least 10m into the Sherwood Sandstone Group. As the proposed end use of the water includes consumption, it will require testing to confirm it's suitability.
- It is recommended that the borehole be sited in the southeast corner of Field 1; as far from the recorded fault as possible to reduce the risk of sulphate rich waters entering the borehole.
- Based on the information supplied, consent to drill and test the borehole, and an abstraction licence, will not be required from the Environment Agency since the proposed abstraction is less than 20m³/day.
- There is a general requirement to inform the BGS of the intent to drill a borehole greater than 15m in depth and to supply the geological information on completion.



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Director, Hydrogeologist

Site Description (Figure 1)				
<ul style="list-style-type: none"> Elevation of approximately 71mAOD. A small stream is shown 220m north at 62mAOD and flows around the site to the south west. There are two small ponds 100m to the north west and south west of the site at site level. 				
Protected Environmental Areas within 1km				
SSSI			None	
SAC			None	
LNR / NNR			None	
RAMSAR			None	
Geology (Figure 2)				
Age /Group / Formation			Description	Expected Thickness
Quaternary	Superficial Deposits	Oadby Till	Predominantly clay with granular bands and up to boulder size rock fragments.	0-3m
		Residual Clay	No significant superficial deposits have been recorded for the majority of the site, although a layer of weathered solid strata, comprising clay increasing in strength with depth, should be expected	3m (<5m)
Triassic	Mercia Mudstone Group	Gunthorpe Formation	Mudstone, red-brown, with subordinate dolomitic siltstone and fine-grained sandstone, greenish grey, common gypsum veins and nodules	~30m
		Radcliffe Formation	Mudstone, siltstone and very fine-grained sandstone, finely interlaminated; pinkish red or red-brown, subordinately green.	~10m
		Sneinton Formation	Interbedded and interlaminated siltstones mudstones and sandstones. Grades into the sandstone of the underlying Bromsgrove Sandstone Formation	~15m
Permian	Sherwood Sandstone Group	Bromsgrove Sandstone Formation	Sandstone, red, yellow and brown, part pebbly; subordinate red mudstone and siltstone	~15m
Carboniferous	Yoredale Series Shales		Interbedded shale, limestone, ironstone and sandstone	>100m
Geological Structure				
<ul style="list-style-type: none"> There is no record of the orientation of the beds beneath the site. Using BGS borehole information the dip of the solid strata beneath the site is around 4° to the south east. This may vary within each fault block. A minor fault is present orientated SW-NE across the site and appears to downthrow strata to the south east. 				
BGS Records (Appendix A)				
One record from a borehole close to the site has been reviewed. The details are summarised below.				
<i>Well Index Number</i>			SK12/34B	
<i>Location</i>			SK 1234 5678 County Mental Hospital 1.4km south east.	
<i>Completion depth</i>			175.7mbgl	
<i>Site Elevation</i>			90mAOD.	
<i>Yielding aquifer</i>			Keuper Sandstone (Sherwood Sandstone Group)	
<i>Yield</i>			6000gallons per hour (27m ³ /day)	
<i>Year of construction</i>			1899-1901	
<i>Rest Water Level</i>			21mbg (69mAOD)	
<i>Other comments</i>			Ironstone bands or conglomerate in carboniferous strata are likely to have been mistaken for Red Granite. Backfilled by 1940.	
Hydrogeology				
Rest Groundwater Level		Estimated from BGS borehole information to be approximately 2-5mbgl.		
Aquifer Potential		Superficial deposits	Essentially a non-aquifer at this location	
		Mercia Mudstone Group	Minor aquifer of low permeability, groundwater flow occurs through granular horizons which may not provide a sustainable yield. Water abstracted from the Mercia Mudstone group will have elevated concentrations of sulphate and may therefore be un-potable.	

	Sherwood Sandstone Group	Classed as a major aquifer with groundwater flow occurring through fractures and fissures. Generally high yielding although is likely to be impeded by the thickness of the aquifer at this location. However, yields of over 20m ³ /day should be easily achievable.
	Yoredale Series Shales	The presence of shale within the formation will act as a barrier to groundwater from the overlying Sherwood Sandstone. Little information is available for the aquifer properties of the Yoredale series although groundwater flow is expected to occur through fractures and fissures and be confined between shale beds; creating a multilayered aquifer system. Yields of over 20m ³ /day may be possible.

Target Aquifer

Sherwood Sandstone Group / Yoredale Series Shales

Water Quality

There is a risk that the water will contain elevated concentrations of sulphate. The water will require testing to prove that it is suitable for use as a domestic supply.

Borehole Siting

The borehole should be sited in the south east corner of Field 1; as far from the recorded fault as possible to reduce the risk of sulphate rich waters entering the borehole.

