



Ysgol Bro Alun, Gwersyllt

Wrexham

Drainage Strategy

October 2019

Project Information	
Project:	Ysgol Bro Alun, Gwersyllt
Report Title:	Drainage Strategy
Client:	Wrexham County Borough Council
Instruction:	The instruction to undertake this Drainage Strategy was received from Mr Carl Jones of Wrexham County Borough Council
File Ref:	12394-Drainage Strategy-01

Approval Record	
Author:	Sally Pettit BSc (Hons)
Checker:	Aled Williams BSc (Hons) MCIWEM
Approver:	Victoria Griffin BSc (Hons) MSc MEnvSc CEnv

Document History		
Revision	Date	Comment
01	18/10/19	First issue

Contents

Introduction	1
Existing Conditions	1
Development Proposals	4
Consultation	4
Surface Water Management	5
Construction, Operation and Maintenance.....	10
Foul Drainage.....	10
Other Considerations	11
Conclusions.....	12
Recommendations.....	12

Appendices

Appendix A	Location Plan and Aerial Image
Appendix B	Topographical Data
Appendix C	Exploration Hole Location Plan
Appendix D	DCWW Sewer Plan and Correspondence
Appendix E	Existing Drainage Layout Plans
Appendix F	Existing and Proposed Plans
Appendix G	ReFH2 Greenfield Runoff Rates
Appendix H	MicroDrainage Storage Volumes
Appendix I	Concept Drainage Sketch
Appendix J	Maintenance Schedules
Appendix K	Concept Designer's Risk Assessment

Tables

Table 1 – Pollution Hazard Indices	9
Table 2 – SuDS Mitigation Indices	9

Introduction

Waterco has been instructed to prepare a Drainage Strategy in respect of a proposed development at Ysgol Bro Alun, Delamere Avenue, Gwersyllt, Wrexham, LL11 4NG.

From April 2015, Wrexham County Borough Council (WCBC) as a Lead Local Flood Authority (LLFA) and Sustainable Drainage Approval Body (SAB) is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of the Sustainable Drainage Strategy is to identify water management measures, including Sustainable Drainage Systems (SuDS), to provide surface water runoff reduction and treatment.

This report has been prepared in accordance with the Welsh Government 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems' (2018).

This report has been prepared in consultation with WCBC (SAB) and Dwr Cymru Welsh Water.

The copyright in this document (including its electronic form) shall remain vested in Waterco Limited (Waterco) but the Client shall have a licence to copy and use the document for the purpose for which it was provided. Waterco shall not be liable for the use by any person of the document for any purpose other than that for which the same was provided by Waterco. This document shall not be reproduced in whole or in part or relied upon by third parties for any use whatsoever without the express written authority of Waterco.

Existing Conditions

The site covers an area of approximately 2.69ha and is located at National Grid Reference (NGR) 331999, 354021. A location plan and an aerial image are included in Appendix A.

Online mapping (including Google Maps / Google Streetview imagery accessed October 2019) shows that the site is occupied by an existing school with associated car parking, hardstanding play areas, playing fields and access. The site is bordered by Alyn Waters Country Park to the north, Gwersyllt Skate Park and a bowling green with Gwersyllt Cricket Club beyond to the east, Delamere Avenue becoming Park Wall Road to the south and school playing fields to the west. Access to the site is provided from Delamere Avenue / Park Wall Road.

Local Topography

Topographical data has been included on the 'Proposed External Levels' plan (Drawing Reference: 5104033/120/02) provided by WCBC and included in Appendix B. The 'Proposed External Levels' plan was produced prior to the construction of the existing school. The 'Proposed External Levels' plan shows that site levels range from 81.36 metres Above Ordnance Datum (m AOD) in the north-west to 79.25m AOD in the south-east. Levels in the vicinity of the school building range between 81.14m AOD and 80.77m AOD.

Ground Conditions

Reference to the British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by superficial Devensian Glaciofluvial Sheet Deposits generally comprising sand and gravel. The superficial deposits are identified as being underlain by bedrock of the Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation (undifferentiated) consisting of mudstone, siltstone and sandstone.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

A 'Ground Investigation Factual Report' has been undertaken by Geotechnics Environmental Ltd (Project Number: PN112613) in January 2012. The report was undertaken prior to the construction of the existing school to obtain information on the ground conditions relating to the design of the proposed works. An 'Exploratory Hole Excavation Plan' is included in Appendix C. A summary of the report is as follows:

- 7No. Trial Pits (HP1 to HP7) were hand excavated to a depth of 1.20m, with the exception of HP4 which was terminated at 0.6m depth due to hard digging conditions. Strata profiles and soil samples were taken in each location and groundwater observations were made. HP1 to HP7 were found to be similar in composition with Made Ground consisting of gravelly fine to coarse sand with clayey gravelly sand below recorded in all the pits, except HP4 which encountered no clay content. No groundwater was encountered in HP1 to HP7 (to a depth of 1.2m).
- 8No. Trial Pits (SA1 to SA5 and TP1 to TP3) were excavated to depths varying between 1.50m and 3.50m below ground level (m.bgl). Groundwater was encountered in TP1 and TP2 at a depth of 2.0m and 1.70m respectively.
- Soakaway testing in accordance with BRE Digest 365 (Soakaway Design 1991) was carried out in Soakaway Pits SA1 to SA5 and TP1. In accordance with BRE365, testing was repeated 3No. times within SA1 and TP1. SA1 recorded consecutive infiltration rates of 1.01^{-4} m/s, 2.96^{-4} m/s and 3.22^{-4} m/s. TP1 recorded consecutive infiltration rates of 3.45^{-5} m/s, 1.84^{-5} m/s and 3.41^{-5} m/s. Both SA1 and TP1 were located in the eastern extent of the site as shown on the 'Exploratory Hole Excavation Plan' (Appendix C). Slow soakage in SA2 to SA5 resulted in only 1No. test carried out in these locations and insufficient fall to calculate an infiltration rate.
- 5No. Cable Percussion boreholes (BH1 to BH5) were advanced to depths of between 9.50 metres below ground level (m.bgl) and 12.28m.bgl. Made Ground was encountered in all boreholes to a depth of between 3.0m.bgl and 3.50m.bgl, with a varying mix of gravel, silt, clay and sand below to a depth of between 6.0m.bgl and 9.50m.bgl. Mudstone was encountered below to the base of the boreholes. Groundwater was struck in all cable percussion boreholes at depths of between 3.30m.bgl and 3.70m.bgl. Groundwater was also struck at 8.20m.bgl in BH5.
- 6No. Window Sample Boreholes (WS1 to WS6) were undertaken to depths of between 3.70m.bgl and 5.0m.bgl. Groundwater was struck in all sample boreholes (except WS5) at depths of between 2.0m.bgl and 3.70m.bgl.

According to BGS (Geo Index Onshore) Aquifer Designation data for Wales [accessed October 2019], the superficial Devensian Glaciofluvial Sheet Deposits and underlying Pennine Lower and Middle Coal Measures Formations are classified as Secondary A Aquifers.

Secondary A Aquifers are ‘permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers’

The Cranfield University ‘Soilscapes’ map [accessed October 2019] indicates that the site is underlain by ‘freely draining, loamy soils.’

Local Drainage

Public sewer records have been obtained from Dwr Cymru Welsh Water (DCWW) and are included in Appendix D. The DCWW sewer records show that there is a 525mm public surface water sewer originating within the south-eastern extent of site. The 525mm public surface water sewer flows south and discharges to a watercourse approximately 290m south-east of the site. No cover or invert levels are provided.

The sewer records also identify a 180mm public foul sewer located immediately south of the site within Delamere Avenue. The 180mm public foul sewer flows east. No cover or invert levels are provided. There is also a 225mm public combined sewer located approximately 30m east of the site. The public combined sewer flows south-east in this location.

A ‘Proposed SuDS Layout’ (Drawing Reference:5104033-WA-C-110) and ‘Proposed Surface Water Layout’ (Drawing Reference: 5104033-WA-C-112) showing the existing drainage for the school are included in Appendix E. The ‘Proposed Surface Water Drainage Layout’ plan shows that surface water from the school building drains to a rainwater harvesting system. The rainwater harvesting system has an overflow to a soakaway located beneath the car park in the eastern extent of the site.

The ‘Proposed Surface Manhole Schedule’ (Appendix E) shows that existing surface water manhole SW05 in the western extent of the site has a cover level of 81m AOD and an invert level of 79.37m AOD.

As shown on the ‘Proposed SuDS Layout’ plan, the car parking spaces are formed from permeable paving. Furthermore, swales are located along the northern, southern and western boundaries of the wider site. The swales are located at the foot of sloping ground and serve runoff from the slopes and runoff from a playing field. The swales discharge to 3no. bioretention areas in the eastern extent of the site. The bioretention areas have formal overflows to the soakaway beneath the car park.

The invert level of the soakaway varies from 78.2m AOD to 78.0m AOD. The soakaway is shown to have a 100mm overflow with an invert level of 79.1m AOD. The overflow connects to the public surface water sewer which originates in the southern extent of the site. The ‘Proposed Surface Water Layout’ plan identifies an invert level of 77.9m AOD for the public surface water sewer on site.

Foul flows currently discharge to the 225mm public combined sewer to the east of the site.

Development Proposals

The proposed development is for an extension on the western side of the existing school building. The extension will comprise 2No. classrooms, a childcare area, 11No. toilets, storerooms, cloakrooms and a kitchen. The proposals include removal and relocation of an existing Multi-Use Games Area (MUGA) and the surrounding hard play area. Existing and proposed development plans are included in Appendix F.

As part of the development proposals, an amenity / biodiversity area will be introduced along the western boundary.

Development plans indicate that proposed floor levels will be consistent with floor levels in the existing school building (shown at 81m AOD).

The proposed development will include approximately 2,353m² of hardstanding. Proposed hardstanding will comprise:

- Building extension - 627m²
- MUGA with surrounding path- 991m²
- Hard play area – 735m²

All measurements have been taken from .dwg copies of the 'Location and Proposed Site Block Plan' (Appendix F).

Consultation

A meeting with Mr Neil Taunt, the SAB officer for Wrexham County Borough Council, was attended by Waterco and Wrexham County Borough Council on the 26th September 2019. A summary of the main points identified during the SAB meeting is detailed below:

- The site is already utilising infiltration methods in the form of a soakaway in the eastern extent of the site (under the car park) and 2No. smaller soakaways in the northern extents (which serve the sports pitch surfaces). There are also filter drains and a swale around the periphery of the site. There is an overflow from the soakaway in the eastern extent to the DCWW public surface water sewer.
- Infiltration testing shows that infiltration is only feasible in the eastern extent of the site.
- An acceptable drainage solution for the new school extension and associated hardstanding is to provide attenuation and flow control (limiting to greenfield rates) with surface water then directed to the existing soakaway in eastern extent. The existing soakaway has an overflow to the public surface water sewer, and as such, the additional inflow to the soakaway would not cause flooding (exceedance of the soakaway).

- An amenity / biodiversity feature will be feasible to the west of the relocated sports surface. The amenity / biodiversity feature will not link to the drainage system.
- The surface water management system should be designed to accommodate the 1 in 100 year + 20% Climate Change (CC) event.
- Attenuation could be provided in the form of a below ground geo-cellular tank, above ground SuDS or within the sub-grade of permeable surfaces.

A pre-development enquiry request was submitted to DCWW in August 2019. In their response (Appendix D), DCWW have stated that:

‘SEWERAGE

The foul flows only from the proposed development can be accommodated within the public sewerage system. We advise that the flows should be communicated with to the foul/combined sewer between manholes SJ32530904 and SJ32531902 (located in the highway to the South of the site).

The proposed development site is crossed by public 180mm foul water only sewer and a 525mm public surface water sewer, please see copy of indicative public sewer record attached. No operational development is to take place within 3metres either side of the centreline of the sewer. Prior to commencing any operational development, we request that the location of this asset is determined. If it is likely that operational development is to take place within 3 metres either side of the centreline of the sewer please stop works and contact us. ...

SEWERAGE TREATMENT

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site. ...’

Surface Water Management

The site is currently occupied by an existing school building with associated car parking, hard play areas and access. The school building currently drains to a rainwater harvesting system which has an overflow to soakaway located beneath the car park. The soakaway has an overflow to the public surface water sewer. Other SuDS features including swales, bioretention areas and permeable paving are present on site and serve the existing playing fields and car park.

The proposed development will introduce approximately 2,353m² of hardstanding in the form of a building, a hard play area, a MUGA and associated paths.

In accordance with TAN15, new development should not create additional runoff when compared with the undeveloped situation. For re-development, runoff should be reduced where possible.

Discharge Method

Standard S1 of the Welsh Government 'Statutory standards for sustainable drainage systems' (2018) sets out the following hierarchy of surface water runoff destinations:

Priority Level 1: Surface water runoff is collected for use;

Priority Level 2: Surface water runoff is infiltrated to ground;

Priority Level 3: Surface water runoff is discharged to a surface water body;

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;

Priority Level 5: Surface water runoff is discharged to a combined sewer.

Priority Level 1: Surface water runoff collected for use

The first priority for surface water discharge is collection of water for use i.e. rainwater harvesting.

Rainwater harvesting and water butts are currently utilised at the site. Additional water butts can be installed where practical. A water butt is a small-scale water storage device that collects rainwater from the roof, via the downpipe. Any water butt should be connected to an appropriate overflow (lower priority runoff destination).

Runoff from the proposed roof areas will drain to the existing rainwater harvesting tank.

Priority Level 2: Surface water runoff is infiltrated to ground

As described above, infiltration tests have been carried out by Geotechnics Environmental Ltd in January 2012. The infiltration test results show that infiltration techniques are feasible in the eastern extent of the site, in the location of the existing soakaway. Limited infiltration is recorded across the remainder of the site.

As agreed with the SAB, surface water runoff from the new development can be drained to the existing soakaway located beneath the car park at a limited rate. On the basis that the soakaway has an overflow to the public surface water sewer, there is no requirement to upsize the existing soakaway.

It is therefore proposed to drain runoff from the proposed roof area and surrounding hard play area to the existing soakaway at a limited rate. The existing piped drainage network serving the existing school will be utilised to avoid making a new piped connection to the soakaway. Discharge from the proposed development should be made to existing manhole SW05 which has an identified invert level of 79.37m AOD (1.63m.bgl).

The MUGA will be formed from a permeable surface and will be self-draining. In accordance with section G1.15 of the 'Statutory standards for sustainable drainage systems' (2018) effective infiltration can be achieved with lower infiltration rates under units such as permeable pavements due to the large storage and infiltrating surface area available.

Proposed Roof and Adjacent Hard-Play

Runoff from the proposed roof and adjacent hard-play areas will be drained to the existing soakaway beneath the car park in the eastern extent of the site. In accordance with SAB requirements, discharge should be made at a limited greenfield rate.

In order to establish the proposed limited discharge rate, the existing greenfield runoff rates have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method. A summary of greenfield runoff rates for a range of events is provided as Appendix G. The existing 1 in 1 year event greenfield runoff rate for the 2,353m² developable area is 0.18 l/s.

A discharge rate of 2 l/s is proposed to ensure the drainage system is self-cleansing.

In order to achieve a limited discharge rate of 2 l/s, attenuation storage will be required. Attenuation storage should be provided in the form of SuDS.

Standard S2 of the Welsh Government: 'Statutory standards for sustainable drainage systems' (2018) sets out the following guidance for hydraulic control:

S2 – Surface water runoff hydraulic control

- 1) *Surface water should be managed to prevent, so far as possible, any discharge from the site for the majority of rainfall events of less than 5mm.*
- 2) *The surface water runoff rate for the 1 in 1 year return period event (or agreed equivalent) should be controlled to help mitigate the negative impacts of the development runoff on the morphology and associated ecology of the receiving surface water bodies.*
- 3) *The surface water runoff (rate and volume) for the 1% (1 in 100 year) return period event (or agreed equivalent) should be controlled to help mitigate negative impacts of the development on flood risk in the receiving water body.*
- 4) *The surface water runoff for events up to the 1% (1 in 100 year) return period (or agreed equivalent) should be managed to protect people and property on and adjacent to the site from flooding from the drainage system.*
- 5) *The risks (both on site and off site) associated with the surface water runoff for events greater than the 1% (1 in 100 year) return period should be considered. Where the consequences are excessive in terms of social disruption, damage or risk to life, mitigating proposals should be developed to reduce these impacts.*
- 6) *Drainage design proposals should be examined for the likelihood and consequences of any potential failure scenarios (e.g. structural failure or blockage), and the associated flood risks managed where possible.*

The SAB require that *'The surface water management system should be designed to accommodate the 1 in*

100 year + 20% Climate Change (CC).'

It is proposed to provide attenuation within the sub-grade material of the new section of hard-play area.

To inform the sizing of the depth of the sub-grade material, an attenuation storage estimate has been provided using MicroDrainage and is included in Appendix H. The storage estimate is based on a flow rate of 2 l/s, a design head of 1m and hydro brake flow control. Based on an impermeable area of 1,362m² (proposed roof and adjacent hard play), an estimated storage volume of 73m³ will be required to accommodate the 1 in 100 year plus 20% CC event.

Based on a surface area of approximately 735m² (hard play area), a sub-grade depth of 350mm and a void ratio of 30% (applicable to a typical stone aggregate), up to 78.75m³ of attenuation storage (sufficient to accommodate the 1 in 100 year plus 20% climate change event) can be provided within the sub-grade of the hard play area (assuming the base of the sub-grade will be formed at a level gradient).

MUGA

Permeable surfacing will be used for the MUGA and the surrounding path allowing for infiltration to the ground. No inflow, other than direct rainfall, will be directed to the MUGA and surrounding path. The MUGA and surrounding path will therefore be self-draining (by infiltration).

To inform a suitable sub-grade depth to accommodate the 1 in 100 year plus 20% CC event, a sub-grade sizing estimate has been carried out using MicroDrainage. An infiltration rate of 0.001m/hour (2.78×10^{-7}) (representing a very poor infiltration rate) has been used within the sizing estimate. Based on an area of 991m² (area of MUGA and surrounding path), a sub-grade depth of 360mm would be sufficient to accommodate the 1 in 100 year plus 20%CC event.

A Concept Drainage Sketch is included in Appendix I.

Exceedance Event

Storage will be provided for the 1 in 100 year plus 20% CC event. Storm events in excess of the 1 in 100 year plus 20% CC event should be permitted to produce temporary shallow depth flooding within playing fields. Finished floor levels should be set at a minimum of 150mm above surrounding ground levels ensuring exceedance flooding will not affect the building.

Surface Water Treatment

In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), commercial roofs (applicable to a school), are classified as having a 'low' pollution hazard level. Table 1 shows the pollution hazard indices for commercial roofs.

Table 1 – Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Commercial Roofs	Low	0.5	0.4	0.4

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2

* Indices values range from 0-1.

Runoff from roofs will be directed to the sub-grade of permeable surfaces before discharging to a soakaway. Table 2 demonstrates that permeable surfacing provides sufficient treatment. The development therefore provides sufficient treatment to runoff and is compliant with Standard S3 – 'Water Quality' of the 'Statutory standards for sustainable drainage systems'.

Table 2 – SuDS Mitigation Indices

Type of SuDS	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.3

Amenity and Biodiversity

The 'Statutory standards for sustainable drainage systems' sets out the following standards for amenity and bio-diversity:

Standard S4 – Amenity – The design of the surface water management system should maximise amenity benefits

Standard S5 – Biodiversity – The design of the surface water management system should maximise biodiversity benefits.

