



Surface Water Drainage: Technical Note

Prepared for:
Keith Langmead Ltd

Location:
Wicks Farm, South Yard B,
Ford Lane,
Arundel
BN18 0DF

June 2020

Our reference:
89065-Hall-WicksFrm-230620-v2.0



Document Issue Record

Location:	Wicks Farm, South Yard B, Ford Lane, Arundel BN18 0DF				
Application:	Erection of a single span warehouse of 450 sq m adjacent to the existing warehouses of 900 sq m				
Prepared for:	Keith Langmead Ltd				
Title:	Surface Water Drainage Technical Note				
Project No.:	89065	Date:	23 rd June 2020	Issue No.:	2.0
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1. Introduction

- 1.1. This Surface Water Drainage Technical Note has been prepared by Unda Consulting Limited on behalf of Keith Langmead Ltd, to address Condition 5 of planning application Decision Notice F/5/19/PL.
- 1.2. Planning application F/5/19/PL relates to *Erection of a single span warehouse of 450 sq m adjacent to the existing warehouses of 900 sq m*. These works are proposed to be undertaken at Wicks Farm, South Yard B, Ford Lane, Arundel BN18 0DF.
- 1.3. Post development the total roof area of the new warehouse will be 450m².
- 1.4. This report assesses the surface water drainage arrangement for the proposed development, which forms Condition 5 of Decision Notice F/5/19/PL. Condition 5 states the following:

Condition 5:

Development shall not commence, other than works of site survey and investigation, until full details of the proposed surface water drainage scheme have been submitted to and approved in writing by the Local Planning Authority. The design should follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations, and the recommendations of the SuDS Manual produced by CIRIA. Winter groundwater monitoring to establish highest annual ground water levels and winter Percolation testing to BRE 365, or similar approved, will be required to support the design of any Infiltration drainage. No building / No part of the extended building shall be occupied until the complete surface water drainage system serving the property has been implemented in accordance with the agreed details and the details so agreed shall be maintained in good working order in perpetuity.

Reason:

To ensure that the proposed development is satisfactorily drained in accordance with policies W SP1, W DM1, W DM2 and W DM3 of the Arun Local Plan. This is required to be a pre-commencement condition because it is necessary to implement the surface water drainage system prior to commencing any building works.

- 1.5. This Technical Note provides the information required to address the surface water drainage elements of planning application F/5/19/PL.

2. Existing Site:

- 2.1. The site is occupied by Redstone Tyres and is approximately 4091m² in size. The site currently comprises two warehouse buildings, located in the north east, which have a combined footprint of 900m². According to Google imagery the remaining area of the site appears to be underlain by gravel and hardstanding, including the area proposed to be developed in the south east.
- 2.2. According to available information the site is underlain by approximately 900m² of built footprint, thus the existing site is considered to be formed of approximately 22% impermeable surfaces.
- 2.3. The site is located on the outskirts of Ford, a village and civil parish in the Arun District of West Sussex. The application area is predominantly surrounded by agricultural land with Ford Lane forming the northern periphery. Two residential dwellings are located adjacent east, labelled Boundary Cottages on OS mapping. According to aerial imagery a number of light industrial units are situated to the north of Ford Lane and appear to form a small industrial estate some 60m east of the site boundary.
- 2.4. The site is located 1.1km west of the nearest main watercourse, the River Arun.

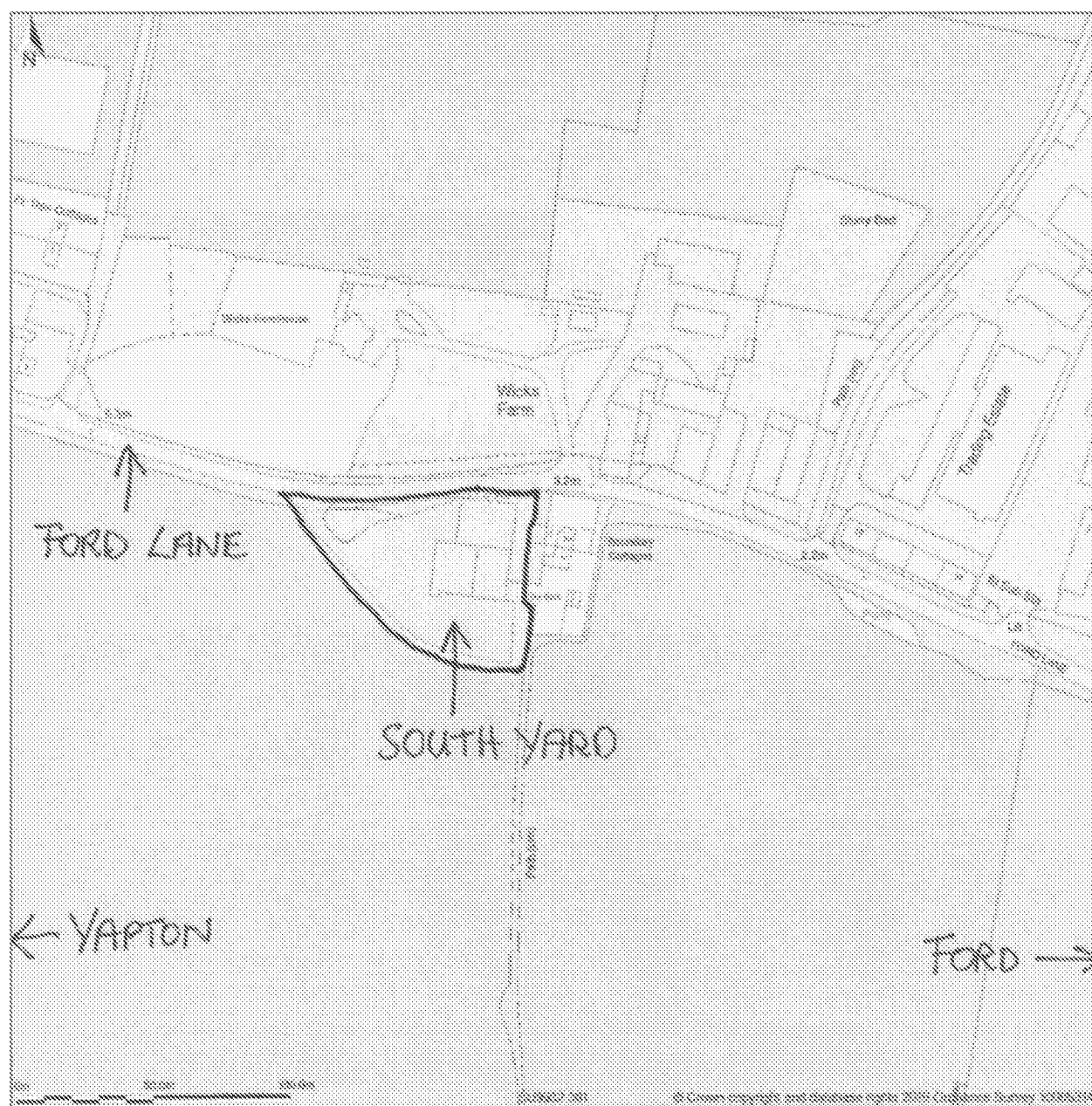


Figure 1: Site Location (Source: OS)

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Figure 2: Aerial View (Source: Google Earth)

Site Topography:

- 2.5. Topographical spot heights have been provided by the client for inclusion within this assessment. These indicate that levels on site range between 4.02mAOD in the north east and 6.48mAOD along the southern boundary. Information provided by the client would suggest that the site gently slopes down from higher land along the southern periphery towards the north.
- 2.6. According to the topographical survey provided, the new warehouse will be developed upon land with an elevation of between 5.00mAOD and 6.41mAOD.
- 2.7. The client has stated that their preferred location for any proposed SuDS feature is to the south of the proposed warehouse. Whilst the provided topographic survey does not extend to cover this section of land Environment Agency 1.0m resolution LiDAR data is available for the site and surrounding area. 1.0m horizontal resolution DTM LiDAR data suggests that the ground topography to the south of the proposed warehouse has an approximate elevation of 6.10mAOD.

Existing Ground Conditions:

- 2.8. The 1:50,000 BGS map shows the site to be located upon the bedrock of Lewes Nodular Chalk. This strata was formed between the Turonian Age and Campanian Age.
- 2.9. According to BGS records superficial deposits comprising Raised Beach Deposits and River Terrace Deposits underlie the site.
- 2.10. The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Deep River Loam with a soil texture of Sand to Sandy Loam.
- 2.11. In light of the underlying geology the client has provided results from an intrusive site investigation which was undertaken by RSK between October 2019 and February 2020. Having reviewed available information the nearest trial pit to the development, and proposed SuDS location, is labelled T4 (refer to appendix).
- 2.12. RSK have reported that T4 was excavated to dimensions 0.6m x 1.6m x 1.8m deep (refer to location plan in the appendix).
- 2.13. According to the information provided, three complete infiltration test cycles were achieved within Trial Pit Four, in full accordance with BRE365, and indicate that there is the potential for infiltration within land to the south the development. Refer to the site investigation results within appendix.
- 2.14. Infiltration testing within Trial Pit Four revealed drainage rates in the underlying strata between 5.54×10^{-5} m/s and 5.97×10^{-5} m/s. Out of the three complete cycles achieved the slowest recorded infiltration rate was 5.54×10^{-5} m/s, in accordance to BRE365. This rate is suitable for infiltration SuDS and has been utilised for the calculations and sizing of the proposed infiltration features. Refer to appendix.
- 2.15. As part of the intrusive works package provided by RSK, seasonal groundwater monitoring has been undertaken in the wider area. Groundwater levels were monitored for a three month duration (between October 2019 and January 2020) and indicate that the maximum winter groundwater level reached approximately 2.70mAOD.
- 2.16. Comparison of the recorded maximum winter groundwater level with topographic spot heights at the development (5.00mAOD to 6.41mAOD) show that the winter groundwater level is at least 2.30mbgl at the site.
- 2.17. The published Environment Agency Groundwater Vulnerability map shows the site is not located within an area classified as a Groundwater Source Protection Zone.

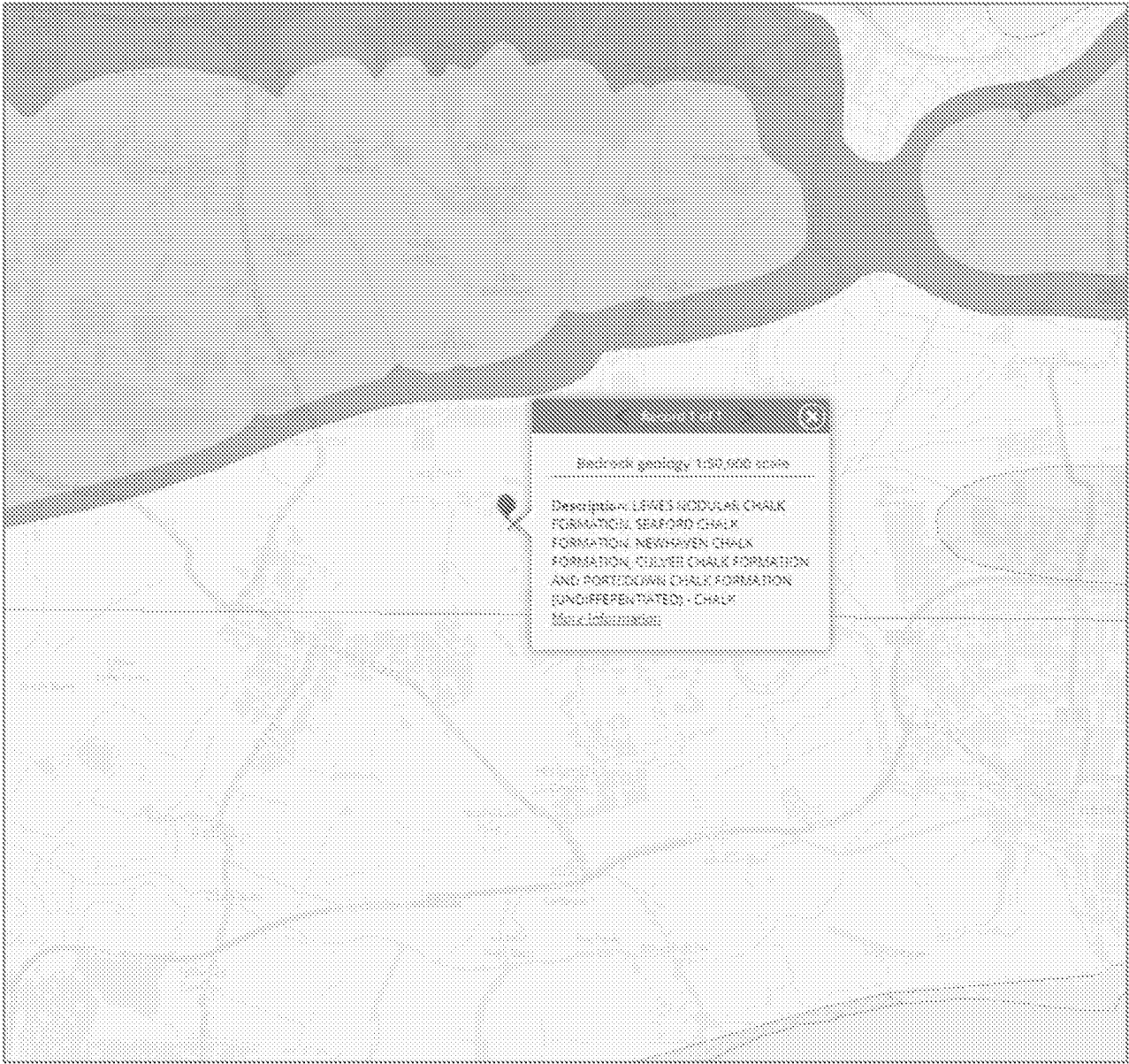


Figure 3: BGS Bedrock Geology (Source: BGS)

