

**RSPB Old Moor Nature Reserve
Proposed Alteration to Car Parks**

FLOOD RISK ASSESSMENT

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1. INTRODUCTION

The Old Moor Nature Reserve occupies about 109 ha of wetlands to the southeast of Barnsley. It lies on the junction of the north/south and east/west routes of the Trans Pennine Trail to the west of the River Dearne. The reserve is served by an existing car park plus a further overflow car park to the south of the site access road at the south east of the site (See Figure 1). The proposed works consist of improving this existing main and overflow car parks with a small extension to the east. The main nature reserve is sited to northeast of the reserve access road and will be unaffected by this development. The Visitors Centre occupies 18th century farm buildings to the southwest of the main reserve. This Centre will not be affected.

The reserve is owned by Barnsley Council and UK Coal but managed by the RSPB, a registered charity with all profits made on site going directly to aid its conservation work.

On the instruction of CF Landscape, an initial Flood Risk Assessment has been prepared for the proposed development in accordance with the National Planning Framework Planning Practice Guidance on Flood Risk and Coastal Change revision dated 6 March 2014.

This Report describes the results of that Assessment. The Report is based on a Landmark Site Check Report dated 3 December 2018 (hereafter referred to as the Landmark Report), site investigations by Sub Surface and White Rose Laboratory Services, a topographical survey carried out in July 2018 and a site visit.

The grid references in this report were obtained by a hand-held GPS and are indicative only.

2. SITE CONDITIONS

2.1 Description

The Main Reserve lies to the west of the River Dearne, to the east of the A6195 road and north of the A633 road. The proposed car park site lies to the west and south of the Reserve access road and north of the A633 at Grid Reference SE422 022. It is bounded by Knoll Beck in the southwest, the site access road in the north and east and farm land to the west. The site is rectangular measuring about 170m northwest to southeast and 110m northeast to southwest. The area of the proposed site is about 1.5 ha. This includes a 0.2ha pond at the northeast which is of special interest to the Reserve and cannot accept water from the car parks.

2.2 Current Use of Site

The western section of the site is the visitors car park with an overflow car park surfaced in sub-base at the centre. The eastern section is marshy ground with the above pond at the northeast.

2.3 Topography

From the 2018 survey of the site, the western existing car park falls to the south at about 1 in 100. The highest levels at the north are typically about 21.2mOD or about 2½ m above the water level in the Knoll Beck at the time of the survey. The bed level in the Beck at the east of the site was about 18.4mOD.

The overflow car park in the central part of the site has no pronounced fall and is typically at a level of about 20.3 mOD.

The undeveloped eastern section falls to the north at about 1 in 500.

There is a low flood bank adjacent to Knoll Beck along the southern boundary with a crest level of about 20.2mOD. A dry ditch to the north of this flood bank is present adjacent to the overflow car park and the undeveloped land to the east. This ditch is not connected to Knoll Beck and acts as a soakaway for drainage from the access road.

This flood bank part of the Environment Agency flood protection for the area but is not maintained by the Environment Agency and is heavily vegetated.

2.4 Geology

From the British Geological Survey Scarborough 1:50,000 Sheet 87 dated 2008, the Mansfield Marine Band outcrops across the site. North of this marine band, the solid geology consists of Pennine Middle Coal Measures comprising mudstone, siltstone and sandstone. South of this marine band, the solid geology consists of Oaks Rock of Pennine Middle Coal Measures. These strata dip to the north east. Broomhill Fault lies 1.1km to the northwest but no major faults are shown near the site. Superficial deposits are present over all of the site. These comprise alluvium comprising silt, clay and sand with gravel and peat interbeds.

From the 1982 Hydrogeological Map of Southern Yorkshire dated 1982 most licensed water abstractions from rocks such as Oaks Rock are for industrial rather than domestic purposes. The map does not show any abstractions in the immediate vicinity of the site.

2.5 Hydrology

2.5.1 Base Rainfall Data

From the Hydrogeological Map of Southern Yorkshire dated 1982, the average annual precipitation for the period 1941 to 1970 is about 600mm. From the Met Office station at Robin Hood Airport, the average annual rainfall for the period 1981 to 2010 is 575mm. The surface level at Robin Hood is 12.0m above sea level about 22 km to the east of the site. From Section 2.3 above, the surface level at the site is about 20m AOD.

The monthly average rainfall for the period 1981 to 2010 at Robin Hood Airport is as follows.

Month	Average rainfall (mm)
January	44.4
February	32.2
March	37.3
April	47.2
May	43.4
June	63.0
July	49.5
August	52.4
September	52.0
October	53.8
November	50.5
December	48.8
Total	574.5

Table 1: Average Monthly Precipitation at Robin Hood Airport

From the Planning Practice Guidance, the base line green-field site run off should be for a 2 year return period. However, a more conservative approach of estimating the design run off is to use Institute of Hydrology, June 1994, Report No 124) method.

The mean annual peak flow (QBAR) is given by:

$$QBAR(rural) = 0.00108AREA^{0.89}SAAR^{1.17}SOIL^{2.17}.$$

Several other similar formulae give similar results.

The site has been partially developed with an existing surfaced car park at the west and a car park surfaced with sub-base in the centre of the site. However, from discussions with the Environment Agency, the green field run off for this site including the surfaced areas should be taken to be 5 litres/second/hectare. That figure has therefore been used in all calculations

2.5.2 Existing Drainage of Proposed Site

The main drainage of the site is Knoll Beck which flows eastwards to join the River Dearne at the eastern corner of the Nature Reserve.

The water level in the reserve to the east of the proposed site is below river level. The water from the reserve is therefore lifted by between 1.0 and 1.5m by two pumps discharging into the River Dearne at SE 43524 02199.

There is a flood bank between Knoll Beck and the development. This limits the flow into the beck with the balance soaking away. This flow is further limited by a ditch between the flood bank and the overflow car park and the extension to the east. This is dead-ended and simply acts as a soakaway. There is no ditch adjacent to the existing car park at the west.

The ditch originally accepted water from the access road via three stone drains but those drains no longer work.

The eastern undeveloped section falls to the north. Run off from this area drains into the pond at the northeast of the site. This in turn drains through a 150mm diameter pipe into the pond to the north of the access road.

2.5.3 History of Site

The River Dearne originally meandered in this area but was initially canalised between about 1900 and 1910. Several attempts have subsequently made to improve flow.

The 1855 1:10,560 map of the area shows the Old Moor House which was to become the Reserve Visitors Centre had already been built. Old Moor lay to the north of this building. A railway line lay to the south of the current site boundary with Knoll Beck meandering eastwards about 100m to the south of the site. The River Dearne lies about 240m further south. South of the river, the area is divided into fields. There was no development on the proposed site.

The 1893 1:10,560 map shows little change. A 75 ft (22.9m) contour has been added to the east of the site.

The 1905 1:10,560 map still shows little change.

By 1956, Knoll Beck has been diverted to its current course with the area between the Beck and the River Dearne, (named the Sheffield and South Yorkshire Navigation Dearne and Dove Canal) redeveloped as railway sidings known as the Wath Marshalling yards. There is a footpath north of the Beck but no other development on the site.

The 1980 1:10,000 map shows that the railway sidings are still present but a flood bank seems to have been built north of Knoll Beck in about its current position. An access track runs SE to NW at the north east of the current site to the east of the Old Moor House with a branch running to the house. A pond has been formed to the east of the site on the nature reserve. Fill is shown to the south of Knoll Beck to the east of the site inside a 20m contour.

The 1989 1:10,000 map shows that the railway sidings have all been removed but no changes on the site. The area of the sidings has now been developed as an industrial estate.

The Old Moor Reserve centre was opened by Barnsley Metropolitan Borough Council in 1998 as part of the regeneration of the Dearne Valley and then developed further with the help of a lottery grant in 2002. The RSPB took over management of the site in 2003 and developed the site further.

Knoll Beck was maintained by the local internal drainage board but is now considered part of the river system and is managed by the Environment Agency.

2.5.4 Historical Land Uses

The Landmark Report highlights various historical land uses in and in the vicinity of the site.

As mentioned above, the 1989 Map shows a heap of unknown constituents 164m to the east south of Knoll Beck. The same map shows a factory 225m away to the south of the River Dearne.

The 1976 map shows tanks 155m to south of Knoll Beck.

The 1956 map shows three areas of water filled ground between 90 and 160m to the south.

A minor air pollution incident occurred in 2015 195m to the south west. There are no other prosecutions or enforcement or prohibition notices within 250m of the site.

There is a landfill site on the former Wath Marshalling Yards 18m to the south. Waste including inert waste was placed on this site.

A number of authorised industrial processes take place 85m to the south west.

2.6 Other Environmental Constraints

No other constraint such as SSSI, Special Protection Areas or environmentally sensitive areas were identified by Landmark.

3. SITE INVESTIGATIONS

3.1 CBR Tests

The CBR was determined by White Rose Laboratory Services Ltd on 13 September 2018 using the dynamic cone penetrometer method in 5 locations. The report is included in the Planning Application and is not repeated here.

3.2 Infiltration Tests

Four trial pits were dug by Sub Surface on 11 October 2018 to determine the soil infiltration rates. The report of the investigation concluded that the strata was of very low permeability and unsuitable for soakaways. The calculations to determine the storage volume required have therefore assumed zero infiltration.

The report is included in the Planning Application and is not repeated here.

4. BASIS OF FLOOD ASSESSMENT

4.1 General

From Figure 2, most of the site is within Environment Agency Flood Zones 2 and 3. The existing car park and the overflow car park are in flood zone 3 and the new section at the east in flood zone 2.

In the Flood Zone 3 areas of flooding on the Map, the land has been assessed by the Environment Agency as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

In Flood Zone 2 areas of flooding, the land has been assessed by the Environment Agency land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% ÷ 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% ÷ 0.1%) in any year.

If the area benefits from a flood defence, this may reduce the likelihood or impact of flooding

RoFRS means that the Environment Agency have carried out a national flood likelihood analysis to predict the chance of flooding taking into consideration flood defences present. A risk rating is then given to each area.

4.2 Flood Defences

The site has a number of flood defences.

- An embankment is present 6m to the SW.
- A grass embankment is present 12m to the SE
- A bridge abutment is present 13m to the SE
- An embankment is present 15m to the SE
- An embankment acting as a defence 19m to the E
- High ground 21m to the SE
- Bridge abutment 21m to the S
- High ground 22m to the SW
- Bridge abutment 77m to the W
- Bridge abutment 81m to the W
- High ground 100m to the W
- High ground 135m to the W
- High ground 319m to the W
- High ground 322m to the W

4.3 Possible Surface Water Flooding Including Flood Defences

Figure 3 defines three areas of possible flooding taking into account the flood defences. The dark blue is floods with a 1 in 75 year return, the light blue with a 1 in 200 return period and the pastel blue with a 1 in 1,000 year return.

Knoll Beck is shown as 1,000 years with a depth of water greater than 1m. To the west, the rating changes to 1 in 200 with a depth of water of 1m.

Higher ratings are also present in the pond at the north east of the site.

4.4 Flood Levels

The Environment Agency do not have any river level data for Knoll Beck but the 2007 storm overtopped the Knoll Beck flood bank and flooded the car park area and the access road up to a level of about 21.6mOD. The crest level of the flood bank is 20.3mOD. The visitors centre was not flooded. This was reported to be a 1 in 35 year storm.

From Figure 2, the difference between Flood Zone 3 and 2 occurs at a level of about 20.3 mOD. The survey suggests that start of Zone 2 occurs at a level below about 20mOD.

From Figure 4, the main area of the reserve is a flood storage area for the River Dearne. The reserve is divided into two areas by an flood internal bank. A spillway with a crest level of 20.02mOD at grid reference SE 43345 02312 allows water from the river to overflow into the storage areas. Three 600mm diameter pipes at grid reference SE 43454 02224 with flap valves allow water to return to the river.

