

212039
Oldlands Farm
Bognor

Drainage Strategy

May 2021

Document Control:

Revision	Date	Prepared	Checked	Approved
PL01	15/04/21	GW	ED	ED
PL02	29/04/21	GW	ED	ED
PL03	06/05/21	GW	ED	ED
PL04	20/05/21	GW	ED	ED

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1.0 Introduction

This report has been prepared by EirEng Consulting Engineers to support the planning submission for the erection of a warehouse (Use Class B8) with ancillary office, associated vehicle parking, van storage, plant, ancillary structures, lighting, landscaping and infrastructure works including earthworks to facilitate flood compensation area at Oldlands Farm, Newlands Road, Bognor PO22 6NN. The layout of the proposed development is detailed in the series of planning drawings by ASA Architects, submitted with the application.

The purpose of this report is to present details of the surface water and foul drainage as a result of the proposed development. The report also incorporates details of the proposed Sustainable Drainage Systems (SuDS) to be utilised on the Site.

2.0 Site Layout and Proposed Development

2.1 Site Location

The site is located north of Bognor just off the A29/A259 at postcode PO22 6NN. The site is presently undeveloped agricultural land and covers an area of approx. 18.87ha total, comprising 7ha development area (for warehouse and van storage), and 11.87ha flood compensation area and fill extraction area. Existing access to the site is directly off the roundabout at the junction of the A29 Shripney Road and the A259 Felpham Relief Road. The national grid coordinates for the site are NGR: 494570, 101850 (TQ 494570, 101850). The existing site plan is included in Appendix A.

The site is directly bounded by the following:

- North and West –The A259 Charles Purley Way;
- East –A railway;
- South –Rolls Royce building and car park.

2.2 Proposed Development

The proposed development comprises the ‘erection of a warehouse (Use Class B8) with ancillary office, associated vehicle parking, van storage, plant, ancillary structures, lighting, landscaping and infrastructure works including earthworks to facilitate a flood compensation area’. The proposed site layout is presented in Appendix B.

2.3 Site Topography and Geology

The topography of the site is predominantly flat where elevations typically vary between 1m and 2.9m AOD based on the 2021 topographical survey. There is a mound of spoil typically around 4.3m high and a low-lying area at around 0.2m AOD. There are ditches on the site and along the southern boundary.

Based on the Preliminary Geo-Environmental Risk Assessment by Delta Simons, the majority of the site is underlain by superficial deposits of Raised Marine Deposits consisting of clay, silt, sand and gravel and River Terrace Deposits containing sand, silt, and clay. Due to being low lying and the nature of the soils below the site, it is unlikely that infiltration to ground would be considered viable. A site investigation is planned for this site during April and May 2021.

3.0 Flood Risk

A separate Flood Risk Assessment (Report No: 20-1543.06) has been prepared by Delta Simons dated April 2021. This details the flood risk and how this can be managed and mitigated to allow the site to be developed.

The FRA report concludes that:

- The main potential source of flooding to the site is fluvial and combined fluvial and tidal flooding, the baseline flood risk from all other sources of flooding are considered Low.
- EA modelled flood data indicates that the site is within the extents of the 5% AEP flood event for both the fluvial and combined fluvial and tidal scenarios. Fluvial risk at the site is attributed to Oldlands Farm Ditch in the south west and combined flood risk is derived from tidal and fluvial interactions between the on-site land drains and Lidsey Rife to the east of the site. The baseline fluvial / tidal flood risk at the Site is assessed to be Moderate to High.
- The identified flood risk will be mitigated by raising site levels to 4.15 m AOD, approximately 2.55 m above the maximum flood level expected during the 1% AEP + 35% CC flood event and 2.44 m above the 1% AEP +45% CC event. To ensure and raising does not increase flood risk elsewhere, it is proposed to provide like-for-like and level-for-level floodplain compensation within a parcel of land to the north west of the site for the 1% AEP + 35% CC event. A high-level assessment of the proposed FCS area indicates that this is feasible for this scheme, the design of the FCS area should be considered further during the detailed design stage.

- Overall, the proposed mitigation measures will reduce the fluvial / tidal risk at the Site and the impact of the development elsewhere to Low.
- The impact of the development on surface water risk will be managed with a surface water management scheme, which is designed to restrict flows to the greenfield rate and attenuate storms up to the 1 in 100 year + 40% CC event. Overall, the impact of the development on surface water risk and all other sources of risk is considered Low.