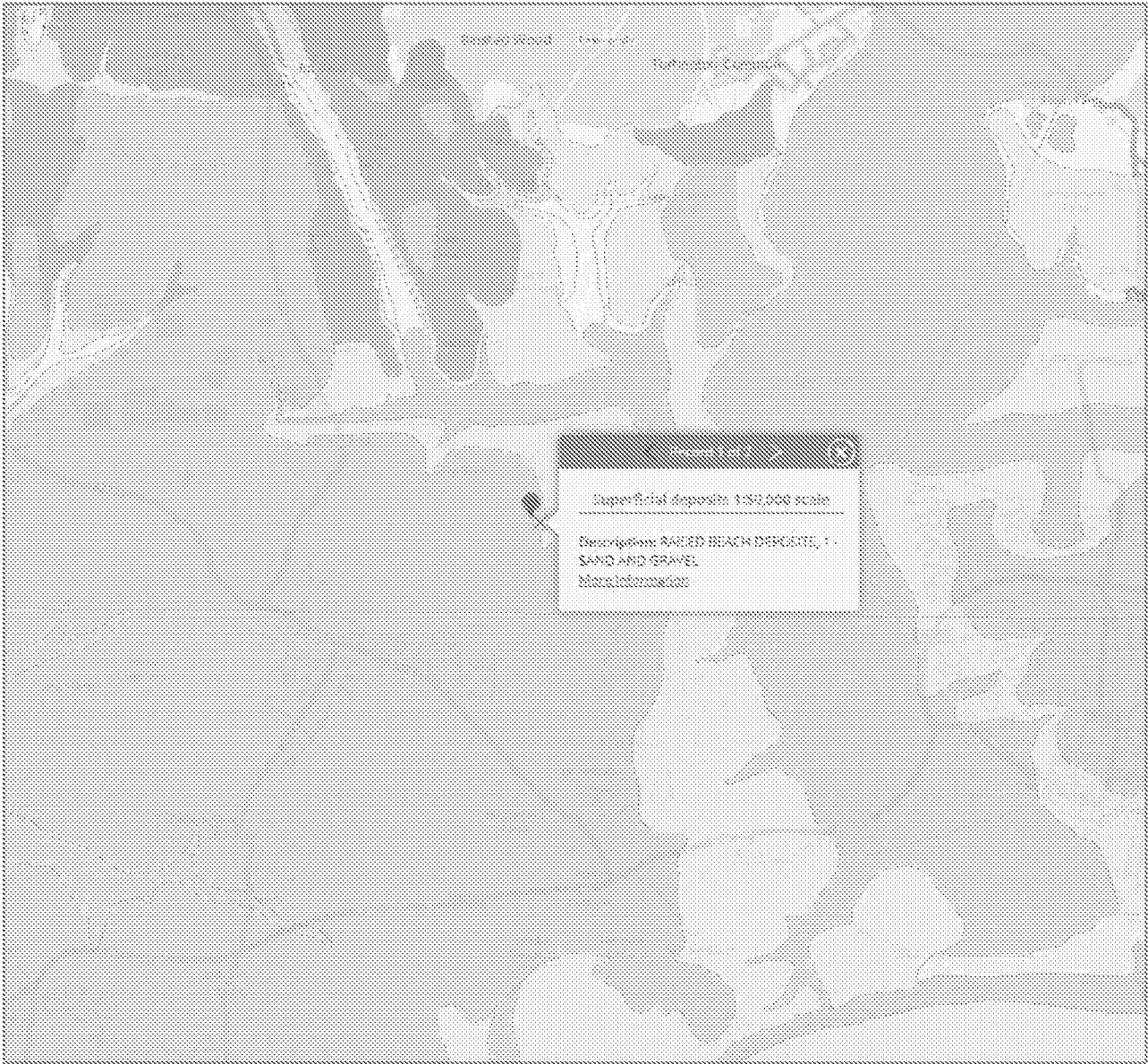


Figure 4: BGS Superficial Geology (Source: BGS)

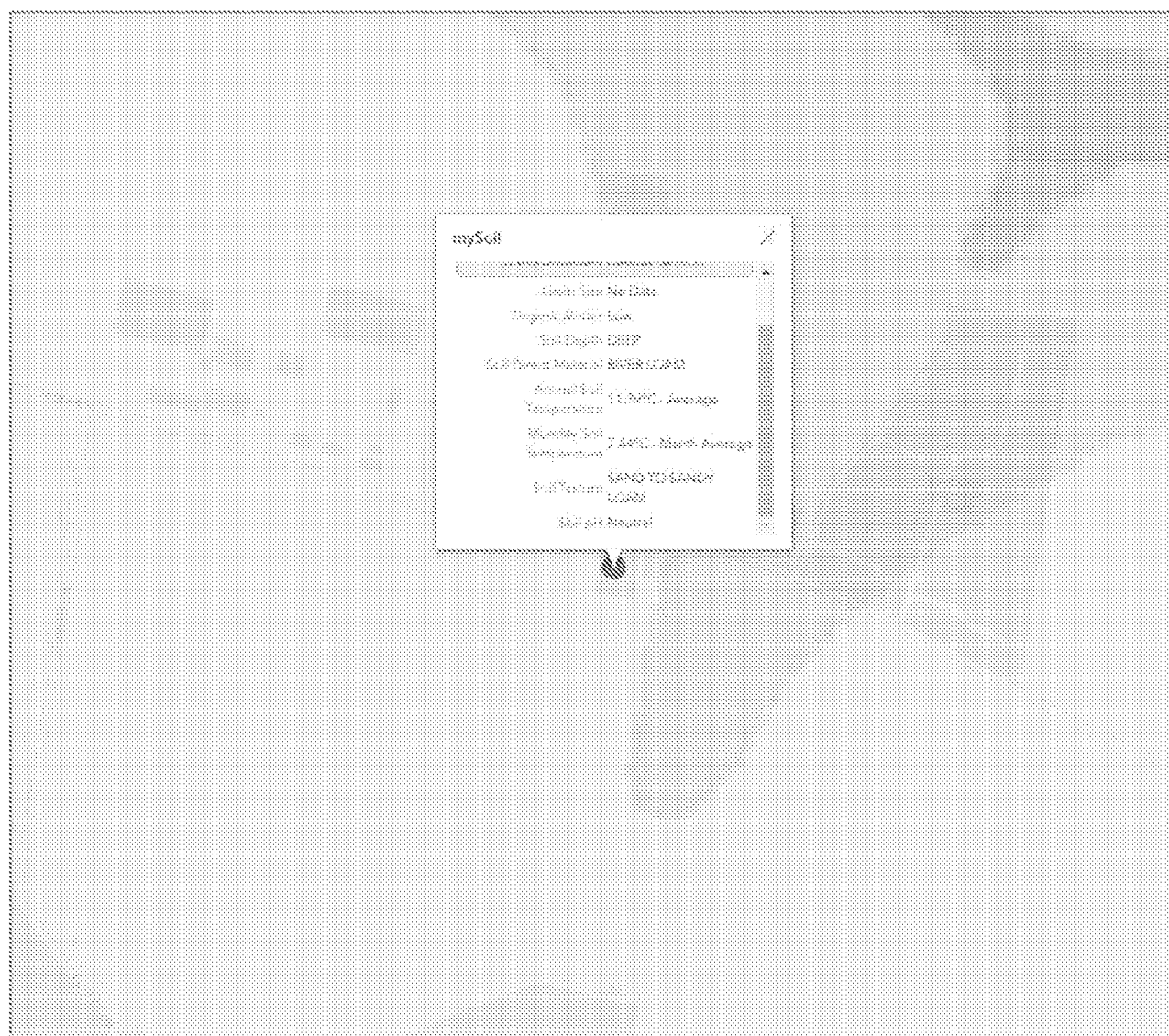


Figure 5: Soil Map (Source: UK Soils, BGS)

Nearby Watercourses / Drainage Features:

- 2.18. There are no existing watercourses or rivers within a close proximity to the site.
- 2.19. According to aerial mapping the closest water features to the site include a pond located 115m east, along Ford Lane, and the River Arun some 1.1km east.

Existing Drainage:

- 2.20. No information relating to the existing drainage arrangements at the site have been provided for inclusion within this report.
- 2.21. However, given that the site is in light industrial use and several downpipes from the existing buildings can be identified on Google Streetview, surface water runoff generated within the existing site boundary is assumed to currently discharge at an uncontrolled rate to ground or via an existing service connection to a sewer beneath Ford Lane.

3. Development Proposals:

Proposed Development:

- 3.1. The proposed planning application is for *Erection of a single span warehouse of 450 sq m adjacent to the existing warehouses of 900 sq m*. Post development the total roof area of the new warehouse will cover 450m².
- 3.2. However, it is worth noting that the majority of the proposed built footprint is already underlain by hardstanding thus generating surface water runoff from the site.
- 3.3. **Despite this, SuDS sizing within the strategy has been based on a total roof area of 450m² thus significant betterment will be provided post development.**

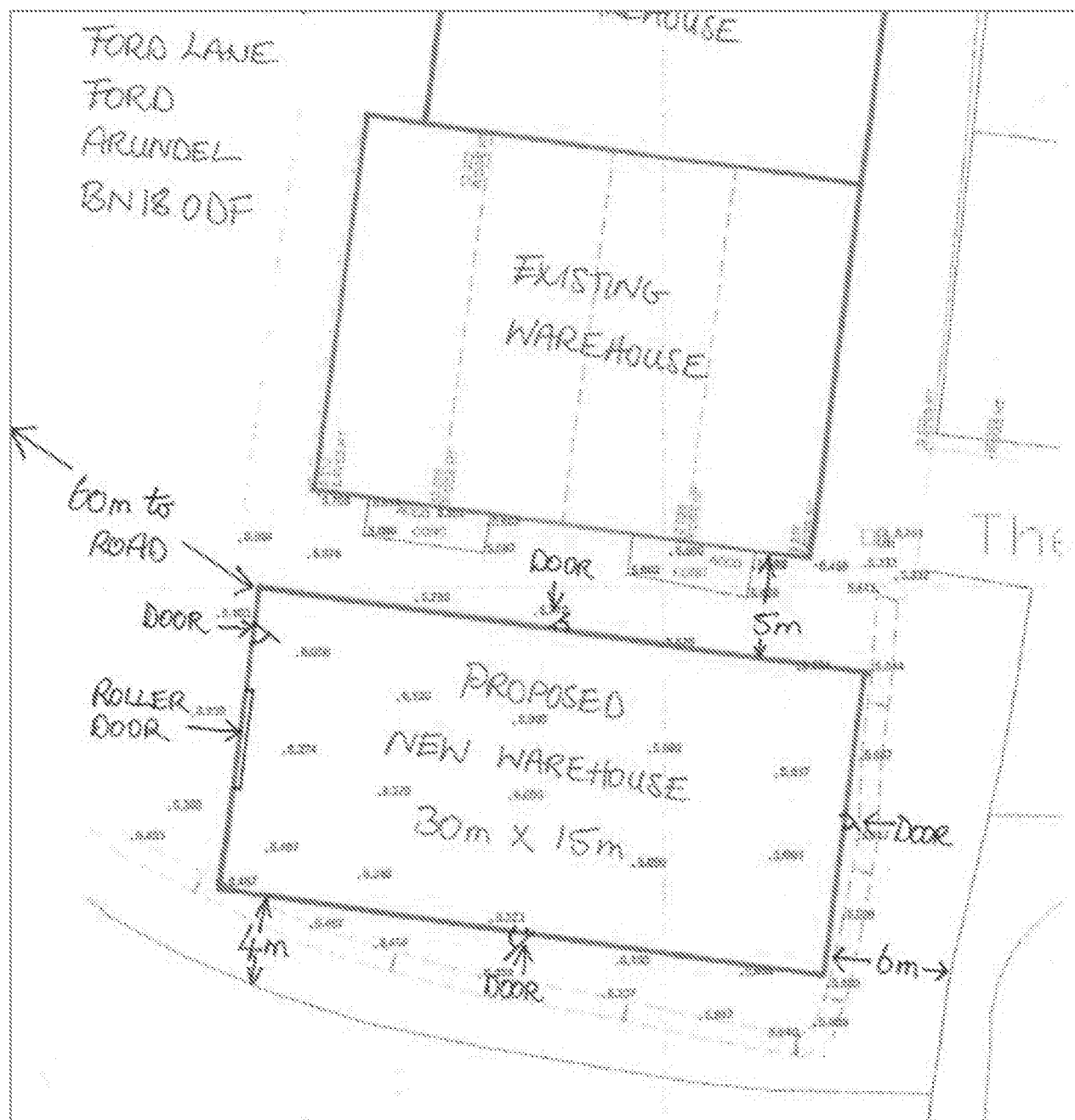


Figure 6: Proposed Site Layout Plan (Source: Keith Langmead Ltd)

4. Surface Water Drainage Strategy:

- 4.1. In order to mitigate flood risk posed by post development runoff, adequate control measures will need to be considered within the site. This will ensure that surface water runoff is dealt with at source and flood risk is not increased elsewhere.

