



Proposed Residential Development

Angels and Hyde Nurseries

Yapton Road

Barnham, West Sussex

Foul and Surface Water Drainage Strategies

On behalf of

West Sussex County Council

March 2010
1334-R1

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ANGELS AND HYDE NURSERIES

YAPTON ROAD, BARNHAM

WEST SUSSEX PO22 0AY

PROPOSED RESIDENTIAL DEVELOPMENT

Drainage Strategy

1. Background

- 1.1 This report has been produced on behalf of West Sussex County Council in support of an outline planning application for residential development at Angels and Hyde Nurseries, Yapton Road, Barnham (Arun DC reference: BN/27/09).
- 1.2 The report presents an outline drainage strategy for the site in the light of the Flood Risk Assessment that was carried out by Brighton Consulting Ltd in November 2009 and the subsequent comments made by the Environment Agency, Southern Water Services Ltd and Arun DC Engineers, as consultees to the planning process.
- 1.3 Relevant consultee responses are included as appendices to this report.
- 1.4 The drawings supporting this report are as follows:
- Drawing No. 1334/1.1 – Location Plan
 - Drawing No. 1334/2.1 – Existing Site Plan
 - Drawing No. 07.2009/10 – Indicative Layout Plan

2. The Site

- 2.1 The site is located on the south side of Yapton Road, Barnham approximately 500m southwest of Barnham village centre. The OS Grid Reference is SU 9628 0404.
- 2.2 The area of the site is around 3.6 hectares. It currently comprises unused nurseries with hard access tracks and various buildings of both permanent and temporary natures. These include covered propagating areas, storage containers and sheds etc. together with two

residential properties. However, the majority of the site is open with permeable/ semi-permeable surfaces.

2.3 The site has no positive surface water drainage system, with impermeable surfaces merely running off to ground. There are ditches on the east, west and southern boundaries, as well as a central ditch to which groundwater and overland flow can travel but they are in a poor state of maintenance and are partially/ fully blocked with debris, vegetation and fallen trees. This is resulting in various land drainage issues throughout the site and surrounding area.

2.4 The east, west and central ditches run south to the main ditch on the southern boundary, which runs east to Hill Lane, then south to join the Lidesy Rife, which is classed as Main River. These ditches are indicated on the Location Plan, Drawing No. 1334/1.1.

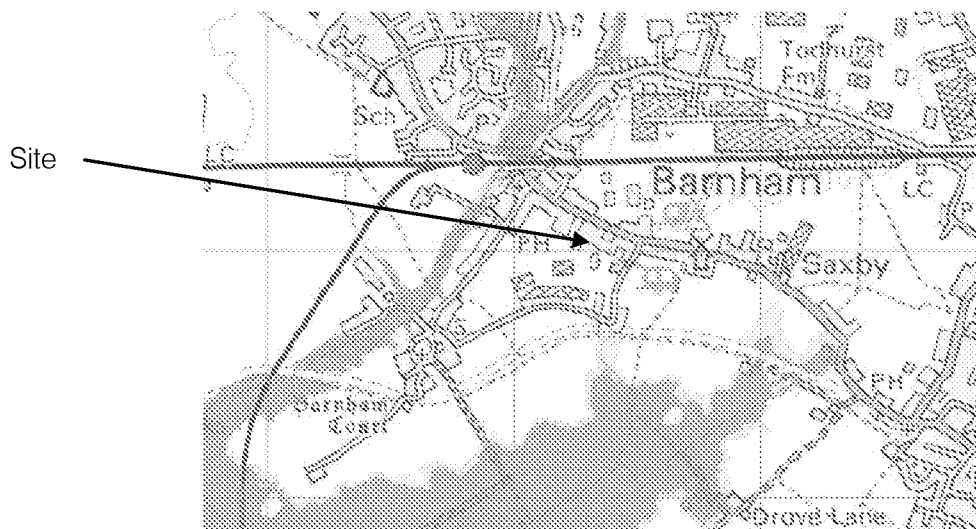
3 Proposed Development

3.1 The proposed development comprises the clearance of the site and its re-development with up to 95 residential dwellings with associated access and parking provision.