Drilling Risks / Borehole Stability

The Driller should be made aware of the following risks:

The Superficial Deposits are likely to be unstable and will require casing off during drilling.

The Mercia Mudstone is prone to ‘squeezing’ if the drilled hole is left open, even for a short period of time.

The Mercia Mudstone is likely to contain bands of siltstone (known as 'Skerries'), halite and gypsum bands which present a risk of flush loss and grout loss. There may also be broken ground associated with the recorded fault present across the site.

The Mercia Mudstone is also known to produce drilling problems such as ‘blocking of the bit’ and drilling instability from halite / gypsum bands within the formation.

Fractures, joins and broken ground associated also present a risk of fluid loss. In each case mud flush is recommended, with the option of thickening the flush available immediately if and when such conditions are encountered.

There is small risk of artesian conditions occurring at well head. It should be noted that failure to control artesian conditions is a criminal offence. An allowance should be made to control artesian conditions if and when they occur.

Borehole Construction (Figure 3)

Target Depth	The borehole should be constructed to a depth of either 90m or the base of the first sandstone bed in the Yoredale Shale.
Finished diameter	150mm
Liner	uPVC casing and screen
Filter pack	Recommended
Seal	At least 10m into competent Sherwood Sandstone, to reduce the risk of potentially sulphate rich waters from the Mercia Mudstone and upper parts of the Sherwood Sandstone entering the borehole.

Regulation

Consent and licence will not be required as the total abstraction is less than 20m³/day.

General Comments

Geology based on 1:50 000 scale map sheet 987.

If the water is to be used for human consumption, food or domestic use, it must be sampled, analysed and passed as fit by the local Environmental Health Officer. We also recommend the installation of an ultra violet and/or chlorination water treatment system to minimise the risk of bacteriological contamination.

An abstraction licence and consent to drill the borehole will not be required from the Environment Agency (EA), as the amount of water to be abstracted is less than 20m³/day.

An abstraction of more than 20m³/day without a licence or consent is a criminal offence.

There is a general requirement to inform the BGS of the intent to drill a borehole greater than 15m in depth and to supply the geological information from the borehole to them.

Boreholes should not be sited within 50m of potentially polluting activities such as (but not limited to); septic tanks, cess pits, silage clamps, chemical or fuel stores.

This prognosis has been prepared based on limited geological and hydrogeological information. Although we have applied our experience and expertise to the data available, no guarantee can be made as to the amount or quality of water obtained.

Development of groundwater sources has an inherent risk. Developers should be aware that it is possible that an insufficient amount or quality of water will be obtained for the project needs.

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LEGEND

mAOD	Metres Above Ordnance Datum
mbgl	Metres Below Ground Level
RWL	Rest Water Level
PWL	Pumped Water Level
TD	Total Depth
uPVC	Unplasticised Poly Vinyl Chloride
SSSI	Special Site of Scientific Interest
SAC	Special Area of Conservation
NGR	National Grid Reference
LNR	Local Nature Reserve
NNR	National Nature Reserve
RAMSAR	Wetlands of International Importance