Drainage Hierarchy:

- 4.2. The drainage strategy for the site has been prepared according to the drainage discharge hierarchy from CIRIA C753 The Suds Manual, as follows:
- Infiltration to the maximum extent that is practical;
 - Discharge to surface waters;
 - Discharge to surface water sewer.
- 4.3. The majority of the proposed warehouse built footprint appears to be currently underlain by hardstanding, thus already generates surface water runoff from the site. **Despite this, all post development roof runoff (450m²) will be managed in accordance with sustainable drainage principles. Therefore, significant betterment will be provided post development when compared to the existing situation.**

Infiltration Potential:

Refer to appendix for site investigation.

- 4.4. The 1:50,000 BGS map shows the site to be located upon Raised Beach Deposits and River Terrace Deposits with Lewes Nodular Chalk bedrock beneath.
- 4.5. Raised Beach, River Terrace and Lewes Nodular Chalk are all potentially permeable therefore infiltration testing has been undertaken to determine applicable percolation rates.
- 4.6. The client has provided results from an intrusive site investigation which was undertaken by RSK between October 2019 and February 2020. Having reviewed the information sent through the nearest trial pit to the development, and proposed SuDS location, is labelled T4 (refer to appendix).
- 4.7. RSK have reported that T4 was excavated to dimensions 0.6m x 1.6m x 1.8m deep (refer to location plan in the appendix).
- 4.8. According to the information provided, three complete infiltration test cycles were achieved within Trial Pit Four, in full accordance with BRE365, and indicate that there is the potential for infiltration within land to the south the development. Refer to the site investigation results within appendix.
- 4.9. Infiltration testing within Trial Pit Four revealed drainage rates in the underlying strata between 5.54×10^{-5} m/s and 5.97×10^{-5} m/s. Out of the three complete cycles achieved the slowest recorded infiltration rate was 5.54×10^{-5} m/s, in accordance to BRE365. This rate is suitable for infiltration SuDS and has been utilised for the calculation and sizing of the proposed infiltration feature. Refer to appendix.
- 4.10. Following submission of the initial drainage strategy (89065-Hall-WicksFrm-200320-v1.0) further consultation correspondence has been received from Sarah Burrows (Engineering Assistant at Arun District Council). Consultation Correspondence email F/10/20/DOC, dated 18th May 2020, states the following:

As the soakaway acts as a blanket with an effective depth of 0.3m it is appropriate to use the base for the calculations. However, the soakaway invert level is at 0.8mbgl, this depth does not correspond with the infiltration test depth of 1.77mbgl. If the infiltration test results are to be used then the soakaway base should be at the same depth as the testing (noted that this was at the top of the chalk stratum with clay above). There are two options:

- a) *Make the soakaway deeper to correspond with the existing tests. The deeper soakaway may have to utilise the sides only for the calculations, please contact us to agree this in advance of a further submission.*
- b) *Carry out winter infiltration tests at the depth of the proposed soakaway and use these to inform the design, utilising the base in the calculations.*

- 4.11. In light of the consultation comments outlined above, discussions were held with Sarah Burrows on 19th June 2020 to determine an appropriate methodology for the calculation of a deeper soakaway in line with point (a).

- 4.12. It was agreed with Sarah Burrows that any proposed soakaway should be located at a depth of 1.77mbgl, to reflect the depth of in-situ testing, and should be sized based upon an infiltration rate of 5.54×10^{-5} m/s applied to soakaway sides only.
- 4.13. Given this, all soakaway sizing within the report (v2.0) has been revised and is based upon lateral infiltration only at a rate of 5.54×10^{-5} m/s. Revised calculations have not allowed for any infiltration from the soakaway base.
- 4.14. All SUDS facilities will be designed to accommodate and dispose of runoff from storms up to the 1:100 year + 40% climate change event.

Proposed Discharge Rate:

- 4.15. Existing greenfield runoff rates for the total site have been calculated as 0.7 l/s for the 1:1 annual runoff event, 1.8 l/s for the 1:30 year event and 2.5 l/s for the 1:100 year event. Refer to calculations in appendix.
- 4.16. However, the existing site is brownfield and covered by approximately 900m² of built footprint. The existing site is therefore approximately 22% impermeable surfaces. Runoff rates for the existing site (including the 22% impermeable coverage) have been calculated using MicroDrainage as 1.0 l/s for the 1:1 annual runoff event, 2.4 l/s for the 1:30 year event and 3.2 l/s for the 1:100 year event. It is important to note that existing hardstanding at the site has not been included within these figures therefore the true brownfield runoff rates are considered to be higher.
- 4.17. Roof runoff from the proposed warehouse will be directed, collected and stored in a soakaway located beneath soft landscaping to the south of the proposed development.
- 4.18. From the soakaway runoff will gradually infiltrate into the ground.
- 4.19. It is proposed to discharge post development runoff to ground, therefore, there will be no off-site discharge post development.

Soakaways:

- 4.20. The proposed development comprises some 450m² of potentially impermeable surfacing.
- 4.21. Runoff from the proposed warehouse roof will be directed towards a soakaway feature located beneath soft landscaping to the south. From the cellular soakaway storage units, runoff will gradually infiltrate into the underlying strata.
- 4.22. Given that the site is underlain by chalk strata, a minimum distance of 10m should be maintained from all buildings in accordance with CIRIA C574. This has been taken into consideration when determining the location of the SuDS feature in drainage layout plan 89065-01.
- 4.23. Following a conversation with Sarah Burrows (Engineering Assistant at Arun District Council) on 19th June 2020, the proposed soakaway has been sized based upon an infiltration rate of 5.54×10^{-5} m/s applied to soakaway sides only.
- 4.24. The soakaway sizing detailed below is based upon lateral infiltration only at a rate of 5.54×10^{-5} m/s. The revised calculations have not allowed for any infiltration from the soakaway base.
- 4.25. Preliminary calculations indicate that sufficient storage required to attenuate runoff from the proposed warehouse roof, arising from the critical 1:100 year + 40% climate change event, can be provided within a cellular soakaway structure of dimensions 100m² x 0.36m deep x 0.95 (void ratio).
- 4.26. Preliminary calculations indicate that some 32.9m³ of storage is required to attenuate the runoff for all storms up to and including the 1:100 year + 40% climate change event.
- 4.27. All preliminary surface water drainage calculations have been undertaken using MicroDrainage software. Refer to the appendix.

Water Quality:

- 4.28. Runoff from roof areas is considered to be uncontaminated thus does not warrant any form of treatment process to improve water quality.
- 4.29. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.

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Design Exceedance:

- 4.30. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. Any resultant floodwater will be naturally routed away from the proposed warehouse. Runoff flow can be managed through detailing the new external levels to direct water west and south, away from structures and into the adjacent fields, within the blue outline boundary. If this is to occur exceedance flows will dissipate via infiltration and evaporation.

Adoption and Maintenance:

- 4.31. It is proposed that all SuDS facilities will be maintained privately by the end user.
- 4.32. A draft Maintenance Schedule is outlined in the Table below.

Cellular Soakaways

- 4.33. The design of soakaways should include monitoring points where the water level in the system can be observed or measured. This can either be via an inspection well or inspection cover. The useful life and effective operation of an infiltration component is related to the frequency of maintenance and the risk of sediment being introduced into the system.
- 4.34. It is not envisaged that silt build up within the cellular soakaway will require a rigorous maintenance regime so long as silt is removed from upstream catch pits and inspection chambers on a regular basis. Notwithstanding this, a suitable maintenance regime for the systems will comprise routine inspection and silt removal (as necessary). Inspection should be undertaken using CCTV equipment within the infiltration tank. Camera access can be gained via inspection chambers and inlet pipework located at each end of the tunnels.
- 4.35. Silt removal can be achieved by jetting the inspection tunnels. Jetting should be undertaken in accordance with current jetting guidelines, in particular the Code of Practice for Sewer Jetting published by The Water Research Centre. Jetting at 150bar at 300l/min should be more than adequate in removing any build-up of material within the soakaway.
- 4.36. A standard jet head with rear facing nozzles should be used. The head should be fed to the far end of the crate tunnel via the nearest inspection chamber, activated and retracted. As the nozzle is removed, debris will be swept back into the inspection chamber where it can then be removed with the use of a standard gully sucker. This method will ensure the effective removal of gross solids (carrier bags, cans, leaf litter etc.) from the system. Whilst 100% removal cannot be guaranteed, it has been shown that this jetting method will also remove an element of finer material which would otherwise be 'lost' within the system.

Pipework and Catchpits:

- 4.37. It is not envisaged that silt build up within the pipework systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits on a regular basis. Notwithstanding this, a suitable maintenance regime for the systems will comprise of routine inspection (every three months) and silt removal (as necessary).

Drainage Element	Maintenance Requirement	Frequency
Gutters & downpipes	Inspect and remove silt/ debris	To be inspected every three months and silt/ debris removed as necessary.
Catchpits and inspection chambers	Inspect and remove silt	To be inspected every three months and silt/ debris removed as necessary. Flow control to be checked for blockages.
Cellular Soakaways	Inspect and remove debris	To be inspected annually and silt removed as necessary.

Table 1: Suggested Maintenance Regime for Elements of the Drainage Infrastructure

Note: In addition to the above maintenance requirements, it is recommended that all drainage elements are inspected:

- Following the first storm event
- Monthly for the first 3 months following commissioning

5. Discussion and Conclusions:

- 5.1. This Surface Water Drainage Technical Note has been prepared by Unda Consulting Limited on behalf of Keith Langmead Ltd, to address Condition 5 of planning application Decision Notice F/5/19/PL.
- 5.2. Planning application F/5/19/PL relates to *Erection of a single span warehouse of 450 sq m adjacent to the existing warehouses of 900 sq m*. These works are proposed to be undertaken at Wicks Farm, South Yard B, Ford Lane, Arundel BN18 0DF.
- 5.3. This report assesses the surface water drainage arrangement for the proposed development, which forms Condition 5 of Decision Notice F/5/19/PL. Condition 5 states the following:

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Reason:

To ensure that the proposed development is satisfactorily drained in accordance with policies W SP1, W DM1, W DM2 and W DM3 of the Arun Local Plan. This is required to be a pre-commencement condition because it is necessary to implement the surface water drainage system prior to commencing any building works.