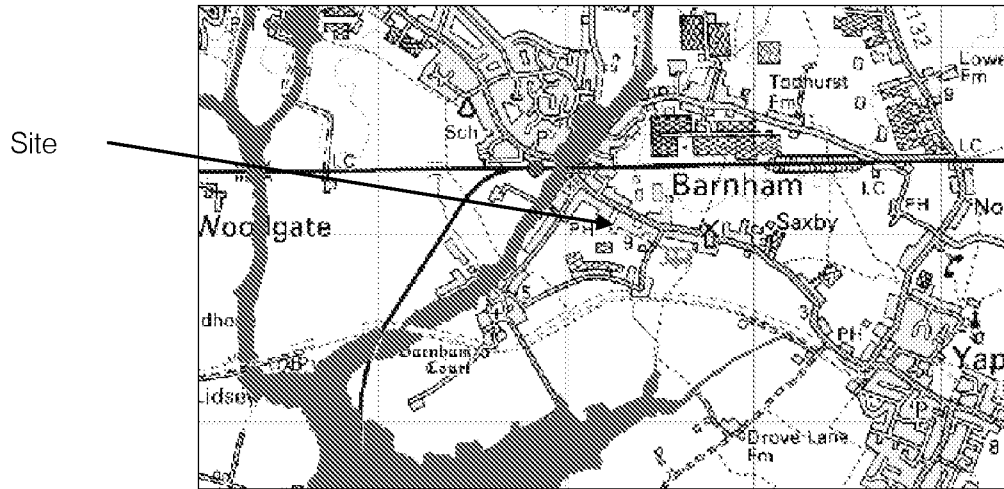
3.2 The proposals incorporate generous open and green space provision with impermeability at only around 50% of the total site area, as indicated on the Indicative Layout Plan .Drawing No. 07.2009/10

4. Flood Mapping

4.1 The site is indicated to lie within Flood Zone 1 on the Environment Agency's Flood Map, as reproduced below.



- 4.2 It is similarly indicated as Flood Zone 1 within the Arun District Council Strategic Flood Risk Assessment (SFRA) – see below for the current extent of the 1 in 1000 year fluvial flood prediction



Arun District Council SFRA Map A1-F

5. Topography

- 5.1 Ground levels on the site are in the region of 8.80m AOD in the northwest corner, falling to around 8.39m AOD in the southeast corner, as indicated on the Site Plan, Drawing No. 1334/2.1. The northwest of the site is a relative high point with ground levels here falling both west to the Barnham Rife and east to Hill Lane.
- 5.2 Whilst the site is relatively flat, the on-site ditches all have reasonable gradients, averaging 1 in 150 as they fall to the stream at Hill Lane, where the road level is around 6.6m AOD. South from here, ground levels fall more rapidly at 1 in 95 to a low of 4.5m AOD at the southeast corner of the lane.
- 5.3 The stream flattens considerably from here as it crosses open land to the south to join the Lidsey Rife.

6. Flooding History

- 6.1 There are no recorded instances of flooding at the site, although Barnham itself has a long history of both foul and surface water flooding. As discussed below, groundwater levels are high and 'running sand' conditions can exist very close to the surface. This can cause sewers and drains to become disturbed, joints to open and infiltration to occur.

- 6.2 Much work has been carried out by the Environment Agency and Southern Water in recent years to improve both the land drainage and sewerage systems.

