Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Former Air Products Site, Acrefair

Clwyd Alyn Housing Ltd

Proposed Housing Development

Surface Water Drainage Investigations

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Caulmert
engineering environmental planning

APPROVAL RECORD

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Caulmert Limited:	Glyndwr Innovations Ltd, St Asaph Business Park, St Asaph, LL17 0JD

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P03	Revised following further investigations	JES	20/09/23

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Surface Water Drainage Investigations

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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.

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

2.0 PREVIOUS DRAINAGE LAYOUT

2.1.1 Figure 3 below is a drawing dating from 2009 which shows the foul and surface water drainage systems serving the Air Products when the plant was still operational.

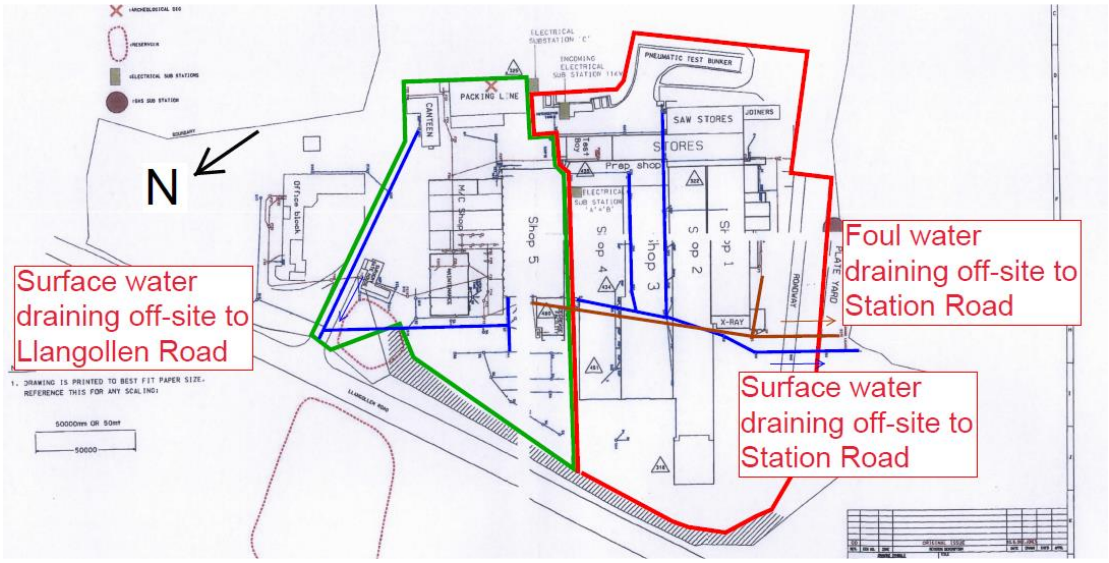


Figure 3: Air Products site 2009

2.1.2 The surface water drainage has two catchments, the green area (15,580m2) draining north towards Llangollen Road and the red area (28,200m2) draining to the southwest.

2.1.3 Surveys undertaken in the period 2021 to 223 have established that the points of discharge shown on the drawing are in the correct location and still exist. The findings of these surveys are described below.

3.0 CONNECTION TO LLANGOLLEN ROAD (WEST SIDE)

3.1.1 There is a chamber within the site (MH2/01, see figures 4 & 5) which matches the location of one of the chambers on the 2009 drawing, on the surface water drain discharging to Llangollen Road. The cover of this chamber is missing and to make it safe it has been backfilled with rubble.



Figure 4: MH2/01

3.1.2 Figure 5 below is taken from a Ground Penetrating Radar (GPR) survey undertaken on 3/11/21. Drainage runs have been marked up and supplementary information has been added from Dŵr Cymru Welsh Water (DCWW) records and a CCTV survey undertaken on 7/1/19.

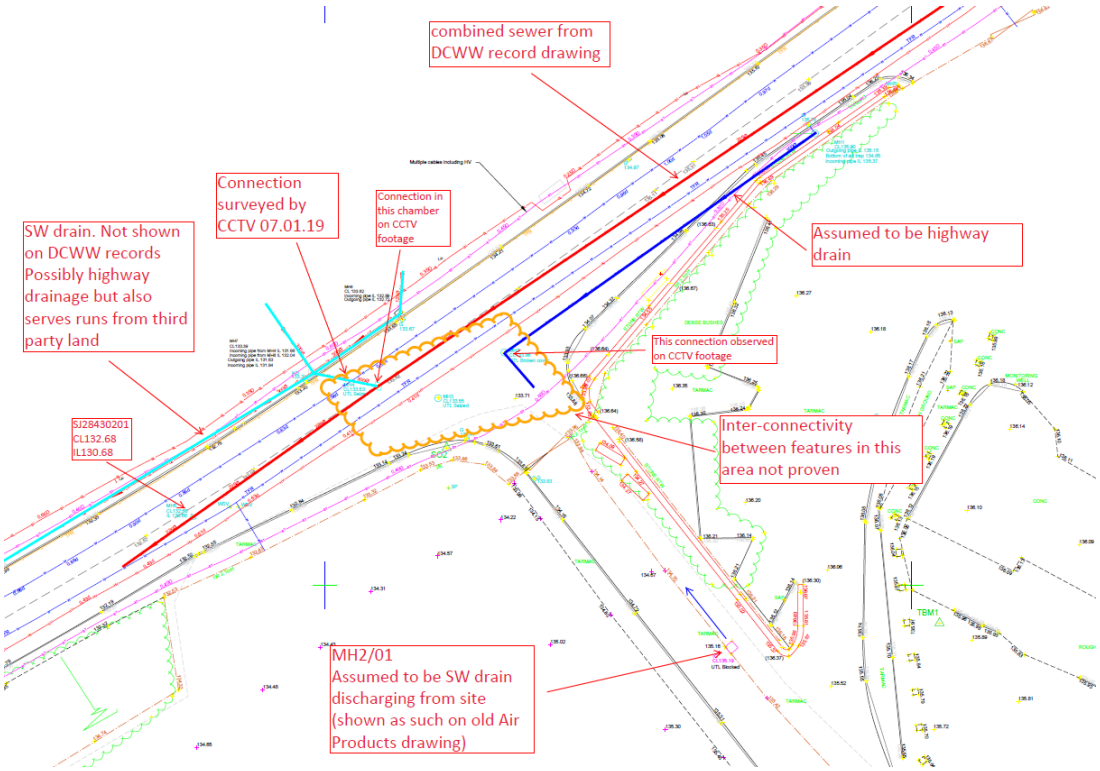


Figure 5: Drainage assets in Llangollen Road Junction

3.1.3 The surface water connection from MH2/01 leaving the site has not as yet been proven, but a possible point of connection has been identified in a chamber which neither the 2019 nor the 2021 survey teams have been unable to open.

3.1.4 A series of chambers exist in Llangollen Road. Those in the carriage have not been opened, as this requires traffic management and the GPR survey provides an overview of what is present. There are two drain runs in Llangollen Road running from northeast to southwest. The run within the carriageway is a DCWW combined sewer.

3.1.5 Responsibility for the run below the northern footway is not known. It may be a highway drain, although the GPR survey has identified at least two connections which pick up surface water from the adjacent land on the north side of the carriageway.

3.1.6 There is also a connection from the combined sewer into the drain run below the northern footway, the location of which has been confirmed by the GPR and CCTV surveys. This is not shown on the sewer records so may be an unauthorised storm overflow.

3.1.7 A CCTV survey of the run below the northern footway was attempted in 2019. This made limited headway as the runs contained large volumes of silt and there was also significant root ingress. The information obtained suggests that the drain runs along Llangollen Road as far as the junction with the B5096 (King Street). No investigation has been progressed beyond that point.

4.0 CONNECTION TO STATION ROAD (EAST SIDE)

4.1.1 There is a gentle fall on the site from north to south. The 2009 layout of the Air Products factory shows the majority of the surface water running off to a drain run which discharges towards Station Road. Foul drainage from the factory is also shown following a similar, parallel route.

4.1.2 At 327945.92E 343001.21N, within the site, there is chamber which approximates to the location of the surface water drain shown on the 2009 drawing. The chamber has a cover level of 132.69mAOD and an invert level of 127.46mAOD (5.23m deep).

4.1.3 Drawing (4876-CAU-XX-XX-DR-C-1600, included in Appendix 3) has been prepared to summarise the findings of various investigations undertaken to establish the connectivity of surface water drains downstream of Station Road.

4.1.4 Ultimately connectivity has been established to what appears to be a culverted watercourse which passes below the B5096/ King Street and appears to run under the driveway of 'Bon Marche'.

4.1.5 A dye test established that the chamber on the site (SWMH01 on the drawing in Appendix 3) connects to a catch pit with a gully cover outside the property 'Trefriw' on Station Road (SWMH03). Figure 6 below shows the known run of surface water drain. A larger scale copy of this drawing is included in Appendix 3. The location of SWMH03 is illustrated in figure 8.

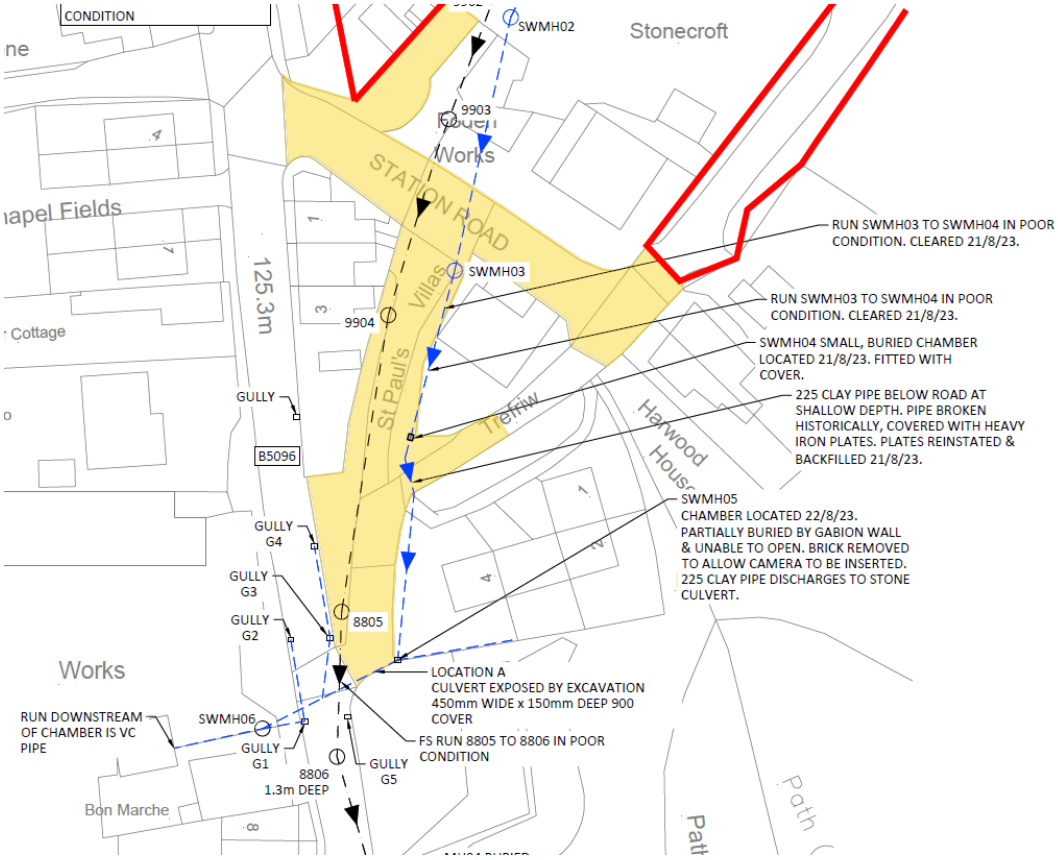


Figure 6: Known extent of surface water drain in Station Road

4.1.6 A CCTV survey carried out on 14th September 2023 located a catchpit 40m upstream of the SWMH03. SONDE location testing has located this chamber buried below the paving slabs that form the driveway to 'Stonecroft' (see figure 7). The run between the two chambers is formed of 225mm clay pipes in good condition. The location of this chamber has not yet been established.



Figure 7: Approximate location of SWMH02 (below CAT scanner)

4.1.7 An attempt to CCTV survey the run downstream of the SWMH03 met with only limited success. The run is heavily silted and the camera was below water level for the whole length surveyed. Due to debris in the pipe neither the CCTV camera nor a SONDE was able to progress beyond 17m.



Figure 8: Location of SWMH03

4.1.8 During an investigation on 21st August 2023 debris was cleared from the run downstream of SWMH03 and ultimately a small chamber (SWMH04, figure 9) was located. There is a change in direction of the drain (to the east) downstream of this chamber (figure 10).



Figure 9: SWMH04: Chamber at southern end of garden to Trefriw

4.1.9 Following the change in direction the drain runs at shallow depth below the track which leads to Harewood House and Tower House. The pipe was found to be broken at this location and covered with old iron plates (figure 10). Immediately downstream of the track there is a further slight change in direction and the drain runs below the garden of 4 The Haven in close proximity to the rear of the retaining wall (which appears to have been installed in early 2021).



Figure 10: Location of SWMH04 and damaged pipe on track to Harewood House



Figure 11: Plate covering historic damage to pipe in access track to Harewood House

4.1.10 A trial pit excavated at the foot of the retaining wall to 4 The Haven has located a chamber (SWMH05) covered by the retaining wall. It has been possible to remove, and subsequently replace a brick from the chamber wall and allow a limited inspection of the interior of the chamber to be undertaken using a CCTV camera. There are two pipes feeding into the chamber, one from SWMH04 and another from the east. Downstream the construction has a stone slab roof. Figure 12 shows the incoming pipe from Station Road and Figure 13 the outgoing culvert.



Figure 12: Incoming drain from Station Road into chamber SWMH05 below retaining wall, 4 The Haven.



Figure 13: Outgoing culvert, from chamber SWMH05

4.1.11 Given the stone slabbed construction downstream of SWMH05, this section is subsequently described in this report as 'a culvert', however its legal status as unadopted surface water sewer or culverted watercourse is not known.

4.1.12 On the 14th September 2023 an excavation was opened up in the unadopted road and the culvert located (location A in Figure 6). The culvert is 450mm wide x 150mm deep, with a depth to invert of 900mm (Figure 14).



Figure 14: Culvert uncovered by excavation at Location A

4.1.13 Attempts to clear the culvert by jetting were unsuccessful and obstructions prevented any meaningful CCTV survey being undertaken.

4.1.14 There are a number of gullies in King Street/ B5096 (numbered G1 to G4 on drawing 4876-CAU-XX-XX-DR-C-1600 in Appendix 3). Connectivity between G2 and G1 was proven by dye testing. It was possible to CCTV survey the run downstream of G1 for 5.5m, to a point where it enters a chamber SWMH06. The cover of this chamber is buried. It may be below the drive of the property 'Bon Marche'.

4.1.15 Dye testing established that the culvert flows from Location A to SWMH06. The dye was observed by a camera that had gained entry to the chamber from gully G1.

4.1.16 Dye placed in gully G3 was also observed flowing through SWMH06.

4.1.17 As road gullies feed into SWMH06, there is the potential for the downstream network to be part of the highway drainage network, as a third option to culvert or surface water sewer.

5.0 CONNECTIONS TO FOUL SEWERAGE

5.1.1 An extract from the DCWW records is included in Figure 15.

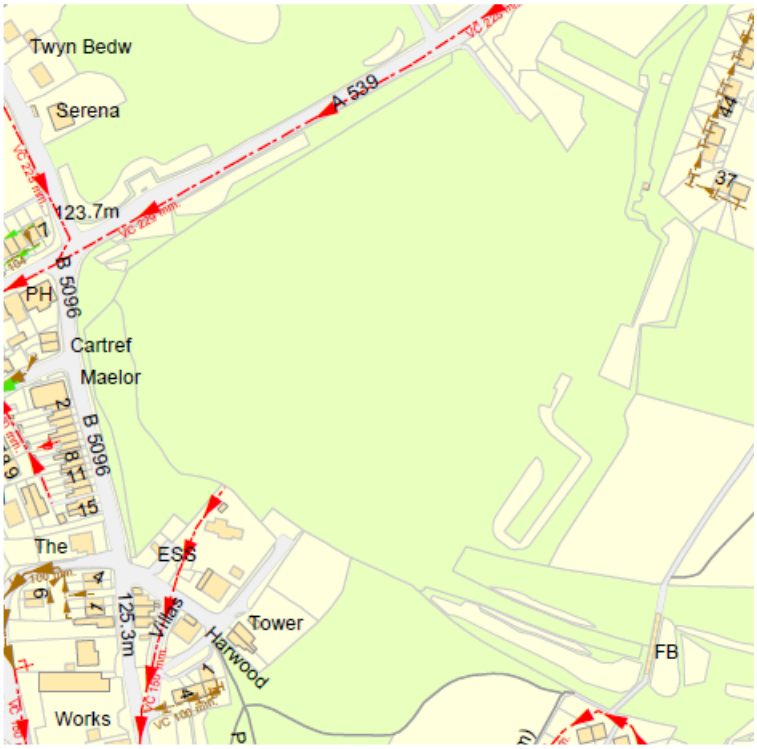


Figure 15: DCWW records extract

5.1.2 There is a combined sewer running below Llangollen Road and a connection leading from the site via Station Road. The sewer in Llangollen Road is 225mm in diameter and that in Station Road 150mm. DCWW have requested that as much of the proposed sewer network to serve the new development be connected to Llangollen Road.

5.1.3 The site layout means that it is not possible for all of the site to drain by gravity to Llangollen Road if the point of connection is to be via the existing access road location. If all of the foul sewers are to drain by gravity then there is a need for some areas of the site to connect to the public sewer via Station Road.

5.1.4 A buried chamber has been located within the site at the upstream end of the public sewer. A CCTV survey has been carried out of the full length of the sewer between the site and the B5096/ King Street (DCWW chamber references SJ27429901 to SJ27428806, see Figure 9). The majority of this run is in good condition, apart from the section between chambers 8805 and 8806 (below the B5096) where the condition is poor.

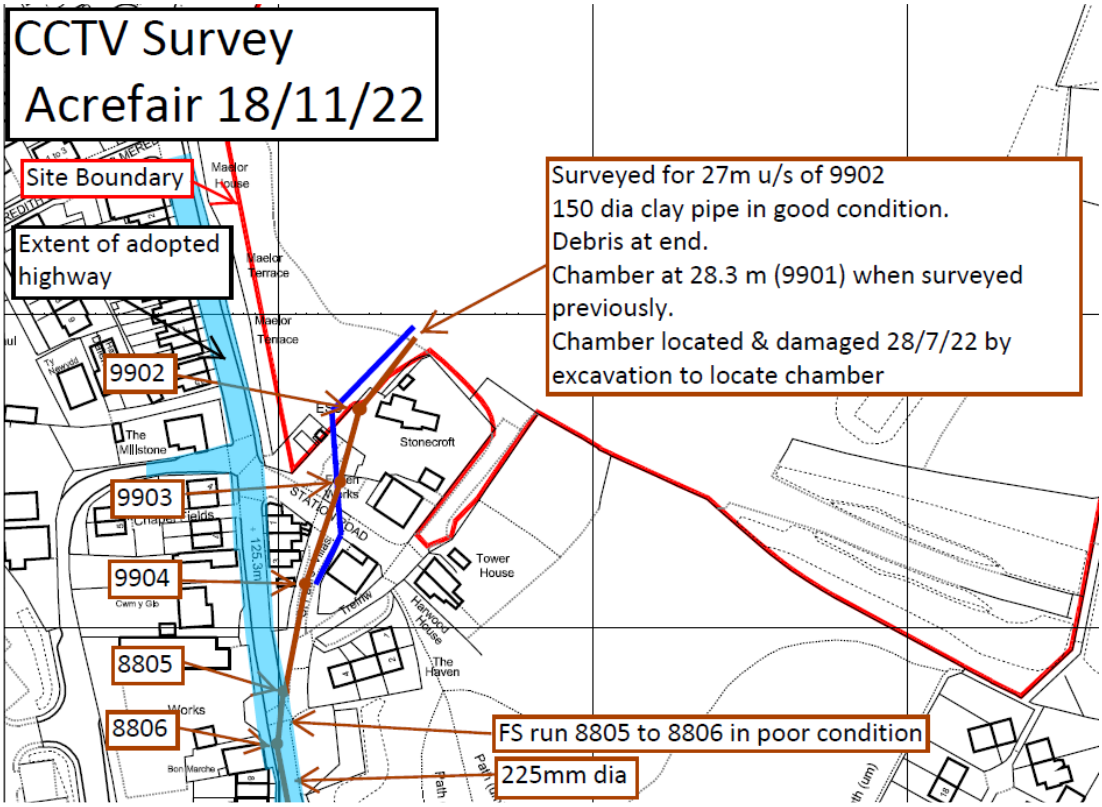


Figure 16: Extents of foul sewer survey in Station Road

5.1.5 Chamber 9902 is also buried, below paving slabs forming the drive to 'Stonecroft'. Figures 17 and 18 show the location of this chamber.



Figure 17: Location of 9902



Figure 18: Chamber 9902

5.1.6 As an aside, there are other chambers in the grass to the side of the drive to 'Stonecroft'. These contain water meters associated with the previous use of the Air Products site (Figure 19).



Figure 19: Water meter chamber

5.1.7 There are several side connections into the sewer on the run 9904 to 8805, which are anticipated to be connections from adjacent residential properties.

5.1.8 The majority of the run from 8806 to the next chamber downstream has also been CCTV surveyed. There is a buried chamber on this run (MH04) and several side connections entering from the east which may be surface water drains from the adjacent retaining wall.

6.0 SUMMARY

6.1.1 Connectivity from the site (SWMH01) to SWMH06 has been proven, however the ownership and legal status of the various sections is unclear.

6.1.2 The run SWMH01 – SWMH02 – SWMH03 is a surface water drain which previously served the Air Products site. This run leaves the site and runs within the curtilages of 'Stonecroft' and Foden Garage before entering the unadopted road to the rear of St Paul's Villas.

6.1.3 SWMH03 has a gully cover lid and has a second incoming pipe, coming in from the east.

6.1.4 After passing through chamber SWMH04 the drain enters the garden of 4, The Haven (a property owned by Wrexham CBC). A retaining wall has been built over this section of the drain (in 2021) and also over chamber SWMH05.

6.1.5 There are two 225mm diameter pipes entering SWMH05, one run from SWMH04 and the other from an easterly direction.

6.1.6 A trial pit was excavated down to expose the drain downstream of SWMH05 (at location A). At this location the drain has a rectangular cross section, with a slab base and 450mm wide x 150mm deep.

6.1.7 Downstream of location A the drain passes below King Street/ B5096 before passing below the driveway of 'Bon Marche', where another buried chamber exists,SWMH06.

6.1.8 There are four highway gullies that connect into the drain between Location A and SWMH06.

6.1.9 Maintenance responsibility for the various sections of the surface water conduit are dependent upon their definition. Sections of the run may be:

- An adopted surface water sewer
- a private surface water sewer
- a culverted watercourse
- a highway drain

6.1.10 Connectivity of the surface water conduit to the adopted sewerage network will need to be established to present a case to Dŵr Cymru Welsh Water that the system is part of the sewerage network. If it connects to a combined system DCWW may resist development surface water being permitted to discharge via this route.

6.1.11 A review of old maps (dating back to 1873) has been undertaken. None of the maps viewed show an above ground watercourse that may subsequently have been culverted.

6.1.12 The section from SWMH01 to SWMH03 appears to be a private surface water drain as it only serves the former Air Products site and it is probable that maintenance responsibility is that of the Air Products site owner.

6.1.13 Between SWMH03 and SWMH05 the status of the conduit is unclear. It is laid below the unadopted highway and serves more than one site. Attempts to establish ownership of this land have been unsuccessful. Maintenance responsibility is unclear. As a private sewer serving multiple sites or as a culverted watercourse maintenance may rest with the landowner through whose property the conduit is passing.

6.1.14 At SWMH05 further drains connect to the route and below King Street/ B5096 the construction changes to a rectangular section, with a stone slab base and cover, a form of construction usually provided on culverted watercourses. There is an additional pipe feeding in to SWMH05.

6.1.15 Downstream of Location A the drain passes below the highway. There are also highway gullies feeding further water into the system. As a private sewer or culvert maintenance responsibility of this section may rest with the Highway Authority. There is also the potential for this section to be considered to be part of the highway drainage network.

6.1.16 Maintenance responsibility downstream of King Street may rest with the landowners, if the network is a private sewer or culverted watercourse or with the Highway Authority if the system downstream of the road gullies is considered to be part of the highway drainage network.

6.1.17 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. While the use of 'leaky' infiltration features is considered acceptable (with some caveats regarding location) it is preferable that the majority of the surface water is conveyed off-site.

6.1.18 Information obtained from the investigation works will enable discussions to be held with Wrexham CBC to establish if they consider the culvert uncovered to be a culvert, conveying a watercourse, or part of the highway drainage network. The status of the conduit downstream of SWMH05 has implications for maintenance responsibility.

6.1.19 Liaison is also required with the SAB / DCWW to establish if they are be satisfied that the drainage route identified by the investigation described in this report forms a suitable means of disposal satisfying S1 (surface water runoff destination) of the SuDS standards, and that they will agree that the conduit can accept a controlled discharge from the site of 6.34l/s (replacing the current flow entering the conduit from the site.

6.1.20 Given the poor condition of the drain run between SWMH03 and SWMH05 it is recommended that this section of drain be replaced, with the new run being laid below the unadopted road of unknown ownership.

6.1.21 Legal investigations should be considered, to establish if the drainage connectivity from the site is successfully proven, what the legal rights and responsibilities would be. As the SAB would need to adopt SuDS on the developed site it is expected that the SAB will also need to

adopt the downstream drainage, or be satisfied the downstream drainage can and will be appropriately maintained to carry flows from the site.

6.1.22 It may also be necessary to undertake a capacity assessment of the off-site drainage to confirm it is adequate to accept controlled flows from the site. This could be challenging, as it is already established that there are other unknown flows entering the pipe. Alternatively it might be possible to monitor how flows from the existing site into the drainage respond to rainfall, and demonstrate the developed site will not increase this.

7.0 CONCLUSION

7.1.1 Connectivity from the site (SWMH01) to SWMH06 (downstream of King Street/ B5096) has been proven.

7.1.2 An informed discussion needs to be held with the Highway Authority, Lead Local Flood Authority and SAB, possibly DCWW regarding the status and maintenance responsibilities for the various sections of the surface water conduit.

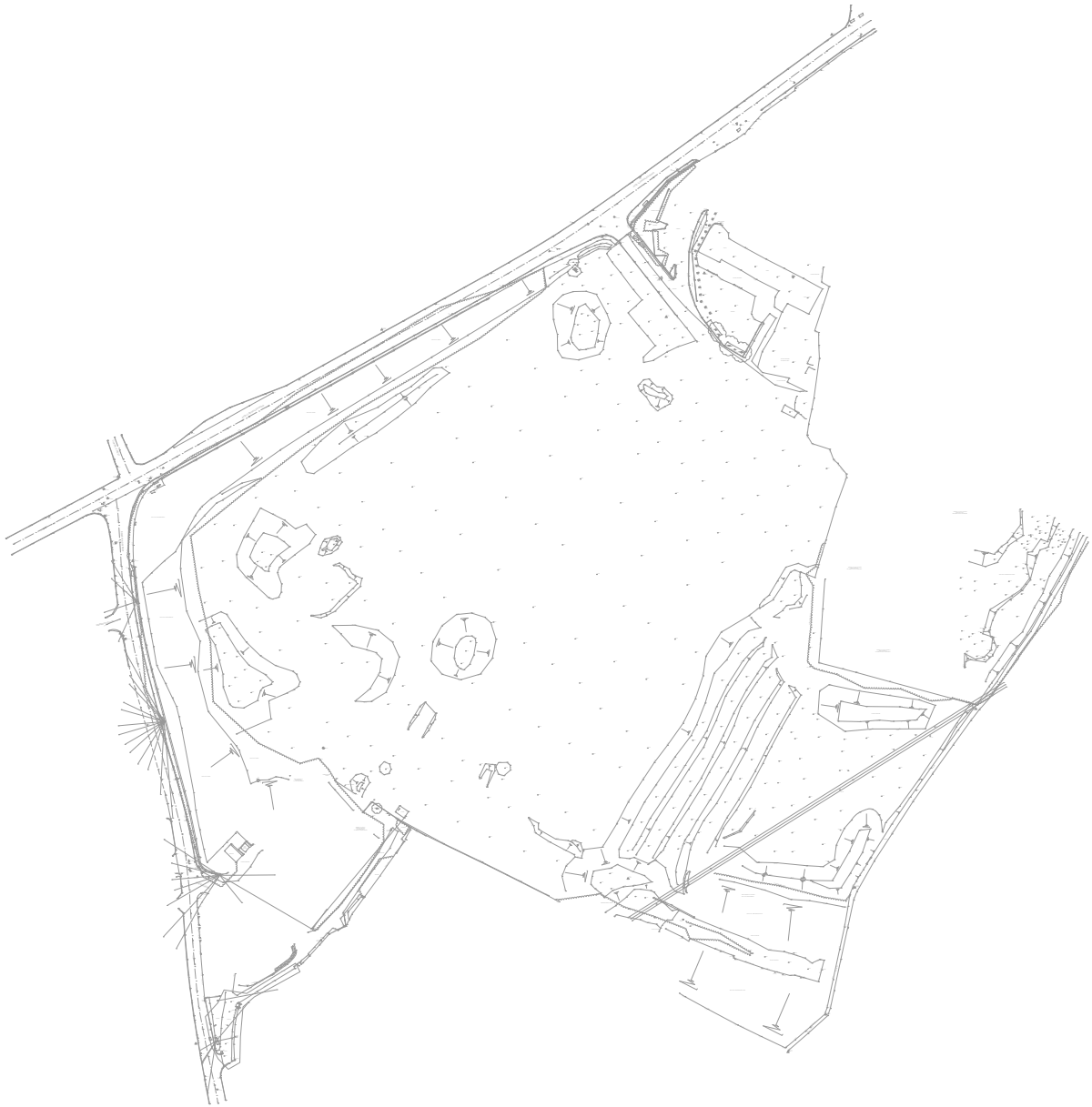
7.1.3 The conduit run below the unadopted road (of unknown ownership) between SWMH03 and SWMH05 is in poor condition, with the chamber SWMH05 being buried below a retaining wall. It is proposed to replace all of this section of drain with new construction, with all of the proposed new drain being laid below the unadopted road. It is not known if Clwyd Alyn has the legal right or responsibility to undertake this work.

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
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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

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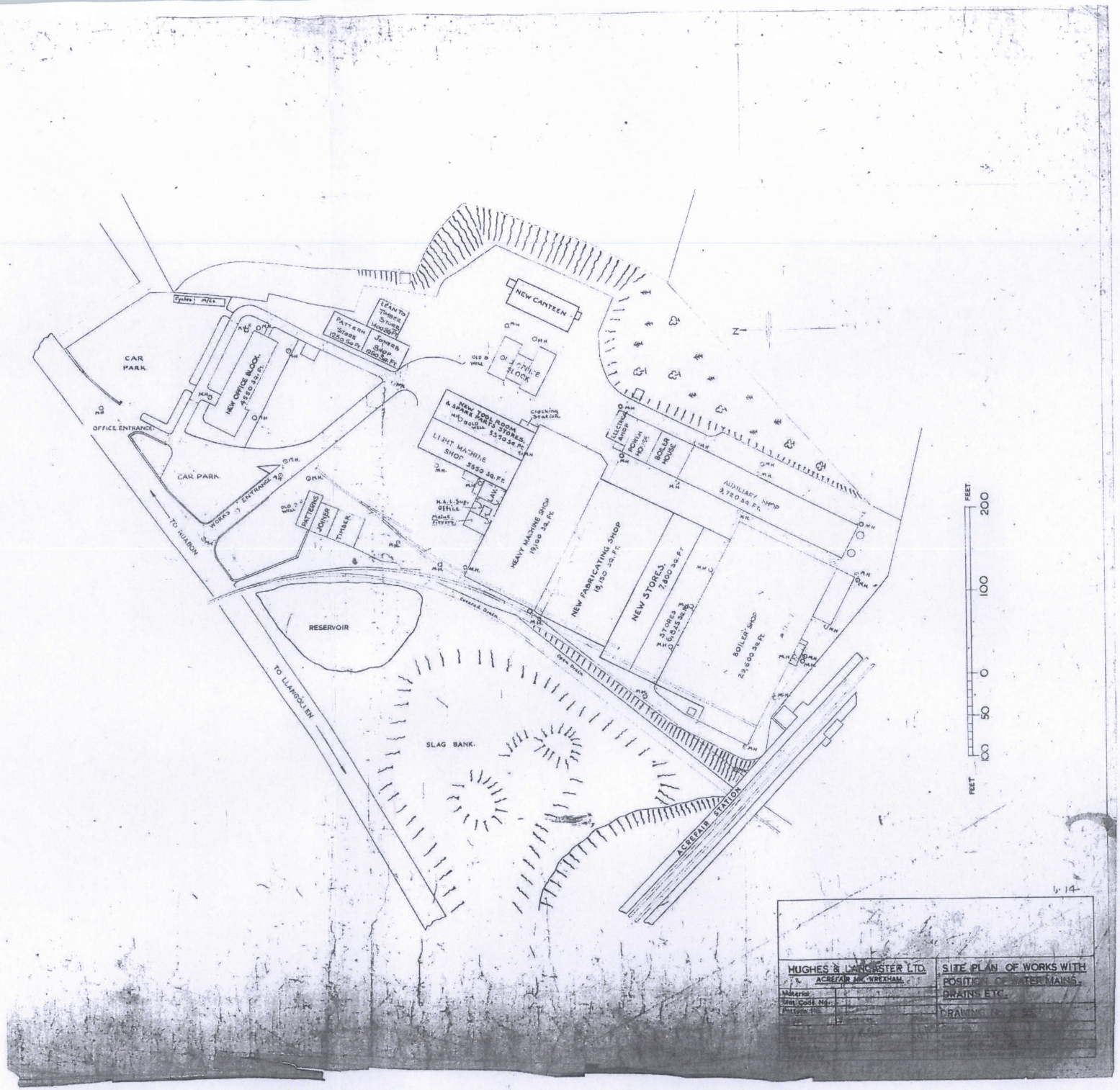
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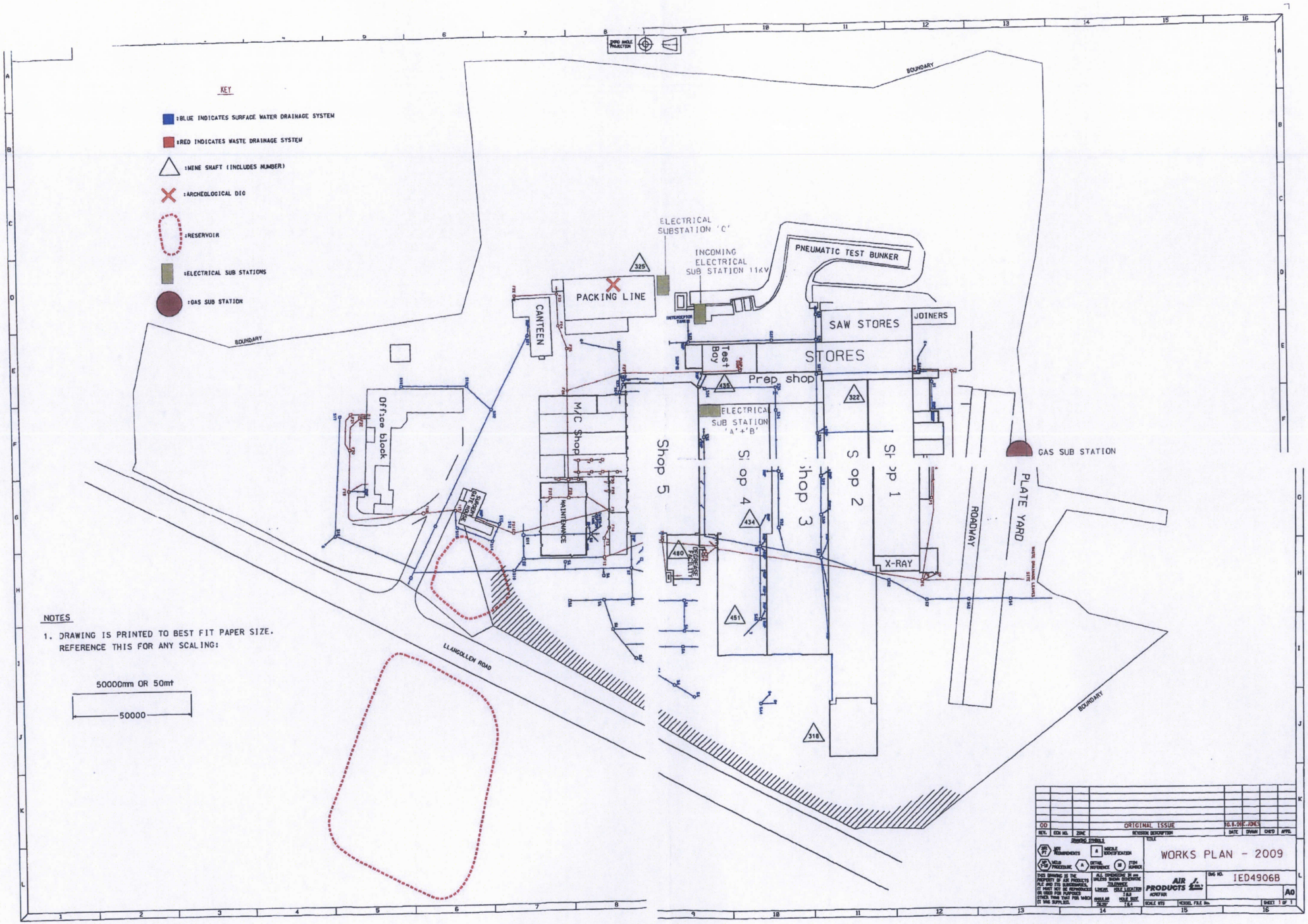
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APPENDIX 2

Historic Drawings


CAR PARK
OFFICE ENTRANCE
NEW OFFICE BLOCK 3520 SQ.FT.
PATTERN STORE 1250 SQ.FT.
JOINERS SHOP 1250 SQ.FT.
PLANT TIMBER STORE 1400 SQ.FT.
NEW CANTEEN
OLD OFFICE BLOCK
OLD WELL
NEW TOOL ROOM & APPRENTICE TRAINING SCHOOL 3530 SQ.FT.
CLOCKING STATION
LIGHT MACHINE SHOP 3530 SQ.FT.
ELECTRIC MOTOR
POWER HOUSE
BOILER HOUSE
AUXILIARY SHOP 9720 SQ.FT.
CAR PARK
WORKS ENTRANCE
TO HUARON
PATTERNS
JOINER
TIMBER
M.A.I. SHOP OFFICE
MAINT. FITTERS
HEAVY MACHINE SHOP 19,100 SQ.FT.
NEW FABRICATING SHOP 19,150 SQ.FT.
NEW STORES 7,900 SQ.FT.
3 STORES 5,685 SQ.FT.
BOILER SHOP 29,600 SQ.FT.
RESERVOIR
TO LLANGOLLEN
SLAG BANK
ACREFAIR STATION
N
FEET
200
100
0
50
100
FEET
HUGHES & LANCASTER LTD.
ACREFAIR NR. WREXHAM.
SITE PLAN OF WORKS WITH POSITION OF WATER MAINS, DRAINS ETC.
Material
Stat. Code No.
Pattern No.
DRAWING No.


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'
GAS SUB STATION
Office block
M/C Shop
MAINTENANCE
Shop 5
Shop 4
Shop 3
Shop 2
Shop 1
X-RAY
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
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APPENDIX 3

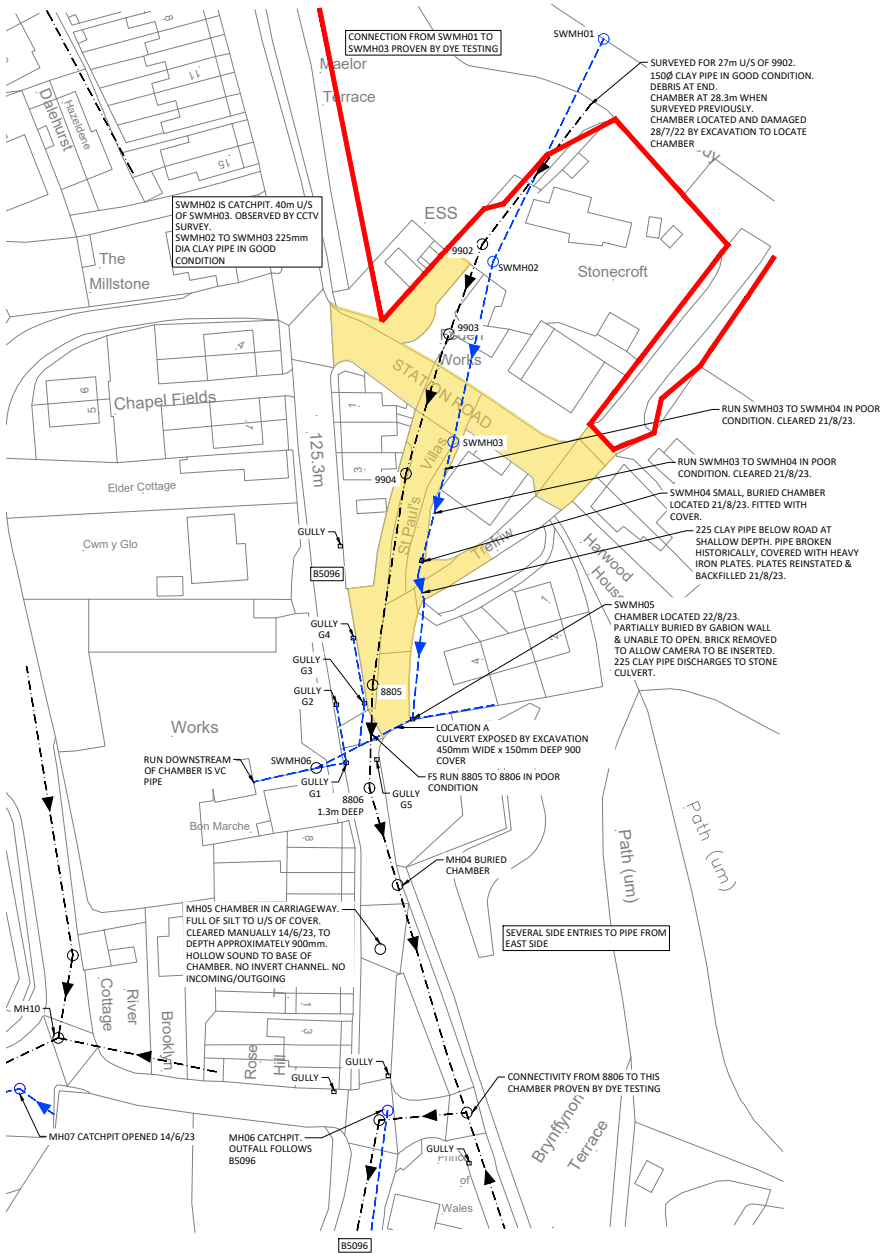
Drawing 4876-CAU-XX-XX-DR-C-1600
Existing Off-Site Drainage

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. 9902 IS BURIED BELOW PAVING SLABS FORMING DRIVEWAY TO 'STONECROFT'.
4. SWMH02 LOCATED BY SONDE 14/09/2023. BURIED BELOW PAVING SLABS IN DRIVEWAY OF 'STONECROFT'.
5. SWMH05 IS BURIED BELOW GABION WALL. UNABLE TO OPEN.
6. CULVERT EXPOSED AT LOCATION A ON 14/09/2023. WATER FLOWING BUT DEBRIS PREVENTED CCTV SURVEY.
7. SWMH06 IS BURIED. POSSIBLY IN DRIVEWAY OF 'BON MARCHE'. CHAMBER IS 5.5m DOWNSTREAM OF GULLY G1.
8. CONNECTIVITY FROM LOCATION A TO SWMH06 PROVEN BY DYE TESTING, OBSERVED BY CAMERA FROM G1.
9. CONNECTIVITY FROM G1 TO SWMH06 PROVEN BY CCTV SURVEY.
10. CONNECTIVITY FROM G2 TO G1 PROVEN BY DYE TESTING.
11. CONNECTIVITY FROM G4 TO G3 PROVEN BY DYE TESTING.
12. CONNECTIVITY FROM G3 TO CULVERT PROVEN BY DYE TESTING, OBSERVED IN SWMH06 BY CAMERA IN CHAMBER FROM G1.

LEGEND

- SITE BOUNDARY
- FOUL RUN AS PER DCWW RECORDS
- SURFACE WATER AS PER CCTV FINDINGS
- SURFACED ACCESS ROADS. OWNERSHIP NOT APPARENT



P04	ADDITIONAL INFORMATION FOLLOWING SURVEY 14.09.23	DA	DH	DH	15.09.23
P03	ADDITIONAL INFORMATION FOLLOWING SURVEY 21/08/23	EB	DH	DH	25.08.23
P02	SW RUN AMENDED & GULLYS ADDED	DA	DH	DH	21.07.23
P01	ISSUED FOR INFORMATION	DA	DH	DH	29.06.23
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION
STATUS: S2

CLIENT: ClwydAlyn

PROJECT: FORMER AIR PRODUCTS SITE ACREFAIR

TITLE: EXISTING OFF-SITE DRAINAGE (SOUTH)

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
DH	DA	DH	DH

DATE	SCALE @ A1	JOB REF:	REVISION
JUNE 2023	1:500	4876	P04

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