- 5.4. The site is occupied by Redstone Tyres and is approximately 4091m² in size. The site currently comprises two warehouse buildings, located in the north east, which have a combined footprint of 900m². According to Google imagery the remaining area of the site appears to be underlain by gravel and hardstanding, including the area proposed to be developed in the south east.
- 5.5. According to available information the site is underlain by approximately 900m² of built footprint, thus the existing site is considered to be formed of approximately 22% impermeable surfaces.
- 5.6. Topographical spot heights have been provided by the client for inclusion within this assessment. According to the topographical survey provided, the new warehouse will be developed upon land with an elevation of between 5.00mAOD and 6.41mAOD.
- 5.7. The client has stated that their preferred location for any proposed SuDS feature is to the south of the proposed warehouse. Whilst the provided topographic survey does not extend to cover this section of land Environment Agency 1.0m resolution LiDAR data is available for the site and surrounding area. 1.0m horizontal resolution DTM LiDAR data suggests that the ground topography to the south of the proposed warehouse has an approximate elevation of 6.10mAOD.
- 5.8. The proposed planning application is for *Erection of a single span warehouse of 450 sq m adjacent to the existing warehouses of 900 sq m*. Post development the total roof area of the new warehouse will cover 450m².
- 5.9. However, it is worth noting that the majority of the proposed built footprint is already underlain by hardstanding thus generating surface water runoff from the site.
- 5.10. Despite this, SuDS sizing within the strategy has been based on a total roof area of 450m² thus significant betterment will be provided post development.
- 5.11. The 1:50,000 BGS map shows the site to be located upon the bedrock of Lewes Nodular Chalk. This strata was formed between the Turonian Age and Campanian Age. According to BGS records superficial deposits comprising Raised Beach Deposits and River Terrace Deposits underlie the site.
- 5.12. The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Deep River Loam with a soil texture of Sand to Sandy Loam.
- 5.13. The published Environment Agency Groundwater Vulnerability map shows the site is not located within an area classified as a Groundwater Source Protection Zone.

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Surface Water Drainage Discussion

- 5.14. The 1:50,000 BGS map shows the site to be located upon Raised Beach Deposits and River Terrace Deposits with Lewes Nodular Chalk bedrock beneath. Raised Beach, River Terrace and Lewes Nodular Chalk are all potentially permeable therefore infiltration testing has been undertaken to determine applicable percolation rates.
- 5.15. The client has provided results from an intrusive site investigation which was undertaken by RSK between October 2019 and February 2020. Having reviewed the information sent through the nearest trial pit to the development, and proposed SuDS location, is labelled T4 (refer to appendix).
- 5.16. RSK have reported that T4 was excavated to dimensions 0.6m x 1.6m x 1.8m deep (refer to location plan in the appendix).
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- 5.19. Following submission of the initial drainage strategy (89065-Hall-WicksFrm-200320-v1.0) further consultation correspondence has been received from Sarah Burrows (Engineering Assistant at Arun District Council). Consultation Correspondence email F/10/20/DOC, dated 18th May 2020, states the following:
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- c) Make the soakaway deeper to correspond with the existing tests. The deeper soakaway may have to utilise the sides only for the calculations, please contact us to agree this in advance of a further submission.*
 - d) Carry out winter infiltration tests at the depth of the proposed soakaway and use these to inform the design, utilising the base in the calculations.*
- 5.20. In light of the consultation comments outlined above, discussions were held with Sarah Burrows on 19th June 2020 to determine an appropriate methodology for the calculation of a deeper soakaway in line with point (a).
- 5.21. It was agreed with Sarah Burrows that any proposed soakaway should be located at a depth of 1.77mbgl, to reflect the depth of in-situ testing, and should be sized based upon an infiltration rate of 5.54×10^{-5} m/s applied to soakaway sides only.
- 5.22. Given this, all soakaway sizing within the report (v2.0) has been revised and is based upon lateral infiltration only at a rate of 5.54×10^{-5} m/s. Revised calculations have not allowed for any infiltration from the soakaway base.
- 5.23. All SUDS facilities will be designed to accommodate and dispose of runoff from storms up to the 1:100 year + 40% climate change event.
- 5.24. Existing greenfield runoff rates for the total site have been calculated as 0.7 l/s for the 1:1 annual runoff event, 1.8 l/s for the 1:30 year event and 2.5 l/s for the 1:100 year event. Refer to calculations in appendix.
- 5.25. However, the existing site is brownfield and covered by approximately 900m² of built footprint. The existing site is therefore approximately 22% impermeable surfaces. Runoff rates for the existing site (including the 22% impermeable coverage) have been calculated using MicroDrainage as 1.0 l/s for the 1:1 annual runoff event, 2.4 l/s for the 1:30 year event and 3.2 l/s for the 1:100 year event.
- 5.26. Roof runoff from the proposed warehouse will be directed, collected and stored in a soakaway located beneath soft landscaping to the south of the proposed development. From the soakaway runoff will gradually infiltrate into the ground.
- 5.27. Given that the site is underlain by chalk strata, a minimum distance of 10m should be maintained from all buildings in accordance with CIRIA C574. This has been taken into consideration when determining the location of the SuDS feature in drainage layout plan 89065-01.

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- 5.28. Following a conversation with Sarah Burrows (Engineering Assistant at Arun District Council) on 19th June 2020, the proposed soakaway has been sized based upon an infiltration rate of 5.54×10^{-5} m/s applied to soakaway sides only.
- 5.29. The soakaway sizing detailed below is based upon lateral infiltration only at a rate of 5.54×10^{-5} m/s. The revised calculations have not allowed for any infiltration from the soakaway base.
- 5.30. Preliminary calculations indicate that sufficient storage required to attenuate runoff from the proposed warehouse roof (450m²), arising from the critical 1:100 year + 40% climate change event, can be provided within a cellular soakaway structure of dimensions 100m² x 0.36m deep x 0.95 (void ratio).
- 5.31. Preliminary calculations indicate that some 32.9m³ of storage is required to attenuate the runoff for all storms up to and including the 1:100 year + 40% climate change event.
- 5.32. Water quality has been assessed in line with the Simple Index approach from Chapter 26 of CIRIA C753 The SuDS Manual. Runoff from roof areas is considered to be uncontaminated thus does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.
- 5.33. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.
- 5.34. This drainage strategy has been undertaken in accordance with the principles set out in NPPF. We can conclude that providing the development adheres to the conditions advised above, the said development proposals can be accommodated without increasing flood risk within the locality in accordance with objectives set by Central Government and the EA.

Unda Consulting Limited

June 2020

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6. Appendix

A - Plans by others:

- Location Plan – Keith Langmead Ltd;
- Topographic Survey and Proposed Layout Plan – Keith Langmead Ltd;
- Warehouse Elevations - Keith Langmead Ltd.

B – Arun District Council Correspondence:

- Planning Application F/5/19/PL Decision Notice;
- Consultation Correspondence Email F/10/20/DOC, dated 18th May 2020.

C - MicroDrainage Calculations:

- ICP SUDS Rural Runoff Calculations;
- ICP SUDS Urban Runoff Calculations;
- Soakaway Sizing Calculations (based upon lateral infiltration only).

D - Plans:

- Proposed Drainage Layout [89065-01].

E – Documents by Others:

- Intrusive Site Investigation Results – RSK;
- Stormbloc Optimum (Cellular Storage Tank) Product Specification - Hydro International.

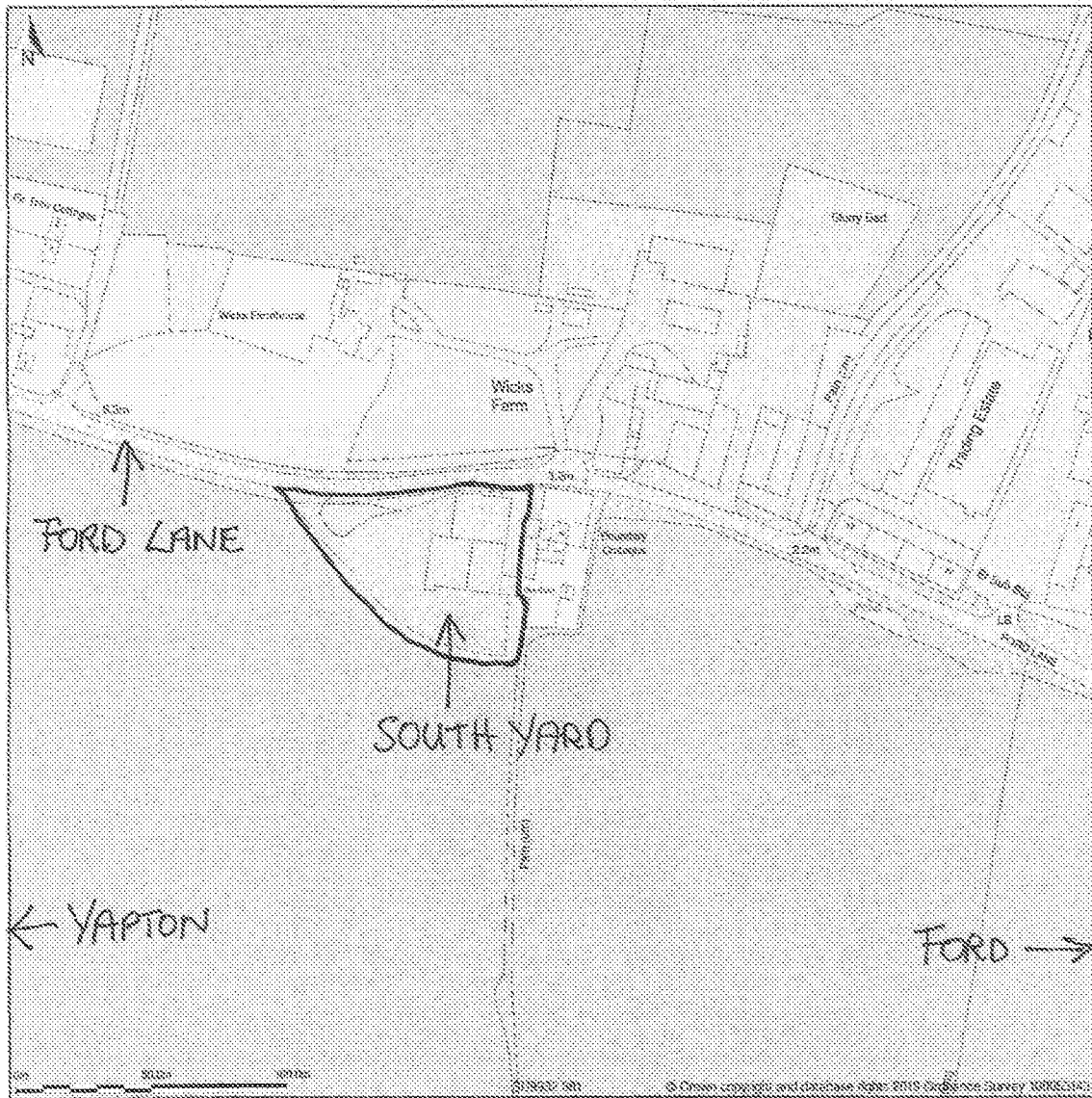
Appendix A

Commercial in Confidence

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SOUTH YARD

Boundary Collages, Ford Lane, Ford, West Sussex, BN18 0DF



1:2500

Site Plan shows area bounded by: 499125.78, 103616.41, 499425.78, 104016.41 (at a scale of 1:2500), OSGridRef: SU9922 381. The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