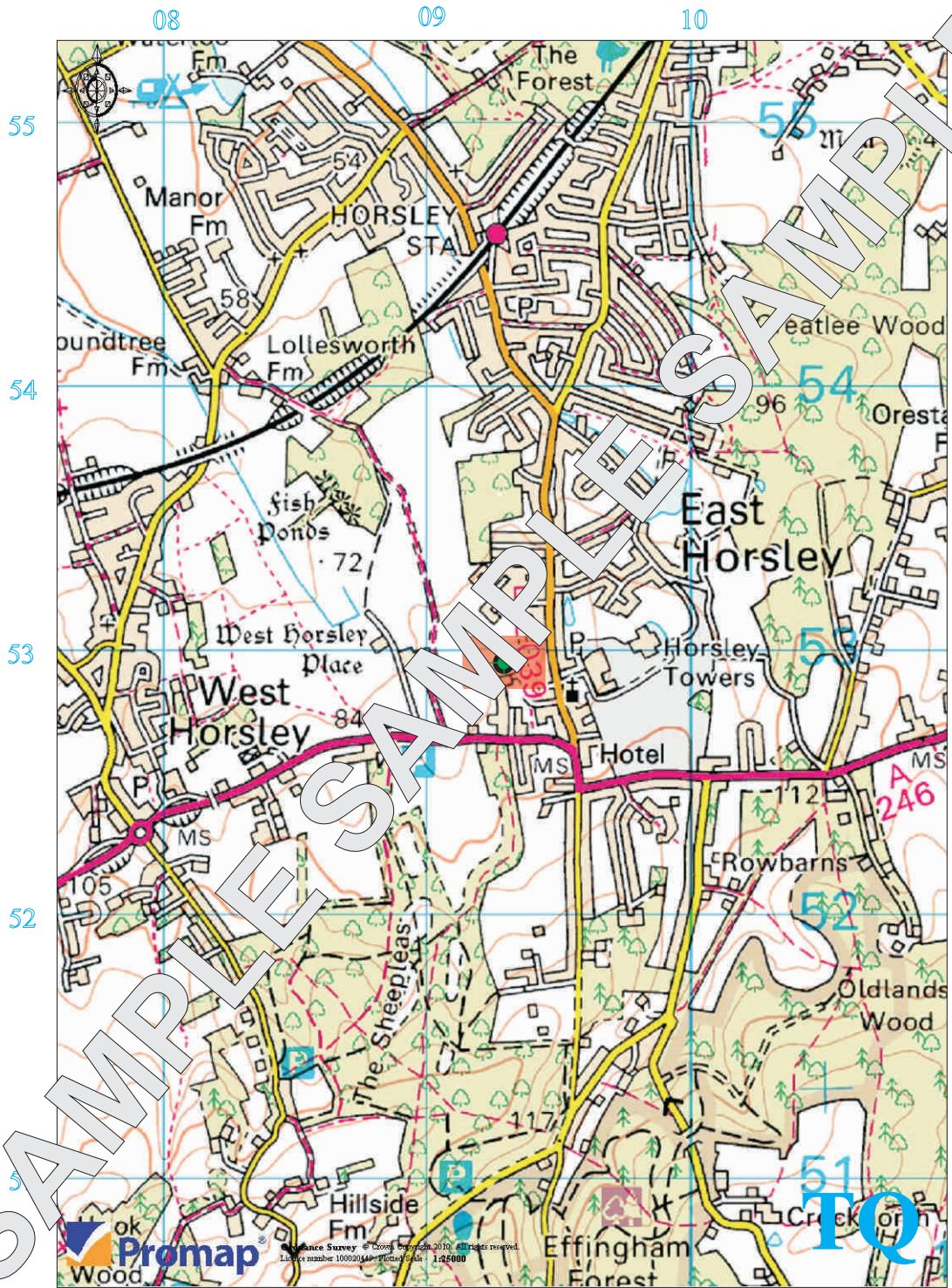
Ranking

Percentage Chance	Qualitative
0 – 20%	No chance to very low probability
20 – 40%	Poor to moderate
40 – 60%	Moderate to good
60 – 80%	Good to very good
80 – 100%	Very good / high probability

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Scale 1: 25000

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Site Location

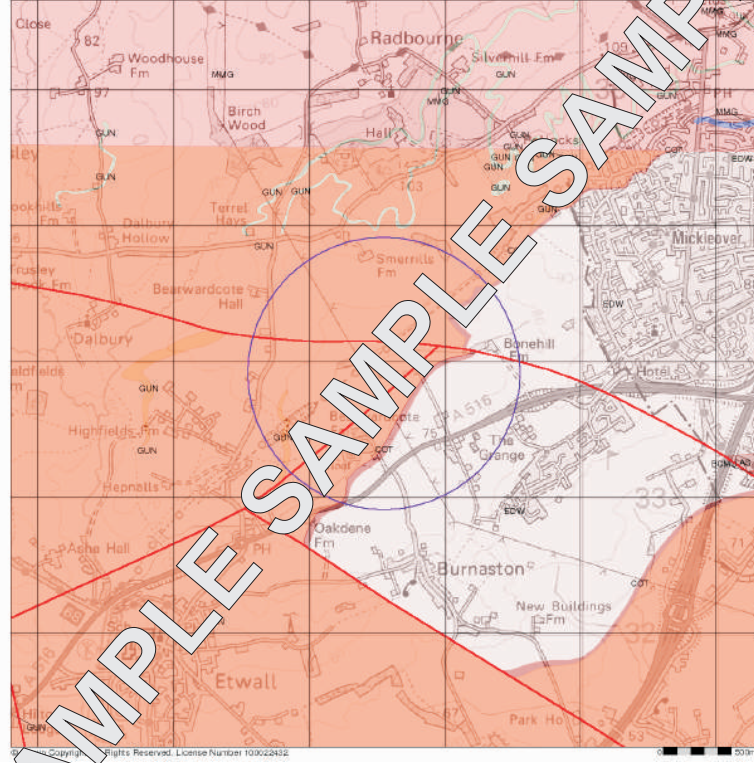


BGS Borehole TQ05/12

Superficial Geology



Solid Geology



- Alluvium
- Glaciofluvial
- Mercia Mudstone Group
- Cotgrave Sandstone Formation
- Site Location
- Fault
- Head
- Oadby Till
- Edwalton Formation
- Gunthorpe Member
- BGS Borehole Location

C05/083-CSL British Geological Survey.
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Figure2.cdr

Sample Borehole Prognosis

Figure 2

Site Geology

