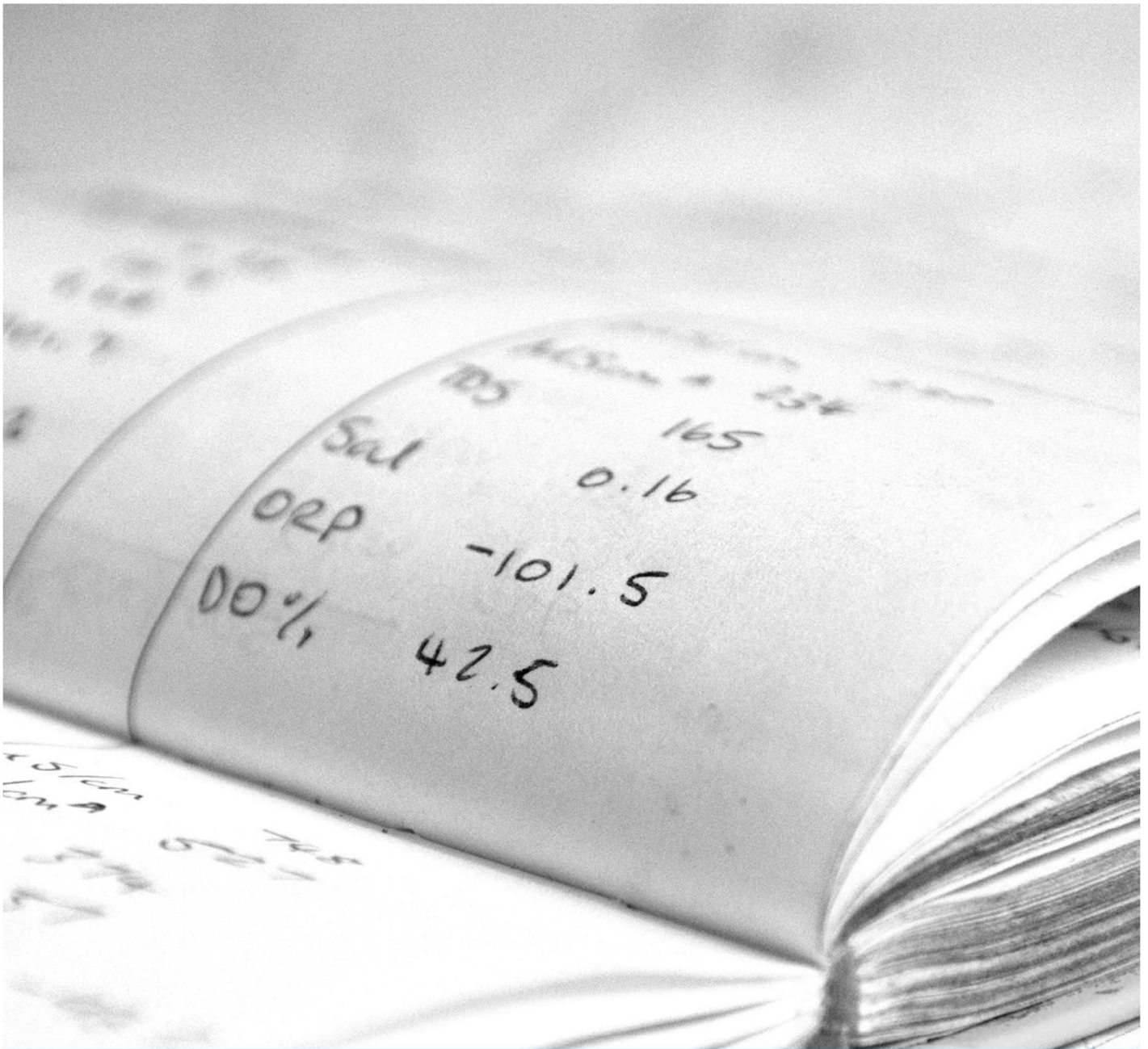




UNITED
BY OUR
DIFFERENCE



Outline Drainage Strategy
Acrefair (South), Wrexham
Air Products Plc

September 2011

QM

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks				
Date	15 September 2011			
Prepared by	Sandy Griffin			
Signature				
Checked by	Richard Jones			
Signature				
Authorised by	Sandy Griffin			
Signature				
Project number	11191085			
File reference	Acrefair/text/reports			

WSP Development and Transportation
The Victoria
150-182 The Quays
Salford
Manchester
M50 3SP

Tel: +44 (0)161 886 2400
Fax: +44 (0)161 886 2401
<http://www.wspgroup.com>

WSP UK Limited | Registered Address WSP House, 70 Chancery Lane, London, WC2A 1AF, UK | Reg No. 01383511 England | WSP Group plc | Offices worldwide

Contents

EXECUTIVE SUMMARY	1
1 Introduction	3
2 Existing Site	5
3 Proposed Foul Drainage	8
4 Proposed Surface Water Drainage	9
5 Conclusion	12
Appendix A Site Location Plan	
Appendix B Indicative Contour Plan	
Appendix C Historical Site Plans	
Appendix D Welsh Water Sewer Records	
Appendix E Foul Water Drainage Calculations	
Appendix F Point of Connection Plan	
Appendix G Environment Agency Correspondence	
Appendix H Surface Water Drainage Calculations	

Executive Summary

CONTEXT

WSP UK Limited was instructed by Air Products Limited to provide an outline drainage strategy to inform the and support a proposed residential development comprising up to 220 units at its former engineering works in Acrefair, North Wales.

INVESTIGATION INFORMATION

WSP has undertaken a utility search of all the services which may have apparatus in and around the site.

WSP has obtained and reviewed foul and surface water sewer records provided by Welsh Water, Wrexham County Borough Council, the Environment Agency and Air Products Limited.

WSP has consulted with Scottish Welsh Water, Wrexham County Borough Council, the Environment Agency and Air Products Limited to establish wherever possible that our investigation and assessment is in line with their expectations and requirements.

WSP has undertaken indicative calculations of foul and surface water flows from the expected development. These calculations have also included an estimate of storage to comply with the Environment Agency's requirement of attenuating flows for a 1 in 100 year storm event plus allowance for climate change.

WSP has also undertaken a site visit.

FOUL DRAINAGE

Welsh Water has agreed in principle to foul flows from up to 220 residential units can discharge in to the existing combined sewer located in Llangollen Road.

It is envisaged that no foul pumping station will be required to serve the proposed development.

Welsh Water has stipulated that points of connection and discharge rates cannot be allocated and reserved for a particular development. The point of connection provided is valid for a period of 12 months.

SURFACE WATER DRAINAGE

The Environment Agency has agreed in principle to a point of discharge in to Tref-y-nant Brook.

Surface water flows are restricted to the site's mean annual peak flow. However, if it can be proven that the site has an existing discharge in to the Tref-y-nant Brook flows can be increased to an equivalent brownfield flow rate. Site investigation is required to determine the route of the surface water network between the site and Tref-y-nant Brook.