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+ RED LINE



SOUTH YARD
FORD LANE
FORD
ARUNDEL
BN18 0DF

EXISTING
WAREHOUSE

EXISTING
WAREHOUSE

PROPOSED
NEW WAREHOUSE
30m x 15m

DOOR

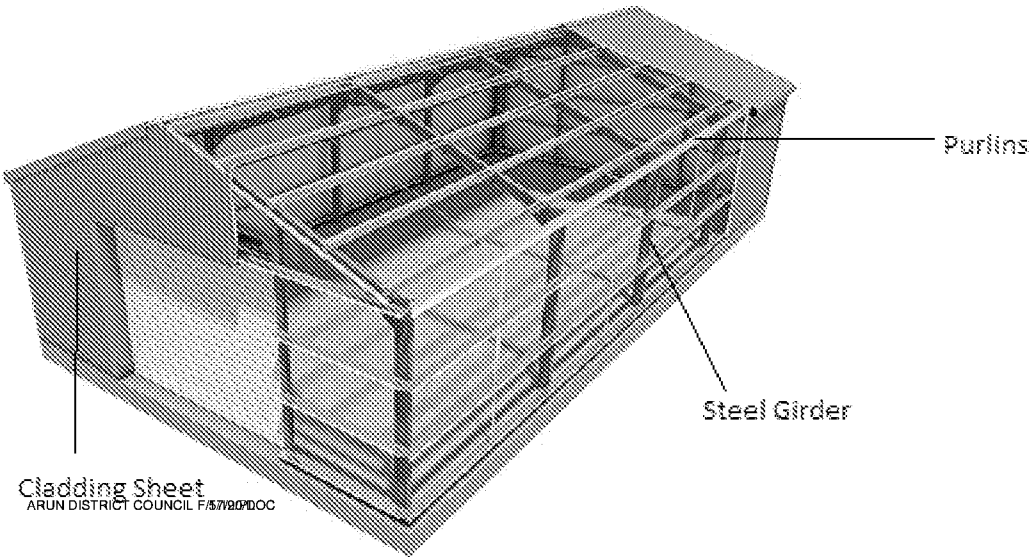
DOOR

ROLLER
DOOR

DOOR

DOOR

FLOOR PLAN



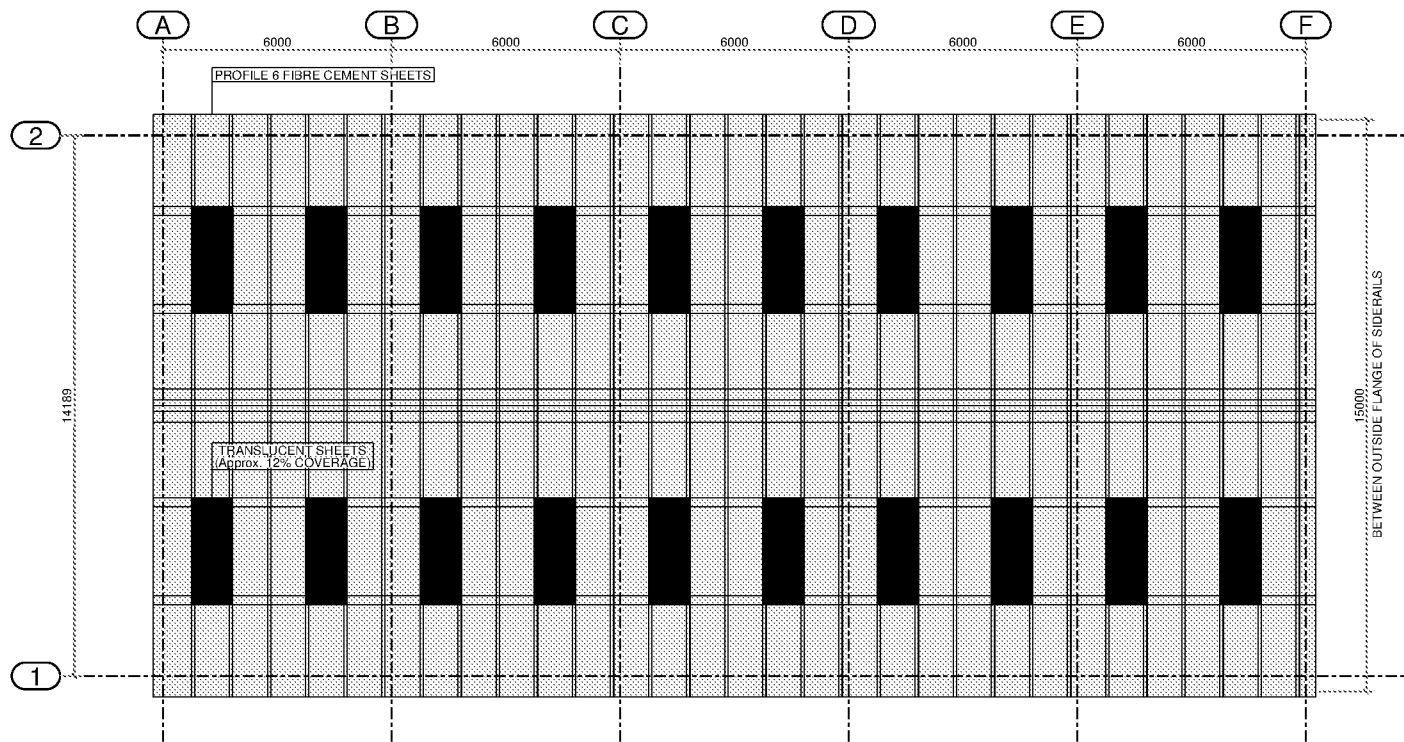
Purlins

Steel Girder

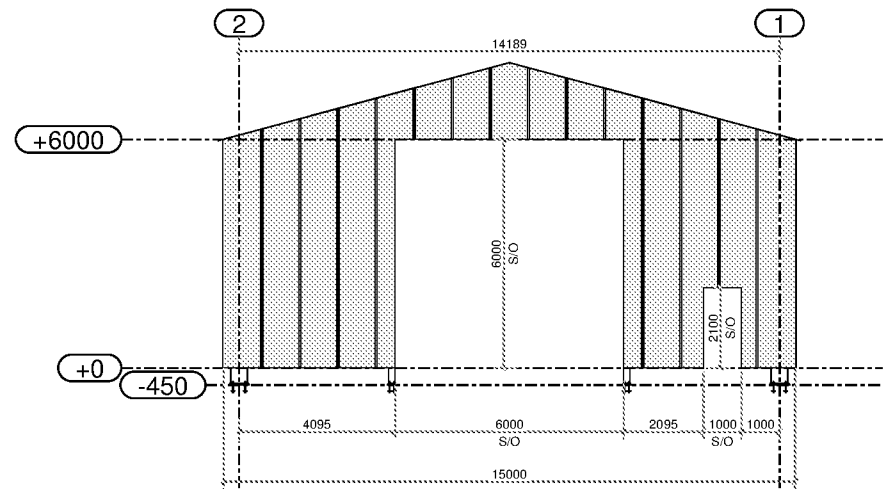
Cladding Sheet

ARUN DISTRICT COUNCIL F/5/7/20/DOC

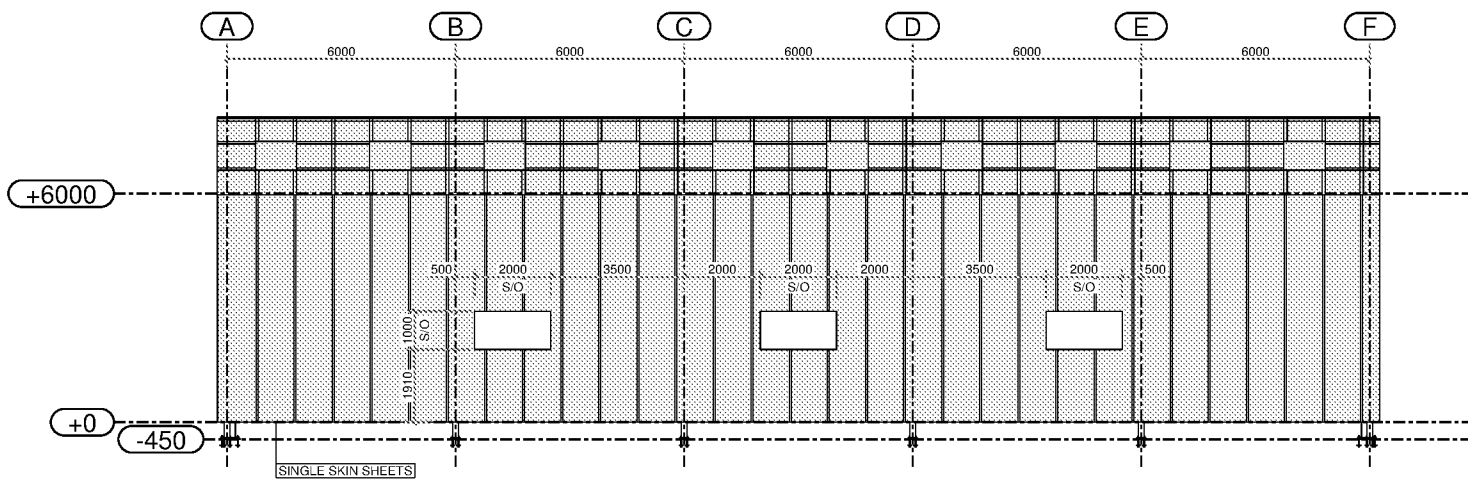




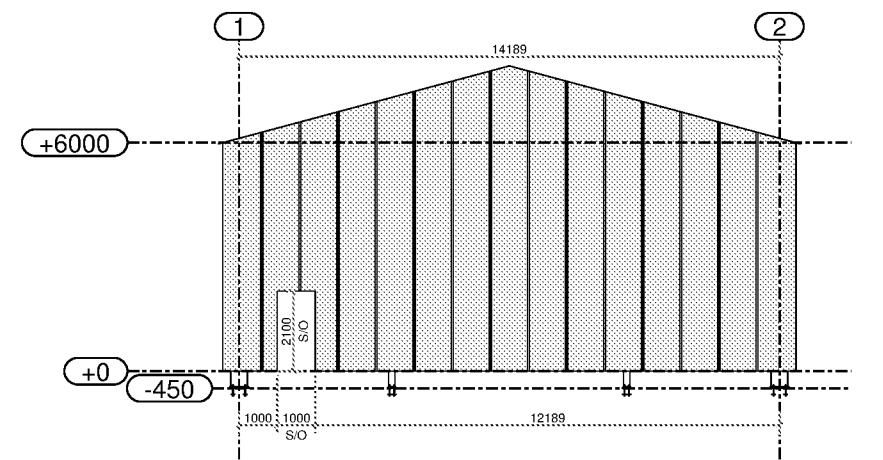
PLAN VIEW



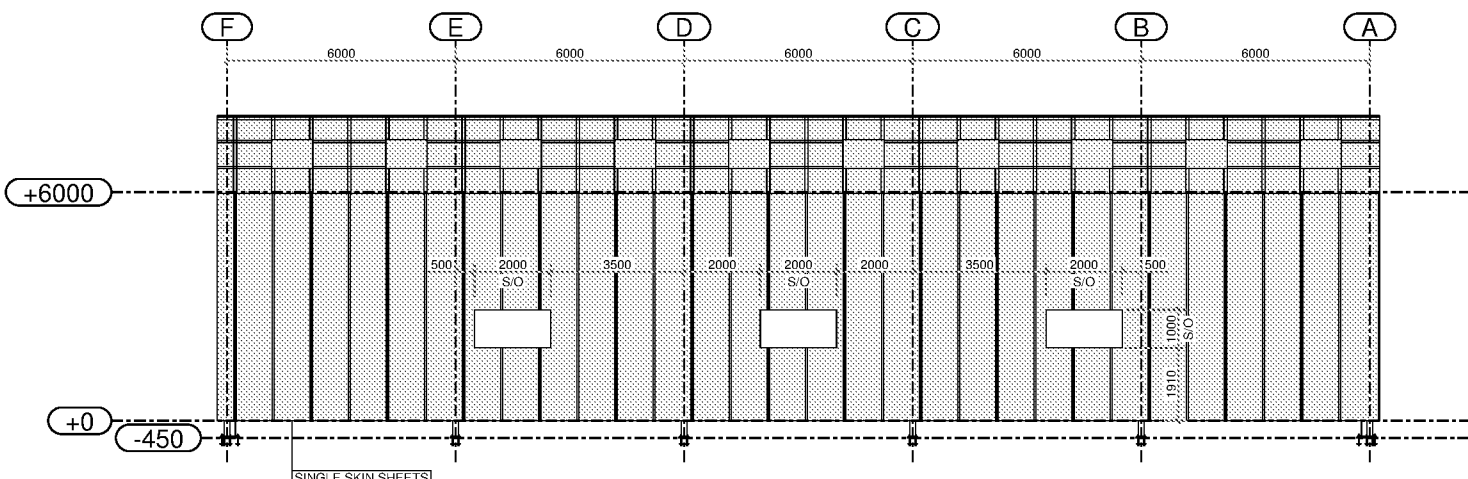
ELEVATION ON GRIDLINE A



ELEVATION ON GRIDLINE 1



ELEVATION ON GRIDLINE F



ELEVATION ON GRIDLINE 2

0	ISSUED FOR TENDER	04.02.2019
REV MARK	REVISION DESCRIPTION	REVISION DATE
DRAWING TITLE	PORTAL CLADDING	
CONTRACT	KIETH LANGMEAD LTD	
MODELLED BY	R.Williams	ISSUE DATE
CONTRACT NO	E10326	SCALE 1:100
DRAWING No	E10326-GA-002	REVISION No. 0

Appendix B

Commercial in Confidence

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Application for Planning Permission

DECISION NOTICE

Application Ref: F/5/19/PL

1 To Addressee

Mr J Hall
John Hall Consulting
113 Limmer Lane
Felpham
Bognor Regis
PO22 7LR

2 Site Address

Wicks Farm, South Yard B
Ford Lane
Ford
BN18 0DF

3 Description of Development

Single span warehouse of 450 sq m adjacent to the existing warehouses of 900 sq m.

4 In pursuance of their powers under this Act and related Orders and Regulations the Council **PERMIT** this development to be carried out in accordance with the application and plans and subject to the following conditions.

- 1 The development hereby permitted shall be begun before the expiration of 3 years from the date of this permission.

Reason: To comply with Section 91 of the Town and Country Planning Act 1990 (as amended).