7. Ground Conditions

- 7.1 The Flood Risk Assessment states that the geology at the site is complex, being situated on two varieties of superficial deposits: Raised Beach Deposits composed of sand and gravel and River Terrace Deposits composed of sand, silt and clay. Both are classified as secondary aquifers. The superficial deposits overlie London Clay that is classified as unproductive strata. However, the clay overlies the Lambeth Group that is classified as a secondary aquifer and Undifferentiated Chalk that is classified as a principal aquifer. The Lambeth Group outcrops approximately 100 metres to the south of the site whilst the chalk outcrops approximately 200 metres to the south.
- 7.2 These predominantly sandy ground conditions, combined with high groundwater levels results in extensive 'running sand' throughout Barnham and surrounding villages, as discussed above.
- 7.3 We inspected the site at the end of February 2010 after a prolonged period of wet weather and hand dug trial holes to obtain an indication of groundwater levels. Water was found at 350 – 450mm below ground level, confirming that this will be a significant factor in determining the most appropriate surface water drainage strategy for the site.
- 7.4 Shallow percolation tests showed reasonable soakage in the upper levels, however, with soil infiltration rates averaging 9×10^{-6} metres/second.

8. Surface Water Drainage Strategy

- 8.1 There are no public surface water sewers in the immediate area and flows from existing developments drain to soakaways and local watercourses.
- 8.2 Soakaways can be made to work satisfactorily but they need to be shallow due to the high water table and often require a high level overflow to a watercourse. Traditional soakaways are of little use in the winter months as they will not empty after rainfall.
- 8.3 New impermeable areas will be created by the proposed development of the site and it will be important to make maximum use of retained green space for soakage. Planting will also need careful attention in order to maximise the potential for the absorption and transpiration of surface and ground water. The current layout appears to achieve these requirements with only a 50% ratio of permeable to impermeable areas.

- 8.4 The existing on-site ditches will need cleaning out, regrading and possibly extending a little towards Yapton Road. There are sufficient falls available to do this work. This will allow surface water to drain more rapidly from the site and also assist in lowering the groundwater levels, particularly if combined with other traditional land drainage works. It is suggested that the ditching works should be carried out as soon as possible in order to improve the ground conditions in advance of any development.
- 8.5 Taking the above into account, we consider that a suitable surface water drainage scheme can be designed based on extensive use of permeable pavements, which can drain highways and parking areas as well as roofs, if required. This will best mimic the existing drainage of the site, make maximum use of available soakage and also provide water quality improvements to the discharge.
- 8.6 The results from a Microdrainage check on the feasibility of using permeable pavements alone, without the need for an overflow, are included at the end of this report. We have used a 100-year return period storm with an additional 30% for climate change and a simplified system of a single large permeable car park for soakage with an area equivalent to the area of highways and car parks within the development. It can be seen that the maximum water depth in the permeable layer is 319mm, which is within the standard layer thickness of 350mm that is often used. The final design may well include for soakage areas within the open spaces and exclude soakage close to the buildings but the principles are shown to be technically sound. In addition, it is likely that high level overflows to the three ditches will be incorporated for security
- 8.7 In due course, the detailed design will require full-scale percolation testing to BRE 365 to obtain accurate soil infiltration rates over the whole of the site. It would be useful to install ground water monitoring at the same time, although we consider it unlikely that groundwater levels will rise above those that we encountered during our inspection in late February. This work will allow the need or otherwise for high level overflows from the permeable pavements to be provided to the on-site ditches and whether any additional SuDS features are required.
- 8.8 Techniques such as rainwater harvesting/ re-cycling should also be considered, which can effect useful reductions in water use and discharge from the site.

9. Foul Water Drainage

- 9.1 There is an existing 225mm diameter public foul water sewer running in a westerly direction across the front of the site to which a connection exists. This sewer will need to be diverted to allow the current layout to be implemented and a new connection made. It is not considered that Southern Water would have any objections to a properly designed diversion of this sewer in accordance with normal procedures.

9.2 There is also a 250mm diameter foul sewage rising main running in a westerly direction across the rear of the site. Similarly, this will need to be diverted to allow the current layout to be implemented and again, it is not considered that Southern Water would have any objections to a properly designed diversion. However, in due course, the exact location of the rising main will need to be established with trial holes and a decision then made in consultation with Southern Water on how best to divert the main and whether any adjustments to the development layout need to be made.

9.3 Southern Water has confirmed that there is available foul sewage capacity for the proposed development. Their full comments are attached but the relevant paragraph is reproduced below:

".....we have identified a point of connection, which would not have any negative impacts on existing levels of service. We are happy that the standard conditions for approval of details will be satisfactory in this situation....."