4.5 Ground Water Flooding

No features were identified for this site by Landmark.

4.6 Surface Water Flooding

4.6.1 Flood Water Storage Areas

From Figure 4, the eastern part of the reserve is a flood storage area for the River Dearne. The proposed car park site is not a storage area.

There is no spillway on the Knoll Beck flood bank.

However in the 2007 floods, Knoll Beck overtopped the flood bank flooding the car parks. During those floods, the River Dearne washlands filled to capacity.

4.6.2 Historic Flood Events

On 26th June 2007, the flood channel exceeded capacity and the Knoll Beck flood bank was overtopped.

On 6th November 2000, the River Dearne caused flooding on site.

In December 1977 due to the Bolton regulator (further downstream) being damaged and closed.

On 19th March 1947, the channel capacity of River Dearne was exceeded.

There were other events between 252 and 482m from site in main river.

5. PROPOSED DEVELOPMENT

5.1 General

The area to be redeveloped will consist of the existing car park, the existing overflow car park and the area of marshy ground between the overflow car park and the west of the pond in the north east corner of the site. These three areas will be treated in a similar manner. The area to the south of the existing pond will be used for water storage.

The existing pond at the north east of the site is part of the Reserve and cannot be used for water storage.

As drawing number 530-T-01 Revision C included in the planning application shows, the final car park will consist of nine sections arranged in three north to south columns. Each of the sections will drain at 1 in 40 north to south to one of two open drains running west to east across the site. These two ditches will drain into a ditch running down the east of the site and discharge into Knoll Beck.

The proposed car park discharge level in the final ditch will be about 0.5m above the water level in Knoll Beck at the time of July 2018 survey. This could be increased to about 0.9m above the water level in Knoll Beck by installing a weir in the car park drainage system.

For financial reasons, the work will be carried out in two phases. Phase 1 is shown on drawing number 537-Rev C. However, the flood water storage capacity required for the full scheme will be constructed in Phase 1.

5.2 Sustainable Urban Drainage Strategy (SuDS)

The existing drainage system for the site is mainly soakaways with some informal seepage into Knoll Beck. There is also a discharge into Knoll Beck at the west of the site.

The proposed drainage design is to limit discharge to Knoll Beck to the green field flow discussed in Section 2.5.1. The site tests showed that in the area of investigation there was no measurable infiltration. In the drainage design, zero infiltration has been assumed with all excess water being stored on site.

The Environment Agency do not have any river level data for Knoll Beck. By interpreting various data for the area, it seems probable that 1 in 6 month and 1 in 5 year storms can be discharged by gravity into Knoll Beck. By lifting the outlet using an internal weir it seems probable a 1 in 20 year storm could be discharged into Knoll Beck. The storage volumes have been designed on this basis.

From discussions with the RSPB, it is proposed to store a 1 in 5 year storm in flood water storage areas. Excess water for storms between 1 in 5 and 1 in 30 will be stored on the car park. A 1 in 30 year storm will overtop the flood bank making all of the car park unusable.

Drainage of development sites HR Wallingford 2004 recommends that balancing capacity is provided for a 6 hour storm for a return period of 100 years. In storms having frequency up to 1 in 30, the part of the car park is designed to remain operative. In less frequent storms, the flood bank overtops and the car parks are flooded. Only frequencies up to 1 in 30 have therefore been considered.

It is unlikely that a 1 in 30 year storm can be discharged by gravity into Knoll Beck. The storage volume has therefore been designed on storing a 6 hour storm on site. As a check, the effects of storing a 3 day storm has also been assessed.

From discussions on site, it is understood that Knoll Beck flood bank overtopped in a 1 in 35 year storm. The car park then becomes flooded. A storm frequency greater than 1 in 30 has not been checked.

The above depends upon the Knoll Beck Flood Bank remaining functional. This is not maintained by the Environment Agency. This should be confirmed and a maintenance programme agreed.

5.3 Effects of Overtopping Knoll Beck Flood Bank

If Knoll Beck flood bank is over topped, the car parks are flooded. This would block the access route to the car parks.

The visitors centre to the north west of the car park is outside the flood zones and was not affected by the severe 2007 flood.

5.4 Drainage layout:

The drainage design is described in Section 5.1 and shown on the Planning Application Drawings.

5.5 Loss of Flood Capacity

The only loss of flood capacity is the imported road materials. This is offset partially by the material excavated from the drains and the flood water storage ponds giving a net loss of about 2,500m³. This loss of capacity only becomes effective when Knoll Beck Flood Bank is overtopped and has a negligible effect on flood water levels in the proposed development area and off site.

5.6 Effect on Surrounding Properties

As stated above, the possible net loss of flood capacity by the development is about 2,500m³. The flood capacity is not active until the flood bank has overtopped. The effect of losing 2,500m³ will then be negligible.

6. FLOOD AND GROUNDWATER SCREENING

6.1 Flooding from Rivers

6.1.1 General

The current Flood Risk Susceptibility from the Environment Agency as supplied by the Landmark Report is shown in Figure 2 and described in Section 4 above.

As stated in Section 5.2 above, provided the Knoll Beck Flood Bank stays intact and areas provided for storage are maintained, the development area is designed to be essentially free from flooding in a 1 in 5 year storm. Some water will then collect on the southern car parks until the Knoll Beck Flood Bank overtops in a 1 in 30 year storm making all of the car park unusable.

6.1.2 Flood Screening

The calculations for this report are based on the flood levels suggested by the EA Flood Map adjusted for the actual levels from the site survey.

7. FLOOD RISK ASSESSMENT

7.1 General

Planning Applications for developments including building or engineering works on Zones 2 or 3 of areas at risk of flooding from rivers or sea must complete a Flood Risk Assessment. Almost all of this site is within Zones 2 or 3. A Flood Risk Assessment is therefore required for this site.

Flood risk assessments should be proportionate to the risk and appropriate to the scale, nature and location of the project; consider the risk of flooding arising from the project in addition to the risk of flooding to the project; take the impacts of climate change; consider the vulnerability of those using the site, including arrangements for safe access; consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made; consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes; include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular project; consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems; consider if there is a need to be safe and remain operational during a worst case flood event over the development's lifetime. There is no requirement to consider risk of failure of these defences.

Warning procedures should be provided in the FRA to allow safe evacuation of the site. This is included in Section 12 below. In particular, the access road to the development site could be flooded when the Knoll Beck Flood Bank overtops. The plan should include measures to counter this.

7.2 Sequential and Exception Tests

As part of the Flood Risk Assessment, evidence needs to be provided that a Sequential Test and where necessary an Exception Test has been carried out. The general approach is to be designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The application of the Sequential Test should help ensure that the development can be safely and sustainably delivered and developers do not waste their time promoting proposals which are inappropriate on flood risk grounds.

The Exception Test needs to show how wider benefits to the community can outweigh the flood risk. It needs to demonstrate that the development will be safe for its lifetime and for information on that lifetime. An example of this benefit would be in areas needing regeneration.

In addition to the above, when completing a FRA as part of meeting the requirements of the Exception Test, an assessment will be required of on and off site opportunities for reducing flood risk overall. This will include an appraisal of the strategic flood risk measures to which the development can contribute.

7.3 Environment Agency Guidance on What should be in the FRA

The detail and technical complexity of a FRA will reflect the scale and potential significance of the development. FRAs can be quite simple where a development is relatively minor in nature, for example where they are evaluating a small development on a site at the margins of the flood plain. Conversely they can comprise major basin-wide studies for significant infrastructure developments. On occasions, preliminary or scoping studies may be undertaken prior to a fuller assessment.

The following list sets out the information that should be submitted as a FRA for developments in Flood Zones 2 and 3 where standing advice has not been provided. Where available, reference should first be made to the Strategic Flood Risk Assessment (SFRA) for locally specific guidance and information.

Plans

- Location plan that includes geographical features, street names and identifies the catchment, watercourses or other bodies of water in the vicinity. The location plan is included as Figure 1.
- A plan of the site showing: existing site; development proposals; identification of any structures, which may influence local hydraulics. This will include bridges, pipes/ducts crossing the watercourse, culverts, screens, embankments, walls, outfalls and condition of channel.

Assessments

Consideration of whether the site falls within the functional flood plain and if so, demonstration that development meets the vulnerability criteria set out in Table 1 of the technical guidance to the NPPF.

Flood alleviation measures already in place, their state of maintenance, and their performance - the Environment Agency or Lead Local Flood Authority are the primary sources for this information. Although Knoll Beck is part of the river system maintained by the EA, they do not maintain the Knoll Beck Flood Bank. This is critical to drainage system at this site.

Information about all potential sources of flooding that may affect the site i from rivers and the sea, streams, surface water run-off, sewers, groundwater, reservoirs, canals and other artificial sources or any combination of these

The impact of flooding on a site including: the likely rate or speed of surface water run-off with which flooding might occur; the order in which various parts of the location or site might flood; the likely duration of flood events; the economic, social and environmental consequences of flooding on occupancy of the site; information on extent and depth of previous flood events or on flood predictions.

It should also include an assessment of how users of the development can avoid exposure to hazardous flooding in and around the development, including whether safe access and exit can be provided for routine and emergency access under both frequent and extreme flood conditions; an assessment of how the layout and form of development can be used to reduce or minimise flood risk; an assessment of the capacity of any drains or sewers, existing or proposed, on the site during various flood events; an assessment of the volume of surface water run-off likely to be generated from the proposed development; proposals for surface water management according to sustainable drainage; principles, with the aim of not increasing, and where practicable; reducing the rate of runoff from the site as a result of the development; the likely impact of any displaced water on third parties caused by alterations to ground levels or raising flood embank; the potential impact on form and structure of rivers or coastal areas, and the likely longer-term stability and sustainability of existing defences.

Estimates should be made of how climate change could affect the probability and intensity of flood events. The assessment should include details of how the development remains safe without increasing flood risk elsewhere for its design life. The hydrological analysis of flood flows and definition of defence standards needs to include the allowances for increased rainfall, flows and sea level rise are contained within the technical guidance to the NPPF; the remaining (known as residual) risks to the site after the construction of any necessary defences and the means of managing those; consideration of the proposal relative to any existing Strategic Flood Risk Assessment carried out by the local authority

Flood risk assessments at all levels should be undertaken under the supervision of an experienced flood risk management specialist (who would normally be expected to have achieved chartered status with a relevant professional body such as the Institution of Civil Engineers (ICE) or the Chartered Institution of Water and Environmental Management (CIWEM)).

7.4 Flood Zones

As stated in Section 4.1 above, Table 1 of the Planning Practice Guidance defines Flood Zones based the probability of river and sea flooding, ignoring the presence of defences.

Zone 1	Land having a less than 1 in 1,000 annual probability of river or sea flooding.
Low Probability	(Shown as 'clear' on the Flood Map) all land outside Zones 2 and 3)
Zone 2	Land having between a 1 in 100 and 1 in 1,000 annual probability of river
Medium	flooding; or
Probability	Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a	Land having a 1 in 100 or greater annual probability of river flooding; or
High Probability	Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b	This zone comprises land where water has to flow or be stored in times of flood.
The Functional Floodplain	(Not separately distinguished from Zone 3a on the Flood Map but from Figure 4 the site is not a functional flood plain)

The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

7.5 **Flood Risk Vulnerability Classification**

Table 2 of the Planning Practice Guidance gives the Flood Risk Vulnerability Classification. This classifies developments under following headings.

- Essential Infrastructure such essential transport infrastructure and wind turbines.
- Highly Vulnerable such as police and ambulance stations
- More Vulnerable such as hospitals
- Less Vulnerable such as police, ambulance and fire stations which are not required to be operational during flooding.
- Water-Compatible Development

The car parks may be considered a water compatible development under the heading 'Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms'.