4.0 Surface Water Drainage

4.1 Existing Surface Water

From Southern Water's sewer records, there are no surface water sewers crossing or adjacent to the site. However, there are existing drainage ditches across and to the south of the site.

A topographical survey dated 2021 is provided in Appendix C.

4.2 Proposed Sustainable Drainage

The surface water drainage system is designed with siphonic drainage from the proposed warehouse building, rainwater pipes from the car park structure and channels from hard external surfaces leading to a piped system with manholes. The proposed surface water drainage will utilise SuDS techniques in the form of an attenuation basin/pond and tanks subject to water table levels. If the water table is found to be shallow (following ongoing site investigations), an alternative system using shallow attenuation tanks or open textured subbase below external permeable paving potentially can be used. The alternative system used will need to be designed to accommodate similar volumes of storage to the basin and tanks.

Surface water from external hard surfaces subject to vehicle storage and HGV movements will be directed to oil interceptors prior to attenuation. The surface water will then be piped to a hydrobrake or similar device limiting the flow to greenfield runoff before discharging to the surrounding ditches. The proposed drainage layout is shown at Appendix E.

The attenuation will be designed with a capacity up to a 1 in 100-year (plus 40% climate change (CC)) event, based on the restricted greenfield runoff discharge rate to be agreed with West Sussex Council. A calculation of this rate is attached at Appendix F. The calculations show the site draining to three main outfalls to adjacent ditches, with each separate system having its own attenuation storage tanks or detention basin. The calculations also allow for tidal blocking, as the Flood Risk Assessment

describes the site as being tidally affected. This has been taken to relate to a period of 6 hours for the purposes of calculation. Any flooding occurring during a 100 year plus 40% CC event will remain on site but a storm event greater than this would potentially cause the attenuation to overtop and would then shed overland following the topography towards the bounding watercourses, similar to existing conditions. Calculations for the drainage design are shown in Appendix F.

Finished floor levels will be set above external levels, which will mitigate the residual risk of flooding.

Maintenance of the SuDS features would be in line with the SuDS Manual (CIRIA C753, 2015) and as described in Appendix G. The maintenance of the drainage system including any SuDS features would be undertaken by the end user.

4.3 Potential SuDS Options on Site

The following represents our considered views on suitable SuDS options appropriate to this site. 'CIRIA C753 The SuDS Manual' was consulted to examine the use of SuDS on this site. Our conclusions are based on the assessment of the site and the evaluation of the relevant design requirements and regulatory consultation.

4.3.1 Rainwater/Greywater Harvesting

This normally involves collecting rainwater from roofs or lightly used wastewater and diverting it into a tank where it can be reused, after filtration, for flushing toilets, gardening, etc but not for washing or drinking. It requires a tank in the ground where the rainwater is collected and the water is filtered before being pumped back into the building for reuse, eg for flushing toilets or used for irrigation.

Due to the use of siphonic drainage and the large expanse of roof, it is not appropriate for this site.

Not Recommended.

4.3.2 Green Roofs

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover, over a drainage layer. They are designed to intercept and retain precipitation, reducing the volume of run-off and attenuating peak flows.

However they can add weight and cost to the building. There are also no flat areas of roof where this would work effectively. They are not proposed to be used for this development.

Not Recommended.

4.3.3 Soakaways

Soakaways are square or circular excavations either filled with rubble or lined with brickwork, precast concrete or polyethylene rings/perforated storage structures surrounded by granular backfill. They can be grouped and linked together to drain large areas including highways. The supporting structure and backfill can be substituted by modular geocellular units. Soakaways provide stormwater attenuation, storm water treatment and groundwater recharge.

Soakaways are not feasible as the ground conditions are likely to be unsuitable.

Not Recommended.

4.3.4 Swales

Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate. They should promote low flow velocities to allow much of the suspended particulate load in the storm water runoff to settle out, thus providing effective pollutant removal. Roadside swales can replace conventional gullies and drainage pipes. Swales are easy to incorporate into the landscape design where space available and they can reduce the run-off rates and volumes.

Swales are unlikely to work on this site due to likely lack of infiltration provided.

Not Recommended.

4.3.5 Permeable Pavements

Permeable pavements provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored and can then be infiltrated into the ground, be reused or discharge to a watercourse or other drainage system. Pavements with aggregate sub-bases can provide good water quality treatment if required.

Although there is a potential to lose long term effectiveness due to siltation, the use of permeable paving may be necessary should there be a high water table, rendering standard deeper underground tanks unusable.