9.4 It is clear from the above, that recent improvements to the public foul sewerage system that Southern Water has carried out, will allow either a direct connection to be made to the sewer that crosses the site or that a suitable requisition can be concluded to allow this development to proceed.

10. Conclusions

10.1 This drainage strategy has been produced in response to various comments made by consultees to planning application BN/27/09 for residential development at the Angels and Hyde Nurseries, Yapton Road, Barnham. The Flood Risk Assessment identified the site to be within Flood Zone 1 (low risk) but surface water drainage is known to require careful attention in the Barnham area due to high groundwater levels and due account has now been taken of this with the preparation of this report.

10.2 Site inspections have revealed poorly maintained ditches on the east, west and southern boundaries as well as a central ditch. It is proposed that these will all be cleared of debris, re-graded as necessary and incorporated into the development layout. Future maintenance of the ditches will need to be secured through the management company that will be set up in conjunction with the development.

10.3 Site testing has determined that shallow soakaways in the form of permeable pavements will be the most satisfactory method for surface water drainage and calculations have shown that this is feasible and technically sound.

- 10.4 Southern Water Services Ltd have identified a point of connection for foul water flows, which would not have any negative impacts on existing levels of service.
- 10.5 We conclude that suitable foul and surface water drainage strategies have been presented here that will enable this development to proceed with a low risk of flooding to the site and without increasing the risk of flooding elsewhere.

1334-R1/RTFC

Robert Clark Associates		Page 1
Willow Cottage Herne Lane Rustington BN16 3EE	Angels Nursery Barnham Permeable pavement check	
Date 9 March 2010 File Angels 1.SRC	Designed By RTFC Checked By	
Micro Drainage	Source Control W.11.4	

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 125 minutes

Storm Duration (mins)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	44.3	44.3	9.7422	0.2022	304.4	O K
30 Summer	44.3	44.3	9.7782	0.2382	409.8	O K
60 Summer	44.3	44.3	9.8092	0.2692	501.6	FLOOD RISK
120 Summer	44.3	44.3	9.8272	0.2872	554.5	FLOOD RISK
180 Summer	44.3	44.3	9.8302	0.2902	564.1	FLOOD RISK
240 Summer	44.3	44.3	9.8282	0.2882	558.5	FLOOD RISK
360 Summer	44.3	44.3	9.8192	0.2792	531.9	FLOOD RISK
480 Summer	44.3	44.3	9.8082	0.2682	498.7	FLOOD RISK
600 Summer	44.3	44.3	9.7962	0.2562	463.6	O K
720 Summer	44.3	44.3	9.7847	0.2447	429.3	O K
960 Summer	44.3	44.3	9.7632	0.2232	366.6	O K
1440 Summer	43.0	43.0	9.7328	0.1927	277.0	O K
15 Winter	44.3	44.3	9.7572	0.2172	348.8	O K
30 Winter	44.3	44.3	9.7982	0.2582	469.7	O K
60 Winter	44.3	44.3	9.8347	0.2947	577.9	FLOOD RISK
120 Winter	44.3	44.3	9.8577	0.3177	644.6	FLOOD RISK
180 Winter	44.3	44.3	9.8587	0.3187	648.3	FLOOD RISK
240 Winter	44.3	44.3	9.8552	0.3152	637.7	FLOOD RISK
360 Winter	44.3	44.3	9.8407	0.3007	594.9	FLOOD RISK
480 Winter	44.3	44.3	9.8227	0.2827	542.5	FLOOD RISK
600 Winter	44.3	44.3	9.8042	0.2642	488.0	FLOOD RISK
720 Winter	44.3	44.3	9.7867	0.2467	435.4	O K
960 Winter	44.3	44.3	9.7552	0.2152	343.3	O K
1440 Winter	39.8	39.8	9.7183	0.1783	236.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	115.73	18
30 Summer	77.80	32
60 Summer	49.94	62
120 Summer	30.96	106
180 Summer	23.06	138
240 Summer	18.58	170
360 Summer	13.66	238
480 Summer	10.97	306
600 Summer	9.25	374
720 Summer	8.05	436
960 Summer	6.45	562
1440 Summer	4.71	796
15 Winter	115.73	18
30 Winter	77.80	32
60 Winter	49.94	60
120 Winter	30.96	116
180 Winter	23.06	146
240 Winter	18.58	184
360 Winter	13.66	260
480 Winter	10.97	334
600 Winter	9.25	402
720 Winter	8.05	470
960 Winter	6.45	590
1440 Winter	4.71	824

Robert Clark Associates		Page 2
Willow Cottage Herne Lane Rustington BN16 3EE	Angels Nursery Barnham Permeable pavement check	
Date 9 March 2010 File Angels 1.SRC	Designed By RTFC Checked By	
Micro Drainage	Source Control W.11.4	

Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.000	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.350	Longest Storm (mins)	1440		

Time / Area Diagram

Total Area (ha) = 1.750

Time	(mins)	Area
from:	to:	(ha)
0	4	1.750

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Willow Cottage Herne Lane Rustington BN16 3EE	Angels Nursery Barnham Permeable pavement check	
Date 9 March 2010	Designed By RTFC	
File Angels 1.SRC	Checked By	
Micro Drainage		Source Control W.11.4

Porous Car Park Details

Infil Coef - Base (m/hr)	0.032400	Invert Level (m)	9.540
Membrane Percolation (mm/hr)	1000	Cover Level (m)	10.000
Safety Factor	2.0	Slope (1:x)	500.0
Porosity	0.30	Max Percolation (l/s)	2733.5
Length (m)	99.2	Depression Storage (mm)	5
Width (m)	99.2	Evaporation (mm/day)	3

Mr Neil Crowther
Arun District Council
Development Control
1, Arun Civic Centre Maltravers Road
Littlehampton, West Sussex
BN17 5LF

Our ref: HA/2010/108965/02-L01

Your ref: BN/27/09/

Date: 10 February 2010

Dear Mr Crowther,

OUTLINE APPLICATION FOR DEMOLITION OF ALL EXISTING BUILDINGS/STRUCTURES & REDEVELOPMENT WITH UP TO 100 DWELLINGS (INCLUDING UP TO 40 AFFORDABLE HOMES) TOGETHER WITH ASSOCIATED OPEN SPACE, LANDSCAPING & ACCESS IMPROVEMENTS

Thank you for your consultation request regarding the application above.

Environment Agency position

The submitted Flood Risk Assessment (FRA) is not considered to be sufficient in this instance and we therefore **OBJECT** to the grant of planning permission and recommend refusal on this basis for the following reasons:

Reason

The FRA submitted with this application does not comply with the requirements set out in Annex E, paragraph E3 of Planning Policy Statement 25 (PPS 25). The submitted FRA does not therefore, provide a suitable basis for assessment to be made of the flood risks arising from the proposed development

In particular:

- The FRA identified the risk of groundwater flooding to the site and a 'probability for the groundwater to emerge to the surface', but this risk is not quantified and therefore it cannot be assessed whether the recommended mitigation is sufficient.
- The applicant proposes to connect to the public sewer. We are not aware of any surface water sewers in the area. It is also unclear whether Southern Water would accept flow from a SuDS system. This would need to be discussed with them. However it seems likely alternative methods of surface water disposal will need to be found.
- The OS map does show a ditch on site. It is unclear whether this ditch exists and whether it is part of a wider ditch network. This should be investigated as it would provide an option for surface water disposal.

We would point out that under Approved Document H of the Building Regulations, the surface water disposal hierarchy should be followed, in that disposal to surface water sewer should be the last option if infiltration and outfall to a watercourse are not practical.

- The FRA states that surface water will be disposed via a SuDS system. Oversized pipes are not a SuDS system. In addition, it is not clear who would take over the maintenance of these as they would not be designed in line with 'sewers for adoption'. Section 6B of the FRA states the SuDS and sewer network would be maintained by the owners, but it is not clear who the owners are and what arrangements would be made to ensure long term maintenance. SuDs are required

This objection is not an objection 'in principle' to the site being developed, but one 'unless/until' such information is received to show that the surface water issues can be adequately resolved. I trust that the above comments are satisfactory but if you require any further information please contact me.

Yours sincerely,

Miss Kate Attrill
Senior Area Planning Officer



Daun Johnson

From: Simon Power
Sent: 29 January 2010 10:38
To: Planning.Responses
Cc: Neil Crowther
Subject: RE: Planning Consultation on: BN/27/09/

Engineers Drainage comments:

Foul drainage:

Proposals are acceptable in principle, but available sewers may not be adequate. Please consult SWS Limited before planning permission is granted.

Surface water drainage:

The applicant proposes to connect to the public sewer, but there are no public surface water sewers in the vicinity of the application site. An alternative method of surface water disposal is required. Please forward any alternative proposed method of disposal for my comments.

SP

From: planning.responses@arun.gov.uk [mailto:planning.responses@arun.gov.uk]
Sent: 14 January 2010 12:01
To: Simon Power
Subject: Planning Consultation on: BN/27/09/

To: Engineers (Fluvial Flooding)

NOTIFICATION FROM ARUN DISTRICT COUNCIL

TOWN AND COUNTRY PLANNING ACT 1990

APPLICATION **BN/27/09/**
NO:

Registered: 13-JAN-10
Site Angels & Hyde Nurseries Yapton Road Barnham PO22 0AY
Address:

Grid Reference: 96330 04110

Category: Plan Applicat'n

Description of Works: Outline application for demolition of all existing buildings/structures & redevelopment with up to 100 dwellings (including up to 40 affordable homes) together with associated open space, landscaping & access improvements (This is a Departure from the Development Plan)

The Council have received the above planning application. I shall be pleased to receive any observations you may wish to make.

[Click here to view the application details](#)

Should you have any comments to make, these should be sent by replying to this email by 18-FEB-10. You can also monitor the progress of this application through the Council web site:

www.arun.gov.uk/planning

Please be aware that any comments you may make will be available on our website.

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

PPC

From: "Neil Crowther" <Neil.Crowther@arun.gov.uk>
To: "PPC Planning" [REDACTED]
Sent: 24 February 2010 11:30
Subject: Angel's Nursery

Regards

Neil Crowther

Principal Planner, Strategic Development Team

Arun District Council, Civic Centre, Maltravers Road, Littlehampton, West Sussex, BN17 5LF
 Tel: 01903 737839

From: Nuttall, David [REDACTED]
Sent: 23 February 2010 09:41
To: Neil Crowther
Subject:

Planning and Development Services

Arun Civic Centre
 Maltravers Road
 Littlehampton
 West Sussex
 BN17 5LF

Your Ref
 BN/27/09/
 Our Ref
 S/AR/2010/27

Date
 18/02/2010

Dear Sir

Outline application for demolition of all existing buildings/structures & redevelopment with up to 100 dwellings (including up to 40 affordable homes) together with associated open space, landscaping & access improvements
 Angels & Hyde Nurseries Yapton Road Barnham PO22 0AY
 BN/27/09/

Thank you for your letter of 14/01/2010

Foul Water Drainage:

Following initial investigations, there is currently inadequate capacity in the local network to provide foul sewage disposal to service the proposed development. The proposed development would increase flows to the public sewerage system, and existing properties and land may be subject to a greater risk of flooding as a result. Additional off-site sewers, or improvements to existing sewers, will be required to provide sufficient capacity to service the development. Section 98 of the Water Industry Act 1991 provides a legal mechanism through which the appropriate infrastructure can be requested (by the developer) and provided to drain to a specific location.

Should this application receive planning approval, please include, as an informative to the permission, the following requirement:

“The applicant/developer should enter into a formal agreement with Southern Water to provide the necessary sewerage infrastructure required to service this development. Please contact Atkins Ltd, Anglo St James House, 39A Southgate Street, Winchester, SO23 9EH (tel 01962 858688), or www.southernwater.co.uk”

We request that should this application receive planning approval, the following condition is attached to the consent: “Construction of the development shall not commence until details of the proposed means of foul sewerage disposal have been submitted to, and approved in writing by, the Local Planning Authority in consultation with Southern Water.”

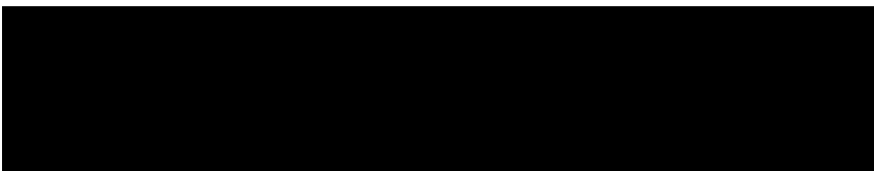
Surface Water Drainage:

Our initial investigations indicate that there are no public surface water sewers in the area to serve this development. Alternative means of draining surface water from this development are required. This should not involve disposal to a public foul sewer.

We request that should this application receive planning approval, the following condition is attached to the consent: “Construction of the development shall not commence until details of the proposed means of surface water disposal have been submitted to, and approved by, the Local Planning Authority in consultation with Southern Water.”

Yours faithfully

Network Development
Atkins Ltd, for Southern Water



<http://www.arun.gov.uk>

NLPG UPRN 100062237016

DX 57406

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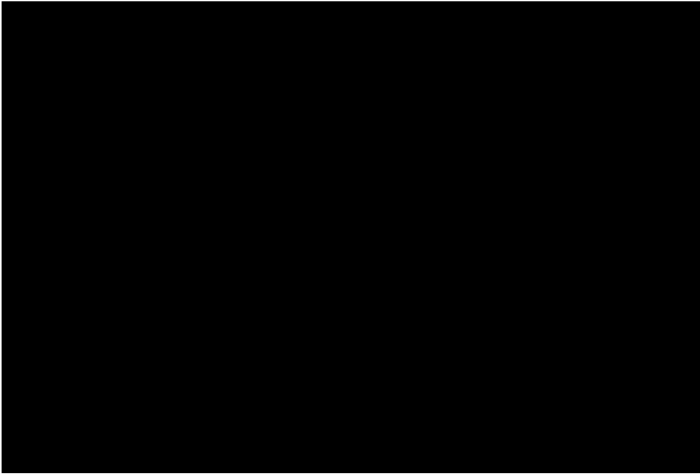
From: Nuttall, David [REDACTED]
Sent: 02 March 2010 09:39
To: Neil Crowther
Subject: RE: BN/27/09 - Angel's Nursery, Barnham

Neil, we have identified a point of connection, which would not have any negative impacts on existing levels of service. We are happy that the standard conditions for approval of details will be satisfactory in this situation.

It is important to note that the solution identified will not resolve existing problems, the solution is to discharge flows at the point on the system where there is adequate capacity.

Regards

David Nuttall





Project					
Angels and Hyde Nurseries Yaptan Road, Barnham					

Client	
West Sussex County Council	
Drawing Title	Location Plan

Robert Clark Associates Ltd	
Chartered Civil Engineers	
Willow Cottage, Herne Lane, Rustington	
West Sussex BN16 3EE	
Tel: 01903 778945 Fax: 01903 778967	

-	Original	PTC	PC MY	RTFC	9.3.10
Rev.	Description	App.	Chk.	Dm.	Date

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Scale 1:5000	At original A3
Drawing Number 1334/1.1	Revision -

Project
Angels and Hyde Nurseries
Yapton Road, Barnham

Client	West Sussex County Council
Drawing Title	Existing Site Plan

Robert Clark Associates Ltd
Chartered Civil Engineers
Willow Cottage, Herne Lane, Rustington
West Sussex BN16 3EE
Tel: 01903 778945 Fax: 01903 778967

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Scale	1:1250	At original	A3
Drawing Number	1334/2.1		Revision -