- 2 The development hereby approved shall be carried out in accordance with the following approved plans:

Site Location Plan, Block plan and floor plan, Elevations plan E10326-GA-001 & E10326-GA-002.

Reason: For the avoidance of doubt and in the interests of amenity and the environment in accordance with Policies D DM1 of the Arun District Local Plan.

- 3 In order to ensure that no detrimental harm occurs to the neighbouring trees to the eastern boundary which are of value, no development shall commence until an Arboricultural Method Statement (AMS) and Tree Protection Plan have been submitted to and agreed in writing by the Local Planning Authority. The Arboricultural Method Statement (AMS) and Tree Protection Plan

shall be carried out as agreed by the Local Planning Authority in perpetuity.

Reason: To ensure the retention and maintenance of trees and vegetation which is an important feature of the area in accordance with policy D DM1 and ENV DM4 of the Arun Local Plan.

- 4 The use hereby permitted shall only take place between the hours of 8:00-19:00 Monday to Saturday (excluding where it falls on Bank/Public Holidays) and 9:00-14:00 on Sundays and Bank/Public Holidays.

Reason: To safeguard the amenities of the neighbouring properties in accordance with Arun District Local Plan policies D DM1 and Q EDM1

- 5 Development shall not commence, other than works of site survey and investigation, until full details of the proposed surface water drainage scheme have been submitted to and approved in writing by the Local Planning Authority. The design should follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations, and the recommendations of the SuDS Manual produced by CIRIA. Winter groundwater monitoring to establish highest annual ground water levels and winter Percolation testing to BRE 365, or similar approved, will be required to support the design of any Infiltration drainage. No building / No part of the extended building shall be occupied until the complete surface water drainage system serving the property has been implemented in accordance with the agreed details and the details so agreed shall be maintained in good working order in perpetuity.

Reason: To ensure that the proposed development is satisfactorily drained in accordance with policies W SP1, W DM1, W DM2 and W DM3 of the Arun Local Plan. This is required to be a pre-commencement condition because it is necessary to implement the surface water drainage system prior to commencing any building works.

INFORMATIVE: Infiltration rates for soakage structures are to be based on percolation tests undertaken in the winter period and at the location and depth of the proposed structures. The percolation tests must be carried out in accordance with BRE365, CIRIA R156 or a similar approved method and cater for the 1 in 10 year storm between the invert of the entry pipe to the soakaway, and the base of the structure. It must also have provision to ensure that there is capacity in the system to contain below ground level the 1 in 100 year event plus 40% on stored volumes, as an allowance for climate change. Adequate freeboard must be provided between the base of the soakaway structure and the highest recorded annual groundwater level identified in that location. Any SuDS or soakaway design must include adequate groundwater monitoring data to determine the highest winter groundwater table in support of the design. The applicant is advised to discuss the extent of groundwater monitoring with the Council's Engineers.

Supplementary guidance notes regarding surface water drainage are located here

<https://www.arun.gov.uk/surfacewater> on Arun District Councils website. A surface water drainage checklist is available here <https://www.arun.gov.uk/drainagechecklist> on Arun District Councils website, this should be submitted with a Discharge of Conditions Application.

INFORMATIVE: Statement pursuant to Article 35 of the Town and Country Planning (Development Management Procedure)(England) Order 2015. The Local Planning Authority has acted positively and proactively in determining this application by assessing the proposal against all material considerations, including planning policies and any representations that may have been received and subsequently determining to grant planning permission in accordance with the presumption in favour of sustainable development, as set out within the National Planning Policy Framework.



Neil Crowther
Group Head of Planning

Case Officer: Mr R Castro-Parker

Decision Issued: **1st August 2019**

Arun District Council
The Arun Civic Centre
Maltravers Road
Littlehampton
West Sussex BN17 5LF

IT IS IMPORTANT THAT YOU READ THE NOTES ATTACHED TO THIS DOCUMENT

APPEALS TO THE SECRETARY OF STATE

If you are aggrieved by the decision of your local planning authority to refuse permission for the proposed development or to grant it subject to conditions, then you can appeal to the Secretary of State under section 78 of the Town and Country Planning Act 1990.

If this is a decision on a planning application relating to the same or substantially the same land and development as is already the subject of an enforcement notice, and you want to appeal against this planning application decision, then you must do so within 28 days of the date of this notice.

If an enforcement notice is served relating to the same or substantially the same land and development as in your application and you want to appeal against this planning application decision, then you must do so within 28 days of the date of service of the enforcement notice, or within 12 weeks of the date of this notice, whichever period expires earlier.

Otherwise, if you want to appeal against this decision then you must do so within 6 months of the date of this notice.

Appeals must be using a form which you can get from the Secretary of State at Temple Quay House, 2 The Square, Temple Quay, Bristol BS1 6PN (Tel: 0303 444 5000) or online at <http://acp.planninginspectorate.gov.uk>

The Secretary of State can allow a longer period for giving notice of an appeal but will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.

The Secretary of State need not consider an appeal if it seems to the Secretary of State that the local planning authority could not have granted planning permission for the proposed development or could not have granted it without the conditions they imposed, having regard to the statutory requirements, to the provisions of any development order and to any directions given under a development order.

PURCHASE NOTICES

If either the local planning authority or the Secretary of State refused permission to develop land or grants it subject to conditions, the owner may claim that he can neither put the land to a reasonably beneficial use in its existing state nor render the land capable of a reasonably beneficial use by the carrying out of any development which has been or would be permitted.

In these circumstances, the owner may serve a purchase notice on the Council (that is, where the land is situated in a National Park, the National Park authority for the Park, or in any other case the district council in whose area the land is situated). This notice will require the Council to purchase the owner's interest in the land in accordance with the provisions of Chapter 1 of Part VI of the Town & Country Planning Act 1990.

Please note that this decision notice only relates to matters under the Planning Acts and does not give consent under any other legislation that may apply to the development. You will need to carry out your own checks to determine whether any other consents or permissions are required. For example, the Building Regulations are likely to apply to most developments, and a Highways Licence may be required from West Sussex County Council for any development within the public highway (including the placing of skips on highway land).

[REDACTED]

From: Sarah Burrow [REDACTED]
Sent: 18 May 2020 13:38
To: Anita Gardner [REDACTED]
Cc: Planning.Responses [REDACTED]
Subject: RE: Planning Consultation on F/10/20/DOC

Hi Anita,

Engineers Comments Regarding Surface Water Drainage

Groundwater monitoring has been completed over the winter period with highest recorded level at 2.7mAOD (at least 2.3mbgl). Infiltration test results (in accordance with BRE365) from TP4 provide an acceptable infiltration rate of 5.54×10^{-5} , this was at a depth of 1.77mbgl.

1: As the soakaway acts as a blanket with an effective depth of 0.3m it is appropriate to use the base for the calculations. However, the soakaway invert level is at 0.8mbgl, this depth does not correspond with the infiltration test depth of 1.77mbgl. If the infiltration test results are to be used then the soakaway base should be at the same depth as the testing (noted that this was at the top of the chalk stratum with clay above). There are two options:

- a) Make the soakaway deeper to correspond with the existing tests. The deeper soakaway may have to utilise the sides only for the calculations, please contact us to agree this in advance of a further submission.
- b) Carry out winter infiltration tests at the depth of the proposed soakaway and use these to inform the design, utilising the base in the calculations.

2: The Drainage layout requires more detail. We would expect to see the following as a minimum:

- a) Cover levels, types and invert levels for all inspection chambers and silt trap.
- b) Pipe diameters, pipe types and gradients/falls.
- c) The exact dimensions of the proposed soakaway, the crates to be used noted on this drawing.

3: We expect to see construction detail drawings for all components including:

- a) Pipe bed and surround
- b) Inspection chambers and silt traps

c) Soakaway

Kind Regards

Sarah Burrow
Engineering Assistant

From: Planning.Responses <[REDACTED]>
Sent: 20 April 2020 17:49
To: Land Drainage <[REDACTED]>
Subject: Planning Consultation on F/10/20/DOC

To: **Engineers (Drainage)**

NOTIFICATION FROM ARUN DISTRICT COUNCIL

TOWN AND COUNTRY PLANNING ACT 1990

APPLICATION NO: F/10/20/DOC

Registered: 24-MAR-20

Site Address: South Yard B Wicks Farm Ford Lane Ford BN18 0DF

Description of Works: Approval of details reserved by condition imposed under ref F/5/19/PL relating to Condition No 5 - surface water drainage

The Council have received the above application to discharge conditions. I shall be pleased to receive any observations you may wish to make in respect of those conditions relating to your field of expertise.

[Click here to view the Discharge of Condition application](#)

[Click here to view conditions on original application - click on decision tab](#)

Should you have any comments to make, these should be sent by replying to this email by 4th May 2020.

www.arun.gov.uk/planning

Please be aware that any comments you may make will be available on our website so please do not insert personal details or signatures on your reply.

In the absence of a reply within the period stated, I shall assume that you have no observations to make.

The officer dealing with this application is Mrs A Gardner who can be contacted on telephone number 01903 737529.

Thanking you in anticipation

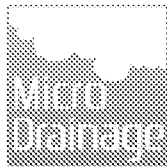
Planning Case Officer
Arun District Council

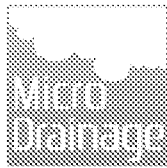
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Appendix C

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Unda Consulting Ltd		Page 1
Southpoint Old Brighton Road Gatwick RH11 0PR	Greenfield Runoff Rate Erection of a Warehouse 89065-060819-Hall-WicksFrm	
Date 19/03/2020 File Soakaway Sizing.SRCX	Designed by TS Checked by EJ	
Innovyze Source Control 2020.1		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.300 Area (ha) 0.409 Urban 0.000 SAAR (mm) 736 Region Number Region 7 Results 1/s QBAR Rural 0.8 QBAR Urban 0.8 Q100 years 2.5 Q1 year 0.7 Q30 years 1.8 Q100 years 2.5		
©1982-2020 Innovyze		

Unda Consulting Ltd		Page 1
Southpoint Old Brighton Road Gatwick RH11 0PR	Brownfield Runoff Rate Erection of a Warehouse 89065-060819-Hall-WicksFrm	
Date 19/03/2020 File Soakaway Sizing.SRCX	Designed by TS Checked by EB	
Innovyze Source Control 2020.1		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.300 Area (ha) 0.409 Urban 0.220 SAAR (mm) 736 Region Number Region 7 Results 1/s QBAR Rural 0.8 QBAR Urban 1.2 Q100 years 3.2 Q1 year 1.0 Q30 years 2.4 Q100 years 3.2		
©1982-2020 Innovyze		