7.6 **Flood Zone Compatibility**

Table 3 of the Planning Practice Guidance is a matrix of The Flood Risk Vulnerability against flood zone and states whether development is appropriate and whether an exception test is required. Water Compatible developments in areas of flood zone 3 which are not part of the functional flood plain and in flood zone 2 are permitted and do not require an exception test.

8. ANALYSIS OF FLOOD RISKS

8.1 **Sequential Test for the Proposed Site**

The development needs to take adjacent to the Nature Reserve which is sited in land affected by mining. It cannot take place away from the reserve.

The three areas of the site (existing car park, overfill car park and marshy ground) are all at similar levels and will be treated the same way. The existing run off from the car park areas will be greater than that from the marshy ground but the run off from all areas once constructed will be similar. The areas to store water will be built as part of the development. There is therefore no hydrological advantage in building one area in preference to another.

However, as stated in Section 5.1 above, the work is to be carried out in two stages with all of the flood water storage capacity being constructed in Phase 1.

The overtopping of the Knoll Beck Flood Bank in 2007 led to a rapid flooding of the site. This needs to be taken into account in the management of the site.

The only loss of flood capacity is from the imported road materials. This is offset partially by the drains giving a net loss of about 2,500m³. This loss of capacity only becomes effective when Knoll Beck Flood Bank is overtopped and has a negligible effect on flood water levels in the proposed development area and off site.

8.2 Effect on Surrounding Properties

As stated above, the net loss of flood capacity by the development is about 2,500m³. The flood capacity is not active until the flood bank has overtopped. The effect of losing 2,500m³ will then be negligible.

The Visitors Centre is in Flood Zone 1 and is not affected by the devolvement.

The access road to the Visitors Centre runs down the eastern and northern boundaries of the site. This will be flooded once the Knoll Bank Flood Plain has been overtopped. This needs to be considered in management of the site.

8.3 Exception Test

As stated in Section 7.6 above, an exception test is not required for this site.

8.4 Climate Change

The above analysis is based on historic data. The Planning Guidance recommends as a national precautionary sensitivity range for peak rainfall intensity for the period 1990 to 2025, the rainfall intensity should be increased by 5% and the peak river flow by 10%.

The sea level should also be assumed at rise at 4.0mm pa for the period 1990 to 2025. This has been taken into account in the analysis.

9. MINING

The site is in a surface area that could be affected by underground coal mining in 6 seams at 100m to 610m in depth. The date of the last working is 1968. The Coal Authority conclude that

any movement in the ground due to coal mining activity associated with these workings should have stopped by now.

The property is not within an area likely to be affected from any planned future underground mining. However reserves do exist which could be worked at some time in the future.

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

The property is not within 200m of the boundary of an opencast site from which coal is being removed by opencast methods.

10. ASSESSMENT of RISK OF FLOODING

10.1 Type of Development

Part of the land is within Flood Risk Zone 3a and the rest in Flood Zone 2. From Section 7.5, water-compatible developments are appropriate for this land.

The proposed use is considered a water-compatible development and is therefore appropriate. A Sequential Test was carried out in Section 8.1 above.

An Exception Test is not required.

10.2 Risk of Flooding Arising From the Development

As discussed above, the development does involve a small loss of flood capacity within the site. It does not affect any property outside of the Nature Reserve. There will therefore be no additional risk of flooding outside of the site due to the development.

Balancing capacity will be provided so that the discharge from the site in a 30 year storm does not exceed the runoff from a 2 year storm on the greenfield site prior to the development. The flood bank overtops in storms of frequency longer than 1 in 30. This results in the flooding of car parks but has no other significant effect. The reserve would in any case have been closed before that happens.

There will therefore be no additional flooding resulting from the development.

10.3 Climate Change

The effects of climate change will marginally increase the flows in the drains and the overall rainfall on the site. This has been taken into account in designing the balancing capacity required. The development will not therefore affect the downstream flows.

Climate change could increase the flow in Knoll Beck and hence cause the flood bank to overtop earlier. It could also bring forward the level for the drains to feed the beck by gravity. This could affect the storage volume required.

10.4 Flood Defences

The site is currently protected by the Knoll Beck flood bank. This flood bank should be maintained.

10.5 Vulnerability of Occupiers of Land

The critical point is the flooding of the reserve access road.

At the time of the 2007 flood, the users of the Nature Reserve were warned by the wardens to leave. This system should be reviewed. In extreme weather the reserve should be closed

10.6 Type of Flooding

The site is at risk from flooding from overtopping Knoll Beck flood bank. The mitigation measures recommended in Section 12 below should include all necessary inspections of the flood bank and any recommended monitoring. It should also cover means of emergency egress from the site.

10.7 Effects of Extreme Flooding Events

The balancing capacity should be sufficient to allow full use of the car park to continue up to a 1 in 5 year storm. Parts of the car park will remain usable in a 1 in 30 year storm. However, in practice, the reserve will be closed before then. There should not therefore be any extreme effects from extreme flooding on the site

Once the Knoll Beck overtops, the car parks will flood rapidly and the access road to the site will become blocked. The Visitors Centre will not be affected.

10.8 Residual Risk of Flooding

The residual risk will not affect the surrounding land but will be limited to the site.

Once the flood bank has overtopped, there is no planned method of removing the flood water other than at the green field rate of discharge.

10.9 History of Site

A history is given in Section 2.5.3 above.

11. ASSESSMENT OF RISK OF CONTAMINATION

The risk of contamination is outside the scope of this report.

12. EMERGENCY PLANNING

The consideration should be given to adding the following requirements to the Health and Safety Procedure for the site.

- The Knoll Beck Flood Bank is critical to the security of the site. Although the beck is managed by the EA, they do not maintain the flood bank. A method of maintaining the bank should be agreed with the EA. Alternatively, the site should be designed on the assumption that the bank does not exist and the beck should be allowed to flood onto the lower car parks.
- The flood bank should be inspected at a frequency to be agreed with the EA and any defects reported to the organisation maintaining the bank.
- In the 2007 flood, visitors to the reserve were warned in person by the wardens. This is considered too informal. In times of flood warnings by the Met Office, the level of the water in Knoll Beck should be monitored and a decision made to shut the reserve when the water reaches a pre-ordained level. Signs should be placed at the entrance saying that the reserve will close when a klaxon sounds.
- Contact numbers should be included in the access sign.
- Depth gauges should be placed at the lowest point on the access road so people are aware of the depth of water.
- Once the site has been cleared, access to the site should be prevented and the reserve closed.
- The emergency planning should be agreed with the site management and then regularly updated. All new wardens should be made aware of the operating conditions.

13. AFTER CLOSURE

After closure, the site will be left in a condition to be agreed with the EA and the owners of the site.

14. RESIDUAL EFFECTS

With the mitigation measures outlined in Section 12 in place, the residual effects should be minor or negligible.

15. CONCLUSIONS

1. The development is compatible with the Flood Risk Zone.
2. There is no significant additional flood risk outside of the site from the change in use of the site.
3. The small loss of flood capacity caused by this development will only have effect after the Knoll Beck Flood Bank is overtopped. It will then have a negligible effect on water levels.
4. The measures highlighted in Section 12 should be carried out.
5. The effects of climate change will increase the flow in Knoll Beck and bring forward the limit when gravity outflow from the site cannot take place. The effects of climate change have been taken into account in designing the site's balancing capacity.

D T Carter
BSc, PhD, MICE, FIMMM, C Eng, FGS

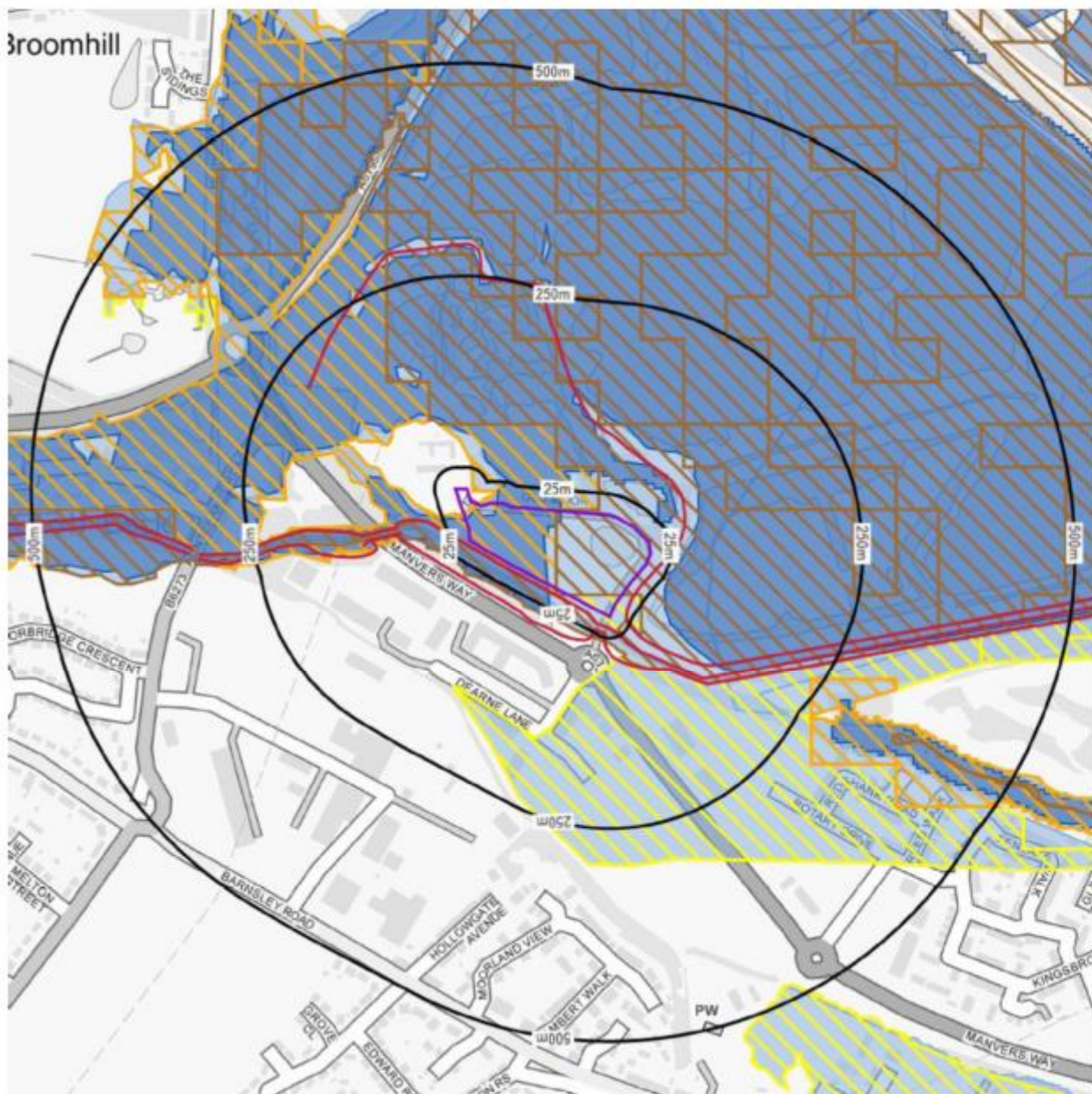
January 2019



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- ◆ Site
- Search Radii

Old Moor FRA: Figure 1



Contains Ordnance Survey data © Crown copyright and database right 2018.

- | | |
|--|---|
|  High Risk - Risk of Flooding from Rivers and Sea (RoFRS) |  Flooding from Rivers or Sea without Defences (Zone 3) |
|  Medium Risk - Risk of Flooding from Rivers and Sea (RoFRS) |  Extreme Flooding from Rivers or Sea without Defences (Zone 2) |
|  Low Risk - Risk of Flooding from Rivers and Sea (RoFRS) |  Flood Defences |
| |  Areas Benefiting from Flood Defences |

Old Moor: Figure 2

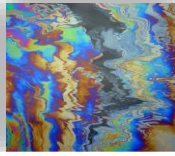


- OS Mastermap Water Network
— Flood Defences
■ Areas Benefiting from Flood Defences

OLD MOOR FRA:: Figure 4



INVESTIGATE



REMEDiate



REGENERATE

TECHNICAL REPORT

**GROUND INVESTIGATION
AT
RSPB CAR PARK,
OLD MOOR LANE,
WATH UPON DEARNE,
SOUTH YORKSHIRE
FOR
CF LANDSCAPE**

**REPORT NO. NE3757
OCTOBER 2018**



SUB SURFACE NORTH EAST LIMITED

AHED House
Dewsbury Road
Ossett
West Yorkshire
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CONTENTS

1. INTRODUCTION	1.1 Site Location and Description
	1.2 Proposed Development and Purpose of the Ground Investigation
2. INVESTIGATION	2.1 Investigation Details
	2.2 Sub Surface Detail
3. SAMPLING AND TESTING	3.1 Sampling
	3.2 Field Testing
	3.3 Laboratory Testing
4. GENERAL	
APPENDICES	Insitu Test results
	Laboratory Test results
	Trial Pit Record sheets
	Figures

GROUND INVESTIGATION AT RSPB CAR PARK, OLD MOOR LANE, WATH UPON DEARNE, SOUTH YORKSHIRE

CLIENT: CF LANDSCAPE

1. INTRODUCTION

This report has been prepared in accordance with an email, dated 27th September 2018, from the Client.

The brief was set out in our estimate, ref. E5958 and dated 27th September 2018, with amendments as the investigation proceeded and includes:

- 4 No. trial pits
- Insitu soakaway testing
- Geotechnical laboratory testing
- Provision of a factual report on the above.

1.1 Site Location and Description

The site is located at the RSPB Car Park, Old Moor Lane, Wath Upon Dearne, South Yorkshire S73 0YF, as indicated on Figure 1. The approximate National Grid Reference of the centre of the site is 442282 402177.

As shown on Figure 2, the rectangular shaped site is generally flat with some slightly lower areas, and is bound to the north and east by Old Moor Lane, to the south by a footpath and then Knoll Beck to the west by access units in the car parking area.

The hardstanding car park comprises the western half of the site, with an area separated by some planted trees and bushes, before opening out onto grassed area in the east, with a pond present in the northeast corner.

1.2 Proposed Development and Purpose of the Ground Investigation

We understand that the proposed development is to reprofile and extend the existing car park.

The purpose of the ground investigation is to determine the ground conditions at the exploratory hole positions and to provide results for assessment by the Engineer/ others.

2. INVESTIGATION

2.1 Investigation Details

Four trial pits were taken out by a mechanical excavator at the positions determined by the client and set out by Sub Surface North East Ltd, as shown on Figure 2. The trial pits were excavated to depths of between 2.10 and 2.40 metres, representative samples were taken and the materials were logged in accordance with BS EN ISO 14688-1: 2002 and BS EN ISO 14689-1: 2003. The resulting Trial Pit Records are appended.

On completion the trial pits were backfilled with arisings by the excavator and it is therefore likely that loose or soft pockets will still remain.

3. SAMPLING, TESTING AND MONITORING

3.1 Sampling

Small bulk disturbed samples were obtained for the strata encountered and were subjected to careful examination and hand shear vane tests, where appropriate and laboratory testing.

The samples will be retained for a period of one month after the issue of this report, for reference purposes, and then disposed of unless otherwise instructed.

3.2 Field Testing

Four hand shear vane tests were undertaken in the trial pits and the results are given on the appended Trial Pit Records.

On completion of the trial pits four soakaway tests were undertaken in the strata. Water was added to the pits from a bowser and water levels were subsequently monitored over a period of four hours. Water levels were found to have fallen insufficiently to determine the Soil Infiltration Rates and details of the soakaway tests are appended.

3.3 Laboratory Testing

The following laboratory tests were carried out in accordance with BS.1377: 1990, where applicable, and the results are appended.

- Moisture content, plastic limit and liquid limit tests

The results of the above analyses are appended.

4. GENERAL

We trust that this report fulfils your present requirements but if you have any queries or we can be of further assistance please contact Mr David Simpson at our Ossett office.

SUB SURFACE CONSULTANTS LIMITED
FACTUAL REPORT No. NE3757
OCTOBER 2018

INSITU TEST RESULTS



SUB SURFACE

SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Insitu Test Results

Site: RSPB Car Park, Old Moor Lane, Wath Upon Dearne, South Yorkshire

Client: CF Landscape

Engineer:

Job Number

NE3757

Sheet:

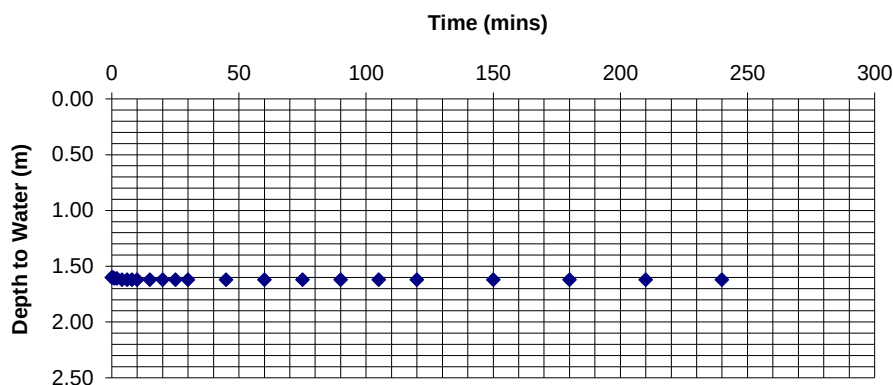
1/4

Soakaway Test

Trial Pit No: TPA

TEST NO: 1

DATE: 11/10/2018



Time (min)	Depth (m)
0	1.60
0.5	1.60
1	1.61
2	1.61
4	1.62
6	1.62
8	1.62
10	1.62
15	1.62
20	1.62
25	1.62
30	1.62
45	1.62
60	1.62
75	1.62
90	1.62
105	1.62
120	1.62
150	1.62
180	1.62
210	1.62
240	1.62

Length of pit: L = 1.50 m

Width of pit: W = 0.60 m

Depth of pit: D = 2.40 m

Base area of pit: A = 0.90 m²

100% effective depth D100 = 1.60 m

75% effective depth D75 = 1.80 m

50% effective depth D50 = 2.00 m

25% effective depth D25 = 2.20 m

time to D75 T75 = - sec

time to D25 T25 = - sec

time from D75 to D25 t_{p75-25} = - sec
(T25 - T75)

volume between D75 & D25 V_{p75-25} = 0.36 m³
(A x (D25 - D75))

surface area to D50 inc. base a_{p50} = 2.58 m²
((2x(D-D50)x(W+L)) + A)

SOIL INFILTRATION RATE

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

f = - m/sec

Test Strata: See Trial Pit Logs
(see Trial Pit)

Remarks: Soil infiltration rate not able to be calculated, strata of very low permeability and unsuitable for soakaways.



SUB SURFACE

SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Insitu Test Results

Site: RSPB Car Park, Old Moor Lane, Wath Upon Dearne, South Yorkshire

Client: CF Landscape

Engineer:

Job Number

NE3757

Sheet:

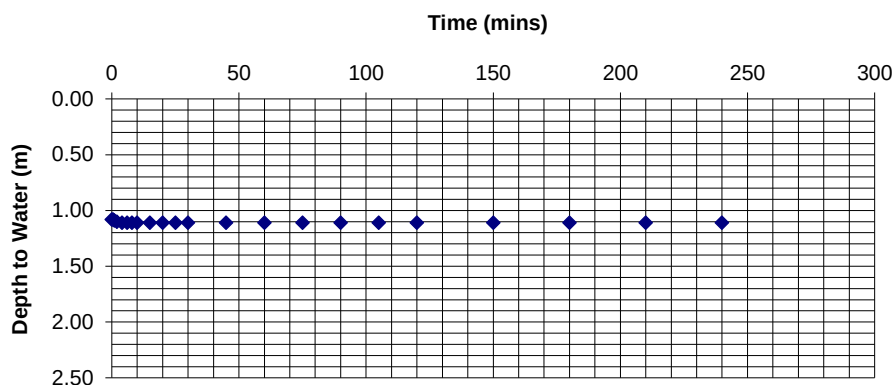
2/4

Soakaway Test

Trial Pit No: TPB

TEST NO: 1

DATE: 11/10/2018



Length of pit: L = 1.60 m

Width of pit: W = 0.60 m

Depth of pit: D = 2.10 m

Base area of pit: A = 0.96 m²

100% effective depth D100 = 1.08 m

75% effective depth D75 = 1.34 m

50% effective depth D50 = 1.59 m

25% effective depth D25 = 1.85 m

time to D75 T75 = - sec

time to D25 T25 = - sec

time from D75 to D25 t_{p75-25} = - sec
(T25 - T75)

volume between D75 & D25 V_{p75-25} = 0.49 m³
(A x (D25 - D75))

surface area to D50 inc. base a_{p50} = 3.20 m²
((2x(D-D50)x(W+L)) + A)

SOIL INFILTRATION RATE

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

$$f = - \text{ m/sec}$$

Time (min)	Depth (m)
0	1.08
0.5	1.08
1	1.09
2	1.10
4	1.11
6	1.11
8	1.11
10	1.11
15	1.11
20	1.11
25	1.11
30	1.11
45	1.11
60	1.11
75	1.11
90	1.11
105	1.11
120	1.11
150	1.11
180	1.11
210	1.11
240	1.11

Test Strata: See Trial Pit Logs
(see Trial Pit)

Remarks: Soil infiltration rate not able to be calculated, strata of very low permeability and unsuitable for soakaways.



SUB SURFACE

SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Insitu Test Results

Site: RSPB Car Park, Old Moor Lane, Wath Upon Dearne, South Yorkshire

Client: CF Landscape

Engineer:

Job Number

NE3757

Sheet:

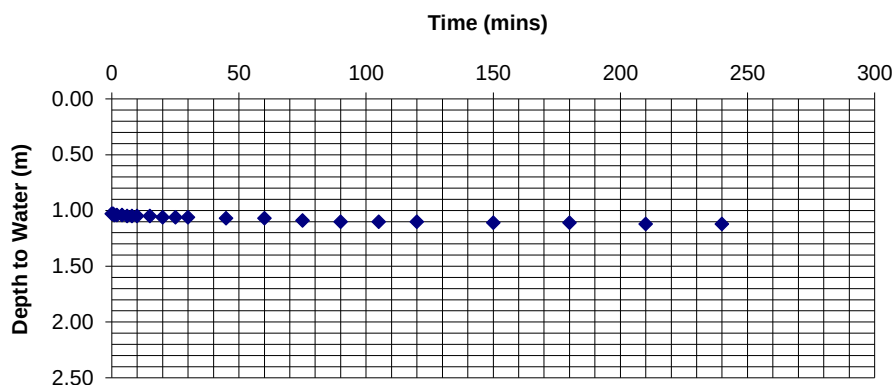
3/4

Soakaway Test

Trial Pit No: TPC

TEST NO: 1

DATE: 11/10/2018



Length of pit: L = 2.00 m

Width of pit: W = 0.60 m

Depth of pit: D = 2.10 m

Base area of pit: A = 1.20 m²

100% effective depth D100 = 1.03 m

75% effective depth D75 = 1.30 m

50% effective depth D50 = 1.57 m

25% effective depth D25 = 1.83 m

time to D75 T75 = - sec

time to D25 T25 = - sec

time from D75 to D25 t_{p75-25} = - sec
(T25 - T75)

volume between D75 & D25 V_{p75-25} = 0.64 m³
(A x (D25 - D75))

surface area to D50 inc. base a_{p50} = 3.98 m²
((2x(D-D50)x(W+L)) + A)

SOIL INFILTRATION RATE

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

f = - m/sec

Time (min)	Depth (m)
0	1.03
0.5	1.03
1	1.04
2	1.04
4	1.04
6	1.05
8	1.05
10	1.05
15	1.05
20	1.06
25	1.06
30	1.06
45	1.07
60	1.07
75	1.09
90	1.10
105	1.10
120	1.10
150	1.11
180	1.11
210	1.12
240	1.12

Test Strata: See Trial Pit Logs
(see Trial Pit)

Remarks: Soil infiltration rate not able to be calculated, strata of very low permeability and unsuitable for soakaways.



SUB SURFACE

SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Insitu Test Results

Site: RSPB Car Park, Old Moor Lane, Wath Upon Dearne, South Yorkshire

Client: CF Landscape

Engineer:

Job Number

NE3757

Sheet:

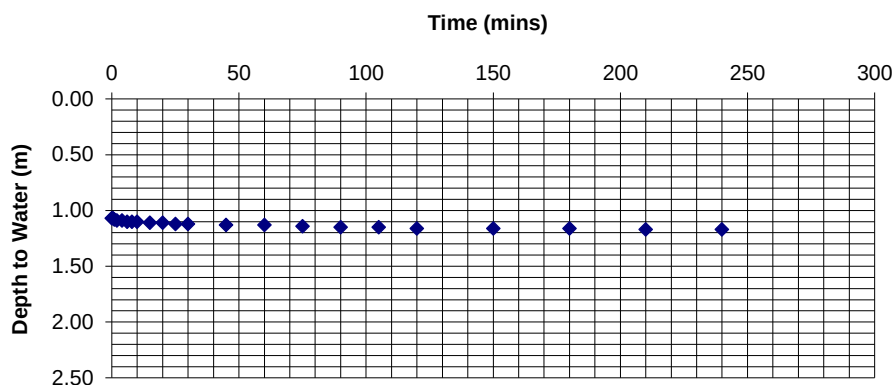
4/4

Soakaway Test

Trial Pit No: TPD

TEST NO: 1

DATE: 11/10/2018



Length of pit: L = 2.00 m

Width of pit: W = 0.60 m

Depth of pit: D = 2.10 m

Base area of pit: A = 1.20 m²

100% effective depth D100 = 1.07 m

75% effective depth D75 = 1.33 m

50% effective depth D50 = 1.59 m

25% effective depth D25 = 1.84 m

time to D75 T75 = - sec

time to D25 T25 = - sec

time from D75 to D25 $t_{p75-25} = -$ sec
(T25 - T75)

volume between D75 & D25 $V_{p75-25} = 0.62$ m³
(A x (D25 - D75))

surface area to D50 inc. base $a_{p50} = 3.88$ m²
((2x(D-D50)x(W+L)) + A)

SOIL INFILTRATION RATE

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

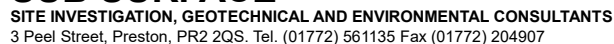
$$f = - \text{ m/sec}$$

Time (min)	Depth (m)
0	1.07
0.5	1.07
1	1.08
2	1.09
4	1.09
6	1.10
8	1.10
10	1.10
15	1.11
20	1.11
25	1.12
30	1.12
45	1.13
60	1.13
75	1.14
90	1.15
105	1.15
120	1.16
150	1.16
180	1.16
210	1.17
240	1.17

Test Strata: See Trial Pit Logs
(see Trial Pit)

Remarks: Soil infiltration rate not able to be calculated, strata of very low permeability and unsuitable for soakaways.

LABORATORY TEST RESULTS

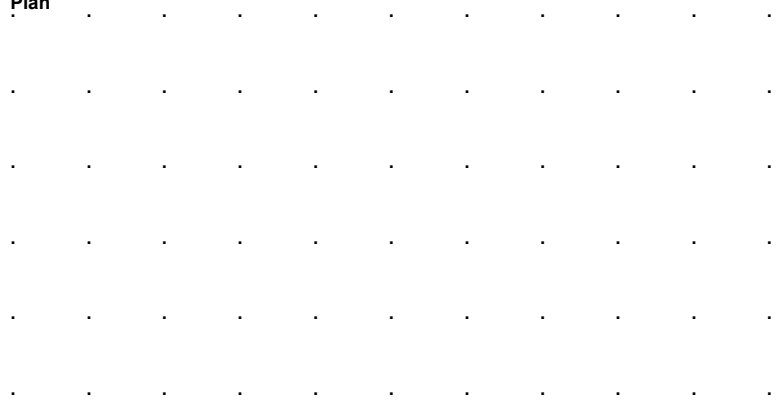


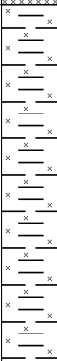
Site : RSPB CAR PARK, OLD MOOR LANE, WATH UPON DEARNE, SOUTH YORKSHIRE Client : C F LANDSCAPE Engineer:	Job Number NE3757
	Sheet 1 / 1

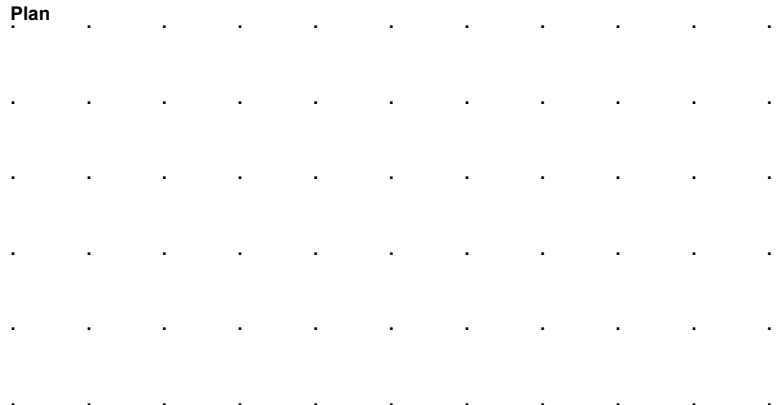
Borehole/ Trial Pit	Depth (m)	Sample	Natural Moisture Content %	Sample Passing 425µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Group Symbol	Laboratory Description
				Percentage %	Moisture Content %						
TPA	0.85	D	30	90	33	42	25	17	0.47	CI	Brown sandy CLAY.
TPA	1.20	B	25	75	33	39	22	17	0.65	CI	Orange brown and brown silty slightly clayey fine to medium grained SAND and fine to medium rounded GRAVEL.
TPA	1.80	D	19	84	23	45	22	23	0.04	CI	Grey silty CLAY with gravel sized mudstone fragments.
TPB	1.10	D	30	86	35	55	28	27	0.26	CH	Orange brown silty CLAY with occasional gravel sized fragments of sandstone and siltstone.
TPC	0.70	D	21	92	23	46	27	19	-0.21	CI	Brown silty CLAY and brown clayey silt in places.
TPC	0.85	D	23	79	29	47	26	21	0.14	CI	Brown and orange brown silty CLAY.

Remarks :

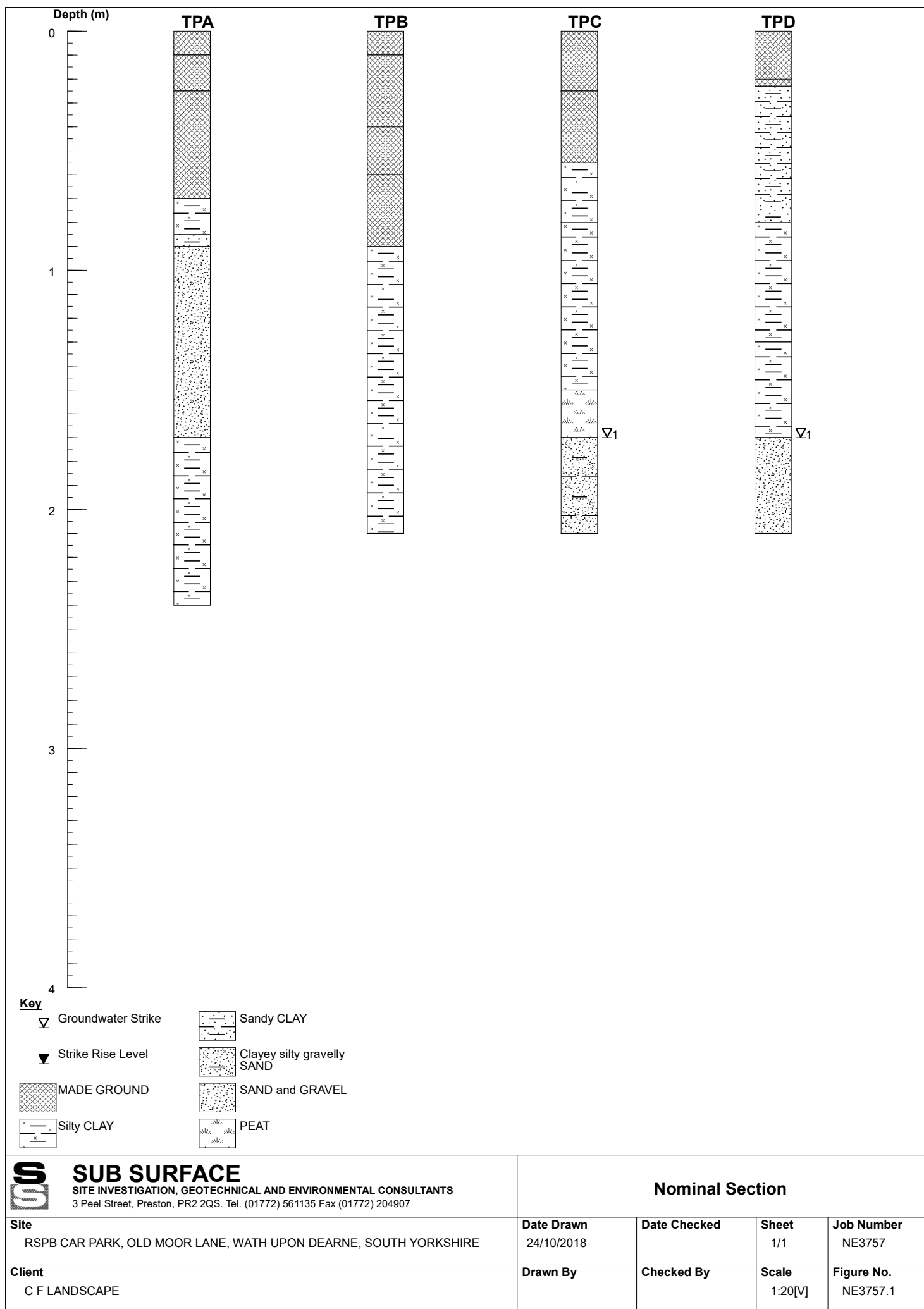
TRIAL PIT RECORD SHEETS

 SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907						Site RSPB CAR PARK, OLD MOOR LANE, WATH UPON DEARNE, SOUTH YORKSHIRE		Trial Pit Number TPA
Excavation Method MECHANICAL EXCAVATOR		Dimensions 0.60m x 1.50m		Ground Level (mOD)		Client C F LANDSCAPE		Job Number NE3757
		Location AS PLAN		Dates 11/10/2018		Engineer		Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.05 0.15	D D				(0.10) 0.10 (0.15) 0.25	MADE GROUND: dark grey sand and fine to medium angular gravel sized stone and road scalping fragments.		
					0.25	MADE GROUND: brown clayey sand.		
0.50	D				(0.45)	MADE GROUND: dark grey and brown silty clay and subangular gravel sized mudstone fragments.		
0.75	D		HV@0.75m, c=85kPa	0.70	0.70	Stiff high strength grey silty CLAY.		
0.85	D		HV@0.85m, c=45kPa	0.85	(0.15) 0.85	Firm medium strength brown sandy CLAY.		
					0.90	Orange brown and brown silty slightly clayey fine to medium SAND and fine to medium rounded GRAVEL.		
1.20	B				(0.80)			
					1.70	Firm grey silty CLAY with gravel sized mudstone fragments.		
1.80	D				(0.70)			
2.30	D		11/10/2018: DRY		2.40	Complete at 2.40m		
Plan 						Remarks Pit sides remained vertical and stable. No groundwater encountered. HV = Hand Shear Vane test On completion backfilled with arisings.		
						Scale (approx) 1:25	Logged By DS/SJ	Figure No. NE3757.TPA

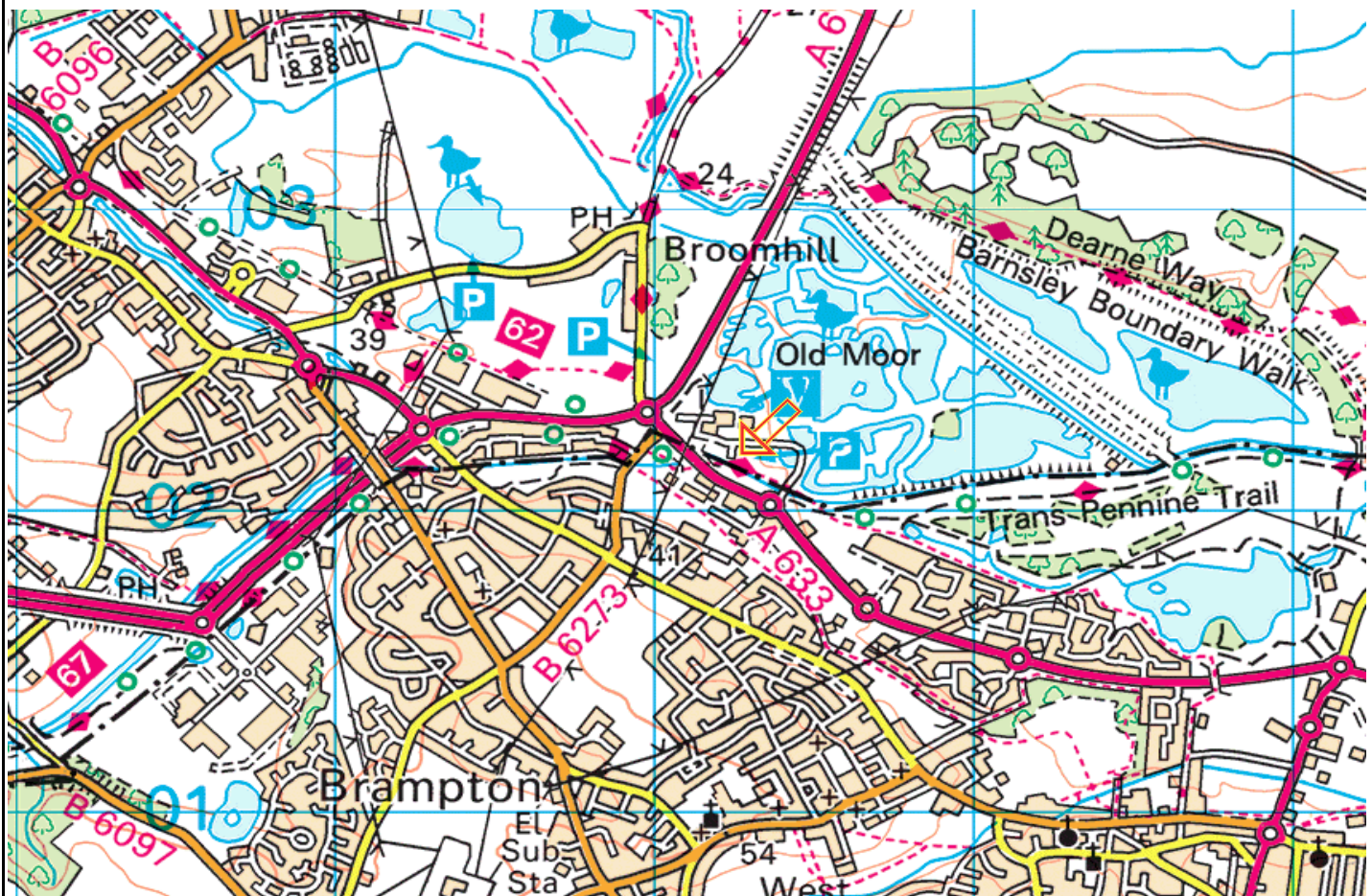
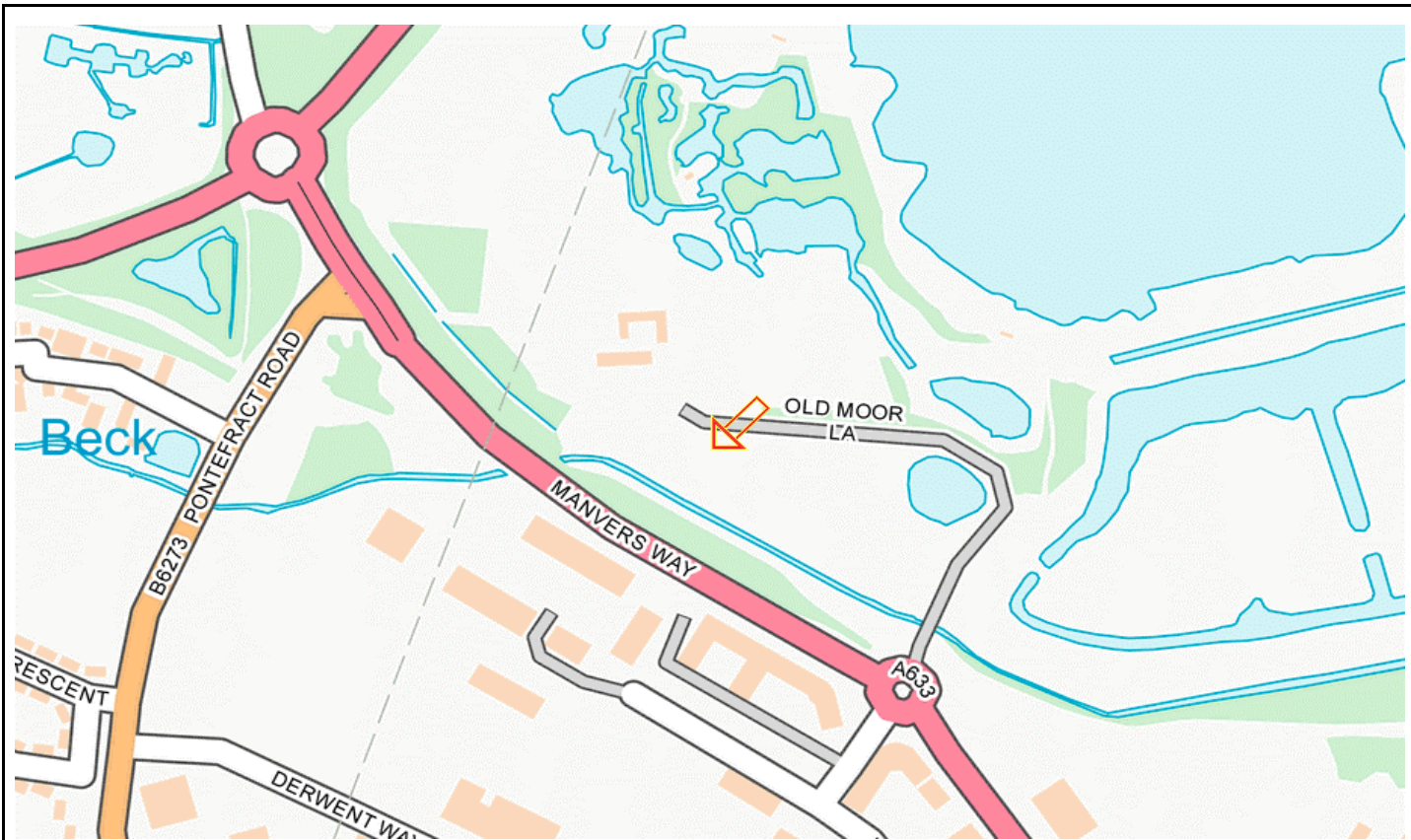
 SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907						Site RSPB CAR PARK, OLD MOOR LANE, WATH UPON DEARNE, SOUTH YORKSHIRE		Trial Pit Number TPB		
Excavation Method MECHANICAL EXCAVATOR		Dimensions 0.60m x 1.60m		Ground Level (mOD)		Client C F LANDSCAPE		Job Number NE3757		
		Location AS PLAN		Dates 11/10/2018		Engineer		Sheet 1/1		
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water		
0.05	D				0.10	MADE GROUND: light brown subangular to angular gravel sized stone.				
0.10	D				0.30	MADE GROUND: topsoil and roots over a dark brown silty clay.				
0.30	D				0.40	MADE GROUND: orange brown and light brown sandy clay and occasional old roots.				
0.50	D				0.60	MADE GROUND: dark grey and brown silty clay and gravel sized mudstone fragments.				
0.75	D				0.90	Firm initially locally stiff orange brown silty CLAY with occasional gravel sized fragments of sandstone and siltstone.				
1.10	D									
1.50	D				(1.20)					
2.00	D				2.10	Complete at 2.10m				
			11/10/2018:DRY							
Plan .						Remarks Pit sides remained vertical and stable. No groundwater encountered. On completion backfilled with arisings.				
						Scale (approx) 1:25	Logged By DS/SJ	Figure No. NE3757.TPB		

 SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907						Site RSPB CAR PARK, OLD MOOR LANE, WATH UPON DEARNE, SOUTH YORKSHIRE		Trial Pit Number TPC
Excavation Method MECHANICAL EXCAVATOR		Dimensions 0.60m x 2.00m		Ground Level (mOD)		Client C F LANDSCAPE		Job Number NE3757
		Location AS PLAN		Dates 11/10/2018		Engineer		Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D				(0.25)	MADE GROUND: topsoil.		
0.40	D				0.25 (0.30)	MADE GROUND: dark grey and brown silty clay with gravel sized mudstone fragments.		
0.70	D				0.55 (0.25)	Desiccated brown silty CLAY and brown clayey silt in places.		
0.85	D				0.80	Stiff high strength brown and orange brown silty CLAY.		
1.20	D		HV@1.20m, c=80kPa		(0.70)			
1.60	D		Damp below(1) at 1.70m.		1.50 (0.20)	Dark brown and brown clayey subangular GRAVEL. Gravel is sandstone and siltstone fragments.		
1.90	D				1.70 (0.40)	Brown clayey silty coarse to medium SAND and fine to medium rounded GRAVEL.		
			11/10/2018:DRY		2.10	Complete at 2.10m		
Plan 						Remarks Pit sides remained vertical and stable. No groundwater encountered. Strata damp below 1.70m HV = Hand Shear Vane test On completion backfilled with arisings.		
						Scale (approx) 1:25	Logged By DS/SJ	Figure No. NE3757.TPC

 SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907						Site RSPB CAR PARK, OLD MOOR LANE, WATH UPON DEARNE, SOUTH YORKSHIRE		Trial Pit Number TPD	
Excavation Method MECHANICAL EXCAVATOR		Dimensions 0.60m x 2.00m		Ground Level (mOD)		Client C F LANDSCAPE		Job Number NE3757	
		Location AS PLAN		Dates 11/10/2018		Engineer		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.50	D				(0.20)	MADE GROUND: topsoil.			
					0.20				
					0.23	MADE GROUND: dark grey silty clay with gravel sized mudstone fragments.			
					(0.57)	Firm brown sandy CLAY (possible made ground or possible disturbed natural strata).			
					0.80	Firm medium strength orange brown and brown silty CLAY.			
0.90	D		HV@1.00m, c=45kPa		(0.50)				
					1.30	Firm dark brown silty CLAY.			
1.40	D				(0.40)				
					1.70	Dark brown and brown slightly clayey coarse to medium SAND and fine to medium rounded GRAVEL.			
1.80	D		Damp below(1) at 1.70m.		(0.40)				
			11/10/2018:DRY		2.10	Complete at 2.10m			
Plan .						Remarks Pit sides remained vertical and stable. No groundwater encountered but ground damp below 1.70m HV = Hand Shear Vane test On completion a soakaway test was carried out at 2.02m.			
						Scale (approx) 1:25	Logged By DS/SJ	Figure No. NE3757.TPD	

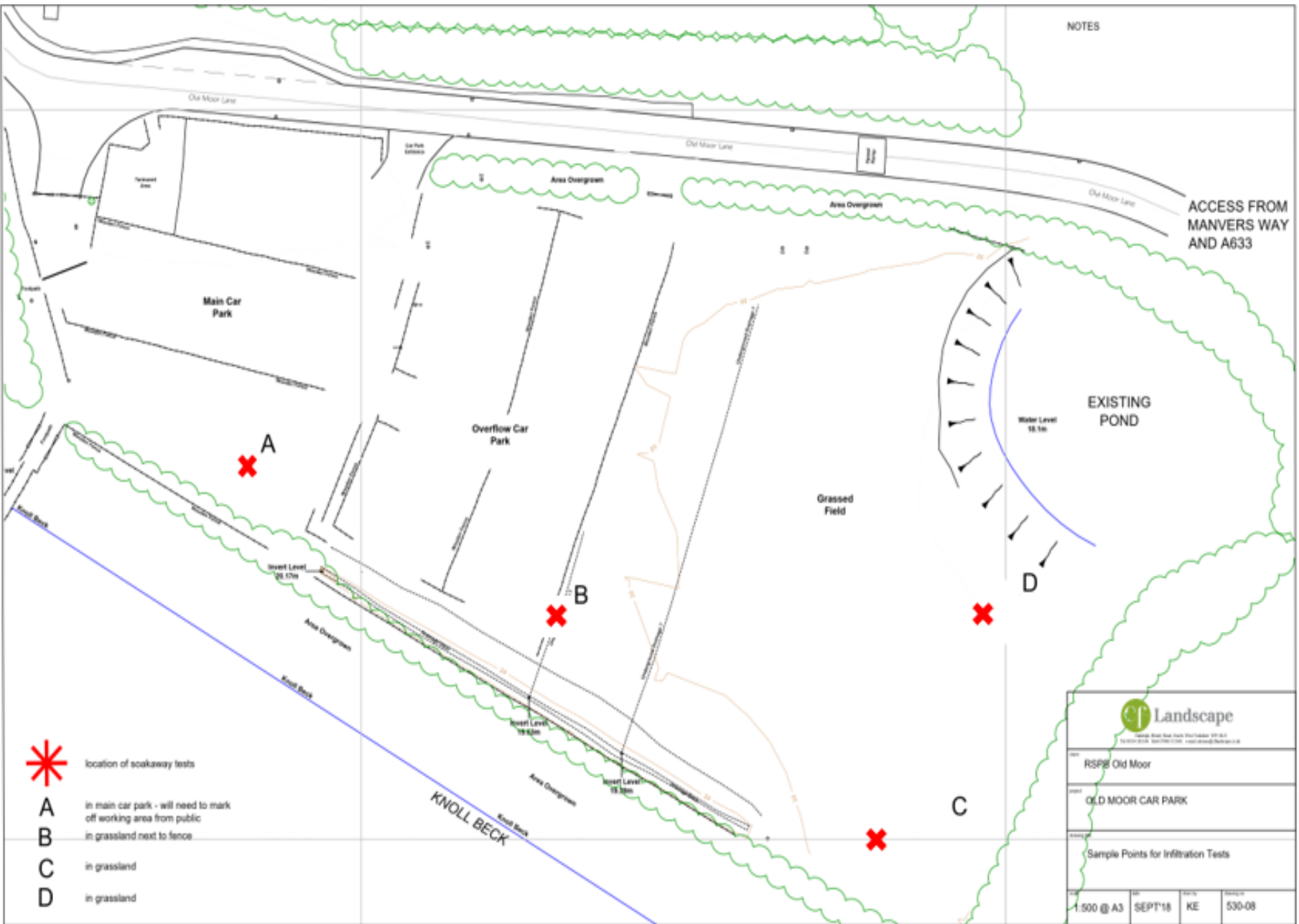


FIGURES



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 SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	General Site Location			
Site RSPB Car Park, Old Moor Lane, Wath Upon Dearne, South Yorkshire	Date Drawn 24-Aug-18	Date Checked	Orientation 	Job No. NE3757
Client CF Landscape	Drawn By TDC	Checked By CAM	Scale —	Figure No. 1



NOTES

ACCESS FROM
MANVERS WAY
AND A633

EXISTING
POND

Water Level
18.1m

Grassed
Field

Overflow Car
Park

Main Car
Park



location of soakaway tests

A
B
C
D

in main car park - will need to mark
off working area from public
in grassland next to fence

in grassland
in grassland



RSPB Old Moor

OLD MOOR CAR PARK

Sample Points for Infiltration Tests

1:500 @ A3 SEPT'18 KE 530-08



SUB SURFACE

SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel: (01772) 561185 Fax: (01772) 204907

Site Layout Plan

Site

RSPB Car Park, Old Moor Lane, Wath Upon Dearne, South Yorkshire

Date Drawn

18-Oct-18

Date Checked

Orientation



Job No.

NE3757

Client

CF Landscape

Drawn By

TDC

Checked By

CAM

Scale

-

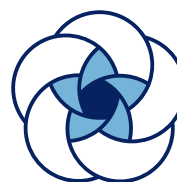
Figure No.

2

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TEST REPORT

C F Landscape
Oakleigh
Healey Road
Ossett
WF5 8LB



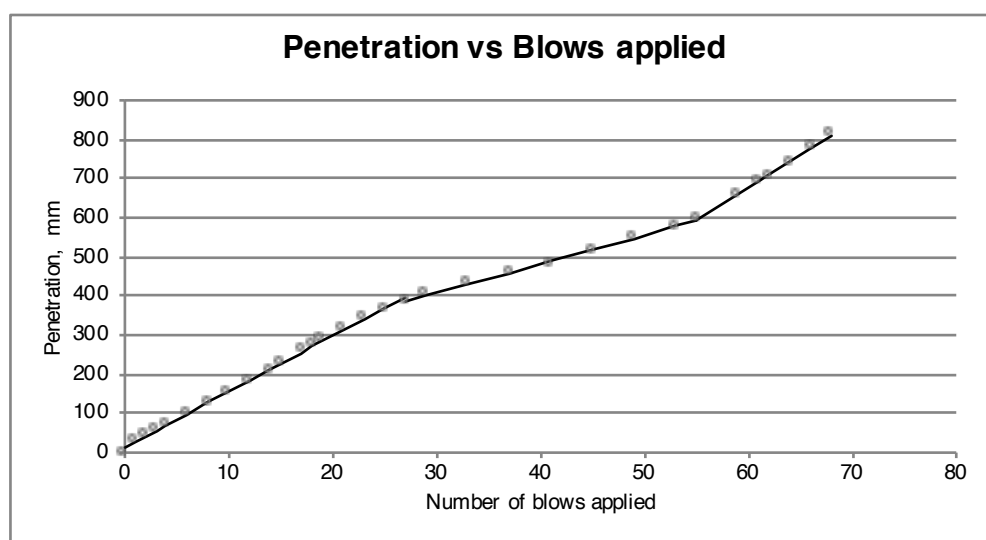
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Rose
Laboratory
Services
Ltd

Lumley St • Castleford • WF10 5LB
01977 520625 • enquiries@whiteroselabs.co.uk

Report WRL/18/2527Adcp
Issue date 18/09/18

Site	RSPB Old Moor, Wombwell		
Material	Grass / turf / soil		
Test Location	Main car park location 1	Tested by	M O'Hara
Test level	-	Date tested	13/09/18
Source	Ex site	Date reported	18/09/18
Supplier	Ex site	Weather	Sunny

Determination of equivalent CBR by Dynamic Cone Penetrometer

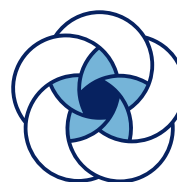


Layer, mm below test start	Mean mm/ blow	Equiv CBR %
0 - 387	14.3	18
387 - 599	7.4	36
599 - 812	16.5	16
Mean	10.8	25

J Church
Managing Director

TEST REPORT

C F Landscape
Oakleigh
Healey Road
Ossett
WF5 8LB



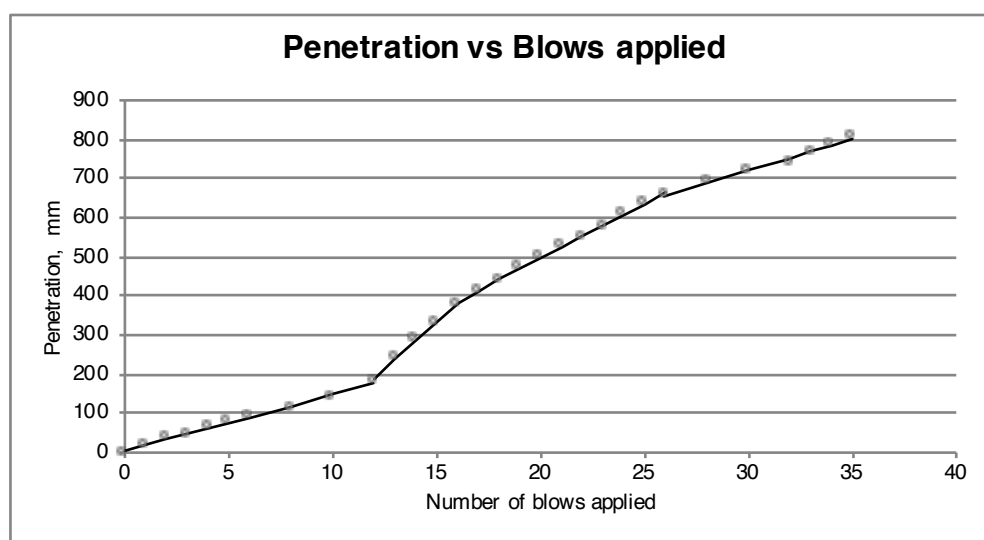
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Report WRL/18/2527Bdcp
Issue date 18/09/18

Site	RSPB Old Moor, Wombwell		
Material	Gravel surface		
Test Location	Main car park location 2	Tested by	M O'Hara
Test level	-	Date tested	13/09/18
Source	Ex site	Date reported	18/09/18
Supplier	Ex site	Weather	Sunny

Determination of equivalent CBR by Dynamic Cone Penetrometer

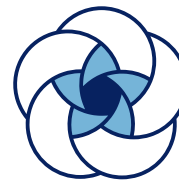


Layer, mm below test start	Mean mm/ blow	Equiv CBR %
0 - 180	14.2	18
180 - 377	48.2	5.0
377 - 659	28.1	8.9
659 - 809	16.1	16
Mean	25.3	9.9

J Church
Managing Director

TEST REPORT

C F Landscape
Oakleigh
Healey Road
Ossett
WF5 8LB



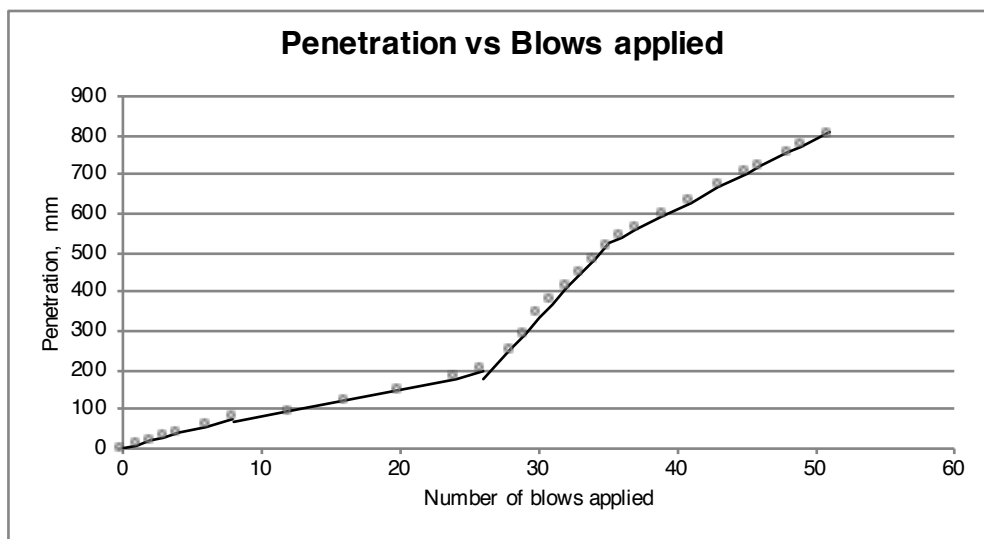
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Report WRL/18/2527Cdc
Issue date 18/09/18

Site	RSPB Old Moor, Wombwell		
Material	20mm gravel surface, sand and limestone beneath		
Test Location	Main car park location 3	Tested by	M O'Hara
Test level	-	Date tested	13/09/18
Source	Ex site	Date reported	18/09/18
Supplier	Ex site	Weather	Sunny

Determination of equivalent CBR by Dynamic Cone Penetrometer

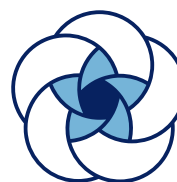


Layer, mm below test start	Mean mm/ blow	Equiv CBR %
0 - 78	9.4	28
78 - 202	7.0	38
202 - 518	38.1	6.4
518 - 604	17.8	14
Mean	16.3	16

J Church
Managing Director

TEST REPORT

C F Landscape
Oakleigh
Healey Road
Ossett
WF5 8LB



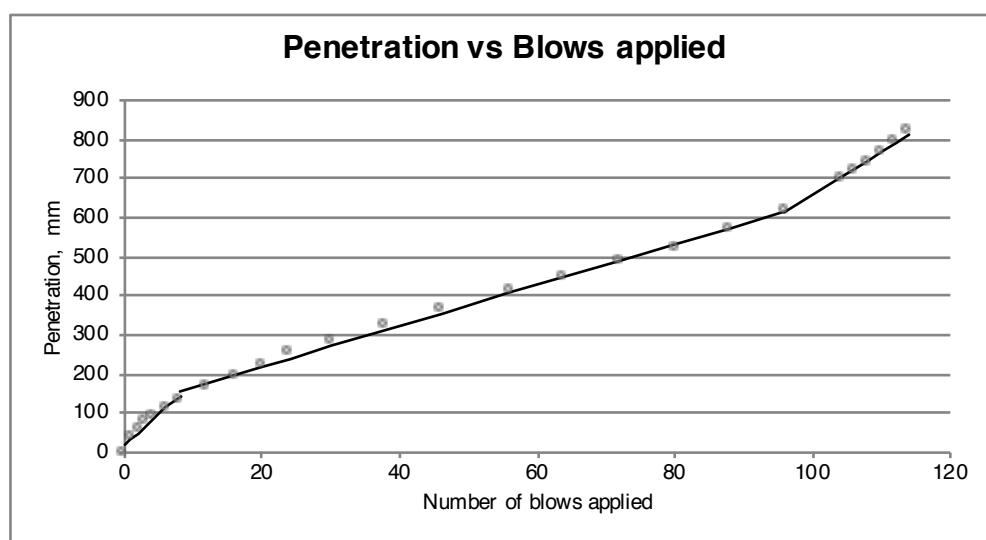
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Report WRL/18/2527Ddcp
Issue date 18/09/18

Site	RSPB Old Moor, Wombwell		
Material	Topsoil with gravelly subsoil 150mm below		
Test Location	Grassed field location 4	Tested by	M O'Hara
Test level	-	Date tested	13/09/18
Source	Ex site	Date reported	18/09/18
Supplier	Ex site	Weather	Sunny

Determination of equivalent CBR by Dynamic Cone Penetrometer

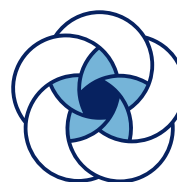


Layer, mm below test start	Mean mm/ blow	Equiv CBR %
0 - 133	15.5	17
133 - 619	5.2	53
619 - 819	11.0	24
Mean	6.2	44

J Church
Managing Director

TEST REPORT

C F Landscape
Oakleigh
Healey Road
Ossett
WF5 8LB



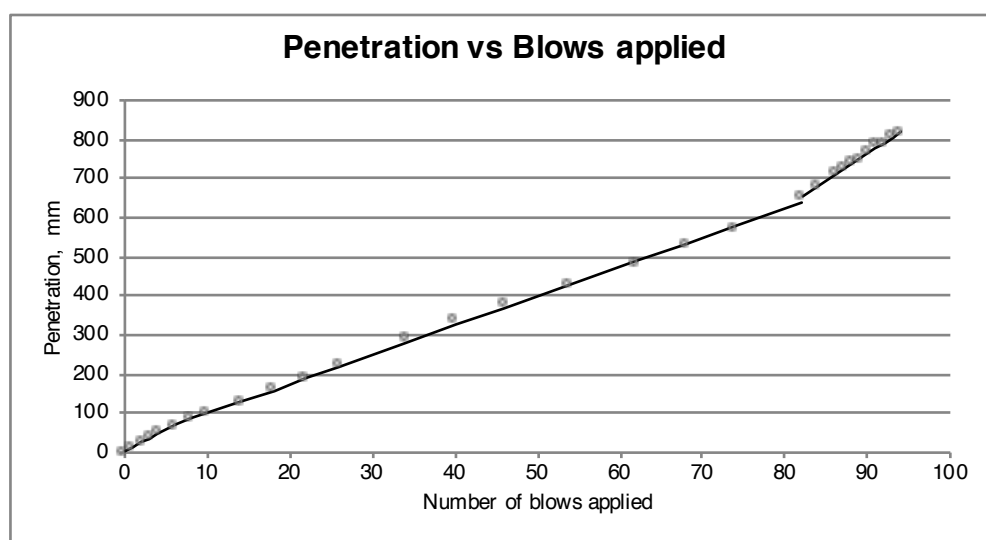
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Report WRL/18/2527Edcp
Issue date 18/09/18

Site	RSPB Old Moor, Wombwell		
Material	Topsoil with gravelly subsoil 150mm below		
Test Location	Grassed field location 5	Tested by	M O'Hara
Test level	-	Date tested	13/09/18
Source	Ex site	Date reported	18/09/18
Supplier	Ex site	Weather	Sunny

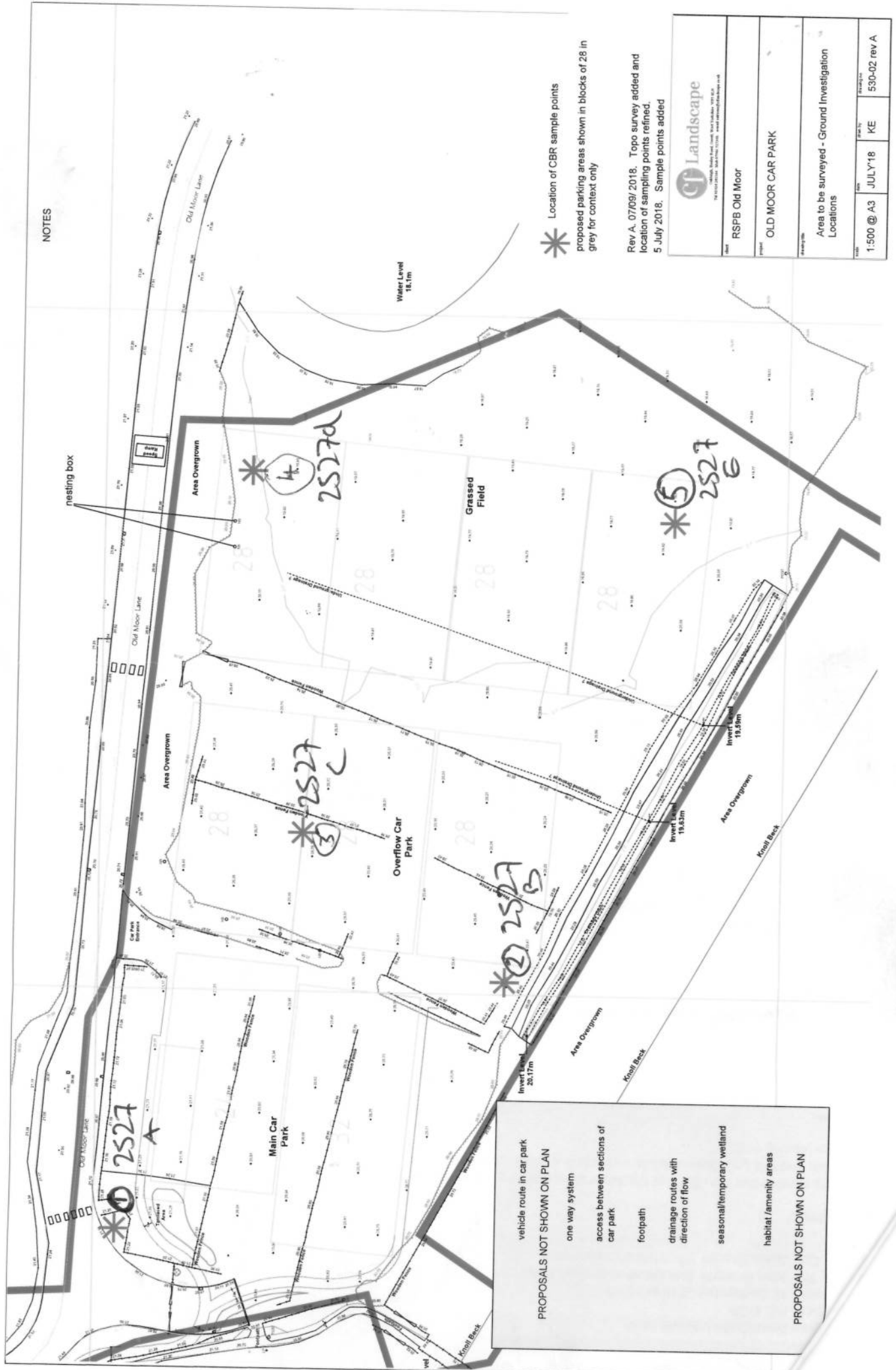
Determination of equivalent CBR by Dynamic Cone Penetrometer



Layer, mm below test start	Mean mm/ blow	Equiv CBR %
0 - 62	10.8	24
62 - 649	7.5	36
649 - 814	14.0	19
Mean	8.2	33

J Church
Managing Director

NOTES



* Location of CBR sample points

proposed parking areas shown in blocks of 28 in grey for context only

Rev A. 07/09/2018. Topo survey added and location of sampling points refined.
5 July 2018. Sample points added

RSPB Old Moor OLD MOOR CAR PARK			
Area to be surveyed - Ground Investigation Locations			
Scale	1:500 @ A3	Drawn by	KE
Project No	JULY'18	Revision	530-02 rev A

vehicle route in car park

PROPOSALS NOT SHOWN ON PLAN

one way system

access between sections of car park

footpath

drainage routes with direction of flow

seasonal/temporary wetland

habitat /amenity areas

PROPOSALS NOT SHOWN ON PLAN