Recommended (if becomes necessary due to high water table).

4.3.6 Geo-cellular/Modular Systems

Modular plastic geo-cellular systems with a high void ratio that can be used to create a below ground storage structure. Modular tanks can be used for run off attenuation but requires silt trap protection and a suitable means of access for cleaning and inspection. On this site, standard tanks may not be suitable due to high water table and smaller, shallower versions may need to be used under external hard surfaces.

Recommended.

4.3.7 Ponds

Ponds can provide both storm water attenuation and treatment. They are designed to support emergent and submerged aquatic vegetation along their shoreline. Runoff from each rain event is detained and treated in the pond. The retention time promotes removal through sedimentation and the opportunity for biological uptake mechanisms to reduce nutrient concentrations.

An attenuation pond is being provided to the north of the site.

Recommended.

4.3.8 Detention Basin

Detention basins are surface structures, typically vegetated depressions that provide flow control through temporary storage and attenuation with controlled release of stored runoff. They should be designed as landscape features that act as visual enhancement and habitat creation. When dry, they can be used for social space and habitat creation.

There is scope to provide a detention basin or pond to the north of the site but a permanent pond is currently proposed.

Recommended (pond or basin).

4.3.9 Infiltration Basin

Infiltration basins are vegetated depressions in the ground designed to store surface water runoff on the surface. They should be dry most of the time except in periods of heavy rain.

Infiltration basins should be designed as landscape features that act as visual enhancement and habitat creation. When dry, they can be used for social space and habitat creation.

As for swales, an infiltration basin is unlikely to work on this site due to likely lack of infiltration provided.

Not Recommended.

4.3.10 Filter Drain

Filter drains are gravel filled trenches that collect, store and move water. They also treat pollution. The trench is filled with free draining gravel and often has a perforated pipe in the bottom to collect the water. They are widely used to drain roads and are often seen along the end of main roads. There is frequently a geotextile just below the surface that is used to trap silt and stop it clogging the gravel deeper in the trench. A small filter strip before the trench is also a good way of stopping silt clogging the trench. A filter strip is an area of vegetated land designed to accept runoff, located between an impermeable area and a receiving water course or drainage system.

As for swales, filter drains are unlikely to work on this site due to likely lack of infiltration provided but may be used if enclosed and part of a permeable paving solution.

Not Recommended (unless used as part of a permeable paving solution).

4.3.11 Rain Garden/Stormwater Planter

Rain gardens and stormwater planters are shallow, localised, landscaped areas which typically rely on engineered soils, enhanced vegetation and underdrains. These features are designed to manage and treat runoff from frequent storm events, providing attenuation and treatment of runoff.

Not appropriate in an industrial or commercial environment where available land is limited.

Not Recommended.

5.0 Foul Drainage

5.1 Existing Foul Drainage

From the Southern Water sewer records, there are no existing foul sewers situated within or immediately adjacent to the site. However, the topographical survey shows a foul manhole within the access road which can be used as a connecting point for the foul drainage from the site.

5.2 Proposed Foul Drainage

The proposed foul drainage from the building and separate amenity block will drain via 150mm diameter gravity sewers prior to discharge to a package sewage pumping station to lift flows to a rising main to be connected to the manhole in the access road, subject to agreement. The proposed site foul drainage layout is provided in Appendix D. Calculations for foul flows are contained in Appendix F.

6.0 Maintenance and Management

Maintenance of the sewers, manholes, gullies, inlets/outlets and channel drains should be inspected at 6 monthly intervals and cleaned out at 12 monthly intervals. A full CCTV survey should also be carried out at 10 yearly intervals, including any underground tanks. For the permeable paving system, this would be in line with manufacturer's information and maintenance requirements, in accordance with CIRIA C753 SuDS Manual requirements.

Maintenance on the site would be managed by the end user. It is recommended that a specialist maintenance contractor should be appointed to undertake maintenance of all drainage on the site for the duration of its occupancy.

Further details of the maintenance and management associated with this development are presented in Appendix G.