Unda Consulting Ltd				Page 1																																																																																																																																																																																																																			
Southpoint Old Brighton Road Gatwick RH11 0PR		Soakaway Sizing Side Infiltration Only 89065-060819-Hall-WicksFrm																																																																																																																																																																																																																					
Date 22/06/2020 File SOAKAWAY SIDE INFILTRAT...		Designed by TS Checked by EJ																																																																																																																																																																																																																					
Innovyze		Source Control 2020.1																																																																																																																																																																																																																					
<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 1077 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>4.441</td><td>0.111</td><td>0.1</td><td>10.5</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>4.478</td><td>0.148</td><td>0.1</td><td>14.1</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>4.519</td><td>0.189</td><td>0.2</td><td>18.0</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>4.561</td><td>0.231</td><td>0.2</td><td>21.9</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>4.584</td><td>0.254</td><td>0.2</td><td>24.1</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>4.598</td><td>0.268</td><td>0.3</td><td>25.4</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>4.615</td><td>0.285</td><td>0.3</td><td>27.1</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>4.625</td><td>0.295</td><td>0.3</td><td>28.0</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>4.630</td><td>0.300</td><td>0.3</td><td>28.5</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>4.633</td><td>0.303</td><td>0.3</td><td>28.8</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>4.637</td><td>0.307</td><td>0.3</td><td>29.2</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>4.641</td><td>0.311</td><td>0.3</td><td>29.5</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>4.639</td><td>0.309</td><td>0.3</td><td>29.4</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>4.633</td><td>0.303</td><td>0.3</td><td>28.8</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>4.618</td><td>0.288</td><td>0.3</td><td>27.3</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>4.601</td><td>0.271</td><td>0.3</td><td>25.8</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>4.586</td><td>0.256</td><td>0.3</td><td>24.3</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>4.573</td><td>0.243</td><td>0.2</td><td>23.1</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>4.560</td><td>0.230</td><td>0.2</td><td>21.9</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>4.454</td><td>0.124</td><td>0.1</td><td>11.8</td><td>Flood Risk</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>125.186</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>84.438</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>54.368</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>33.788</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>25.189</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>20.297</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>14.957</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>12.032</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>10.154</td><td>0.0</td><td>600</td></tr><tr><td>720 min Summer</td><td>8.835</td><td>0.0</td><td>670</td></tr><tr><td>960 min Summer</td><td>7.086</td><td>0.0</td><td>770</td></tr><tr><td>1440 min Summer</td><td>5.183</td><td>0.0</td><td>1024</td></tr><tr><td>2160 min Summer</td><td>3.782</td><td>0.0</td><td>1428</td></tr><tr><td>2880 min Summer</td><td>3.020</td><td>0.0</td><td>1844</td></tr><tr><td>4320 min Summer</td><td>2.195</td><td>0.0</td><td>2640</td></tr><tr><td>5760 min Summer</td><td>1.749</td><td>0.0</td><td>3456</td></tr><tr><td>7200 min Summer</td><td>1.466</td><td>0.0</td><td>4248</td></tr><tr><td>8640 min Summer</td><td>1.270</td><td>0.0</td><td>5016</td></tr><tr><td>10080 min Summer</td><td>1.125</td><td>0.0</td><td>5752</td></tr><tr><td>15 min Winter</td><td>125.186</td><td>0.0</td><td>19</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	4.441	0.111	0.1	10.5	Flood Risk	30 min Summer	4.478	0.148	0.1	14.1	Flood Risk	60 min Summer	4.519	0.189	0.2	18.0	Flood Risk	120 min Summer	4.561	0.231	0.2	21.9	Flood Risk	180 min Summer	4.584	0.254	0.2	24.1	Flood Risk	240 min Summer	4.598	0.268	0.3	25.4	Flood Risk	360 min Summer	4.615	0.285	0.3	27.1	Flood Risk	480 min Summer	4.625	0.295	0.3	28.0	Flood Risk	600 min Summer	4.630	0.300	0.3	28.5	Flood Risk	720 min Summer	4.633	0.303	0.3	28.8	Flood Risk	960 min Summer	4.637	0.307	0.3	29.2	Flood Risk	1440 min Summer	4.641	0.311	0.3	29.5	Flood Risk	2160 min Summer	4.639	0.309	0.3	29.4	Flood Risk	2880 min Summer	4.633	0.303	0.3	28.8	Flood Risk	4320 min Summer	4.618	0.288	0.3	27.3	Flood Risk	5760 min Summer	4.601	0.271	0.3	25.8	Flood Risk	7200 min Summer	4.586	0.256	0.3	24.3	Flood Risk	8640 min Summer	4.573	0.243	0.2	23.1	Flood 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15 min Summer	4.441	0.111	0.1	10.5	Flood Risk																																																																																																																																																																																																																		
30 min Summer	4.478	0.148	0.1	14.1	Flood Risk																																																																																																																																																																																																																		
60 min Summer	4.519	0.189	0.2	18.0	Flood Risk																																																																																																																																																																																																																		
120 min Summer	4.561	0.231	0.2	21.9	Flood Risk																																																																																																																																																																																																																		
180 min Summer	4.584	0.254	0.2	24.1	Flood Risk																																																																																																																																																																																																																		
240 min Summer	4.598	0.268	0.3	25.4	Flood Risk																																																																																																																																																																																																																		
360 min Summer	4.615	0.285	0.3	27.1	Flood Risk																																																																																																																																																																																																																		
480 min Summer	4.625	0.295	0.3	28.0	Flood Risk																																																																																																																																																																																																																		
600 min Summer	4.630	0.300	0.3	28.5	Flood Risk																																																																																																																																																																																																																		
720 min Summer	4.633	0.303	0.3	28.8	Flood Risk																																																																																																																																																																																																																		
960 min Summer	4.637	0.307	0.3	29.2	Flood Risk																																																																																																																																																																																																																		
1440 min Summer	4.641	0.311	0.3	29.5	Flood Risk																																																																																																																																																																																																																		
2160 min Summer	4.639	0.309	0.3	29.4	Flood Risk																																																																																																																																																																																																																		
2880 min Summer	4.633	0.303	0.3	28.8	Flood Risk																																																																																																																																																																																																																		
4320 min Summer	4.618	0.288	0.3	27.3	Flood Risk																																																																																																																																																																																																																		
5760 min Summer	4.601	0.271	0.3	25.8	Flood Risk																																																																																																																																																																																																																		
7200 min Summer	4.586	0.256	0.3	24.3	Flood Risk																																																																																																																																																																																																																		
8640 min Summer	4.573	0.243	0.2	23.1	Flood Risk																																																																																																																																																																																																																		
10080 min Summer	4.560	0.230	0.2	21.9	Flood Risk																																																																																																																																																																																																																		
15 min Winter	4.454	0.124	0.1	11.8	Flood Risk																																																																																																																																																																																																																		
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																				
15 min Summer	125.186	0.0	19																																																																																																																																																																																																																				
30 min Summer	84.438	0.0	34																																																																																																																																																																																																																				
60 min Summer	54.368	0.0	64																																																																																																																																																																																																																				
120 min Summer	33.788	0.0	124																																																																																																																																																																																																																				
180 min Summer	25.189	0.0	182																																																																																																																																																																																																																				
240 min Summer	20.297	0.0	242																																																																																																																																																																																																																				
360 min Summer	14.957	0.0	362																																																																																																																																																																																																																				
480 min Summer	12.032	0.0	480																																																																																																																																																																																																																				
600 min Summer	10.154	0.0	600																																																																																																																																																																																																																				
720 min Summer	8.835	0.0	670																																																																																																																																																																																																																				
960 min Summer	7.086	0.0	770																																																																																																																																																																																																																				
1440 min Summer	5.183	0.0	1024																																																																																																																																																																																																																				
2160 min Summer	3.782	0.0	1428																																																																																																																																																																																																																				
2880 min Summer	3.020	0.0	1844																																																																																																																																																																																																																				
4320 min Summer	2.195	0.0	2640																																																																																																																																																																																																																				
5760 min Summer	1.749	0.0	3456																																																																																																																																																																																																																				
7200 min Summer	1.466	0.0	4248																																																																																																																																																																																																																				
8640 min Summer	1.270	0.0	5016																																																																																																																																																																																																																				
10080 min Summer	1.125	0.0	5752																																																																																																																																																																																																																				
15 min Winter	125.186	0.0	19																																																																																																																																																																																																																				
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Unda Consulting Ltd					Page 2
Southpoint Old Brighton Road Gatwick RH11 0PR		Soakaway Sizing Side Infiltration Only 89065-060819-Hall-WicksFrm			
Date 22/06/2020 File SOAKAWAY SIDE INFILTRAT...		Designed by TS Checked by EJ			
Innovyze		Source Control 2020.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	4.496	0.166	0.2	15.8	Flood Risk
60 min Winter	4.542	0.212	0.2	20.1	Flood Risk
120 min Winter	4.589	0.259	0.3	24.6	Flood Risk
180 min Winter	4.615	0.285	0.3	27.0	Flood Risk
240 min Winter	4.630	0.300	0.3	28.5	Flood Risk
360 min Winter	4.650	0.320	0.3	30.4	Flood Risk
480 min Winter	4.662	0.332	0.3	31.6	Flood Risk
600 min Winter	4.669	0.339	0.3	32.2	Flood Risk
720 min Winter	4.672	0.342	0.3	32.5	Flood Risk
960 min Winter	4.674	0.344	0.3	32.7	Flood Risk
1440 min Winter	4.676	0.346	0.3	32.9	Flood Risk
2160 min Winter	4.669	0.339	0.3	32.2	Flood Risk
2880 min Winter	4.658	0.328	0.3	31.1	Flood Risk
4320 min Winter	4.632	0.302	0.3	28.7	Flood Risk
5760 min Winter	4.608	0.278	0.3	26.4	Flood Risk
7200 min Winter	4.587	0.257	0.3	24.4	Flood Risk
8640 min Winter	4.569	0.239	0.2	22.7	Flood Risk
10080 min Winter	4.553	0.223	0.2	21.2	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	84.438	0.0	33		
60 min Winter	54.368	0.0	62		
120 min Winter	33.788	0.0	122		
180 min Winter	25.189	0.0	180		
240 min Winter	20.297	0.0	238		
360 min Winter	14.957	0.0	354		
480 min Winter	12.032	0.0	466		
600 min Winter	10.154	0.0	576		
720 min Winter	8.835	0.0	684		
960 min Winter	7.086	0.0	790		
1440 min Winter	5.183	0.0	1082		
2160 min Winter	3.782	0.0	1536		
2880 min Winter	3.020	0.0	1988		
4320 min Winter	2.195	0.0	2848		
5760 min Winter	1.749	0.0	3640		
7200 min Winter	1.466	0.0	4464		
8640 min Winter	1.270	0.0	5272		
10080 min Winter	1.125	0.0	6048		
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Southpoint Old Brighton Road Gatwick RH11 0PR	Soakaway Sizing Side Infiltration Only 89065-060819-Hall-WicksFrm	
Date 22/06/2020 File SOAKAWAY SIDE INFILTRAT...	Designed by TS Checked by EJ	
Innovyze Source Control 2020.1		

Rainfall Details

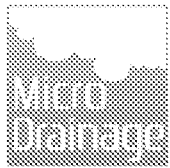
Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.200	Shortest Storm (mins)	15
Ratio R	0.343	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.045

Time (mins)	Area
From: To: (ha)	
0 4	0.045

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Southpoint Old Brighton Road Gatwick RH11 0PR	Soakaway Sizing Side Infiltration Only 89065-060819-Hall-WicksFrm	
Date 22/06/2020 File SOAKAWAY SIDE INFILTRAT...	Designed by TS Checked by EJ	
Innovyze Source Control 2020.1		

Model Details

Storage is Online Cover Level (m) 4.690

Infiltration Basin Structure

Invert Level (m) 4.330 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.19944

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	100.0	0.360	100.0

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Appendix D

Commercial in Confidence

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Key

- Site Boundary (4091m²)
- Existing Warehouses (900m²)
- Proposed Warehouse (450m²)
- Cellular Soakaway (16.4m³)
- Proposed Downpipes
- Proposed Surface Water Pipework
- Proposed Inspection Chamber
- Design Exceedance Route

Notes:

- Preliminary calculations indicate that sufficient storage required to attenuate runoff from the proposed warehouse roof, arising from the critical 1:100 year + 40% climate change event, can be provided within soakaway structure of dimensions 100m² x 0.36m deep x 0.95 (void ratio). Refer to Stormbloc Optimum Half Block details for product specification.
- Given that the site is underlain by chalk strata, a minimum distance of 10m should be maintained from all buildings in accordance with CIRIA C574.
- All subterranean pipe work will be 160mm in diameter.
- All levels are in metres above ordnance datum

Client:

Keith Langmead Ltd

Site Address:

Wicks Farm,
South Yard B,
Ford Lane,
Arundel
BN18 0DF

Job Reference:	Date:
89065-060819-Hall-WicksFrm	22-Jun-20

Drawing Number:	Revision:
89065-01	v2.0

Designed by:	Drawn by:	Checked by:
TS	TS	EB

Scale: 1:250@A2	Unda Consulting Ltd Southpoint Old Brighton Road Gatwick RH11 0PR
Disclaimer: The drawings provided are for planning purposes only.	



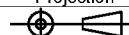
Appendix E

Commercial in Confidence

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LEGEND:

-  Borehole Location
(Completed as part of August 2018 investigation)
-  Window Sample Borehole Location
(Completed as part of August 2018 investigation)
-  Window Sample Borehole Location
(Completed as part of September 2019 investigation)
-  Trial Pit Location
(Completed as part of February 2020 investigation)

P1	29.10.19	FIRST ISSUE	MFP	ALT	ALT
REV.	DATE	DESCRIPTION	BY	CHD.	APR.
Dimensions		Projection	Scale	Orig Size	
m			1:250	A3	



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Email: info@rsk.co.uk
Web: www.rsk.co.uk

CLIENT **REDROW HOMES LIMITED & WATES DEVELOPMENTS LIMITED**

PROJECT **FORD AIRFIELD**

TITLE **EXPLORATORY HOLE LOCATION PLAN**

JOB No.: **29228** DRAWING FILE: **29228 - VER 01_YAEDIT2**

BY:	DATE:	FIGURE 1	REV:
MFP	29.10.19		P1

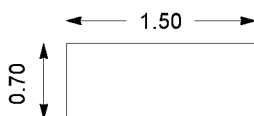


TRIAL PIT LOG

Contract: Ford Airfield		Client: Wates / Redrow		Trial Pit: T3d	
Contract Ref: 29228	Start: 20.02.20 End: 20.02.20	Ground Level (m AOD): 6.87	National Grid Co-ordinate: E:499222.5 N:103825.8	Sheet: 1 of 1	

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
						Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of flint. (TOPSOIL)	6.57	0.30	
						Firm light brown/orange brown slightly sandy CLAY with occasional angular to subrounded fine to medium gravel of flint. (HEAD DEPOSITS)		(1.20)	
							5.37	1.50	
						Trial pit terminated at 1.50mbgl.			