The Environment Agency has stipulated that storage of surface water on site for a 1 in 100 year storm event plus allowance for climate change is required. Depending on the rate of discharge from the site the volume of storage required can range from 807m³ to 3,632m³.

Site investigation is required to determine the invert level of the existing surface water sewer exiting the site to establish if a gravity drainage system can be implemented.

This summary forms part of WSP's Outline Drainage Strategy (ref. 11191085). Under no circumstances is it to be used as an independent document.

1 Introduction

1.1 APPOINTMENT

1.1.1 WSP UK Ltd has been commissioned by Air Products Plc to provide an outline drainage strategy to inform and support a proposed residential development at the former Air Products Plc site located off Llangollen Road in Acrefair, Clywd.

1.2 PROPOSED DEVELOPMENT

1.2.1 The outline drainage strategy has been developed for a proposed residential site with an approximate area of 8.75 hectares and up to 220 dwellings.

1.3 OBJECTIVE OF STRATEGY

1.3.1 The objective of the strategy is to provide information and present proposals on the following:

- The existing surface water and foul water drainage systems within and in the vicinity of the site,
- Proposed surface water and foul water flows,
- Proposed surface water and foul water discharge points,
- Proposed surface water storage volumes,
- Proposed off-site reinforcement works,
- Constraints imposed by the regulatory bodies, including the Environment Agency and the local water authority.

1.3.2 The drainage strategy process comprised a desk study, data research, calculations and consultation with regulatory bodies.

1.3.3 A site visit was undertaken on the 14th July 2011 to assess the general topography of the area and to identify existing drainage features that may affect the site.

1.4 FLOOD AND WATER MANAGEMENT ACT 2010

1.4.1 This strategy has been prepared in consultation with regulatory bodies and third parties. The views, advice and recommendations provided by the regulatory bodies and third parties represent their current standards and procedures.

1.4.2 It should be noted that these standards and procedures are being reviewed by the respective regulatory bodies and third parties against the requirements imposed by the Flood and Water Management Act 2010. The advice and recommendations provided may change when associated Regulations have been issued in order to implement the full scope of the Act.

1.4.3 The Flood and Water Management Act 2010 received Royal Assent on the 8th April 2010. This Act provides duties on the Environment Agency, Local Authorities, Developers and other bodies to manage flood risks. The Act has significant planning and design implications for Developers including residential sites.

1.4.4 The main areas affecting developers are:

- Lead Local Flood Authority (LLFA) to adopt sustainable urban drainage systems (SUDS). The LLFA may be either a Unitary or County Council,
- Approval fees and non-performance bonds to be standardised,

-
- A National Standard for SUDS design, construction, maintenance and operation to be issued. This guidance will emphasise the preference for surface water SUDS features and the need to provide green corridors in to the master plan,
 - Changes to the rights to connect to sewers will restrict automatic connection rights to only Section 104 sewer schemes or approved SUDS schemes constructed to a new national sewer or new SUDS standard respectively,
 - Two options for the SUDS approval process. Either directly to the SUDS Approval Body or as a combined application to the Planning Authority as part of the Planning Application.

1.5 FLOOD CONSEQUENCE ASSESSMENT

1.5.1 The Environment Agency has confirmed that the site, with grid reference SJ 28013 43074, is outside any flood zone as identified within the Development Advice Map supporting TAN15 Development and Flood Risk. For this reason a formal Flood Consequence Assessment would not be required to accompany any planning application. It is recommended that this is reviewed, at the time of submitting a planning application, against the then current Development Advice Map to ensure the site remains outside any flood zone.

2 Existing Site

2.1 SITE LOCATION

2.1.1 The site, centred on the National Grid Reference 328013E 343074N, is located at Acrefair in North Wales approximately 2km west of Ruabon and 11km south west of Wrexham. A site location plan can be found in Appendix A of this report.

2.2 SITE DESCRIPTION

2.2.1 The site is approximately 8.75 hectares in size and is a mixture of undeveloped brownfield land, open space and wood land. The site has been previously industrially utilised, most recently supporting an engineering works which has been vacated and demolished in 2010. The former engineering works building floor slabs, site roadway, car parks and storage yard area surfacing remain occupying an area of approximately 5.25 hectares.

2.2.2 The site is bounded by the A539, Llangollen Road, to the north beyond which lies a combination of open space and residential properties. Residential properties located along Lancaster Terrace back on to the site's east boundary above the former site's car park. Further south, along the site's east boundary, the land is a mixture of open space and wood land. Land to the south of the site is predominately open space with residential properties located along Cae Coch Lane, Station Road and The Haven. King Street, forms the site's west boundary, separating residential and commercial premises from the former engineering works site.

2.2.3 The site's principal access is located off the A539 Llangollen Road. A gated vehicular access also exists on the site's south boundary at the head of Station Road.

2.2.4 Tref-y-nant Brook, a designated main river, is located approximately 750m to the south west of the proposed development site. A smaller unnamed watercourse is also located approximately 370m to the south west of the site.

2.2.5 The site's topography has been shaped by its use as a former engineering works with large open relatively flat areas surrounded by embankments, cutting and retaining wall structures. Along the site's north east boundary, in a former car park area, the levels range from 139.26m AOD to 139.62m AOD. Beyond this boundary the site is in cutting with the corresponding top of bank levels ranging from approximately 140m AOD to 147m AOD. The level of Llangollen Road immediately adjacent to the site's north east boundary is similar to the site's level at 139.17m AOD.

2.2.6 From the site's north east boundary the levels fall in a south westerly direction in to the site and generally follow the adjacent Llangollen Road carriageway level up to the first existing site access where the road and site level is approximately 137.22m AOD. The levels continue to fall south westerly until the second access off Llangollen Road. At this point a general site level of 135.70m AOD is recorded. Whereas, the corresponding carriageway level in Llangollen Road is 133.78m AOD and a graded access is provided in to the site.

2.2.7 To the south west of this second access the former engineering work's site is predominately a level plateau at typically 135.7m AOD. The plateau drops away approaching the site's west boundary where it falls in to the relatively flat cutting of the former Acrefair rail station platform at approximately 133.80m AOD. To the east of the plateau the site rises steeply up a vegetated bank to its east boundary where a level of 150.96m AOD is recorded.

2.2.8 A gated access on the site's west boundary, leading off Station Road, has a level of 133.20m AOD. The surrounding road levels are significantly lower than the site's plateau level with 123.40m AOD recorded at the junction of King Street and Llangollen Road and 125.33m AOD recorded at the junction of King Street and Station Road. An indicative contour plan is shown in Appendix B.

2.3 SITE HISTORY

2.3.1 The earliest available historical maps, 1873-1875, show the site containing a small engineering works belonging to the New British Iron Works, a reservoir located approximately mid-way along the site's northern boundary, the Acrefair rail station and a large area of earthworks cutting in the site's north west corner.

2.3.2 The historical maps show little change in the site's development up until 1963 where the engineering works are enlarged and a residential development, Lancaster Terrace, is recorded backing on to the site's east boundary.

2.3.3 The 1977 historical map shows an enlarged engineering works which footprint extends over the area of former cutting in the site's north west corner. The station is shown as disbanded and the reservoir has been filled in.

2.3.4 Other than the reservoir the historical maps show no other water bodies within the site.

2.3.5 Historical records of land use show a landfill located adjacent to the site's west boundary extending in to the site.

2.3.6 A site plan of the works dated 22nd June 1950 titled 'Site Plan of Works with Position of Water Mains, Drains etc' show a covered and open drain between the engineering works and the earthworks cutting in the site's north west corner. Based on the depth of cutting shown on the plan the drain flows in a south west direction, passing under the Acrefair station, before exiting the site. No record is shown as to where the drain discharges. The plan also shows a series of manholes and drainage runs within the site associated with the engineering works. It is not clear if the drainage runs represent foul, surface water or combined systems. However, the drainage runs are shown exiting the site in to Llangollen Road and, as with the open drain, across the site's west boundary.

2.3.7 A later site plan, titled 'Works Plan -2009' and dated 10th August 2009 shows the engineering works with separate foul and surface water drainage systems. The foul drainage is shown leaving the site across its west boundary on a similar alignment to that shown in the 1950 plan. The surface water drainage is shown discharging via two separate networks; one discharging in to Llangollen Road and the other across the site's west boundary parallel with the foul network. Pipe sizes and manhole depths are not recorded on the plan.

2.3.8 Although manholes were evident on site during the site visit. Confirmation on their system type, depth, size and direction of flow could not be obtained as they had been infilled for safety reasons.

2.3.9 Copies of the historical drainage site plans are contained in Appendix C.

2.4 EXISTING ADOPTED FOUL AND COMBINED SEWERS

2.4.1 Welsh Water sewer plans, see Appendix D, show that there are a number of public combined sewers in the vicinity of the site;

-
- 225mm diameter combined sewer flowing south west along Llangollen Road,
 - Unknown sized combined sewer flowing south west from the site's west boundary heading towards King Street

2.4.2 No public foul or combined sewers are shown within the site boundary.

2.5 EXISTING ADOPTED SURFACE WATER SEWERS

2.5.1 Welsh Water sewer plans show no public surface water sewers either within or in the vicinity of the site.

2.5.2 Wrexham County Borough Council has confirmed it has an existing 150mm and 225mm diameter highway drain in Llangollen Road. This highway drain commences in Llangollen Road's north footway, south of its junction with King Street, and flows south west before passing through private land between residential properties, 'Pendil' and 'No.2 Brookmount'.

2.5.3 No public surface water sewers are shown within the site boundary.

2.6 EXISTING PRIVATE FOUL WATER DRAINS

2.6.1 Welsh Water sewer plans show no private foul drain or private foul drain subject to Section 104 adoption agreement either within or in the vicinity of the site.

2.6.2 Private foul drainage associated with the former engineering works is shown on site plans, see paragraph 2.3.5 and 2.3.6 above.

2.7 EXISTING PRIVATE SURFACE WATER DRAINS

2.7.1 Welsh Water sewer plans show no private surface water drain or private surface water drain subject to Section 104 adoption agreement either within or in the vicinity of the site.

2.7.2 Private surface water drainage associated with the former engineering works is shown on site plans, see paragraph 2.3.5 and 2.3.6 above.

2.8 EXISTING LAND DRAINAGE

2.8.1 The former engineering works, comprising building floor slabs, site roadway, car parks and storage yard area surfacing is considered to be 100% impermeable and drained via the network of private surface water drains described in paragraph 2.3.5 and 2.3.6 above.

2.8.2 The remaining site is considered to be 100% permeable and is thought to drain naturally using the natural topography and infiltration.

2.8.3 No water bodies are evident within the site boundary.

2.8.4 Tref-y-nant Brook, a designated main river, is located approximately 750m to the south west of the proposed development site. A smaller unnamed watercourse is located approximately 370m to the south west of the site.

3 Proposed Foul Drainage

3.1 INTRODUCTION

3.1.1 The foul water drainage strategy has been based on an adoptable sewer system and should be designed and constructed in accordance with current regulations, Sewers for Adoption 6th Edition and Welsh Water requirements.

3.1.2 To permit access, sewers for adoption should be located within highways or open public spaces. Sewers which are located in private areas may be offered for adoption provided they are accessible 24 hours a day and at least 3 metres is provided between the sewer and surrounding buildings. The actual clearance required is dependent on invert levels and pipe sizes.

3.1.3 Welsh Water has stated its preference for a gravity sewerage system to avoid operational and maintenance cost associated with pumping stations. However, it will not object to a pumping station if a gravity sewerage system is unreasonable.

3.2 FOUL WATER FLOWS

3.2.1 The estimated design foul water flows generated by a development of up to 220 residential units is 10.2 litres per second. This flow rate is based on a gravity system and has been determined in accordance with Sewers for Adoption 6th Edition and the requirement to allow for 4000 litres per dwelling per 24 hours, see Appendix E.

3.3 FOUL WATER POINT OF DISCHARGE

3.3.1 Welsh Water has advised that the site must be designed using separate drainage systems for foul water and surface water.

3.3.2 Welsh Water has confirmed the foul flows from the proposed development can be accommodated within the existing public sewerage system located in Llangollen Road, downstream of its manhole ref. SJ28431202. This manhole is located opposite the Willow Court residential development, see Appendix F.

3.3.3 Highway and land drainage run-off will not be permitted to discharge directly or indirectly in to the public sewerage system.

3.3.4 Welsh Water has stipulated that the point of connection and accepted discharge rates cannot be allocated and reserved for a particular development. Consequently, the information provided is valid for a maximum period of 12 months from the 25th July 2011.

3.4 GRAVITY OR PUMPED SEWERAGE SYSTEMS

3.4.1 Due to the site's existing topography and the longitudinal fall on Llangollen Road a gravity sewerage system can be achieved. However, this is based on the proposed foul sewer taken the most direct route to the existing sewer in Llangollen Road. In cases, this may be down the existing heavily overgrown embankment that separates much of the site from Llangollen Road.

3.4.2 If access to the sewer in Llangollen Road is restricted to the existing site accesses it is envisaged pumping will be required from any development proposed along the site's west boundary where the existing levels are generally 2m lower than the larger plateau level. In preparing the site's master plan consideration should be given to the location of development within the site to avoid pumping where necessary.

4 Proposed Surface Water Drainage

4.1 INTRODUCTION

4.1.1 The Environment Agency has confirmed that the site is outside any flood zone as identified within the Development Advice Map supporting TAN15 Development and Flood Risk.

4.1.2 The Environment Agency recommends that surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management. SUDS are an approach to managing surface water run-off which seeks to mimic natural drainage systems and retain water on or near the site as opposed to traditional drainage approaches which involve piping water off site quickly as possible. SUDS involve a range of techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands. Approved Document Part H of the Building Regulations (2000) sets out a hierarchy for the disposal of surface water which encourages the use of SUDS.

4.1.3 Historical site plans show the site had two separate surface water drainage networks; one exiting the site in to Llangollen Road's combined sewer and the other via the site's west boundary.

4.1.4 The route and discharge point of the surface water drainage network leaving the site via the site's west boundary is unknown. However, based on a recorded pollution incident on the 17th December 2009 there is evidence to suggest the site's surface water drainage discharges in to Tref-y-nant Brook or a tributary of it, see Appendix G. Further investigation is required to determine the surface water drainage route leaving the site's west boundary.

4.2 SURFACE WATER DISCHARGE RATES

4.2.1 The Environment Agency has confirmed that the surface water run-off should be controlled as near to its source as possible. It has also stated its preference to see SUDS methods utilised if at all practicable.

4.2.2 Where infiltration is not practicable the Environment Agency has provided two scenarios for the surface water run-off:

Undeveloped Sites

4.2.3 The discharge rate is to be limited to its mean annual peak flow (Qbar). Additional flows over and above Qbar will need to be stored on site for a full range of return periods up to the 100 year event including adjustment for future climate change.

4.2.4 The mean annual peak flow for the site has been calculated at 2.60 litres per second per hectare, see Appendix H.

4.2.5 Based on a developable area of 5.25 hectares, which represents the approximate area of hard standing currently on the site, and a 60% impermeable developed area the limiting discharge rate will be 8.19 litres per second.

Brownfield Developments

4.2.6 The discharge rate is to be limited to two thirds of the existing brownfield runoff rate. Where the pre-existing brownfield run off rate cannot be determined the discharge rate will be restricted to Qbar and flows attenuated for up to a 1 in 100 year event including adjustment for future climate change.

4.2.7 The brownfield runoff rate for the site's existing hard standing area has been calculated at 94.87 litres per second per hectare. Therefore, the corresponding limiting two thirds rate is 63.28 litres per second per hectare.

4.2.8 However, approximately 40% of the existing hard standing area discharges in to the combined sewer in Llangollen Road and cannot be considered as currently discharging in to the local watercourses. Therefore, the corresponding reduced two thirds brownfield flow rate is 40.38 litres per second per hectare.

4.2.9 Based on a developable area of 5.25 hectares, which represents the approximate area of hard standing currently on the site, and a 60% impermeable developed area the limiting discharge rate will be 127.20 litres per second.

4.3 SURFACE WATER POINT OF DISCHARGE

4.3.1 The site's underlying drift deposits comprise glacial till. This, along with an historical landfill site located adjacent to the site's west boundary preclude infiltration as a practicable technique for discharging surface water.

4.3.2 Welsh Water has stated that surface water drainage must be a separate system from the foul water and discharge either using soakaways or directly in to a local watercourse. No surface water is permitted to discharge in to the existing combined public sewers in the vicinity of the site.

4.3.3 The Environment Agency has agreed in principle to brownfield restricted flows discharging in to Tref-y-nant Brook provided it can be shown that there is an existing discharge to this water course. If an existing discharge cannot be proven the Environment Agency will only accept the equivalent undeveloped site's mean annual peak flow.

4.4 ATTENUATION AND ESTIMATED VOLUMES

4.4.1 The Environment Agency has stated that on-site attenuation will be required for discharges up to a 1 in 100 year storm event including allowance for climate change.

4.4.2 To comply with the Environment Agency's requirement for attenuation of surface water the estimated total storage required for the site is between 807m³ and 1,429m³ if flows are restricted to the brownfield flow rates. However, if discharge is restricted to the undeveloped site's mean annual peak flow the corresponding storage required is between 2,475m³ and 3,632m³.

4.4.3 The estimated range of storage required may be used as a starting point for detailed design but it must never be used as a final design as the variables it assumes are significant. Final design storage volumes may be outside the ranges provided.

4.4.4 Sewers for Adoption 6th Edition states that there should be no external surface water flooding for up to a 1 in 30 year storm event and that storage over and above the 1 in 30 year event should not be sited within the adoptable system. The estimated range of storage required for a 1 in 30 year storm event is between 671m³ and 1,429m³ for the brownfield site scenario and between 1,997m³ and 3,632m³ for the undeveloped site scenario.

4.4.5 Based on the estimated storage for a 1 in 30 year storm event other storage features are required to take the balance up to a 1 in 100 year storm event plus allowance for climate change. This balance may be up to 758m³ and 1,635m³ for the brownfield development and undeveloped site respectively.

4.4.6 Attenuation of surface water can be provided in a number of ways. These vary from shallow swales located adjacent to the carriageway through to larger detention basins often sited downstream of the main drainage network. The need to provide adequate space for water storage must be considered and allowed for in the master plan.

4.5 GRAVITY OR PUMPED SEWERAGE SYSTEMS

4.5.1 An investigation to determine the invert level of the site's furthest downstream surface water manhole is required to determine if the proposed development can utilise the existing drainage and establish a gravity drainage sewerage system.

5 Conclusion

5.1 EXISTING DRAINAGE

5.1.1 Welsh Water sewer plans show combined sewers in Llangollen Road and adjacent to the site's west boundary.

5.1.2 Historical site plans show the former engineering works had separate foul and surface water drainage networks. Foul water and surface water exited the site across its west boundary. In addition, surface water exited the site in to Llangollen Road.

5.2 FOUL WATER DRAINAGE

5.2.1 Design foul flows for the proposed development have been calculated at 10.2 litres per second.

5.2.2 Welsh Water has indicated that unrestricted foul flows can discharge in to the existing 225mm diameter combined sewer located in Llangollen Road. The foul drainage routes between the site and the point of connection will not cross third party land.

5.2.3 A gravity sewerage system can be achieved for the proposed development provided consideration is given to the plot layout in the future master plan.

5.3 SURFACE WATER DRAINAGE

5.3.1 The Environment Agency has confirmed that flows from the proposed development can discharge in the Tref-y-nant Brook. The rate of discharge permitted will depend on proving an discharge exists between the site and the water course.

5.3.2 Depending on the outcome of the Environment Agency condition the rate of discharge is either 2.60 litres per second per hectare or 40.38 litres per second per hectare. These rates are based on a developed area of 5.25 hectares and 60% impermeability.

5.3.3 To comply with the Environment Agency's requirement for on-site attenuation of surface water the estimated storage required ranges from 807m³ to 3,632m³.

5.3.4 Welsh Water will not permit surface water discharging in to the combined sewers in the vicinity of the site.

Appendices, Figures & Tables

Appendix A Site Location Plan

J:\WSPDSchemes\Acrefair, Air Products Ltd\DRAWINGS\AUTOCAD\GA General Arrangement\1085-GA-01.dwg 30/09/2011 14:07:45 Smith, Toby



DO NOT SCALE

KEY
SITE BOUNDARY

A	15/09/11	TS	FIRST ISSUE	SG	SG
REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS: FOR INFORMATION ONLY



The Victoria, 150-182 The Quays, Salford M50 3SP
Tel: +44 (0)161 886 2400 Fax: +44 (0)161 886 2401
<http://www.wspgroup.com>

CLIENT: AIR PRODUCTS PLC

ARCHITECT: N/A

PROJECT: ACREFAIR

TITLE: SITE LOCATION PLAN

SCALE @ A3: N.T.S.	CHECKED: SG	APPROVED: SG
CAD FILE: 1085-GA-01	DESIGN-DRAWN: TS	DATE: September 2011
PROJECT No: 11191085	DRAWING No: 1085/GA/01	REV: A

© WSP Group plc

Appendix B Indicative Contour Plan

J:\WSPDSchemes\Acrefair, Air Products Ltd\DRAWINGS\AUTOCAD\GA General Arrangement\1085-GA-03.dwg 30/09/2011 14:09:18 Smith, Toby



DO NOT SCALE

KEY
SITE BOUNDARY

A	15/09/11	TS	FIRST ISSUE	SG	SG
REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS: FOR INFORMATION ONLY



The Victoria, 150-182 The Quays, Salford M50 3SP
Tel: +44 (0)161 886 2400 Fax: +44 (0)161 886 2401
<http://www.wspgroup.com>

CLIENT: AIR PRODUCTS PLC

ARCHITECT: N/A

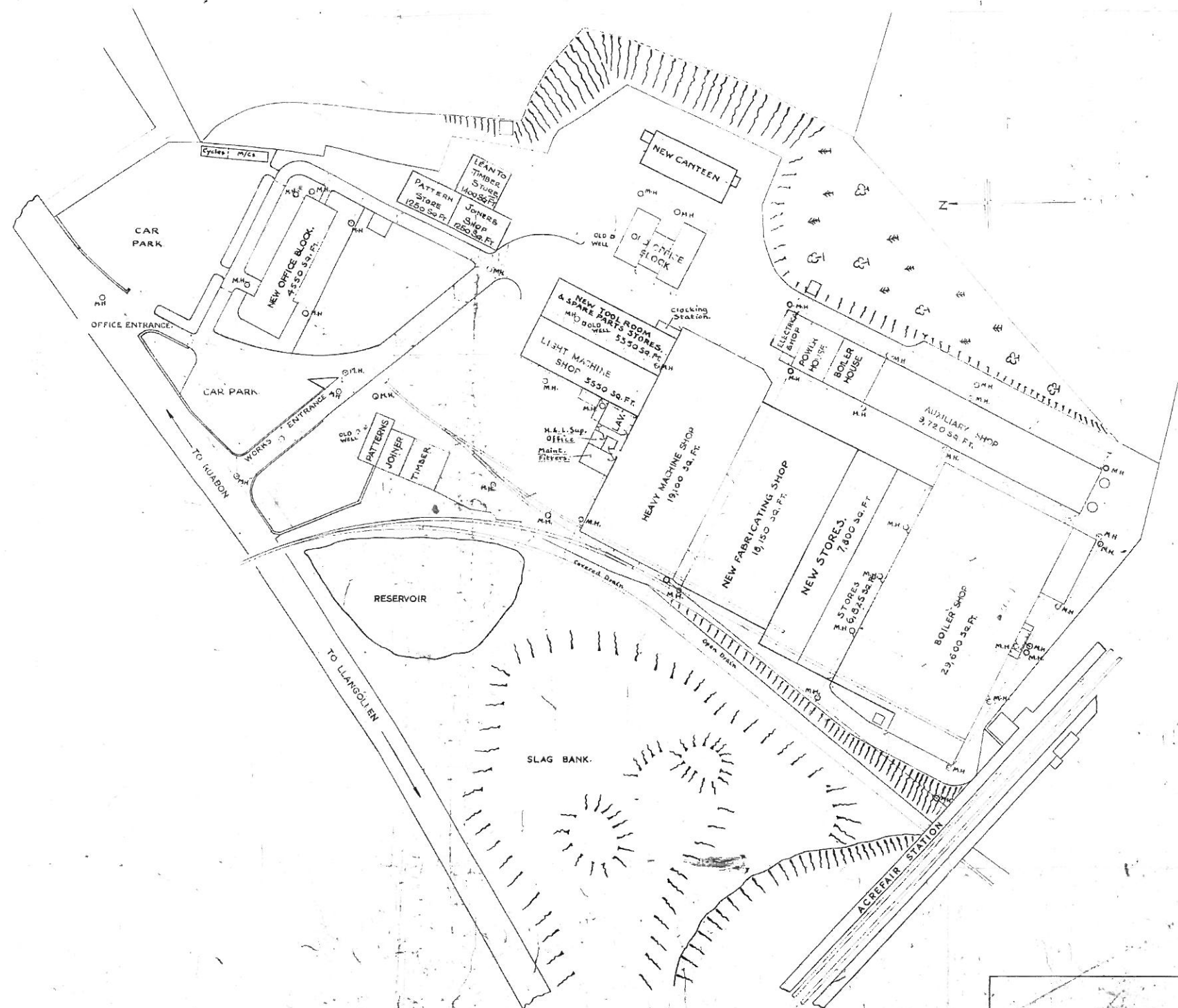
PROJECT: ACREFAIR

TITLE: INDICATIVE CONTOUR PLAN

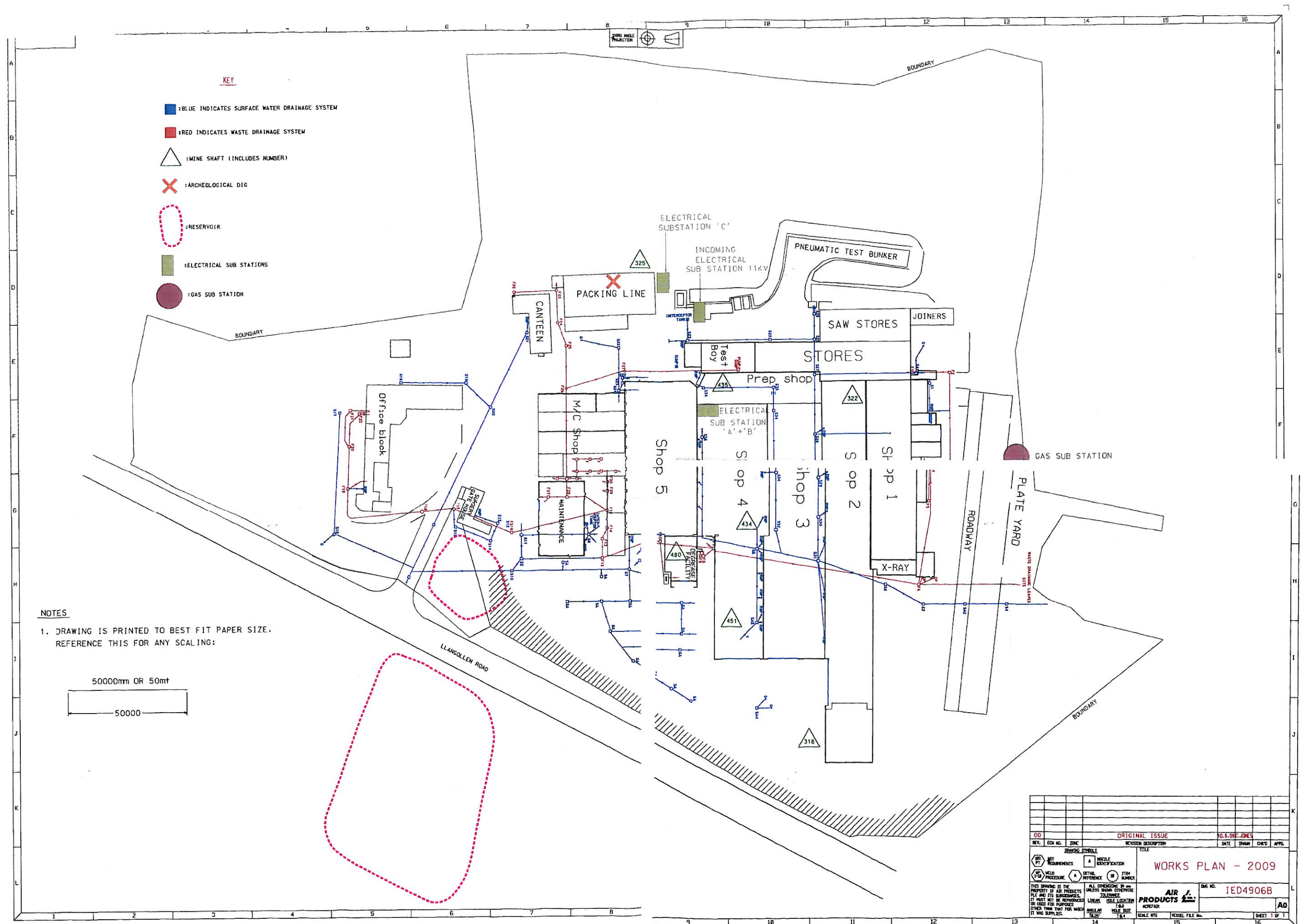
SCALE @ A3: N.T.S.	CHECKED: SG	APPROVED: SG
CAD FILE: 1085-GA-03	DESIGN-DRAWN: TS	DATE: September 2011
PROJECT No: 11191085	DRAWING No: 1085/GA/03	REV: A

© WSP Group plc

Appendix C Historical Site Plans



HUGHES & LANCASTER LTD. ACREFAIR, WREXHAM.		SITE PLAN OF WORKS WITH POSITION OF WATER MAINS, DRAINS ETC.	
Materials		DRAWING No. C. 55	
Est. Code No.			
Particulars			



Appendix D Welsh Water Sewer Records

WSP Development and Transportation
The Victoria
150-182 The Quays
Salford
Manchester
M50 3SP

Date: 25/07/2011
Enquiries Tel.: 08009172652
Our Ref.: 2011/DCWW/74394
Your Ref.: 91085/C
Grid Ref.: SJ2803143135

F A O Sandy Griffin

Dear Sir/Madam

Re: 220 No residential development, Former Air Production Site, Acrefair, Wrexham

Further to the above consultation we would provide the following comments:-

SEWERAGE

The public sewerage system in the vicinity of the proposed site is generally of a combined type.

The foul only flows from the proposed development can be accommodated within the public sewerage system at or downstream of manhole ref. SJ28431202.

In relation to surface water flows from the proposed development, these will have to be disposed of separately by other means, i.e. using soakaways or discharging directly to a watercourse in liaison with the Land Drainage and / or Environment Agency.

Please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

If any onsite or offsite sewers are to be offered for adoption they must be constructed to conform with the publication "Sewers for Adoption"- 6th Edition.

If a connection is required to the public sewerage system, the developer is advised to contact the Dwr Cymru Welsh Water Developer Services on Tel: 0800 9172652.

Please note that in order to make a connection to the public sewerage system, it may be necessary to cross third party land, for which you must first gain permission from all the relevant landowners. Should you encounter difficulties in gaining the permission to do so, it may be possible to requisition a new sewer under Sections 98 to 101 of the Water Industry Act 1991 from the boundary of the proposed development to the public sewerage system. Should you require further information please write to us at the address given above.

WSP MANCHESTER	
27 JUL 2011	
Action	
File Ref:-	

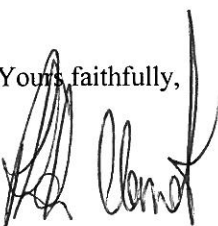
SEWAGE TREATMENT

To progress with the proposed development, we would suggest undertaking a feasibility study of the Waste Water Treatment Works. The outcome of a study would establish what would be required to accept the proposed flows, without causing detriment to the public sewerage asset or the environment. To provide a quotation to undertake a study, we would require a fee of £250 plus VAT made payable to Dwr Cymru Welsh Water.

WATER SUPPLY

Please note that the area in question is not administered for water supply by Dwr Cymru Welsh Water. You should contact Dee Valley Water plc on 01978 846946.

We hope the above is satisfactory. However, should you require further assistance please contact us on the above telephone number, quoting our reference.

Yours faithfully,


Rhidian Clement
Principal Planner

Demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.

Enc

Sewer Plan
Cheque Receipt



Dŵr Cymru
Welsh Water

2011/DCWW/74394



LEGEND

Waste network:

- | | | | |
|--|-------------------------|--|---|
| | Foul chamber | | Outfall |
| | Surface water chamber | | Lampole |
| | Combined chamber | | Storm Overflow |
| | Combined sewer overflow | | Rising main |
| | Special purpose chamber | | Gravity sewer |
| | Treatment works | | Private sewer |
| | Pumping station | | Private sewer subject to Sect. 104 adoption agreement |

NB: Sewer symbol colour indicates the type
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Dŵr Cymru Cyf gives this information as to the position of its underground apparatus by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the Company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New Roads and Streetworks Act 1991 and of the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

**EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.**

Reproduced by permission of Ordnance Survey on behalf of
HMSO, © Crown copyright and database right 2008.
All rights reserved.
Ordnance Survey License number 100019534.

Map Ref:
Map scale: 1:2,500
Printed by:
Printed on: 25.07.11

Appendix E Foul Water Drainage Calculations

Project AUREKAIR - AIR PRODUCTS PLC			Status	
Date By Checked	JULY 2011	Job no. 91085	Section	Sheet no. 1
Rev	Date	Details OUTLINE DRAINAGE STRATEGY		Tel Fax
Part FOUL SEWERS				



REF	OUTPUT
Sewer for Adoption. 6th Edition 2.12 Hydraulic Design (gravity sewers) 2.12.1 Design flow = 4000 L / dwelling / 24hrs $= \frac{4000 \times 220}{24 \times 3600}$ $= \underline{\underline{10.2 \text{ l/s}}}$ 10.2 l/s.	

Appendix F Point of Connection Plan

J:\WSPDSchemes\Acrefair, Air Products Ltd\DRAWINGS\AUTOCAD\GA General Arrangement\1085-GA-02.dwg 30/09/2011 14:08:27 Smith, Toby



DO NOT SCALE

KEY
SITE BOUNDARY

A	15/09/11	TS	FIRST ISSUE	SG	SG
REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS: FOR INFORMATION ONLY



The Victoria, 150-182 The Quays, Salford M50 3SP
Tel: +44 (0)161 886 2400 Fax: +44 (0)161 886 2401
<http://www.wspgroup.com>

CLIENT: AIR PRODUCTS PLC

ARCHITECT: N/A

PROJECT: ACREFAIR

TITLE: POINT OF CONNECTION PLAN

SCALE @ A3: N.T.S.	CHECKED: SG	APPROVED: SG
CAD FILE: 1085-GA-02	DESIGN-DRAWN: TS	DATE: September 2011
PROJECT No: 11191085	DRAWING No: 1085/GA/02	REV: A

© WSP Group plc

Appendix G Environment Agency Correspondence

creu lle gwell
creating a better place



Asiantaeth yr
Amgylchedd Cymru
Environment
Agency Wales

Air Products PLC
Acrefair
Wrexham
LL14 3HW

Ein cyf/Our ref:
NEM5/RE/AIRPRODUCTSPLC/0809

Dyddiad/Date: 23rd December 2009

Dear Mr Price

I am writing to you regarding an incident that occurred on the Tref-y-nant Brook near Acrefair on the 17th December 2009 downstream of Air Products PLC. Environment Officers confirmed substantial amount of foam in the brook.

From our investigations and a site meeting with Les Price, Works Engineer – maintenance of Air Product PLC, we believe that the source of this pollution was a discharge of Blue Gold Industrial cleaner from one of the tanks located on site. It was understood that the company believed they were discharging to a sump which was connected to foul. However after lifting the surface water manholes on the site it was evident that foam was present. This indicated that some of the detergent had entered the surface water drainage system.

Please can the company ensure and confirm that the drains are now clean and free from contaminants and that the sump is emptied to prevent further risk to the environment. If the company are to continue discharging similar substances, please ensure that you have the consent of the sewer provider and ensure that there is no risk of this substance reaching surface water.

The Environment Agency are aware that the site is now closed and that decommission has begun on site. Environment officers on site noticed chemical containers/IBC/tanks and other waste material still remaining on site.

Please could you provide the Environment Agency with a copy of the decommissioning plan for the site. This must include a list of waste and any potential chemicals/substances still on site which may need disposing of, and a list of the disposal routes for these products.

The Environment Agency are happy to work with Air Products PLC in providing advice in respect to waste management and pollution prevention through this decommissioning phase, and would appreciate a final site visit when the decommissioning works are complete.

Dee Protection Zone consent

We understand that you may no longer require your DPZ Consent. Please see the attached slip and confirm whether or not your Company still require the DPZ Consent, sign and return the slip to us at the above address within the next 14 days



Griffin, Sandy

From: Taunt, Neil <neil.taunt@environment-agency.wales.gov.uk>
Sent: 02 August 2011 07:43
To: Griffin, Sandy
Cc: Barry, Ruairi
Subject: RE: Site at Acrefair

Sandy,

If it can be shown that there is an existing discharge to Tref-y-nant Brook then that will be no problem. If not then we would require you to demonstrate that the site would naturally drain to this catchment and we would only accept an equivalent Greenfield runoff rate into this watercourse as detailed in my previous email.

If you wish to discuss any further then please don't hesitate to contact me (01244 894570). I will be away from the office until Thursday.

Regards

Neil

Neil Taunt

**Technical Specialist
Development and Flood Risk (Northern Area)
Environment Agency Wales**

From: Griffin, Sandy [mailto:Alexander.Griffin@WSPGroup.com]
Sent: 01 August 2011 14:31
To: Taunt, Neil
Cc: Barry, Ruairi
Subject: RE: Site at Acrefair

Neil,

Thanks for your reply. The outline drainage strategy will look at SUDS and the use of infiltration techniques to drain surface water within the site boundary. However, if an off-site discharge point is required is the Tref-y-nant Brook acceptable. I think the site may have had a surface water drainage system that connected to this watercourse in the past.

Regards,

Sandy Griffin
Associate Director, Property & Development

The Victoria, 150-182 The Quays, Salford M50 3SP
Tel: +44(0)161 886 2466
Fax: +44(0)161 886 2401
Mob: +44(0)7979 708 723

Website: www.wspgroup.co.uk

We are WSP. United by our difference.

From: Taunt, Neil [mailto:neil.taunt@environment-agency.wales.gov.uk]
Sent: 14 July 2011 10:23
To: Griffin, Sandy

Cc: Barry, Ruairi
Subject: RE: Site at Acrefair

Hi Sandy,

Surface water run-off should be controlled as near to its source as possible. Preferably, we would wish to see SuDS methods utilised if at all practicable – e.g. infiltration / soakaway. If SuDS are not to be used, the developer will need to demonstrate to us why it is not practical at that particular location.

The following scenarios apply if infiltration is not practicable:- if the site is currently undeveloped, we normally require that the discharge rate is limited to the greenfield runoff rate (with on-site attenuation for up to the 1% rainfall event with an appropriate allowance to climate change).

For existing developed sites (brownfield), we ask that the developer calculates the existing brownfield runoff rate and, in order to improve the existing situation, the runoff rate should be limited to 2/3 of the existing rate. Where the pre existing discharge rate can not be determined then we would expect discharge rates to be attenuated to the equivalent Greenfield rate for the site,

If you have any questions on the above then please contact either myself or colleague Ruairi Barry.

Regards

Neil

Neil Taunt

**Technical Specialist
Development and Flood Risk (Northern Area)
Environment Agency Wales**

From: Griffin, Sandy [mailto:Alexander.Griffin@WSPGroup.com]
Sent: 13 July 2011 14:18
To: Taunt, Neil
Subject: RE: Site at Acrefair

Neil,

It is for redevelopment of the existing site. The site was formerly an industrial site which has been demolished. The proposed redevelopment is for up to 220 residential units.

Regards,

Sandy Griffin
Associate Director, Property & Development

The Victoria, 150-182 The Quays, Salford M50 3SP
Tel: +44(0)161 886 2466
Fax: +44(0)161 886 2401
Mob: +44(0)7979 708 723

Website: www.wspgroup.co.uk

We are WSP. United by our difference.

From: Taunt, Neil [mailto:neil.taunt@environment-agency.wales.gov.uk]
Sent: 13 July 2011 08:37
To: Griffin, Sandy
Subject: RE: Site at Acrefair

Sandy,

Is this for a redevelopment of site or an extension to the existing?

Regards

Neil

Neil Taunt

**Technical Specialist
Development and Flood Risk (Northern Area)
Environment Agency Wales**

From: Griffin, Sandy [mailto:Alexander.Griffin@WSPGroup.com]
Sent: 12 July 2011 14:04
To: Taunt, Neil
Subject: RE: Site at Acrefair

Neil,

I am preparing a drainage strategy for the site at Acrefair (grid ref. SJ 28017 43070) and would like to know the constraints the Environment Agency would impose on the site's development in terms of drainage. Constraints may include rates of discharge, volumes to be attenuated on site etc. I would also like to know what acceptable points of discharge are available; I have seen a copy of an EA letter regarding a pollution incident that occurred in 2009 where the local Tref-y-nant Brook was affected. I'm not sure at this stage if the site has an existing direct discharge in to this watercourse or via the local sewer network. However, would this watercourse still represent a suitable discharge point.

Location plan attached of the site.

Please call if you need any further information.

Regards,

Sandy Griffin
Associate Director, Property & Development

The Victoria, 150-182 The Quays, Salford M50 3SP
Tel: +44(0)161 886 2466
Fax: +44(0)161 886 2401
Mob: +44(0)7979 708 723

Website: www.wspgroup.co.uk

We are WSP. United by our difference.

From: Taunt, Neil [mailto:neil.taunt@environment-agency.wales.gov.uk]
Sent: 20 June 2011 07:40
To: Griffin, Sandy
Subject: RE: Site at Acrefair

Sandy,

The grid ref you have supplied is outside of any flood zone as identified within the Development Advice Map supporting TAN15 Development and Flood Risk. For this reason a formal flood consequence assessment would not be required to accompany any planning application. Dependant on the scale of the application an assessment may be required to ensure that the proposal does not adversely increase flooding elsewhere associated with surface water generated from new impermeable surfaces.

If you have any other questions then please let me know.

Regards

Neil

Neil Taunt

**Technical Specialist
Development and Flood Risk (Northern Area)
Environment Agency Wales**

From: Griffin, Sandy [mailto:Alexander.Griffin@WSPGroup.com]
Sent: 17 June 2011 15:55
To: Taunt, Neil
Subject: FW: Site at Acrefair

Click [here](#) to report this email as spam.

Neil,

Many thanks for fielding my call earlier.

The site's Grid Reference is SJ 28017 43070.

As discussed is a Flood Consequences Assessment required to support a planning application at this location?

Regards,

Sandy Griffin
Associate Director, Property & Development

The Victoria, 150-182 The Quays, Salford M50 3SP
Tel: +44(0)161 886 2466
Fax: +44(0)161 886 2401
Mob: +44(0)7979 708 723

Website: www.wspgroup.co.uk

We are WSP. United by our difference.

Environmental Advisor of the Year 2011
[Click here](#) to hear stories from our WSP people.

WSP is a FTSE4Good company

WSP is one of the world's fastest-growing design, engineering and management consultancies. Specialising in property, transport and environmental projects, we work with clients to create built and natural environments for the future.

CONFIDENTIAL

This e-mail is confidential to the named recipient. If you have received a copy in error, please destroy it. You may not use or disclose the contents of this e-mail to anyone, nor take copies of it. The only copies permitted are (1) by the named recipient and (2) for the purposes of completing successful electronic transmission to the named recipient and then only on the condition that these copies, with this notice attached, are kept confidential until destruction.

WSP UK Limited Registered Office: WSP House, 70 Chancery Lane, London, WC2A 1AF Registered Number 01383511 England

Appendix H Surface Water Drainage Calculations

AIR PRODUCTS, ACREFAIR, WREXHAM : RUNOFF RATES DETERMINED BY WINDES (IoH INPUT METHOD/ICP SUDS) AND CALCULATION OF Qbar VALUES

SOURCE: WINDES
INPUTS

Existing Land Characteristics						Peak Flood Flow m³/s	
Area No.	Area Size (Ha.)	SAAR (mm)	SOIL type	URBAN (%)	REGION	QBAR rural	QBAR urban
1	8.76	948	0.3	0	9	0.0228	0.0228

SOURCE: EA REPORT 'PRELIMINARY RAINFALL RUNOFF MANAGEMENT FOR DEVELOPMENTS' RESULTS
RESULTS

Catchment mean annual peak flow m³/s	Mean annual peak flow per unit area l/s/ha	1year peak discharge runoff rate per unit area l/s/ha	1year peak discharge runoff rate per catchment
QBAR	QBAR/A	Q1yr	Q1yr x Area
0.0228	2.60	2.21	19.38

30 Year

	QBAR/A	Q30yr	Q30yr x Area
Area 1	40.10	34.09	298.58

100 Year

	QBAR/A	Q100yr	Q100yr x Area
Area 1	49.60	42.16	369.32

ASSESSMENT OF EXISTING DEVELOPMENT SITE RUN-OFF**Modified Rational Method**

$$\text{Flow Q} = 2.78 \cdot \text{CV} \cdot \text{CR} \cdot i \cdot A$$

Constant	Assumed Cv	Cr	Imp Area (Ha)	Rainfall Intensity (mm/hr)	Flow Q (l/sec)
2.78	0.75	1.30	5.25	35.00	498.05

EA requirement for 2/3 of developed flow

Total Flow Q (l/sec)	Factor	Reduced Flow Q (l/sec)	Flow Q/Area (l/sec/Ha)
498.05	2/3	332.20	63.28

Restricted Discharge to South of Site (roughly 60:40 split of flow between discharge points)

Brownfield Rate for Site (l/sec)	Approx Area Discharging to Llangollen Road (Ha)	Approx Area Discharging to South (Ha)	Restricted Discharge to South of Site (l/sec/Ha)
63.28	1.90	3.35	<u>40.38</u>

AIR PRODUCTS, ACREFAIR, WREXHAM: QUICK STORAGE ESTIMATE

Scenario	M5-60	Ratio R	Total Developable Area (Ha)	Imp. Area (60% of total, Ha)	Brownfield Run-off (l/sec/ha)	Limited Discharge (l/sec)	30 Year Storage Required (m³)	100 Year +30% CC Storage Required (m³)
Brownfield Run-off is Agreed	18	0.3	5.25	3.15	40.38	127.20	344 to 671	807 to 1,429

Scenario	M5-60	Ratio R	Total Developable Area (Ha)	Imp. Area (60% of total, Ha)	QBAR Greenfield Run-off (l/sec/ha)	Limited Discharge (l/sec)	30 Year Storage Required (m³)	100 Year +30% CC Storage Required (m³)
Greenfield Run-off is Agreed	18	0.3	5.25	3.15	2.60	8.19	1,271 to 1,997	2,475 to 3,632

Difference between 30 year and 100year+30% volumes (using maximum of the range)

Return Period Volumes			
Scenario	30 year	100 year+30%	Difference
1	671	1,429	758

Return Period Volumes			
Scenario	30 year	100 year+30%	Difference
2	1,997	3,632	1,635