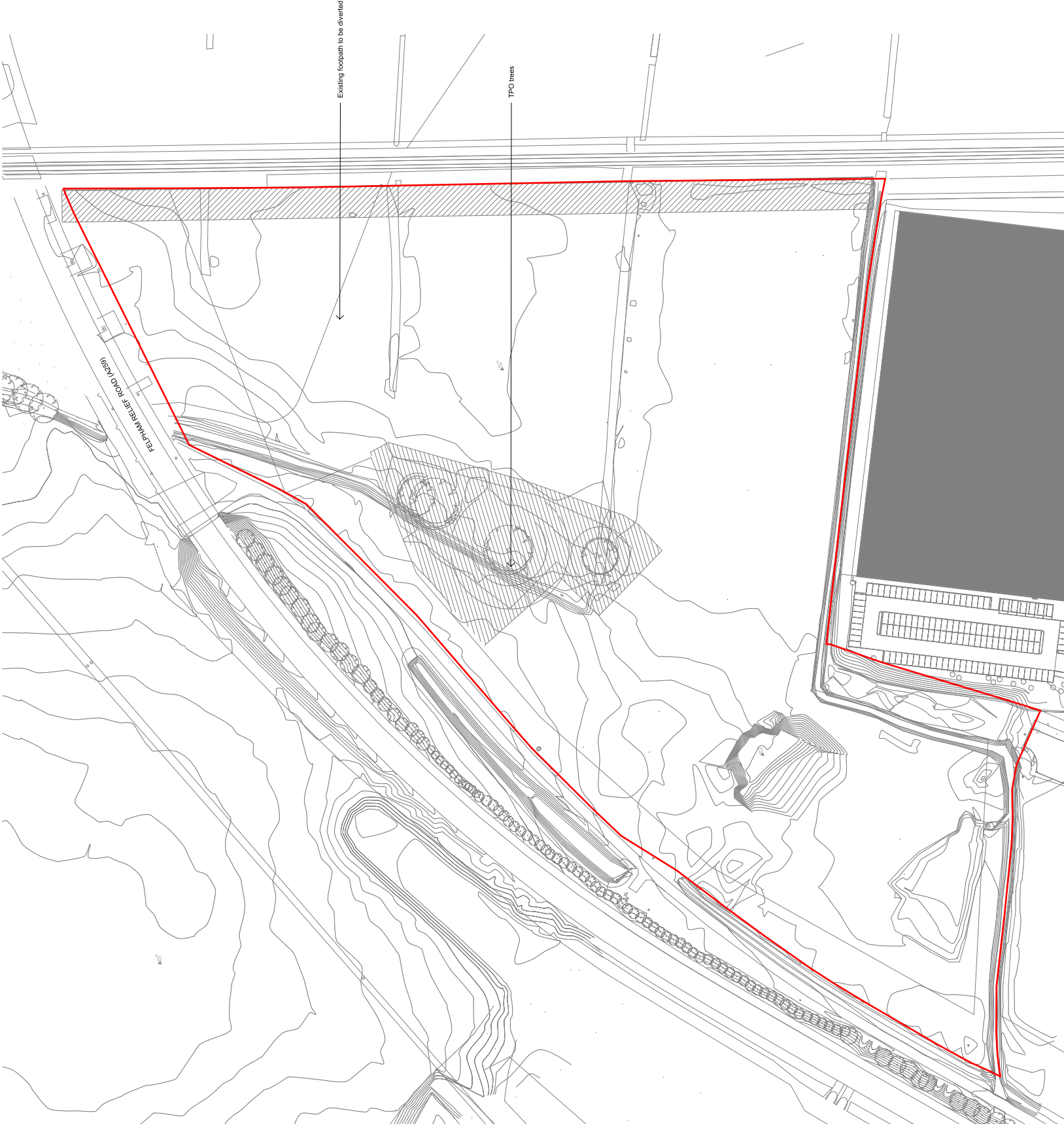
7.0 Summary and Conclusions

The proposed development would be operated with minimal risk from flooding with the proposed mitigation measures and would not increase flood risk elsewhere.

Proposed surface water flows will be discharged to the adjacent watercourses via hydrobrakes or similar subject to agreement with West Sussex Council. The proposed surface water discharge rate and volume will be in accordance with greenfield run-off. Foul discharge to Southern Water's system will be subject to their requirements and available capacity.

The on-site treatment and pollution prevention measures with the provision of oil separators, permeable paving (if used) and catchpit inspection chambers/manholes, will provide adequate stages of treatment prior to discharge to the receiving watercourse.