Plan (Not to Scale)



General Remarks

1. Checks for buried ferrous objects carried out during excavation by specialist unexploded ordnance (UXO) officer using magnetometer.
2. Trial pit remained dry and stable during excavation.
3. No visual or olfactory evidence of contamination.
4. No groundwater encountered.
5. No samples or well installation required.
6. On completion, trial pit backfilled with arisings.

All dimensions in metres

Scale: **1:25**

Method Used: Machine dug	Plant Used: 8 Ton Tracked Excavator	Logged By: ATranter	Checked By:	
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TRIAL PIT LOG

Contract: Ford Airfield			Client: Wates / Redrow		Trial Pit: T3s
Contract Ref: 29228	Start: 20.02.20 End: 20.02.20	Ground Level (m AOD): 6.87	National Grid Co-ordinate: E:499222.5 N:103825.8		Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
						Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of flint. (TOPSOIL)	6.57	0.30	
						Firm light brown/orange brown slightly sandy CLAY with occasional angular to subrounded fine to medium gravel of flint. (HEAD DEPOSITS)	5.97	0.90	
						Trial pit terminated at 0.90mbgl.			

Plan (Not to Scale)		General Remarks			
		1. Checks for buried ferrous objects carried out during excavation by specialist unexploded ordnance (UXO) officer using magnetometer. 2. Trial pit remained dry and stable during excavation. 3. No groundwater encountered. 4. No visual or olfactory evidence of contamination. 5. No samples or well installation required. 6. On completion, trial pit backfilled with arisings.			
		All dimensions in metres		Scale: 1:25	
Method Used: Machine dug	Plant Used: 8 Ton Tracked Excavator	Logged By: ATranter	Checked By:		

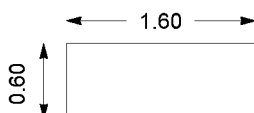


TRIAL PIT LOG

Contract: Ford Airfield			Client: Wates / Redrow		Trial Pit: T4
Contract Ref: 29228	Start: 21.02.20 End: 21.02.20	Ground Level (m AOD): 3.65	National Grid Co-ordinate: E:499332.2 N:103763.9		Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
						Brown slightly sandy silty CLAY with frequent rootlets. Sand is fine to coarse. (TOPSOIL)	3.35	(0.30) 0.30	
						Orangeish brown slightly sandy CLAY. Sand is fine to coarse. (HEAD DEPOSITS)			
						. . . Partings of white chalk between 1.00m and 1.55mbgl.	2.10	1.55	
						Structureless chalk recovered as off white silty GRAVEL with medium cobble content. Gravel is fine to coarse medium density chalk with occasional cobbles of white chalk. (LEWES NODULAR CHALK FORMATION AND SEAFORD CHALK FORMATION (UNDIFFERENTIATED))	1.85	1.80	
						Trial pit terminated at 1.80mbgl.			

Plan (Not to Scale)



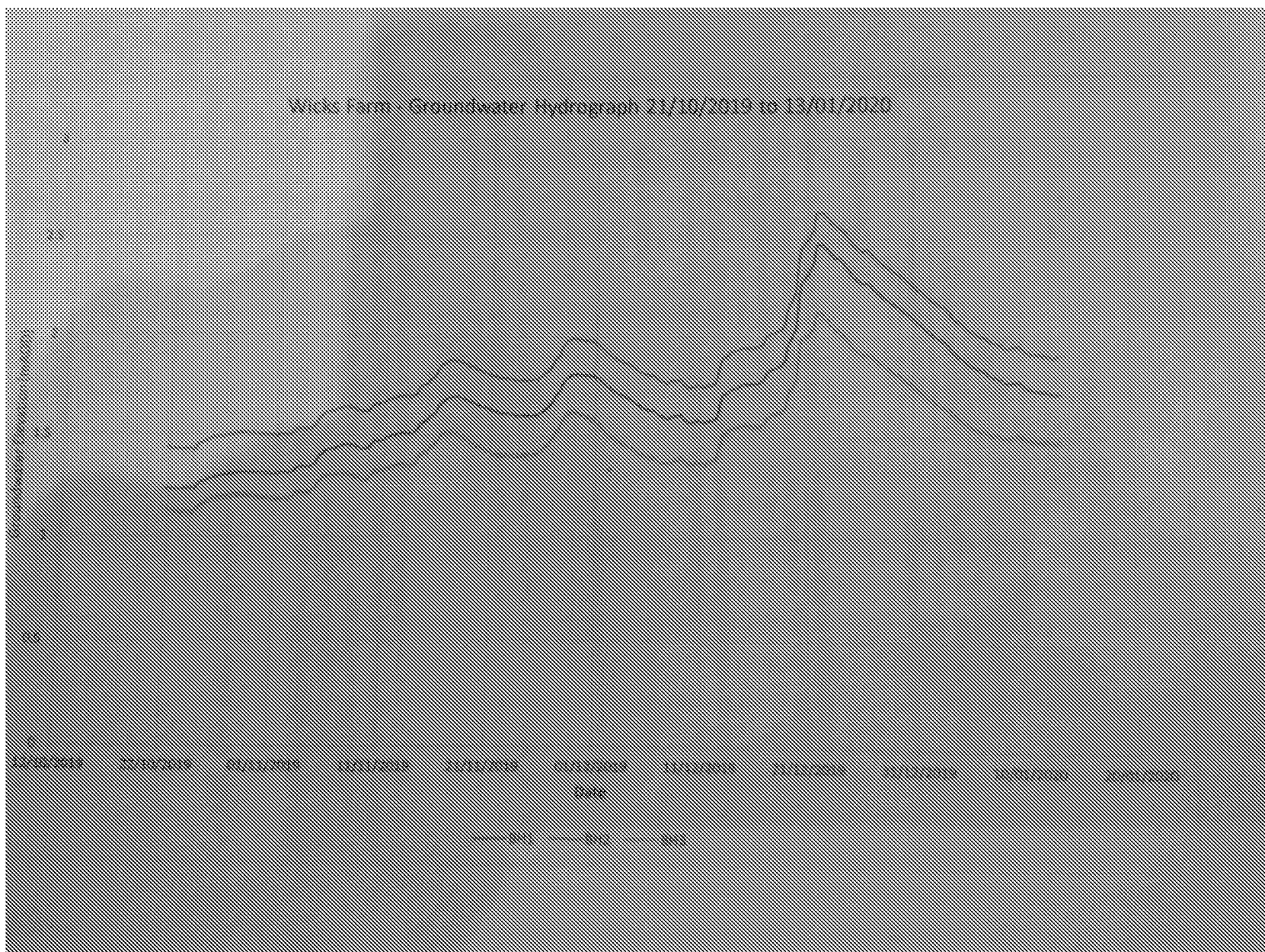
General Remarks

1. Checks for buried ferrous objects carried out during excavation by specialist unexploded ordnance (UXO) officer using magnetometer.
2. Trial pit remained stable during excavation.
3. Groundwater seepage encountered at 1.80mbgl.
4. No visual or olfactory evidence of contamination.
5. No samples or well installation required.
6. On completion, trial pit backfilled with arisings.

All dimensions in metres

Scale: **1:25**

Method Used: Machine dug	Plant Used: 8 Ton Tracked Excavator	Logged By: SMianowska	Checked By:	
---------------------------------	--	------------------------------	-------------	--



Attenuate surface water and stormwater effectively even in challenging high-traffic urban environments.

Stormbloc® Optimum is a resilient geocellular storage system that provides underground storage and infiltration of urban runoff.

Lightweight materials combined with robust design make it easy to transport, quick to install and extremely durable, even beneath high-traffic areas such as roads, car parks and warehouse yards.

Stormbloc® Optimum is modular and easily customisable, giving you the freedom to configure storage for even the most challenging SuDS project.

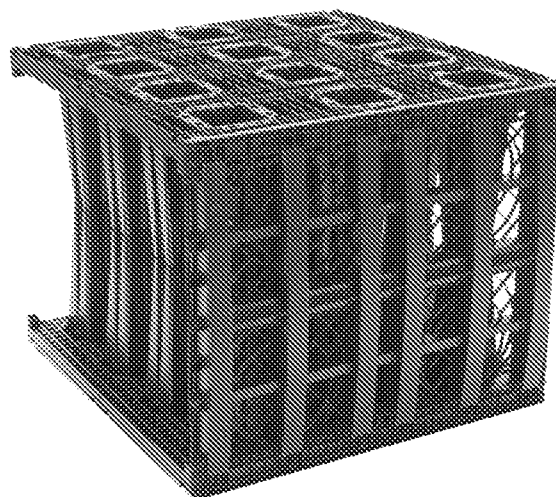
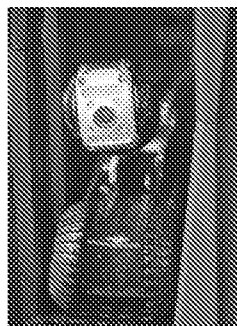
Applications

- New and retrofit Sustainable Drainage (SuDS) schemes.
- Infiltration / soakaway schemes.
- Attenuation schemes.
- Highways and infrastructure projects.
- To increase swale / pond capacity.
- Car parks and Park & Ride schemes.
- Housing Developments.
- Schools and Public / Civil schemes.
- Aquifer re-charge.
- Storage for rainwater harvesting and re-use.

Inspection and Maintenance Access

Access shafts can be easily constructed during installation of the Stormbloc® Optimum system to enable inspection and maintenance.

The channels between the vertical struts allow access for CCTV inspection, maintenance and cleaning and ensures that the storage volume of the system isn't compromised by the build up of silts.



Benefits

Customise Your Storage

Length, width and depth of storage can be customised in order to meet even the most demanding of drainage environments. Two inspection channels enable easy inspection and maintenance.

Save Space On Site

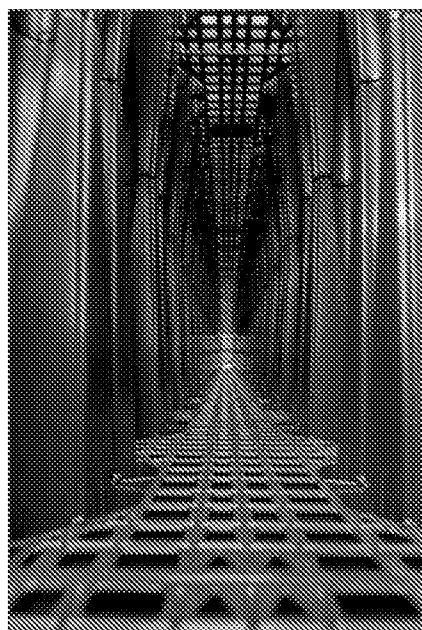
Stormbloc® Optimum stacks into compact nests for transportation and storage, saving valuable space during transport and on site. The nested units can also enable more storage volume to be lifted into excavations at any one time, saving time and cost of lifting machinery. The units unstack simply for installation. With up to 75% space reduction, a double pallet of stacked, nested boxes delivers more than 14 m³ of stormwater storage, and a single lorry delivery can provide 345 m³.

Lightweight and Strong

Combining strength with a storage coefficient of 96%, Stormbloc® Optimum allows you to plan and design effective SuDS systems even in challenging urban environments with high traffic levels. The Stormbloc® Optimum can withstand heavy goods vehicle traffic with an overall load of up to 60 tons, and can be installed at base depths of up to 4 metres.

Technical information

	Stormbloc® Optimum Full Block	Stormbloc® Optimum Half Block
Material	Polypropylene	Polypropylene
Length / Width / Height	800 / 800 / 660 mm	800 / 800 / 360 mm
Nominal Block Volume	0.422 m ³	0.230 m ³
Nominal Storage Capacity per Unit	0.405 m ³	0.221 m ³
Constructed Block Weight	18.6 kg	13.7 kg
Porosity	96%	96%
Vertical Ultimate Compressive Strength	≥ 420 kN/m ²	≥ 420 kN/m ²
Horizontal Ultimate Compressive Strength	≥ 165 kN/m ²	≥ 225 kN/m ²



Stormbloc® Optimum inspection and maintenance channel.



Stormbloc® Optimum installation.

Learn more

To learn more about how Stormbloc® Optimum can help you to make better water management decisions, visit hydro-int.com, search Stormbloc Optimum online or contact us:

