Caulmert Limited

Engineering, Environmental & Planning Consultancy Services

Former Air Products Site, Acrefair

Clwyd Alyn Housing Ltd

Proposed Housing Development

Drainage Strategy

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Drainage Strategy

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1.0 INTRODUCTION

1.1 Background

1.1.1 A planning application is being submitted for the redevelopment of the Former Air Products site in Acrefair for residential use. The site is at postcode LL14 3RJ (grid reference 28028E 343070N) and is currently a vacant brownfield site. Caulmert has been appointed to prepare a drainage strategy for surface water and foul drainage from the development, and this report sets out the proposed approach to be taken.

1.1.2 The site has a long history of heavy industrial use, dating back to at least 1817. There are numerous coal mine shafts (which have now been remediated) and it was also occupied by an ironworks. An early railway serving both the site and coal mines and other industries on the north site of Llangollen road crossed the site, running roughly north-south and until 1965 a strip of land on the south side of the site was occupied by Acrefair station. Its' most recent use, prior to closure in 2009 was by Air Products Ltd, as a manufacturing site for large scale equipment to process gases for industrial uses. Over 200 people worked at Air Products.

1.1.3 The site location and extents is shown in Figure 1 below. It measures 4.38Ha.



Figure 1: Site Location Plan

1.1.4 A topographical survey of the site is included in Appendix 1 while Appendix 2 contains historic drawings of the site. The 2009 drawing shows both the layout of the different workshops and facilities and also has indicative layout of both the foul and surface water drainage systems. There is a small surface water drainage system running northwest, out into Llangollen Road while the majority of the site drains to the site, towards Station Road. There is also a note on the drawing near Station Road 'waste drainage leaves site'. The second drawing in Appendix 2 is older, shows drainage features running in the cutting of the old railway which crosses the site and also the old railway passing below Acrefair station.

1.1.5 Figure 2 below is an aerial view, taken during the demolition of the factory and provides a good indication of how heavily developed the site was, with large buildings used by Air Products.



Figure 2: Aerial view during demolition

1.2 Existing Site Features

1.2.1 A topographical survey has been undertaken and a copy is enclosed in Appendix 1. Much of the site is on a plateau of made ground, generally at a level around 134.0mAOD, this made ground is primarily formed of industrial waste, the earlier historic drawing describing the northwest side of the site, adjacent to Llangollen Road as a slag bank. To the east of the site the ground rises relatively steeply to approximately 150mAOD. This area has not been developed in the past.

1.2.2 The site plateau is elevated above Llangollen Road, King Street and the Station Road area by approximately 8m and the boundaries to these northern and western elevations are formed of retaining walls topped by steeply sloping, wooded batters.

1.2.3 In the southern corner of the site is a deep, former railway cutting with steeply sloping sides. Filling on the site to the western end of this cutting and off-site to the east of the cutting has restricted the drainage path and this cutting often contains water to a depth of 1m to2m (figure 3).



Figure 3: Flooded former railway cutting

1.2.4 A comprehensive ground investigation has been undertaken, the results of which are presented in a separate report, the Phase II Geo-Environmental Report (ref 4876-CAU-XX-XX-RP-O-0302). This considers both the geotechnical properties and the contamination issues present on the site.

1.2.5 As noted in 1.1.2 past use of the site includes coal mining. Nineteen shafts have been identified on the site. Their location is shown on the constraints plan contained in Appendix 3. A programme of mine shaft capping and coal workings remediation work was carried out in 2021-22.

1.2.6 A record drawing provided by Dŵr Cymru Welsh Water (DCWW) is enclosed in Appendix 4. This shows a foul sewer in Llangollen Road and also a spur in Station Road, leading to a demarcation chamber inside the site boundary, at the location of the note 'waste drainage leaves site' on the historic drawing.

1.2.7 Although the site demolition works had been comprehensive, removing both the buildings and the floor slabs, a chamber remains on the site near the location of the demarcation chamber shown on the DCWW record drawing.

1.2.8 In November 2021 a drainage CCTV survey was undertaken, which located the various chambers in Station Road shown on the DCWW record drawing. While the demarcation chamber was identified by the CCTV survey, it could not be found, above ground on site. The survey did however establish that the chamber seen on site was not part of the foul drainage system and thus must be the downstream chamber of the old surface water drain which is also shown on the historic drawing.

1.2.9 Further investigation work located the demarcation chamber and also established that the surface water drain ultimately connects to a conduit passing below King Street/ B5096 and entering the grounds of 'Bon Marche'. A report summarising details of the investigation is included as Appendix 5.

1.2.10 Given the extent of buildings which previously occupied the site, the runoff rate for surface water must have been significant. However all traces of these building have been removed. Consequently a greenfield runoff rate has been established for the site, using the HR Wallingford on site tool (Appendix 6). This is a 1:1 year rate of 5.58l/s and a Q_{BAR} rate of 6.34l/s.

1.2.11 Historically surface water from a small northern area of the site drained towards Llangollen Road which contains both a combined sewer (229mm diameter from DCWW records) and a surface water drain running west. The combined sewer is located below the highway while the surface water drain below the footway. A drawing and report summarising this survey is included in Appendix 7.

1.2.12 An area to the northeast of the site, previously occupied by an office building and car park was been sold off separately and is being developed by Gower Homes. The planning application submitted for the development has been reviewed to establish any implications that application may have for the Air Products site (from a drainage perspective). The exceedance route for surface water from the site, should there be blockage or failure of the drainage system has been identified as a constraint affecting the proposed development and is shown on the drawing in Appendix 3.

1.3 Flood Risk

1.3.1 The site is in Technical Advice Note 15 (TAN15) Zone A, with no risk of fluvial flooding on site indicated on Natural Resources Wales (NRW) Flood Map for Planning. Figure 4 is also taken from the NRW flood maps. The purple areas on the plan show routes/ ponding of surface water flooding. There are isolated areas of low risk surface water flooding which can be addressed by design, as they relate to localised low spots and do not extend beyond the site. This includes the former railway cutting, shown by the dark purple line in running along the southern boundary of the site.

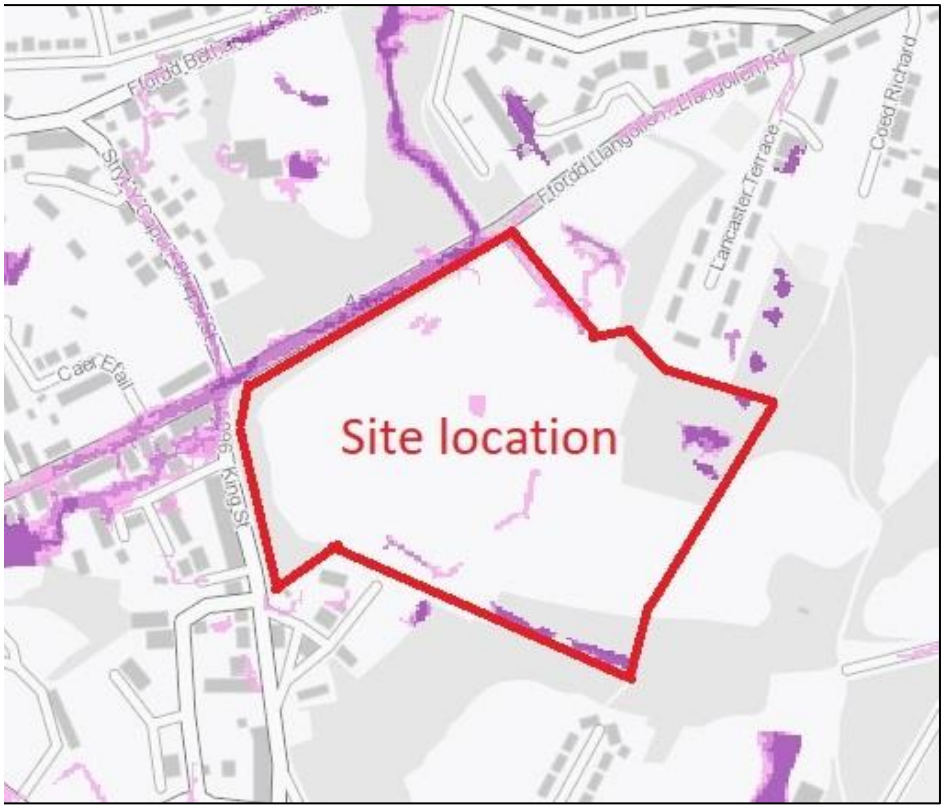


Figure 4: NRW flood risk map.

1.4 Proposed Development

1.4.1 The proposed layout for new development is shown in Figure 5 below and Appendix 8. It consists of 159 new dwellings, together with the associated infrastructure of access roads, parking areas and public open spaces.



Figure 5: Proposed site layout

1.4.2 Table 1 below summarises the principle features of the site.

Use	Roof Area / property) (m^2)	Number	Nett Impermeable Area (m^2)	Porous Paved Areas (m^2)	Soft landscaping (m^2)
3P2B Wheelchair Bungalow	99	1	112	13	
3P2B Bungalow	77	6	537	75	
2P1B Apartment	150	26	4,063	163	
4P2B House	55	58	3,915	725	
5P3B House	60	34	2,465	425	
5P3B House	65	13	1,008	163	
6P4B House	75	16	1,400	400	
7P4B House	88	5	503	125	
Private parking areas				2,245	
Adoptable highways			9,484		
Landscape & gardens					15,979
TOTAL			**23,487**	**4,334**	**15,979**

Table 1: Proposed Land Use

1.4.3 To establish a strategy it has been assumed that the roof area and one parking bay/ property are impermeable (with a foul sewer demarcation chamber located in the impermeable parking bay). All other drives and paths around houses are assumed to be formed of a porous material.

1.4.4 Access roads, which will be offered for adoption will have an impermeable construction and private accesses to parking areas are assumed to have a permeable construction.

1.4.5 There is a long history of heavy industrial use on the site together with extensive former mine workings. Advice been provided by a geotechnical engineer regarding the implications of using infiltration as a means of surface water disposal.

1.4.6 Generally the Coal Authority recommends against soakaways in the proximity of former mine workings as it significantly increases risk of sudden collapse within any unrecorded mine shafts, which have been poorly filled. On the Air Products site there is a significant amount of fill over the historical natural ground level. Any unrecorded mine shafts will have been subject to a significant surcharge for over 100 years and consequently the risk of poorly consolidated fill being present within any unrecorded shafts is significantly reduced. SuDS features such as permeable paving and swales do not result in a concentrated groundwater flow, and on the Air Products site and such features will not be particularly close to the original ground level. Consequently they will not produce the concentrated flows of infiltrated surface water which may be problematical.

1.4.7 Contamination is also present on the site and soakaways in contaminated ground generating concentrated flows may potentially cause leaching of contaminants. The persistent contaminants within the Air Products site are heavy metals associated with the coal and iron ore and these are unlikely to be very mobile. In addition the site has been 'unpaved' for over 10 years and there are no records of this resulting in any concerns. The use of permeable paving and swales etc, which will lose some water by 'leaky' infiltration is a continuation of the existing surface water drainage regime.

1.4.8 There is one small area on the site (in the vicinity of 328062.097E 343020.727N) where trichloroethene (TCE) solvents where historically identified. The full extent of this contamination requires further investigation. Unless the further investigations show otherwise, infiltration should not be used as a means of disposal in this area.

1.4.9 A historic mining feature, the Dee Level drainage adit (provided to drain the coal workings) runs underneath the site at depth as is likely to be linked to the old workings below the site. This discharges into the Gronwen Stream which then flows into the Dee. It is anticipated that any water lost by infiltration from the site will ultimately enter the adit without causing any detriment to the local groundwater or surface water quality.

1.4.10 It is recommended the disposal of some surface water by using 'leaky' infiltration features is practical, provided that these are only used where the depth of fill is significant (over 4m) and at locations remote from housing (minimum 10m away).

1.4.11 Table 2 overleaf contains a summary of potential infiltration features and a consideration of the constraints which determine if they are suitable for use on the former Air Products site.

Potential Infiltration Feature	Acceptability in Respect of Geotechnical Risks	Acceptability in Respect of Environmental Risks	Use in Development
Soft landscaping/ rain gardens	Acceptable for all areas of site	Acceptable for all areas of site	Acceptable
Open detention basins / swales	Acceptable where depth of fill greater than 4m	Acceptable for all areas of site	If fill depth is shallow use liner to prevent infiltration
Permeable driveways/ parking	Not acceptable with 10m of properties	Acceptable for all areas of site	Use liner to prevent infiltration when close to properties
Leaky systems – ie filter drains	Acceptable where fill depth in excess of 4m & when over 10m from properties	Acceptable for all areas of site	Only use where fill depth in excess of 4m & when over 10m from properties
Cellular soakaway or soakaway for individual property	Not acceptable	Not acceptable	Not to be used
Cellular soakaway or soakaway for multiple properties (adoptable)	Not acceptable	Not acceptable	Not to be used

Table 2: Suitability of infiltration features

No infiltration in vicinity of 328062.097E 343020.727N, Local Contamination

1.4.12 While infiltration cannot be used as the primary method for the disposal of surface water, SuDS features including rain gardens, swales and above ground detention basins which will dispose of water by 'leaky' infiltration and evapotranspiration during high frequency/ low intensity events is practical.

1.4.13 Historically the majority of surface water from the site discharged from the site to the conduit below King Street/ B5096.

1.4.14 It is proposed to limit the discharge rate to 6.34l/s, the Q_{BAR} greenfield runoff rate from the area to be positively drained (see calculation in Appendix 9).

1.4.15 The estimated volume of attenuation that will need to be provided on site to accommodate a 1:100 year event+ 30% climate change allowance and 10% urban creep is 2,346m^3 (Appendix 9).

1.4.16 In the past there have been two points of connection from the site to the public sewer, one run connected to the combined sewer in Llangollen Road while another connection existed to Station road via the garden of 'Stonecroft'. A comprehensive investigation of the Station Road route has been undertaken and use of this point of connection has been discussed with DCWW (Appendix 5).

1.4.17 The foul sewers from a large area of the site can be drained by gravity to a connection in Llangollen Road. Foul sewers from those areas of the site that cannot discharge to Llangollen Road will drain via Station Road.

2.0 SUSTAINABLE DRAINAGE

2.1 Project Approach to Sustainable Drainage

2.1.1 This section summarises the outline design for the disposal of surface water from the site. The approach recommended in the Sustainable Drainage Systems Standards for Wales (SDSSfW) and the CIRIA SuDS manual is to manage the quality and quantity of rainwater runoff close to where it falls and to allow its use in a manner which provides amenity benefits to site users and also encourages biodiversity.

2.1.2 The SDSSfW have standards which need to be addressed. These are:

- S1. Surface water runoff destination
- S2. Surface water runoff hydraulic control
- S3. Water Quality
- S4. Amenity
- S5. Biodiversity

2.1.3 Subsequent paragraphs of this section of the report outline how these objectives can be achieved within the drainage design for the proposed new development of the Air Products site.

2.2 S1. Surface Water Runoff Destination

2.2.1 The Welsh Government standard has five priority levels for surface water runoff. These are:

- Priority 1: Surface water runoff collected for use
- Priority 2: Surface water runoff is infiltrated to ground
- Priority 3: Surface water runoff is discharged to a surface water body
- Priority 4: Surface water runoff is discharged to a surface water sewer, highway drain or another drainage system
- Priority 5: Surface water runoff is discharged to a combined sewer

Information has been gathered specific to the Air Products site and is considered against these priorities below.

2.3 S1. Surface Water Runoff Destination, Priority 1: Runoff Collected for Use

2.3.1 Priority 1 is to collect water for reuse. From past experience rainwater harvesting is not cost-effective for housing developments, however it will be practical to provide water butts to collect rainwater for garden watering.

2.3.2 No stress on the mains water supply has been identified.

2.3.3 Water butts will be provided to harvest water for gardening use to the houses.

2.4 S1. Surface Water Runoff Destination, Priority 2: Infiltration to Ground

2.4.1 The brownfield nature of the site and the implications for infiltration are considered in 1.4.5 to 1.4.10. The advice provided by the geotechnical engineer is that 'leaky' infiltration from swales and porous parking areas may be used, provided that it is only used where the depth of fill is significant (over 4m) and at locations remote from housing (minimum 10m away).

2.4.2 No infiltration tests have been carried out. The geotechnical and environmental advice received is that infiltration cannot be used on the site as a primary means of surface water disposal.

2.5 S1. Surface Water Runoff Destination, Priority 3: Discharge to a Surface Water Body

2.5.1 There is no watercourse in the immediate vicinity of the site.

2.6 S1. Surface Water Runoff Destination, Priority 4: Discharge to a Surface Water Sewer

2.6.1 No surface water sewers are shown on the drawings provided by DCWW. There are however surface water drains in the vicinity of the site, both in Station Road and Llangollen Road. Historic drawings of the site show the majority of the site draining towards Station Road and the old surface water drain leaving the site has been located.

2.6.2 The surface water drain in Llangollen Road is connected to gullies around the site entrance and presumably is a highway drain. There does not appear to have been any connection from the site to this drain.

2.6.3 A comprehensive investigation has been undertaken of surface water drainage in the Station road area and connectivity has been proven to a conduit passing below the B5096/ King Street which is shared with drains from other sources including the public highway.

2.6.4 CCTV surveys of both drain runs have been abandoned due to blockages.

2.7 S1. Surface Water Runoff Destination, Priority 5: Discharge to a Combined Sewer

2.7.1 There is no requirement to consider discharge to a combined sewer. An existing discharge route to a surface water drain has been established from historic drawings and on site surveys.

2.8 S2. Surface Water Runoff Hydraulic Control

2.8.1 It is proposed to limit the runoff from the site to the Q_{BAR} rate of 6.34l/s.

2.8.2 The estimated total volume of attenuation storage required to accommodate the runoff from the site during a 1 in 100 year + 30% climate change event (with a 10% urban creep allowance) is 2,346m^3 (see Appendix 9).

2.8.3 A sketch layout is included in Appendix 8 showing the envisaged locations for attenuation tanks, tank sewers, detention basins and swales to accommodate this volume of water.

2.8.4 Rain gardens, swales and porous parking areas and to be used wherever practical to provide 'leaky' infiltration features close to the source points. Orifice plates will be used to control discharges from these areas to maximise storage as close to the point of origin as possible allowing disposal by 'leaky' infiltration & evapotranspiration to be maximised.

2.9 S3. Water Quality

2.9.1 For developments of this size and nature, the potential for pollution is anticipated to be low.

2.9.2 An assessment of the surface water quality made in accordance with section 26.7.1 of the SuDS manual is contained in Appendix 10.

2.9.3 The incorporation of raingardens, pervious pavements and swales into the drainage path will provide sufficient mitigation for the level of potential pollution anticipated.

2.10 S4. Amenity and S5. Biodiversity

2.10.1 The guidance in SDSSfW encourages the use of 'softer' drainage solutions.

2.10.2 It is proposed to introduce rain gardens wherever practical to drain the highway.

2.10.3 The site layout developed has a large, central public open space. It is proposed to convey surface water from the upper areas of the site to the surface water drainage outfall (towards Station Road) within this public open space using a swale.

2.10.4 Areas of the public open space will be used as detention basins during less frequent rainfall events. Weirs will be provided on the swale to maximise upstream storage (and the associated potential for loss by 'leaky' infiltration and evapotranspiration. Swales and detention basins will be incorporated into the landscape architecture of the site to provide an integrated approach to drainage and amenity and allow the potential for biodiversity to be maximised.

2.11 S6. Design of Drainage for Construction, Operation and Maintenance

2.11.1 It is envisaged that highways on the site will be offered for adoption.

2.11.2 The site is to be developed by social housing provider Clwyd Alyn, and some properties will be made available on the open market.

2.11.3 Ultimately it is proposed to offer the surface water drainage of the proposed development to the SAB for adoption. The design of the proposed surface water drainage system is to follow the good practice contained in SDSSfW and the CIRIA SuDS manual, including the necessary provisions for future operation and maintenance.

3.0 FLOOD RISK

3.1 General

3.1.1 As noted in 1.3.2, the site is in Technical Advice Note 15 (TAN15) Zone A, with no risk of fluvial flooding on site indicated on Natural Resources Wales (NRW) Flood Map for Planning.

3.1.2 Within the site boundaries isolated areas of low risk surface water flooding are shown on the flood maps which can be addressed by design. These includes the former railway cutting and relate to localised low spots and do not extend beyond the site.

3.1.3 A general description of the site topography has been provided above. The original ground generally falls from north to south, with the majority of the site being situated on a made ground plateau, which is above Llangollen Road, King Street and Station Road. The eastern area of the site rises steeply from the plateau and the natural route for drainage is towards Station Road.

3.2 Exceedance Routing

3.2.1 A planning application has been submitted for a small housing development immediately to the north of the site. The drainage strategy for that development has been studied and the exceedance route established. This is shown on the constraints plan included in Appendix 3. Care has been taken with the development of the proposed housing layout to avoid placing houses on the exceedance route from that site.

3.2.2 The topography of the site in general falls from north to south and the layout being developed will bring surface water towards the central open space.

3.2.3 Historically the exceedance route from the site would have followed the railway cutting on the first drawing in Appendix 2. The former location of this cutting is also shown on the constraints plan in Appendix 3. Since the cutting has been backfilled, the garden of 'Stonecroft' appears to form the exceedance route and the potential for flooding of the house is significant.

3.2.4 An exceedance route from the public open space onto Station Road has been identified and is shown on the constraints plan in Appendix 3 and the outline drainage layout in Appendix 8 by the blue arrows. The route will be designed to direct flows along Station Road which historically provided a link to the site and away from 'Stonecroft'.

3.2.5 The provision of kerbs may be required to help direct exceedance flows.

4.0 PROPOSED DEVELOPMENT

4.1 Site Layout

4.1.1 The key drainage features for the drainage of the proposed new development as described above are shown indicatively on the sketch layout in Appendix 8 and summarised below:

- Rainwater butts to be provided to all hoses to collect water for gardening purposes.
- Access roads to be offered for adoption and have impermeable surfaces.
- No infiltration to be provided in the small area of the site with TCE contamination.
- Wherever practical rain gardens to be provided to drain access roads, providing amenity and biodiversity benefits and maximising potential for disposal of low-intensity/ high frequency runoff by infiltration and evapotranspiration.
- Wherever practical driveways and private parking areas to be formed of porous construction to able surface water disposal of low-intensity/ high frequency events by 'leaky' infiltration.
- Flow restrictors to be provided to maximise storage upstream and associated potential for disposal by infiltration.
- No infiltration to be provided within 10mof buildings.
- Infiltration only to be used where fill depths are greater than 4m to minimise risk of concentrated flow of ground water entering any historic mine workings.
- Discharge rate to be limited to greenfield Q_{BAR} rate of 6.34l/s.
- Attenuation storage to be provided for 1:100 year + 30% climate change event.
- Estimated volume of attenuation to be provided is 2,346m^3.
- Attenuation volume includes 10% allowance for urban creep.
- Wherever practical surface water to be conveyed by swale situated in the central public open space.
- Wherever practical attenuation to be provided in shallow detention basins.
- Surface water discharge from site to follow historic route to Station Road.
- Foul drainage from upper areas of site to discharge to Llangollen Road.
- Foul drainage from areas of site unable to readily connect to Llangollen Road to discharge via existing sewer from site to Station Road.
- Exceedance route from adjacent site identified and directed to access road.
- Exceedance route from site to Station Road to be created.

5.0 CONCLUSION

5.1 Sustainable Drainage

5.1.1 The table below summarises how the drainage strategy for the proposed new housing development on the Former Air Products site at Acrefair will address the standards and priorities contained in the Sustainable Drainage System Standards for Wales.

Standard	Comments
S1 – Destination	
Priority 1 – Re-use	• Water butts • Limited demand for non-potable water • No stress on mains • Rainwater harvesting not cost effective
Priority 2 – Infiltration	• Site is brownfield. Historical uses include coal mining, iron works and heavy industry fabrication • persistent contaminants associated with the coal and iron ore are unlikely to be very mobile • There is a small area of the site with TCE contamination. The full extent of this contaminated land needs to be quantified. No infiltration to be provided within the contaminated area. • Site is also partially located on made ground • Use of 'leaky' infiltration practical where depth of fill exceeds 4m) and risk of concentrated water flows entering mine working is low • No infiltration within 10m of housing
Priority 3 – Discharge to surface water body	• Impractical. No watercourse in close proximity to the site
Priority 4 – Discharge to surface water sewer	• Preferred option. Site previously discharged to surface water drain. • Existing surface water drain from site investigated and connection to surface water drain passing below B5096/ King street has been proven. • Connection to Llangollen Road drainage may also possible. • Further investigation of downstream drainage may be required.
Priority 5 – Discharge to combined sewer	• Not required, connection to surface water drain is practical
S2 – Runoff Hydraulic Control	
	• Flow controls to be provided to enable upstream storage and maximize volume of water disposed of by 'leaky' infiltration. • The Q_{BAR} greenfield runoff rate for the whole site is 6.34/s. • Discharge rate for the drained area to be limited to 6.34/s (Q_{BAR} greenfield runoff rate for area to be developed). • Attenuation to be provided in rain gardens/ porous subbase and detention basins for events with return period up to 1 in 100 year+ 30% climate change +10% urban creep • Volume of attenuation required estimated to be 2346m^3.

Standard	Comments
S3 – Water Quality	
	• Use of raingardens, porous construction to parking areas/ hard standings and swales will provide sufficient mitigation for level of potential pollution anticipated.
S4 – Amenity & S5 - Biodiversity	
	• Rain gardens to be used for highway runoff wherever practical. • Swale to be provided for conveyance wherever practical. • Detention basins to be used for attenuation storage where practical.
S6 – Construction, Operation & Maintenance	
	• It is proposed that the site will include a mix of social housing, to be managed by Clwyd Alyn and affordable homes which will be offered for sale. The access road network to be offered to highway authority for adoption • Surface water drainage to adopted by SAB.

5.2 Foul Drainage

5.2.1 It is proposed that the site to be served by gravity sewers. As much of the site as is practical to discharge to a connection in Llangollen Road.

5.2.2 Any areas of the site that are unable to drain to Llangollen Road to make connection to public sewer in the site and discharge via Station Road.

5.3 Flood Risk

5.3.1 The site is located on land designated as Zone A by TAN15, with no risk of fluvial flooding.

5.3.2 There are some small, isolated areas of low risk surface water flood within the site boundaries which can be addressed by design. These do not extend beyond the site.

5.3.3 A planning application for the development immediately to the north of the site. In an exceedance event surface water will discharge onto the Air Products site. No houses have been placed on that route and flows will be directed towards the carriageway.

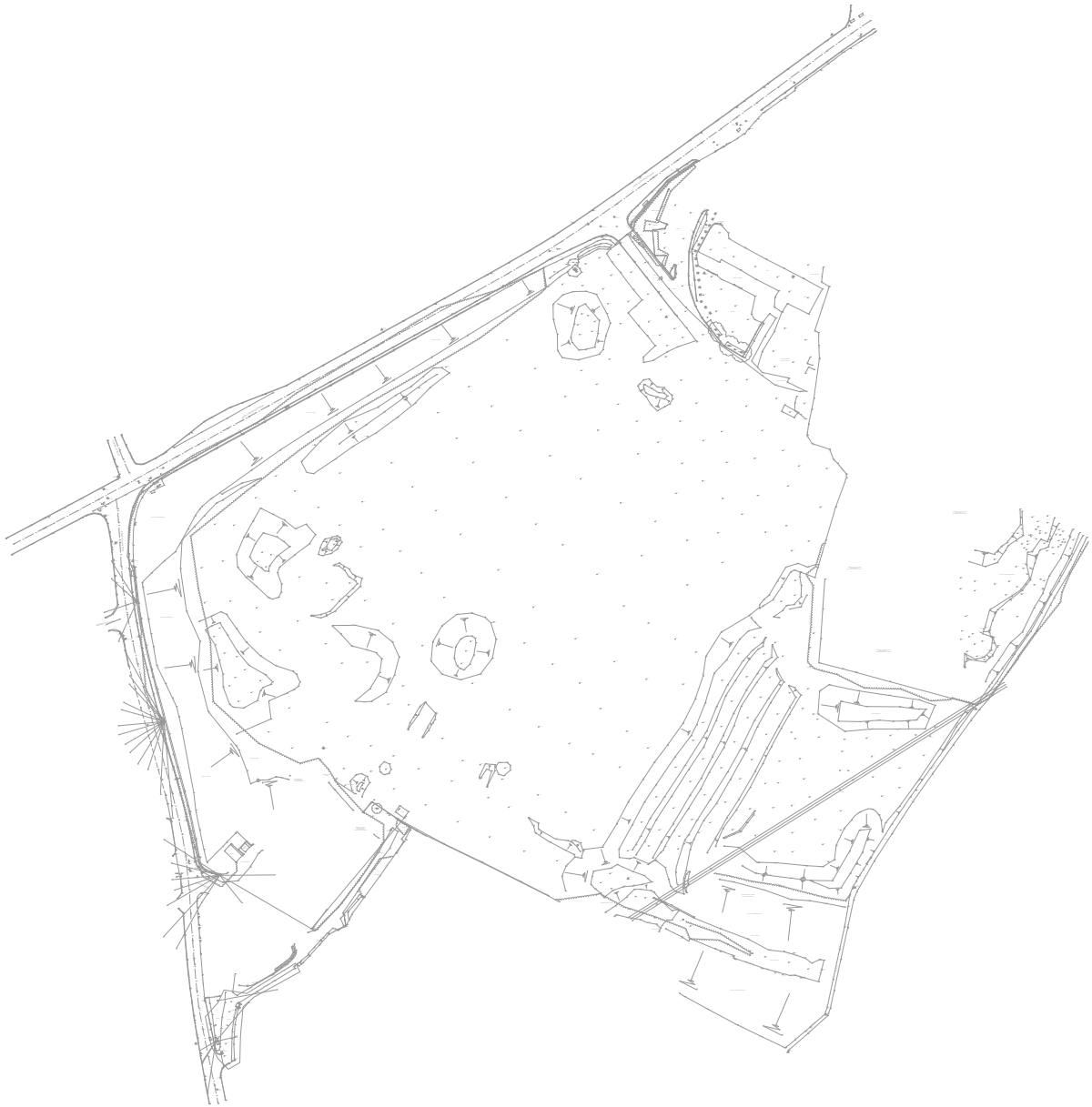
5.3.4 The topography of the site in general falls from north to south and the layout being developed will bring surface water towards the central open space. An exceedance route from this open space onto Station Road has been identified.

APPENDIX 1

Topographical Survey

NOTES

1. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN METRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS NOTED OTHERWISE.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.
3. TOPOGRAPHICAL SURVEY BASED ON SURVEY OPERATIONS DRAWINGS 22E197 /001 TO 004.



REV	MODIFICATIONS	BY	RE	AP	DATE
P01	ISSUED FOR INFORMATION	CR	CR	DH	02.03.23

PURPOSE OF ISSUE: FOR INFORMATION
STATUS: S2

CLIENT: ClwydAlyn

PROJECT: FORMER AIR PRODUCTS SITE ACREFAIR

TITLE: TOPOGRAPHICAL SURVEY

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
	CR		

DATE	SCALE @ A1	JOB REF:	REVISION
02.03.2023	1:1000	4876	P01

DRAWING NUMBER: 4876-CAU-XX-XX-SK-C-0100

Caulmert engineering environmental planning

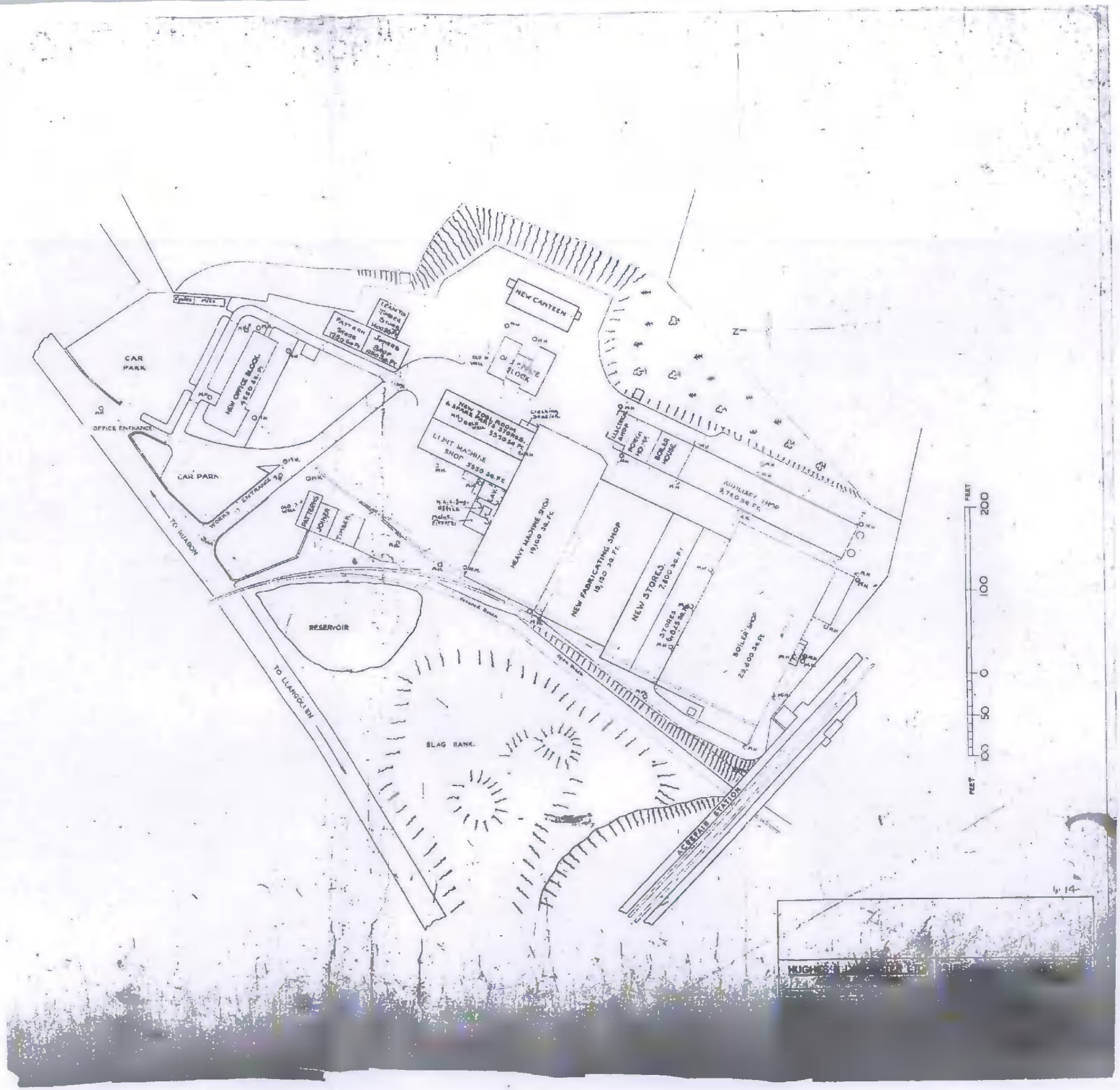
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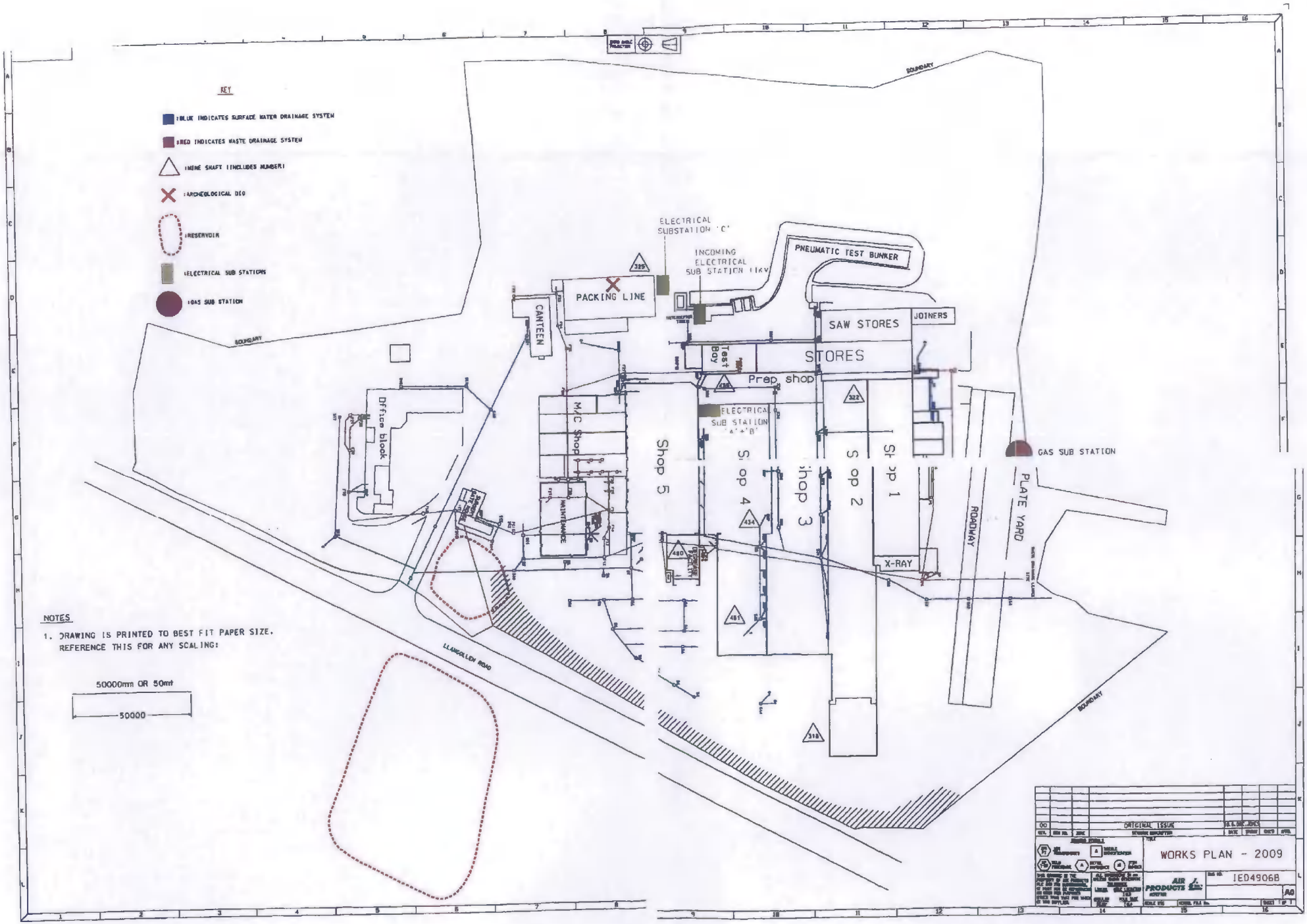
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APPENDIX 2

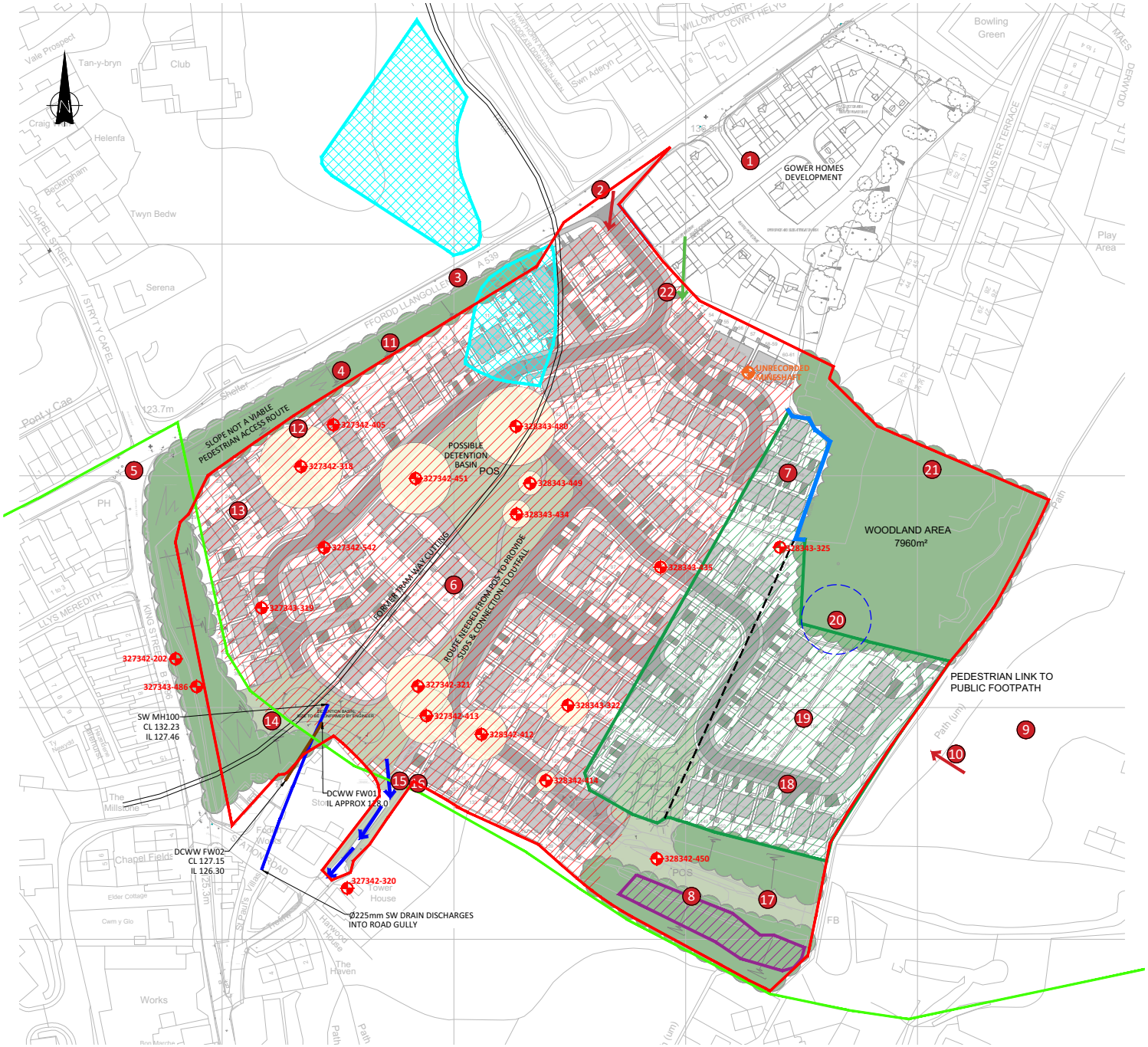
Historic Drawings


CAR PARK
OFFICE ENTRANCE
NEW OFFICE BLOCK
NEW CANTEEN
CAR PARK
WORKS ENTRANCE
TO HUARON
LIGHT MACHINE SHOP
PATTERNS
JOINERS
TIMBER
RESERVOIR
TO LLANGOLLEN
SLAG BANK
HEAVY MACHINE SHOP
NEW FABRICATING SHOP
NEW STORES
BOILER SHOP
ACCESS ROAD
ACCESS STATION
BOILER HOUSE
AUXILIARY PUMP
FEET
200
100
0
50
100
FEET


KEY
:BLUE INDICATES SURFACE WATER DRAINAGE SYSTEM
:RED INDICATES WASTE DRAINAGE SYSTEM
:MINE SHAFT (INCLUDES NUMBER)
:ARCHEOLOGICAL DIG
:RESERVOIR
:ELECTRICAL SUB STATIONS
:GAS SUB STATION
BOUNDARY
ELECTRICAL SUBSTATION 'C'
INCOMING ELECTRICAL SUB STATION 11KV
PNEUMATIC TEST BUNKER
PACKING LINE
CANTEEN
SAW STORES
JOINERS
STORES
Test Bay
Prep shop
ELECTRICAL SUB STATION 'A' + 'B'
Office block
M/C Shop
MAINTENANCE
Shop 5
Shop 4
Shop 3
Shop 2
Shop 1
X-RAY
GAS SUB STATION
ROADWAY
PLATE YARD
LLANGOLLEN ROAD
NOTES
1. DRAWING IS PRINTED TO BEST FIT PAPER SIZE. REFERENCE THIS FOR ANY SCALING:
50000mm OR 50mt
50000
ORIGINAL ISSUE
WORKS PLAN - 2009
AIR PRODUCTS
IED4906B
A0

APPENDIX 3

Constraints Plan



LEGEND 2

1. PROPOSED RESIDENTIAL DEVELOPMENT ON ADJACENT SITE BY GOWER HOMES. WILL PROVIDE A "POSITIVE" STREET SCENE FRONTING ONTO LLANGOLLEN ROAD AND THE PROPOSALS DO NOT APPEAR TO OVERLOOK THE SITE.

2. VIEWS INTO THE SITE ARE RESTRICTED BY THE TOPOGRAPHY. THE SITE ENTRANCE OFF LLANGOLLEN ROAD PROVIDES ONE OF THE FEW GLIMPSES INTO THE SITE.

3. LLANGOLLEN ROAD IS THE PRIMARY ROUTE INTO ACREFAIR. THE SITE IS SEPARATED FROM THE ROAD BY THE STEEP TOPOGRAPHY AND LINE OF MATURE TREES.

4. TREE LINED STEEP EMBANKMENTS. THE SITE IS SEPARATED FROM LLANGOLLEN ROAD AND KINGS STREET AND THIS WILL REDUCE THE OPTIONS FOR PROVIDING A POSITIVE / ACTIVE STREET SCENE ALONG THESE BOUNDARIES.

5. LOCAL HUB OF SHOPS AND SERVICES.

6. THE SITE IS DOMINATED BY A LARGE AND GENERALLY FLAT PLATEAU WHERE FACTORY BUILDINGS ONCE STOOD.

7. LARGE STONE RETAINING WALL SURVIVING FROM THE SITES PAST USE AS AN IRON WORKS. POTENTIAL TO INCORPORATE THIS HISTORIC FEATURE INTO THE DEVELOPMENT TO PROVIDE A REMINDER OF THE SITES HISTORY.

8. A DEEP, STEEP SIDED RAILWAY CUTTING, HEAVILY WOODED. UNSUITABLE FOR DEVELOPMENT BUT POTENTIAL FOR INTERESTING POS FEATURE.

9. A PUBLIC FOOTPATH AND EXTENSIVE AREA OF POS ADJACENT TO THE SITE. POTENTIAL FOR LINKING INTO THE SITE.

10. VIEW INTO AND ACROSS THE SITE FROM THE PUBLIC FOOTPATH. POTENTIAL TO RETAIN THIS VIEW WITH CAREFUL PLACEMENT OF BUILDINGS AND APPROPRIATE BOUNDARY TREATMENT.

11. DENSE MATURE WOODLAND CONTAINING HISTORICAL STRUCTURES ASSOCIATED WITH FORMER IRON WORKS. UNSUITABLE FOR DEVELOPMENT, BUT POTENTIAL FOR LINKING INTO SITE TO PROVIDE POS. ANY LINK IS LIKELY TO BE IN THE FAR NORTHWEST ADJACENT TO EXISTING PUBLIC FOOTPATH DUE TO SITE LEVELS

12. ROUTE REQUIRED TO TAKE SW FLOWS TOWARDS POS

13. SITE LEVELS NEED TO BE RAISED TO ENSURE FLOWS TOWARDS EXCEEDANCE ROUTE

14. AREA KEPT CLEAR FOR FW & SW CONNECTIONS

15. POSSIBLE EXCEEDANCE ROUTE AND PEDESTRIAN LINK TO STATION ROAD

16. POSSIBLE SURFACE WATER CONNECTION

17. LIKELY TO BE ISOLATED DUE TO REDUCTION IN SITE LEVELS TO THE NORTH

18. LINE OF ROAD TO ENSURE SUITABLE GRADIENTS ACHIEVED

19. SLOPING SITE AT A GRADIENT OF APPROXIMATELY 1 IN 8. PROBLEMATIC TO DEVELOP THIS PART OF THE SITE AND FULLY COMPLY WITH THE REQUIREMENTS OF LIFETIME HOMES. I.E. PARKING REQUIREMENTS, ACCESSIBLE ROUTES AND LEVEL ACCESS. DEVELOPMENT WILL REQUIRE RETAINING WALLS AND EARTHWORKS

20. BADGER SETT WITH 30m BUFFER / PROTECTION ZONE

21. POSSIBLE ALREADY ELEVATED. MATURE TREES PRESENT IF RETAINED, POS LIKELY TO BE ISOLATED DUE TO REDUCTION IN SITE LEVELS TO THE SOUTH

22. NO EXCEEDANCE ROUTE DEFINED BUT LEVELS INFER ITS VIA PLOT 16

NOTES

1. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN METRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS NOTED OTHERWISE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.

3.BASED ON MUNRO ASSOCIATES DRAWING 21-231 - SITE PLAN - V13

LEGEND

- EXISTING RETAINING WALLS
- INFILLED RESERVOIR
- ANTICIPATED DEEP MADE GROUND - NON STANDARD FOUNDATION
- ANTICIPATED SHALLOW NATURAL GROUND - STANDARD FOUNDATIONS ANTICIPATED, HOWEVER CUT WORKS REQUIRED, ALONG WITH SLOPES/RETAINING STRUCTURES
- RAILWAY CUTTING (STEEP ROCK CUTTING) FLOODS DURING WINTER
- APPROXIMATE MADE GROUND NATURAL GROUND BOUNDARY (MADE GROUND TO WEST AND NATURAL TO THE EAST)
- ROUTE FOR EXCEEDANCE FLOWS FROM SITE
- EXISTING SURFACE WATER DRAIN FROM SITE
- EXISTING PUBLIC FOUL SEWER CONNECTION FROM SITE
- ASSUMED EXCEEDANCE ROUTE FROM ADJACENT SITE, BASED ON INFORMATION TAKEN FROM PLANNING APPLICATION
- WORLD HERITAGE SITE BUFFER ZONE
- SHAFT LOCATIONS
- MINESHAFT COLLAPSE RADIUS

THE MAJORITY OF THE SITE IS LIKELY TO BE UNDERLAIN BY SHALLOW COAL WORKINGS WHICH WILL REQUIRE DRILLING AND GROUTING PRIOR TO DEVELOPMENT.

P05	UPDATED TO V13 LAYOUT	EJD	DK	DK	11.10.22
P04	UPDATED TO V11 LAYOUT	EJD	DK	DK	05.10.22
P03	UPDATED TO V10 LAYOUT AND DRAINAGE CONSTRAINTS ADDED	EJD	DK	DK	29.09.22
P02	DEEP MADE GROUND - NON STANDARD FOUNDATION AREA SIZE AMENDED	DA	DK	DK	24.11.21
P01	ISSUED FOR INFORMATION	AAR	DH	DH	16.03.21
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION — STATUS: S2

CLIENT: ClwydAlyn

PROJECT: FORMER AIR PRODUCTS SITE, ACREFAIR

TITLE: CONSTRAINTS PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
DK	AAR	DK	DK

DATE	SCALE @ A2	JOB REF:	REVISION
24.02.2021	1:1250	4876	P05

DRAWING NUMBER: 4876-CAU-XX-XX-DR-C-1802

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APPENDIX 4

Correspondence with DCWW

David High

From: David High
Sent: 05 December 2022 16:54
To: Jake MacMillan
Subject: Former Air Products site, Acrefair (DCWW ref PPA0006080)
Attachments: 2022-11-18 CCTV Survey.pdf

Good afternoon Jake,

Further to our email exchanges on 28/10/22 we have now carried out a CCTV survey between SJ27429901 and SJ27428806 which demonstrates connectivity. While there are some displaced joints etc between 9901 and 8805 all of the runs are serviceable. The run between 8805 and 8806 (situated below the B5096) however contains numerous defects.

The attached sketch shows the extent of the runs surveyed.

I will be very pleased to share the video files with you. What is the best way to transmit them? The three files are 260mb in total

Regards

David High

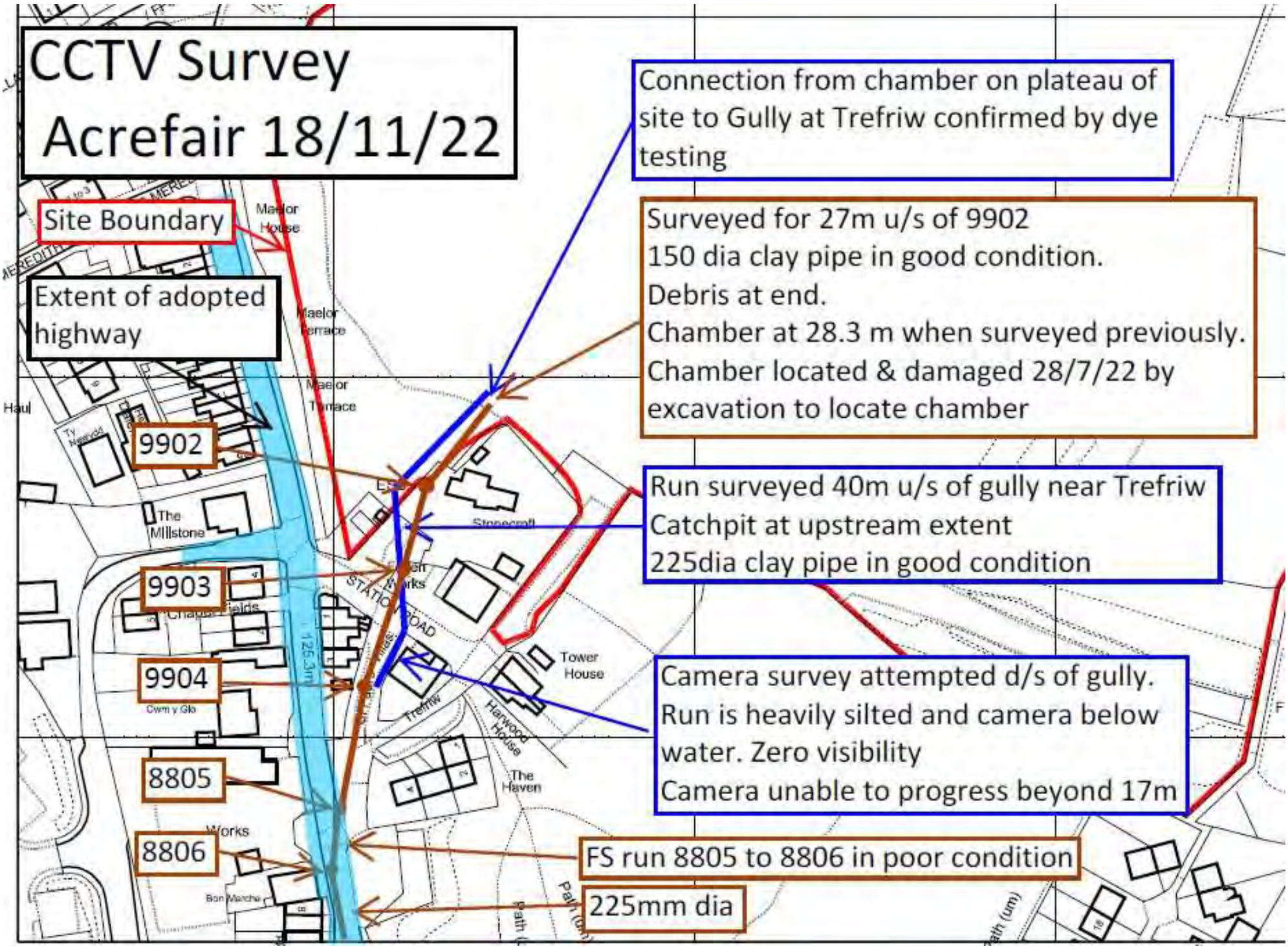
Caulmert
engineering environmental planning

David High	Caulmert Ltd
Associate	Mobile: 07535 291131
davidhigh@caulmert.com	Direct: 01745 777 164
www.caulmert.com	Phone: 01745 530 890

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CCTV Survey
Acrefair 18/11/22
Site Boundary
Extent of adopted highway
9902
9903
9904
8805
8806
Connection from chamber on plateau of site to Gully at Trefriw confirmed by dye testing
Surveyed for 27m u/s of 9902
150 dia clay pipe in good condition.
Debris at end.
Chamber at 28.3 m when surveyed previously.
Chamber located & damaged 28/7/22 by excavation to locate chamber
Run surveyed 40m u/s of gully near Trefriw
Catchpit at upstream extent
225dia clay pipe in good condition
Camera survey attempted d/s of gully.
Run is heavily silted and camera below water. Zero visibility
Camera unable to progress beyond 17m
FS run 8805 to 8806 in poor condition
225mm dia
Maelor House
Maelor Terrace
The Millstone
Tower House
Harwood House
The Haven
Trefriw
Cwm y Glo
Ban Marche
125.3m

David High

From: David High
Sent: 06 January 2023 08:26
To: Jake MacMillan
Cc: Daniel Brettell; HelenArmitage@aaprojects.co.uk; Justine Lea; Pete Lloyd
Subject: Former Air Products site, Acrefair (DCWW ref PPA0006080)
Attachments: 2022-09-01 Flows & Loads.pdf

Happy New Year Jake,

Are you able to provide me with an update on the actions required and potential timescales for the resolution of the phosphates issue on the River Dee downstream of Acrefair? My client (social housing provider Clwyd Alyn Housing) is currently collating information to allow at outline planning application to be submitted for the former Air Products site, with a population equivalent of 540 (see attached calculation).

My understanding of the present situation is that the WwTW at Cefn Mawr has a phosphates permit. However, a section of the Dee from Gwalia Cottage to Halton exceeds the required phosphate levels. One of the larger WwTWs in the non-compliant area that does not have a phosphate permit at the present time is Corwen and this has been identified by DCWW as a priority location for phosphates removal.

If Cefn Mawr has a phosphates permit, are the works able to accommodate the increase in load from the proposed new development? Do other factors (non-compliance with present phosphate requirements in the Dee at Cefn Mawr for instance) influence the decision-making process? When the priority works to the WwTw are Corwen are completed will this have positive implications for developments on other sites? Are you able to provide an indicative timescale for the resolution of these issues?

Clearly there is a significant volume of infrastructure work required to service a development of 160 homes. In Powys consent has been granted for developments including conditions restricting house occupancy until certain works are completed by DCWW and this will allow infrastructure work to be carried out and allow properties to be constructed to allow occupation once a phosphate permit is in place. While I of course appreciate that such a decision must be made by the planning authority after consideration of advice from NRW & DCWW, it would be useful to understand the constraints that will inform any advice DCWW may provide to the planning authority, the anticipated timescale to resolve these constraints and if a work-around (similar to that applied in Powys) may be considered for the site in Acrefair.

Best wishes

David

Caulmert
engineering environmental planning

David High	Caulmert Ltd
Associate	Mobile: 07535 291131
davidhigh@caulmert.com	Direct: 01745 777 164
www.caulmert.com	Phone: 01745 530 890

CALCULATION SHEET

Client:	Site:	Project:	
Tir Tai	Acrefair	Former Air Products site	Caulmert

Made by:	Date:	Checked by:	Date:	Sheet no.:
David High	01/09/2022			
Approved by:	Date:			

Former Air Products Site, Acrefair

Site Population

House mix taken from Munro Associates Drawing 21-231-10-C dated 25/5/22

Population of houses as section 5 of Flow & Loads 4

House Type	No	Bed-rooms	Pop/ house	Popul-ation
3P2B	1	2	5	5
3P2B	8	2	5	40
2P1B Apart	26	1	3	78
4P2B	58	2	5	290
5P3B	30	3	5	150
5P3B	13	3	5	65
6P4B	19	4	6	114
7P4B	5	4	6	30
Total	**160**			**772**

For population 26-50 P population can be reduced by a factor of 0.8

Assumed popuation of Air Products site 0.8 x 772 = 618

Population based on Architects quoted values

House Type	No	Bed-rooms	Pop/ house	Popul-ation
3P2B	1	2	3	3
3P2B	8	2	3	24
2P1B Apart	26	1	2	52
4P2B	58	2	4	232
5P3B	30	3	5	150
5P3B	13	3	5	65
6P4B	19	4	6	114
7P4B	5	4	7	35
Total	**160**			**675**

For population 26-50 P population can be reduced by a factor of 0.8

Assumed popuation of Air Products site 0.8 x 675 = 540

CALCULATION SHEET

David High

From: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Sent: 10 January 2023 11:28
To: David High
Cc: Daniel.Brettell@clwydalyn.co.uk; Helen Armitage; Justine Lea; Pete Lloyd
Subject: FW: Former Air Products site, Acrefair (DCWW ref PPA0006080)

Hi David,

Thank you for the email and happy new year to you to.

Corwen is one of the Works that we've announced as being accelerated for completion by the end of the current AMP (31st March 2025), however with regard to Cefn Mawr WWTW our position is the development can be accommodated within this treatment works whilst staying within the permit.

The current stage of this is that NRW are in the process of undertaking a review of all our WwTW permits, and until such a time that they've began feeding back on this then we will not know if Cefn Mawr WwTW will require tightening.

With regard to your query on whether there Corwen scheme will have positive implications downstream, yes it likely will but ultimately it would be for the LPA to determine if they are content, and we would still need to know from NRW whether Cefn Mawr requires tightening of its permit.

I trust the above makes sense however please let me know if you have any further queries.

In regards to the connection point of this site I've had a meeting last week with our operational colleagues, and having reviewed the CCTV footage they're concerned if the 150mm sewer to the south west can take this number of dwellings.

Do you have an estimate on the flow rate from the previous site into the sewer to the south west? And have you explored the option of discharging to the 225mm sewer in Llangollen Road?

Best regards,

Jake MacMillan
Development Control Officer | Developer Services
Dŵr Cymru Welsh Water

T: 0800 917 2652 | E: 45xxx | M: 07557860559
A: PO Box 3146, Cardiff, CF30 0EH
W: dwrcymru.com
E: developer.services@dwrcymru.com

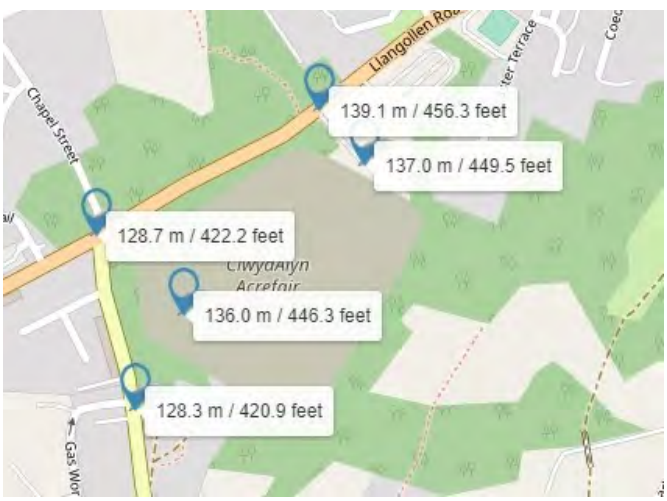
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David High

From: David High
Sent: 10 January 2023 14:35
To: Jake MacMillan
Cc: Daniel.Brettell@clwydalyn.co.uk; Helen Armitage; Justine Lea; Pete Lloyd
Subject: RE: Former Air Products site, Acrefair (DCWW ref PPA0006080)

Hi Jake,

Thanks for your email. With regards to the connection, we have looked at connecting into the 225mm sewer on Llangollen Road. Road access to the site is in the northern corner, adjacent to the highest area of the site. The site itself is on a plateau, falling by approximately 1m from NW to SE (in the direction of our preferred point of connection).



Other than at the access point, all of the frontage of the site to public highways is formed of wooded batter supported by retaining walls. To make a connection to the sewer in Llangollen Road without crossing a retaining wall will require the provision of a pumping station. I'm aware that DCWW not like sewers which are laid below/ within retaining walls.

At the falls on the site lead to a surface water drain which is in parallel with the public sewer leading to Station Road. From a site perspective the connection leading to Station Road is ideally situated.

According to https://www.wrexham-history.com/employees-air-products/ there were 200 people working at Air Products when the site closed in 2009

Regards

David

From: Jake MacMillan Jake.MacMillan@dwrcymru.com
Sent: 10 January 2023 11:28
To: David High <davidhigh@caulmert.com>
Cc: Daniel.Brettell@clwydalyn.co.uk; Helen Armitage <HelenArmitage@aaprojects.co.uk>; Justine Lea <JustineLea@aaprojects.co.uk>; Pete Lloyd <info@plplanning.co.uk>
Subject: FW: Former Air Products site, Acrefair (DCWW ref PPA0006080)

David High

From: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Sent: 12 January 2023 12:33
To: David High
Cc: Daniel.Brettell@clwydalyn.co.uk; Helen Armitage; Justine Lea; Pete Lloyd
Subject: RE: Former Air Products site, Acrefair (DCWW ref PPA0006080)

Hi David,

Thanks for the below, do you have a more details topographic map and proposed site plans? From looking on our mapping system, it looks like a fair portion of the site could gravitate to Llangollen road via the NE entrance, avoiding the retaining wall.

We may be able to allow some properties to connect into the south west point, however the take-home of my previous discussion with the network operatives was that they aren't comfortable with the majority of the site discharging to the one connection point in the south west.

Best regards,

Jake MacMillan
Development Control Officer | Developer Services
Dŵr Cymru Welsh Water

T: 0800 917 2652 | E: 45xxx | M: 07557860559
W: dwrcymru.com
A: PO Box 3146, Cardiff, CF30 0EH
E: developer.services@dwrcymru.com

If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our website

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From: David High <davidhigh@caulmert.com>
Sent: 10 January 2023 14:35
To: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Cc: Daniel.Brettell@clwydalyn.co.uk; Helen Armitage <HelenArmitage@aaprojects.co.uk>; Justine Lea <JustineLea@aaprojects.co.uk>; Pete Lloyd <info@plplanning.co.uk>
Subject: RE: Former Air Products site, Acrefair (DCWW ref PPA0006080)

******** External Mail ********
Hi Jake,

Thanks for your email. With regards to the connection, we have looked at connecting into the 225mm sewer on Llangollen Road. Road access to the site is in the northern corner, adjacent to the highest area of the site. The site itself is on a plateau, falling by approximately 1m from NW to SE (in the direction of our preferred point of connection).

David High

From: David High
Sent: 31 March 2023 08:27
To: George Owain; Jake MacMillan
Subject: Former Air Products site, Acrefair (DCWW Refs PPA0006080/ PPA0007647)

Good morning Owain/ Jake,

I have been forward a copy of the response sent to PL Planning on 28/2/23 ref PPA0007647. It expresses a preference to connect to the combined sewer at or downstream of manhole SJ27438102 located in Llangollen Road. Can you please forward a plan showing the location of this manhole?

There is also a statement that although flows will eventually drain to our Cefn Mawr WwTW, it would be preferable if a connection can be made into the Five Fords catchment. Can you please confirm where a connection will need to be made to meet this preference?

Regards

David High

Caulmert
engineering environmental planning

David High	Caulmert Ltd
Associate	Mobile: 07535 291131
davidhigh@caulmert.com	Direct: 01745 777 164
www.caulmert.com	Phone: 01745 530 890

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David High

From: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Sent: 31 March 2023 08:54
To: David High
Subject: RE: Former Air Products site, Acrefair (DCWW Refs PPA0006080/ PPA0007647)
Attachments: SJ27438102 plan.pdf

Hi David,

Thank you for the below query, please see an updated plan showing manhole SJ27438102.

In regards to a point of connection that discharges to Five Fords, I will look into this with relevant colleagues to find a suitable point on the network, however from taking a preliminary look it appears that it would at least be 700m away.

Best regards,

Jake MacMillan
Development Planning Officer | Developer Services
Dŵr Cymru Welsh Water

T: 0800 917 2652 | E: 45xxx | M: 07557860559
W: dwrcymru.com
A: PO Box 3146, Cardiff, CF30 0EH
E: developer.services@dwrcymru.com

If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our website

---

From: David High <davidhigh@caulmert.com>
Sent: 31 March 2023 08:27
To: Owain George <Owain.George@dwrcymru.com>; Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Subject: Former Air Products site, Acrefair (DCWW Refs PPA0006080/ PPA0007647)

******** External Mail ********
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Regards

David High

David High

From: David High
Sent: 24 May 2023 10:03
To: Jake MacMillan
Subject: Former Air Products site, Acrefair (DCWW Refs PPA0006080/ PPA0007647)
Attachments: 4876-CAU-XX-XX-DR-C-1601_S2-P01.pdf

Good morning Jake,

I write in response to your email of 31 March 2023 and the preference to connect to a chamber at or downstream of SJ27438102, which is situated at the junction of A539 (Llangollen Road) and the B5096 (King Street) in Acrefair. The chamber is in the foreground of the two views below.





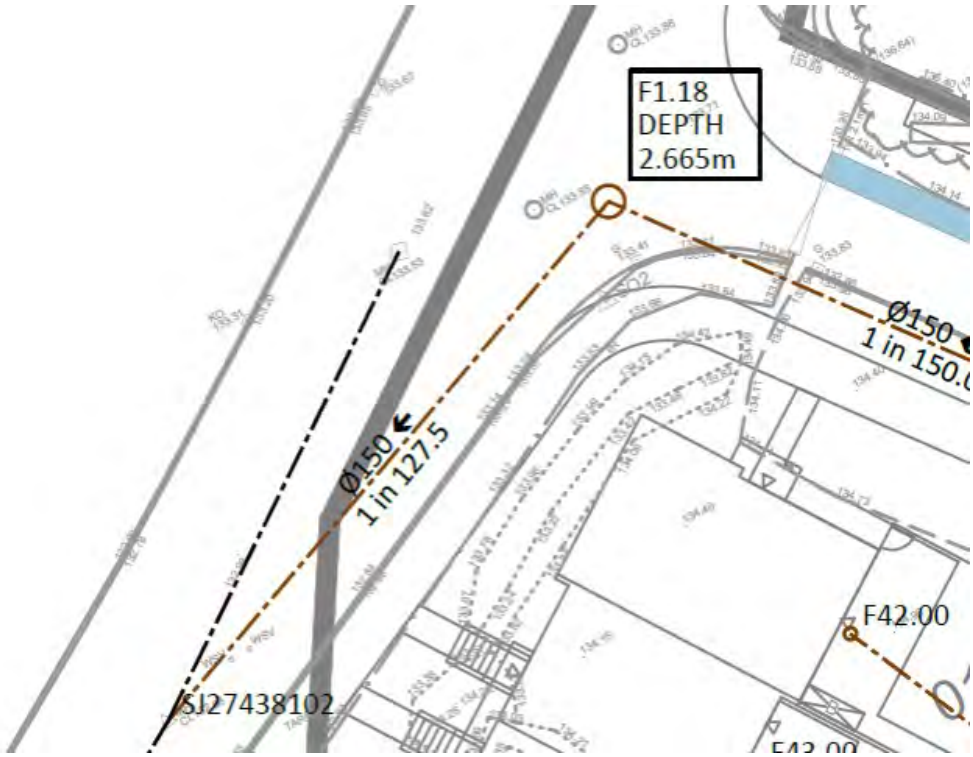
The site is situated on a plateau, above the sloping, wooded batters which are supported by a retaining walls on the boundaries to both roads. Knowing that DCWW have a preference to avoid sewers crossing retaining walls we have explored an option to locate the sewer below the proposed new access road, with a connection to the PSN in Llangollen Road further east, near chamber SJ27438102. The photo below shows this chamber and the access



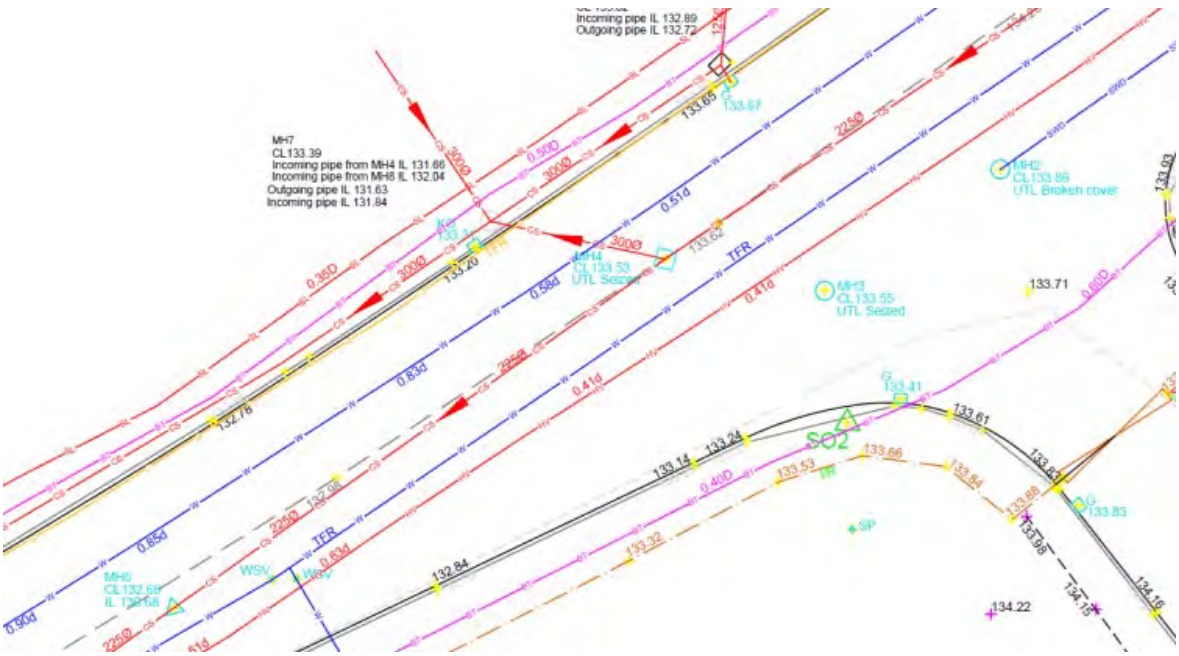
The attached drawing shows the proposed layout for the site. Of the 159 proposed houses it appears that we can make a gravity connection to 8102 for 142 houses, and propose that the remaining 17 houses connect to the sewer via the spur to Station Road.

To make the connection to 8102 requires some sewer runs will need to be relatively deep and have annotated the drawing with the depth of some pertinent chambers, the deepest being F1.12 as 3.978m.

The extract of the drawing below shows the route of the proposed connection to 8102 and you may wonder why a connection to this chamber is proposed, rather than the one upstream on the same sewer.



As Llangollen Road falls to the west, the invert level of 8102 is slightly deeper, enabling more properties to be reached. In addition, we have carried out both CCTV and GPR surveys of drainage in this area. While further investigation may clarify arrangements there appears to be a connection from the PSN to the 300mm pipe in the northern footway, which is called off as a 'CS' on the plan. From the CCTV survey we believe the run below the footway to be a surface water drain (and possibly a Highways asset).



Connecting to 8102 avoids the potential for effluent from the site to enter the inter-connecting pipe.

I would be grateful to receive your views regarding this proposal.

In addition, if you are also able to provide any update on 'the phosphate situation' that would be appreciated. We note from previous correspondence that the Cefn Mawr WwTW has a phosphates permit. Do those works have adequate capacity to take and treat the flows from the site? If the effluent is 'phosphate stripped', from your experience of other planning applications, does that fact that it has been stripped normally satisfy NRW that the treated effluent does not have an adverse impact on the River Dee SAC?

Regards

David

Caulmert
engineering environmental planning

David High	Caulmert Ltd
Associate	Mobile: 07535 291131
davidhigh@caulmert.com	Direct: 01745 777 164
www.caulmert.com	Phone: 01745 530 890

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David High

From: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Sent: 24 May 2023 12:03
To: David High
Subject: RE: Former Air Products site, Acrefair (DCWW Refs PPA0006080/ PPA0007647)

Hi David,

Thank you for providing the below updated plan, I will discuss this further with our network operatives and report back.

in regards to Cefn Mawr treatment works, you are correct in that it has a phosphate permit, our assessment of this treatment works is that there is no permit change necessary, however the current situation is that natural resources Wales our ratifying our assessment and we are all waiting their position on this. I can confirm that Cefn Mawr treatment works can accommodate the foul flows from your proposal without the need for further reinforcement works.

Best regards,

Jake MacMillan
Development Planning Officer | Developer Services
Dŵr Cymru Welsh Water

T: 0800 917 2652 | E: 45xxx | M: 07557860559
W: dwrcymru.com
A: PO Box 3146, Cardiff, CF30 0EH
E: developer.services@dwrcymru.com

If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our website

---

From: David High <davidhigh@caulmert.com>
Sent: 24 May 2023 10:03
To: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Subject: Former Air Products site, Acrefair (DCWW Refs PPA0006080/ PPA0007647)

******** External Mail ********
Good morning Jake,

I write in response to your email of 31 March 2023 and the preference to connect to a chamber at or downstream of SJ27438102, which is situated at the junction of A539 (Llangollen Road) and the B5096 (King Street) in Acrefair. The chamber is in the foreground of the two views below.

David High

From: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Sent: 31 May 2023 09:33
To: David High
Subject: RE: Former Air Products site, Acrefair (DCWW Refs PPA0006080/ PPA0007647)

Hi David,

I've heard back from our network operatives who have no objections to your drainage proposal in principle, please let me know if there are any other queries that you have.

Best regards,

Jake MacMillan
Development Planning Officer | Developer Services
Dŵr Cymru Welsh Water

T: 0800 917 2652 | E: 45xxx | M: 07557860559
W: dwrcymru.com
A: PO Box 3146, Cardiff, CF30 0EH
E: developer.services@dwrcymru.com

If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our website

---

From: David High <davidhigh@caulmert.com>
Sent: Wednesday, May 24, 2023 12:05 PM
To: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Subject: RE: Former Air Products site, Acrefair (DCWW Refs PPA0006080/ PPA0007647)

******** External Mail ********
Thanks Jake,

That is useful to know

Regards

David

From: Jake MacMillan <Jake.MacMillan@dwrcymru.com>
Sent: Wednesday, May 24, 2023 12:03 PM
To: David High <davidhigh@caulmert.com>
Subject: RE: Former Air Products site, Acrefair (DCWW Refs PPA0006080/ PPA0007647)

Hi David,

APPENDIX 5

Surface Water Drainage Investigations

See Separate Report:

Reference 4876-CAU-00-00-RP-D-0306.S2.P03

‘Surface Water Drain Investigations’

APPENDIX 6

Greenfield Runoff Rate

Print | Close Report

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	David High
Site name:	Air Products
Site location:	Acrefair

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.97983° N
Longitude:	3.07351° W
Reference:	3323846057
Date:	Mar 02 2023 10:44

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 2.78

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics	Default	Edited
SAAR (mm):	848	848
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

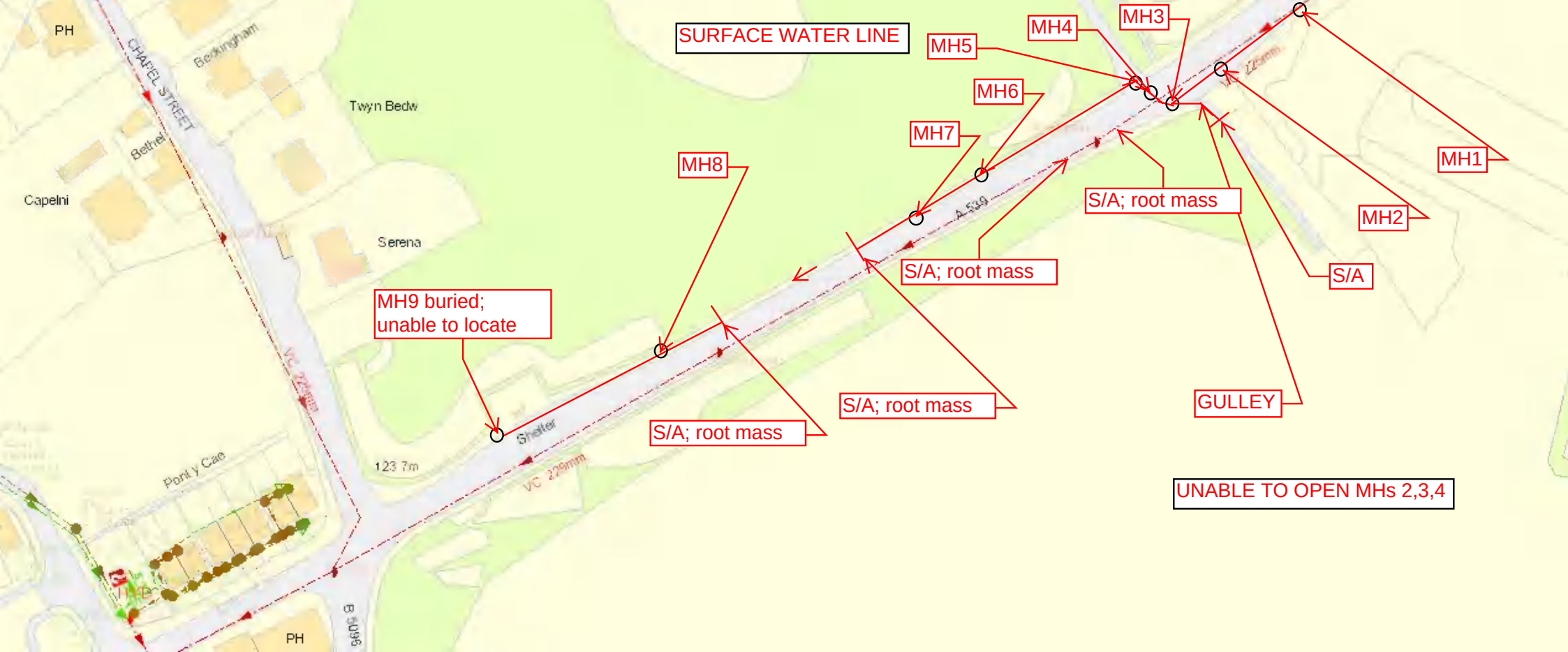
(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	6.34	6.34
1 in 1 year (l/s):	5.58	5.58
1 in 30 years (l/s):	11.29	11.29
1 in 100 year (l/s):	13.82	13.82
1 in 200 years (l/s):	15.6	15.6

APPENDIX 7

Existing Drains (Llangollen Road)


SURFACE WATER LINE
MH1
MH2
MH3
MH4
MH5
MH6
MH7
MH8
MH9 buried; unable to locate
S/A; root mass
S/A; root mass
S/A; root mass
S/A; root mass
S/A
GULLEY
UNABLE TO OPEN MHs 2,3,4
PH
CHAPEL STREET
Beckingham
Twyn Bedw
Bethel
Capelni
Serena
Shelter
123.7m
Pont y Cae
B 3096
PH
VC 229mm
VC 229mm
A 539

APPENDIX 8

Proposed Site Layout



0 100 200

metres

N

LEGEND

MINESHAFT COLLAPSE RADIUS

MINESHAFT LOCATION / DIAMETER

BRICK FACED RETAINING WALL WITH APPROXIMATE HEIGHT INDICATED

TIMBER CRIBLOCK RETAINING WALL

EXTERNAL STORE / SHED / CYCLE STORE

BIN STORE LOCATION

BOUNDARY FENCING TO BE 1.8M HIGH TIMBER HIT AND MISS FENCING WITH CONCRETE POSTS AND GRAVEL BOARDS.

GATES TO BE 1.8M HIGH PERSONNEL GATE TO MATCH FENCING. LOCKABLE TO SBD STANDARD.

FENCING BETWEEN REAR GARDENS TO BE 1.2M HIGH TIMBER HIT AND MISS FENCING WITH CONCRETE POSTS AND GRAVEL BOARDS.

- ASPHALT ROAD AND PARKING BAYS
- ASPHALT FOOTPATH
- BLOCK PAVIOR (NON-ADOPTABLE)
- GRASSCRETE PARKING BAY
- PAVING
- RAIN GARDEN
- PROPOSED GROUND LEVEL (PRELIMINARY)
- SECTION INDICATOR. REFER TO DRAWING 20 FOR CROSS SECTIONS

SCHEDULE OF ACCOMMODATION

	3P2B WHEELCHAIR BUNGALOW	2
	3P2B BUNGALOW	6
	2P1B WALK-UP APARTMENT	26
	4P2B HOUSE	58
	5P3B HOUSE	36
	5P3B HOUSE	11
	6P4B HOUSE	16
	7P4B HOUSE	4
TOTAL No. DWELLINGS		**159**

APPROXIMATE SITE AREA 71,802m²

NOTES:
ALL DIMENSIONS TO BE CHECKED AND CONFIRMED ON SITE PRIOR TO ANY WORKS OR FABRICATION.

DO NOT SCALE OFF THIS DRAWING.

ANY ERRORS, OMISSIONS OR DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF MUNRO ASSOCIATES IMMEDIATELY.

REV	DATE	DESCRIPTION	BY
K	04.08.23	Minor revision. POS m² added.	PO
J	27.07.23	Minor revisions to layout and mix of house types. Additional external levels added and draft FFLs to all plots.	PO
H	11.01.23	Minor revisions to highway turning heads. Draft external levels added. Cross section indicators added. Drawing issued for PAC.	PO
G	06.10.22	Red line site boundary revised.	PO
F	05.10.22	Pedestrian link to public footpath added.	PO
E	04.10.22	Minor amendments following client comments.	PO
D	27.09.22	Revised scheme of 159 dwellings and detail added	PO
C	25.05.22	Revised scheme of 160 dwellings	PO
B	16.05.22	Revised scheme of 160 dwellings	PO
A	08.04.22	Revised scheme of 170 dwellings	PO

Drawing Status
OUTLINE PLANNING

munro associates
www.munro-associates.com
UNIT 29, THE RURAL ENTERPRISE CENTRE, STAFFORD DENE, BATTLEFIELD ENTERPRISE PARK, SHREWSBURY, SY1 3FE.
T: 01743 341408 E: design@munro-associates.com

Client
Clwyd Alyn

Project
Residential Development
The Works, Acrefair
LL14 3HW

Scale
1:1000 @ A1
1:2000 @ A3

Date
March 2022

Drawn
P Oliver

Drawing Title
SITE LAYOUT

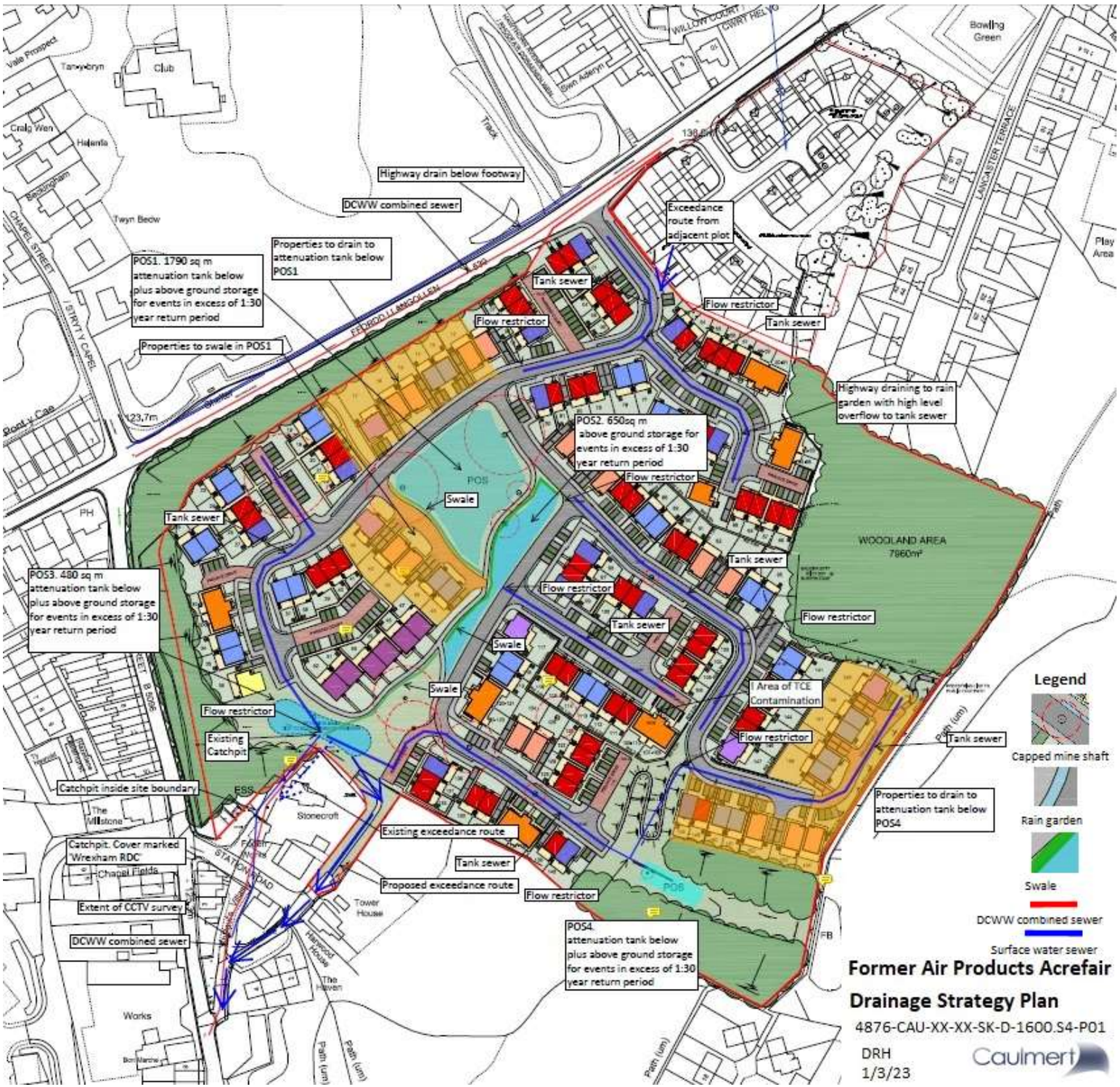
Project No.
21-231

Drawing No.
10

Revision
K

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Registration No. 08117820 Vat No. 650 8829 15


Highway drain below footway
DCWW combined sewer
Properties to drain to attenuation tank below POS1
POS1. 1790 sq m attenuation tank below plus above ground storage for events in excess of 1:30 year return period
Properties to swale in POS1
Exceedance route from adjacent plot
Tank sewer
Flow restrictor
Highway draining to rain garden with high level overflow to tank sewer
POS2. 650sq m above ground storage for events in excess of 1:30 year return period
Swale
POS
WOODLAND AREA
7860m²
POS3. 480 sq m attenuation tank below plus above ground storage for events in excess of 1:30 year return period
Area of TCE Contamination
Existing Catchpit
Catchpit inside site boundary
Existing exceedance route
Proposed exceedance route
Extent of CCTV survey
DCWW combined sewer
POS4. attenuation tank below plus above ground storage for events in excess of 1:30 year return period
Properties to drain to attenuation tank below POS4
Legend
Capped mine shaft
Rain garden
Swale
DCWW combined sewer
Surface water sewer
Former Air Products Acrefair
Drainage Strategy Plan
4876-CAU-XX-XX-SK-D-1600.S4-P01
DRH
1/3/23
Caulmert

APPENDIX 9

Surface Water Storage Requirement

Calculated by:	David High
Site name:	Air Products
Site location:	Acrefair

This is an estimation of the storage volume requirements that are needed to meet normal
best practice criteria in line with Environment Agency guidance "Rainfall runoff management
for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and
the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design
of drainage systems. It is recommended that hydraulic modelling software is used to calculate
volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	52.97999° N
Longitude:	3.07422° W
Reference:	1717606477
Date:	Sep 22 2023 10:42

Site characteristics

Total site area (ha):	4.38
Significant public open space (ha):	1.6
Area positively drained (ha):	2.78
Impermeable area (ha):	2.34
Percentage of drained area that is impermeable (%):	84
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	2.78
Net impermable area for storage volume design (ha):	2.38
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	61
Rainfall 100 yrs 12 hrs:	--	73.73
FEH / FSR conversion factor:	1.01	1.01
SAAR (mm):	875	848
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.3	0.3
Hydological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 10 year:	1.42	1.42
Growth curve factor 30 year:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Q_{BAR} for total site area (l/s):	10.36	9.99

Design criteria

Climate change allowance factor:	1.3

Urban creep allowance factor:	1.1		Q_{BAR} for net site area (l/s):	6.58	6.34
Volume control approach	Use long term storage				
Interception rainfall depth (mm):	5				
Minimum flow rate (l/s):	2				

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	5.8	5.6
1 in 30 years (l/s):	11.7	11.3
1 in 100 year (l/s):	14.3	13.8

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m^3):	1685	1713
Long term storage 1/100 years (m^3):	633	633
Total storage 1/100 years (m^3):	2318	2346

This report was produced using the storage estimation tool developed by HRWallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

APPENDIX 10

Surface Water Quality

CALCULATION SHEET

Client:	Site:	Project:	
Clwyd Alyn	Air Products, Acrefair	Drainage Strategy	Caulmert

Made by:	Date:	Checked by:	Date:	Sheet no.:
David High	27/02/2023			1 of 2

Water Quality Summary

Water quality assessed using Simple Index Approach as described in Section 26.7.1 of the SuDS Manual.

Land Use Type	Residential roofing	Individual driveway	Residential parking
Pollution Hazard Level	Very low	low	low
Pollution Hazard Indices			
TSS	0.20	0.50	0.50
Metals	0.20	0.40	0.40
Hydrocarbons	0.05	0.40	0.40
SuDS components proposed			
Component 1	Pervious pavement	Pervious pavement	Pervious pavement
Component 2	Swale	Swale	Swale
Component 3	None	None	None
SuDS Pollution Mitigation Indices			
TSS	0.95	0.95	0.95
Metals	0.9	0.9	0.9
Hydrocarbons	>0.95	>0.95	>0.95
Groundwater Protection Type			
GW protection Pollution Mitigation Indices	Pervious pavement	Pervious pavement	Pervious pavement
TSS	0.7	0.7	0.7
Metals	0.6	0.6	0.6
Hydrocarbons	0.7	0.7	0.7
Combined Pollution Mitigation Indices			
TSS	>0.95	>0.95	>0.95
Metals	>0.95	>0.95	>0.95
Hydrocarbons	>0.95	>0.95	>0.95
Acceptability of Pollution Mitigation			
TSS	Sufficient	Sufficient	Sufficient
Metals	Sufficient	Sufficient	Sufficient
Hydrocarbons	Sufficient	Sufficient	Sufficient

CALCULATION SHEET

Client:	Site:	Project:		
Clwyd Alyn	Air Products, Acrefair	Drainage Strategy		
Made by:	Date:	Checked by:	Date:	Sheet no.:
David High	27/02/2023			2 of 2

Water Quality Summary

Water quality assessed using Simple Index Approach as described in Section 26.7.1 of the SuDS Manual.

Land Use Type	Low traffic roads	Low traffic roads
Pollution Hazard Level	low	low
Pollution Hazard Indices		
TSS	0.50	0.50
Metals	0.40	0.40
Hydrocarbons	0.40	0.40
SuDS components proposed		
Component 1	Pervious pavement	Swale
Component 2	Swale	None
Component 3	None	None
SuDS Pollution Mitigation Indices		
TSS	0.95	0.5
Metals	0.9	0.6
Hydrocarbons	>0.95	0.6
Groundwater Protection Type		
GW protection Pollution Mitigation Indices	Pervious pavement	300mm soils
TSS	0.7	0.4
Metals	0.6	0.3
Hydrocarbons	0.7	0.3
Combined Pollution Mitigation Indices		
TSS	>0.95	0.7
Metals	>0.95	0.75
Hydrocarbons	>0.95	0.75
Acceptability of Pollution Mitigation		
TSS	Sufficient	Sufficient
Metals	Sufficient	Sufficient
Hydrocarbons	Sufficient	Sufficient

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