Appendix A – Existing Site Plan



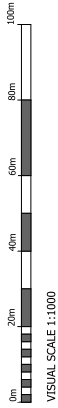
Existing Site Plan
1 : 1000

Scale for planning purposes only
ashton smith to be notified of dimensions in figure dimensions
This drawing is to be used solely for information as required
For other information refer to the latest revision of any cross referenced drawing



LOCATION PLAN:

NOTES:



VISUAL SCALE 1:1000



REVISIONS		DATE	DESCRIPTION	DRAWN BY	CHECK BY
1	REV	17/05/2021	Updated following Planning Consultants comments	DE	GC

PROJECT TITLE Bognor Regis		DRAWING TITLE Existing Site Plan	
STATUS	PLANNING	DATE	30/04/2021
SHEET	SCALE	SUITABILITY	REVISION
A1	1 : 1000	S2	P1
DRAWING NO.		21023 - ASA - V0 - XX - DR - A - PL02 - (S2 - P1)	
DE	GC	DE	GC

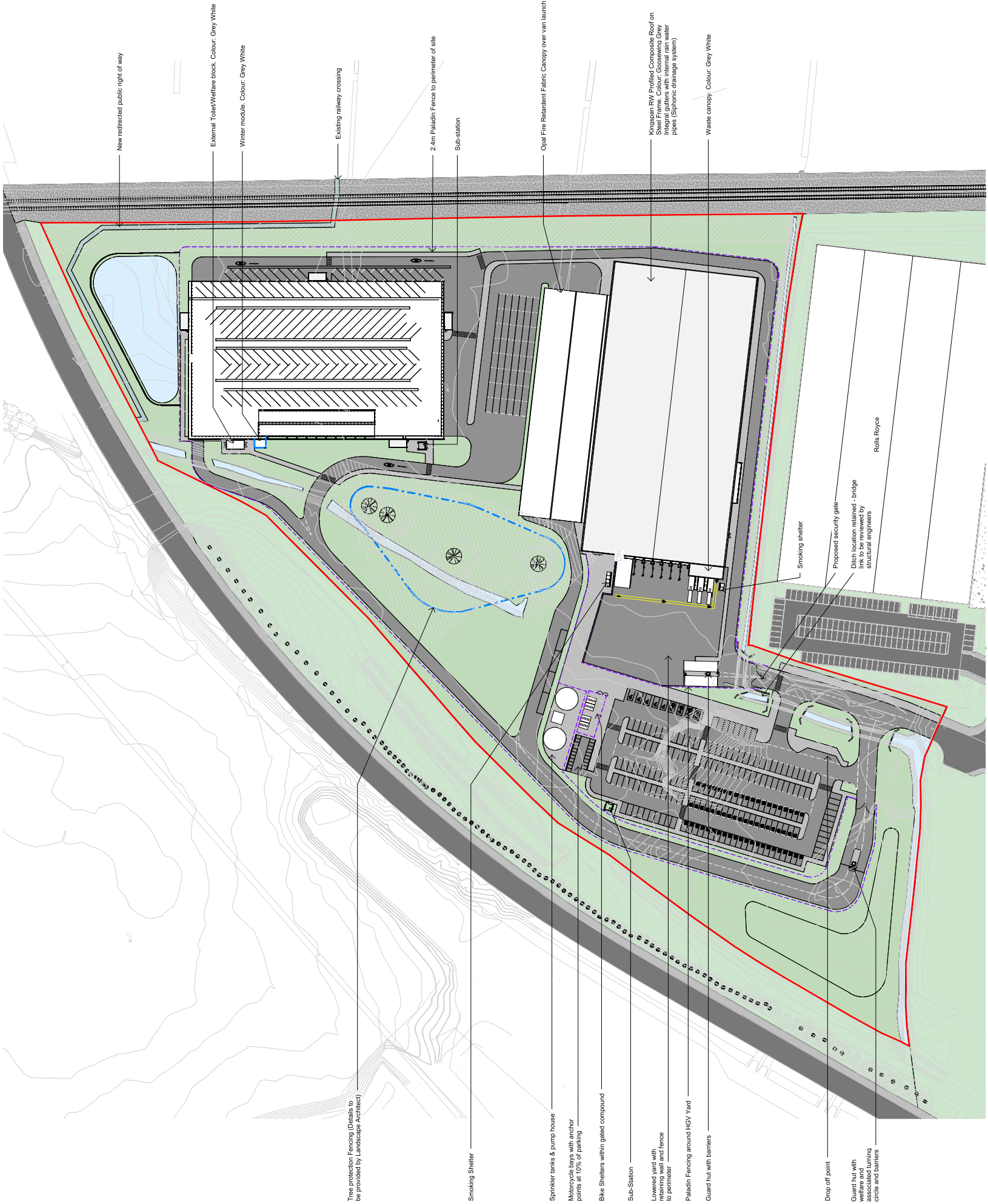
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2021

ashton smith
beyond design

Ashton Smith, Belvedere House, 2 Victoria Avenue, Haregate, North Yorkshire, HG1 1LE
Tel: 01454 601000
www.ashtonsmith.co.uk

Appendix B – Proposed Site Layout



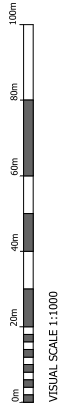
Proposed Site Plan
1 : 1000

Scale for planning purposes only
ashton smith to be notified of dimensions in figure dimensions
This drawing is to be used solely for information and is not intended for construction purposes
For other information refer to the latest revision of any cross referenced drawing



LOCATION PLAN:

NOTES:



VISUAL SCALE 1:1000



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REV	DATE	DESCRIPTION	

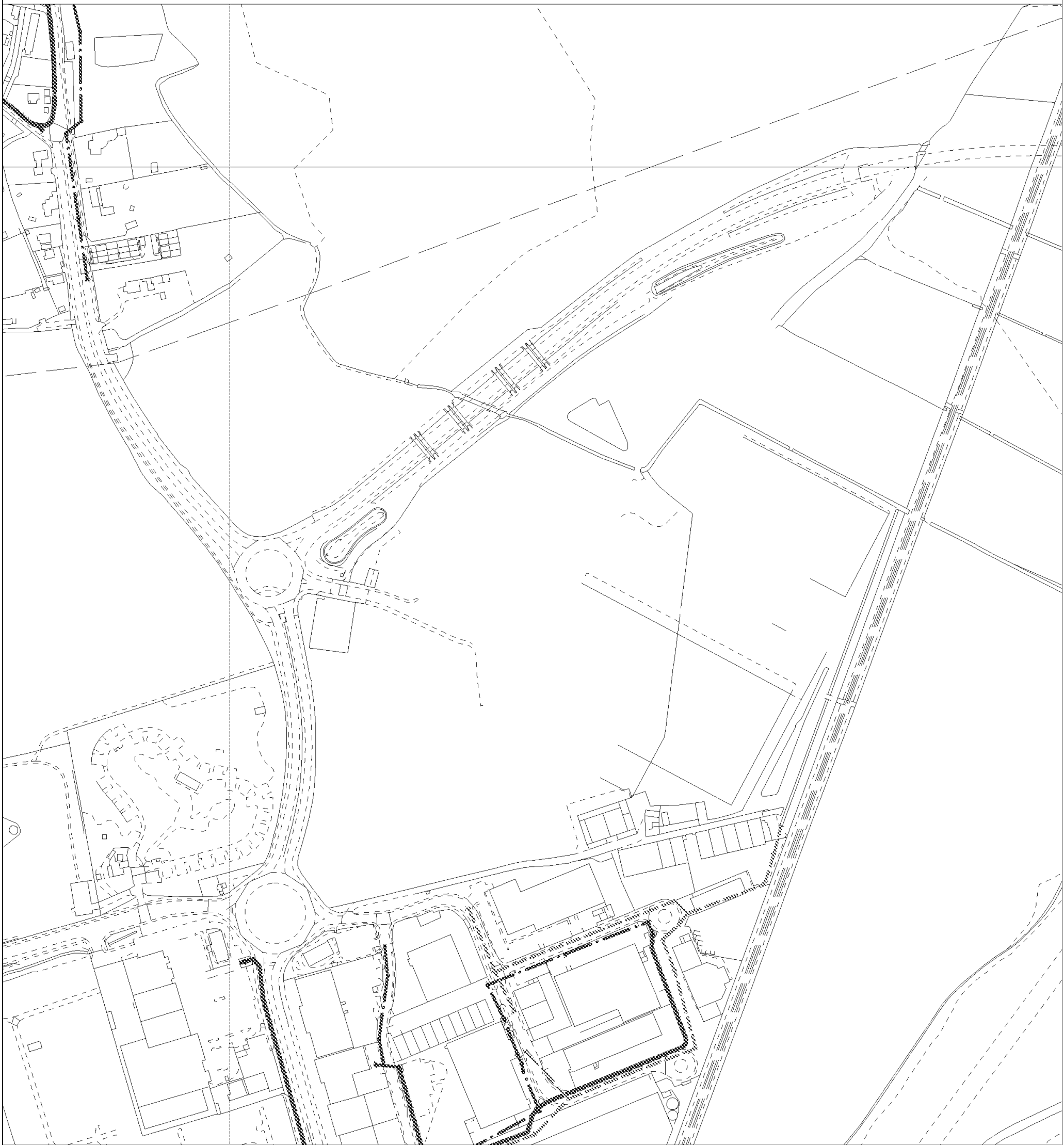
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PROJECT TITLE	Bognor Regis	STATUS	PLANNING	DATE	30/04/2021	SCALE	1 : 1000	SHEET	A1	DRAWING NO.	21023 - ASA - V0 - XX - DR - A - PL03 - (S2 - P2)
DR	DE	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
DR	DE	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC

Appendix C – Topographical Survey

Appendix D – Southern Water Records

SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530

O.S. REF: SU9401NW

Scale: 1:4560

Screen Print

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

ARUN DISTRICT COUNCIL BE/42/19/DOC



Printed By: chandne

Date: 16-4-2019

Southern Water MapGuide Browser

Requested By:

Appendix E – Proposed Drainage Layout

-

	P3	07.05.21	JM	SITE LAYOUT UPDATED.
	P2	02.05.21	JM	AMENDMENTS TO NETWORK DESIGN.
	P1	26.04.21	JM	ISSUE FOR DISCUSSION.
		DATE	BY	DESCRIPTION
				REVISIONS

PROJECT TITLE
OLDLANDS FARM, BOGNOR

DRAINAGE LAYOUT

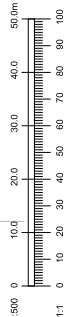


at Rogan's Court, Dun Laoghaire, Co. Dublin, Ireland.

DATE	DATE
25.04.21	25.04.21

11000	11000
STATUS	11000
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FIG NO.	DWG NO.	REVISION
212039	C004	P3



18. All covers to be in accordance with BS EN254 and the following local codes:
 - D400 - cleanways, service roads and car parks, etc.
 - D600 cover to be used for direct traffic track on set back areas.
19. Concrete to be used for underground drainage, on site and for surface water drainage to confirm integrity, survey to be carried out and issued to ERM on completion of the work at each area.
20. All materials in concrete pour areas to be completely replaced and any over pouring to be removed.
21. Before any materials are installed to manufacturers requirements all must comply with BS EN 857-1 with appropriate test certificates and all materials must be accompanied by test certificates. All materials to be confirmed by independent laboratory tests to be carried out by ERM and, minimum 2.4m x 2.4m concrete to achieve class.
22. Pond, interceptor located in surficial area must be designed to have a reinforced concrete slab beneath pavement designed to allow for loading with surface water runoff off roof and surrounding areas, including all appropriate piling, swelling as appropriate, depending on appropriate piling.
23. For purposes of this specification, it is not necessary to keep the excavation as reasonably dry as possible.
24. For purposes of interceptor supply, draining assume a flow of water take at average level at interceptor location.
25. Existing details to be filled in.

[illegible]

DRAINAGE NOTES

1. All private drainage works to be carried out in accordance with BS EN 754-2 and Building Regulations Part H.
2. All drainage works to be carried out in accordance with the requirements of the Building Regulations Part H and the *Water Supply (Water Fittings) Regulations 1999* (as amended) and the *Water Supply (Water Fittings) Regulations 2001* (as amended).
3. All connections to existing public sewers to be in accordance with and to the satisfaction of the Local Authority.
4. Concrete protection (bedding class Z1) to pipework to be provided for all drains, with a cover of less than 600mm.
5. All drains to be covered with a cover of less than 600mm.
6. All pipework beneath roads, or paths and other trafficked areas, to be made of reinforced concrete or equivalent material.
7. All pipework installed to existing and proposed trenchless vegetation in landscaped areas, to be made of reinforced concrete or equivalent material.
8. All below ground drains from vehicle bays (subject to be 100mm dia.) to 140 litres shallower, all external below ground drains (subject to be 100mm dia.) shall be made of reinforced concrete or equivalent material.
9. All pipework in manholes are to be laid soft to suit all uses and to be made of reinforced concrete, shown on drawing, for the stopping pipe.
10. The drawing to be used in conjunction with all other relevant engineering and architect drawings, specifications and documentation.
11. The position and invert levels of all existing drains, sewers and manholes to be shown on drawing, and the position and commitment of the proposed works and any discrepancies noted immediately to Engineering Consultancy.
12. All drains to be shown as class "A", bed and surround unless noted 9.0 All pipes to be shown as class "A", bed and surround unless noted

Ordnance Survey information used under licence no. 100055189.

Appendix F – Surface Water, Qbar and Foul Calculations

Eireng Consulting Engineers		File: 212039_Storm Calculations.pfd Network: Outfall 1 Jakub Matveev 01/05/2021		Page 1 Oldlands Farm Bognor																																																																																																																																																																																																				
Design Settings Rainfall Methodology Return Period (years) Additional Flow (%) FSR Region M5-60 (mm) Ratio-R CV Time of Entry (mins) FSR 2 0 England and Wales 17.000 0.400 0.750 5.00 Maximum Time of Concentration (mins) Maximum Rainfall (mm/hr) Minimum Velocity (m/s) Connection Type Minimum Backdrop Height (m) Preferred Cover Depth (m) Include Intermediate Ground Enforce best practice design rules 30.00 50.0 1.00 Level Soffits 0.200 1.200 ✓ ✓ <tr><td colspan="6"> Nodes <table><tr><th>Name</th><th>Area (ha)</th><th>T of E (mins)</th><th>Add Inflow (l/s)</th><th>Cover Level (m)</th><th>Diameter (mm)</th><th>Easting (m)</th><th>Northing (m)</th><th>Depth (m)</th></tr><tr><td>S001</td><td>0.085</td><td>5.00</td><td>0.0</td><td>3.100</td><td>1200</td><td>494478.992</td><td>101875.138</td><td>1.195</td></tr><tr><td>S002</td><td>0.052</td><td>5.00</td><td>0.0</td><td>2.750</td><td>1200</td><td>494467.837</td><td>101896.994</td><td>1.045</td></tr><tr><td>S003</td><td>0.041</td><td>5.00</td><td>0.0</td><td>2.800</td><td>1200</td><td>494523.291</td><td>101923.862</td><td>1.340</td></tr><tr><td>S004</td><td>0.024</td><td>5.00</td><td>0.0</td><td>2.680</td><td>1200</td><td>494578.745</td><td>101950.730</td><td>1.465</td></tr><tr><td>ACO Qmax 350 (equivalent manhole diameter)</td><td>0.158</td><td>5.00</td><td>0.0</td><td>2.180</td><td></td><td>494484.336</td><td>101803.142</td><td>0.540</td></tr><tr><td>S005</td><td>0.000</td><td>5.00</td><td>0.0</td><td>3.050</td><td>1800</td><td>494486.098</td><td>101828.053</td><td>1.420</td></tr><tr><td>S006</td><td>0.095</td><td>5.00</td><td>0.0</td><td>2.800</td><td>1800</td><td>494488.888</td><td>101847.636</td><td>1.065</td></tr><tr><td>S007</td><td>0.000</td><td>5.00</td><td>0.0</td><td>3.400</td><td>1200</td><td>494513.130</td><td>101833.917</td><td>1.955</td></tr><tr><td>S008</td><td>0.610</td><td>5.00</td><td>0.0</td><td>2.770</td><td>1500</td><td>494635.987</td><td>101836.966</td><td>1.345</td></tr><tr><td>S009</td><td>0.127</td><td>5.00</td><td>0.0</td><td>2.900</td><td>1800</td><td>494562.554</td><td>101873.027</td><td>1.785</td></tr><tr><td>S010</td><td>0.126</td><td>5.00</td><td>0.0</td><td>3.200</td><td>1800</td><td>494586.560</td><td>101926.881</td><td>2.235</td></tr><tr><td>S011</td><td>0.313</td><td>5.00</td><td>0.0</td><td>2.750</td><td>1200</td><td>494651.724</td><td>101863.602</td><td>1.240</td></tr><tr><td>S012</td><td>0.195</td><td>5.00</td><td>0.0</td><td>2.300</td><td>1500</td><td>494683.905</td><td>101947.652</td><td>1.165</td></tr><tr><td>S013</td><td>0.000</td><td>5.00</td><td>0.0</td><td>2.300</td><td>1800</td><td>494608.641</td><td>101976.417</td><td>1.545</td></tr><tr><td>S014</td><td>0.000</td><td>5.00</td><td>0.0</td><td>2.200</td><td>1800</td><td>494609.905</td><td>101979.723</td><td>1.460</td></tr><tr><td>S015</td><td>0.000</td><td>5.00</td><td>0.0</td><td>2.000</td><td>1800</td><td>494629.854</td><td>101977.111</td><td>1.440</td></tr><tr><td>Attenuation 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