The proposed drainage system will maximise the amenity and biodiversity potential of a MUGA by utilising permeable surfaces. The use of permeable surfaces and utilising the existing soakaway will deliver water quality benefits (to the underlying aquifer). The developer will be incorporating a planted buffer, comprising trees and shrubs between the MUGA and western boundary to maximise the amenity and biodiversity value of the site.

The site comprises open green space and already incorporates SuDS features. The drainage system has been designed to minimise disruption to existing green space and SuDS features, thereby reducing the risk of disruption to existing ecosystems.

Construction, Operation and Maintenance

Standard S6 of the Statutory standards for sustainable drainage systems states;

S6 – Design of drainage for Construction, Operation and Maintenance

- 1) All elements of the surface water drainage system should be designed so that they can be constructed easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
- 2) All elements of the surface water drainage system should be designed to ensure maintenance and operation can be undertaken (by the relevant responsible body) easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
- 3) The surface water drainage system should be designed to ensure structural integrity of all elements under anticipated loading conditions over the design life of the development site, taking into account the requirement for reasonable levels of maintenance.

All drainage systems will be readily accessible for maintenance access.

Maintenance of drainage features such as permeable surfaces will be the responsibility of the site owner. Maintenance can be arranged through appointment of a site management company.

A maintenance schedule for permeable paving is included in Appendix J.

Foul Drainage

An additional 11No. toilets are proposed as part of the development therefore foul flows generated by the development are likely to increase.

Correspondence from DCWW (Appendix D) states that, *‘The foul flows only from the proposed development can be accommodated within the public sewerage system. We advise that the flows should be communicated with to the foul/combined sewer between manholes SJ32530904 and SJ32531902 (located in the highway to the South of the site).*

The existing foul drainage arrangement is shown on the ‘Proposed Drainage Layout Overview’ (Appendix E). Foul flows from the school are directed east and join a 225mm public combined sewer to the east of the site. The existing foul drainage system will be used to serve the proposed development.

Other Considerations

The proposed extension includes new building footprint above existing surface water and foul drains west of the existing building. The existing surface water and foul drains should be re-routed as to avoid a build over arrangement.

As shown on the existing drainage layout and manhole schedules (Appendix E), limited fall is available in the existing surface water drainage network. As such, it may not be possible to extend the existing drains around the proposed building extension whilst achieving gravity drainage. Currently, surface water drains are routed anti-clockwise around the school building, originating north-east of the school building. To achieve gravity drainage, it may be necessary to lay a new surface water drain serving the northern portion of the school building (with the drain directed east), with the existing drain retained to serve the southern portion of the school building.

Conclusions

The proposed development is for an extension of the school building comprising 2No. classrooms, a childcare area, 11No. toilets, storerooms, cloakrooms and a kitchen. The proposals include removal and relocation of an existing Multi-Use Games Area (MUGA).

The proposed development will introduce impermeable drainage area in the form of a building, hard play area and a MUGA. This will result in an increase in surface water runoff. In order to ensure the increase in surface water runoff will not increase flood risk elsewhere, sustainable drainage systems will be used to accommodate storm events up to and including the 1 in 100 year plus 20% climate change event.

All methods of surface water discharge have been assessed. Runoff from the proposed extension and adjacent hard-play area will be discharged at a limited rate to the existing drainage system. The existing drainage system includes rainwater harvesting and a soakaway which overflows to the public surface water sewer. Discharge to the existing drainage system will be made at a rate of 2 l/s (a rate as close to the greenfield rate as possible whilst ensuring the drainage system is self-cleansing).

In order to achieve a discharge rate of 2 l/s, attenuation storage will be required. It is proposed to provide attenuation storage within the sub-grade of the hard-play area adjacent to the proposed building. Based on a surface area of approximately 735m² (hard play area), a sub-grade depth of 350mm and a void ratio of 30% (applicable to a typical stone aggregate), up to 78.75m³ of attenuation storage (sufficient to accommodate the 1 in 100 year plus 20% climate change event) can be provided within the sub-grade of the hard play area.

The MUGA will be formed from a permeable surface and will be self-draining.

Treatment of surface water will be provided through the use of permeable surfaces.

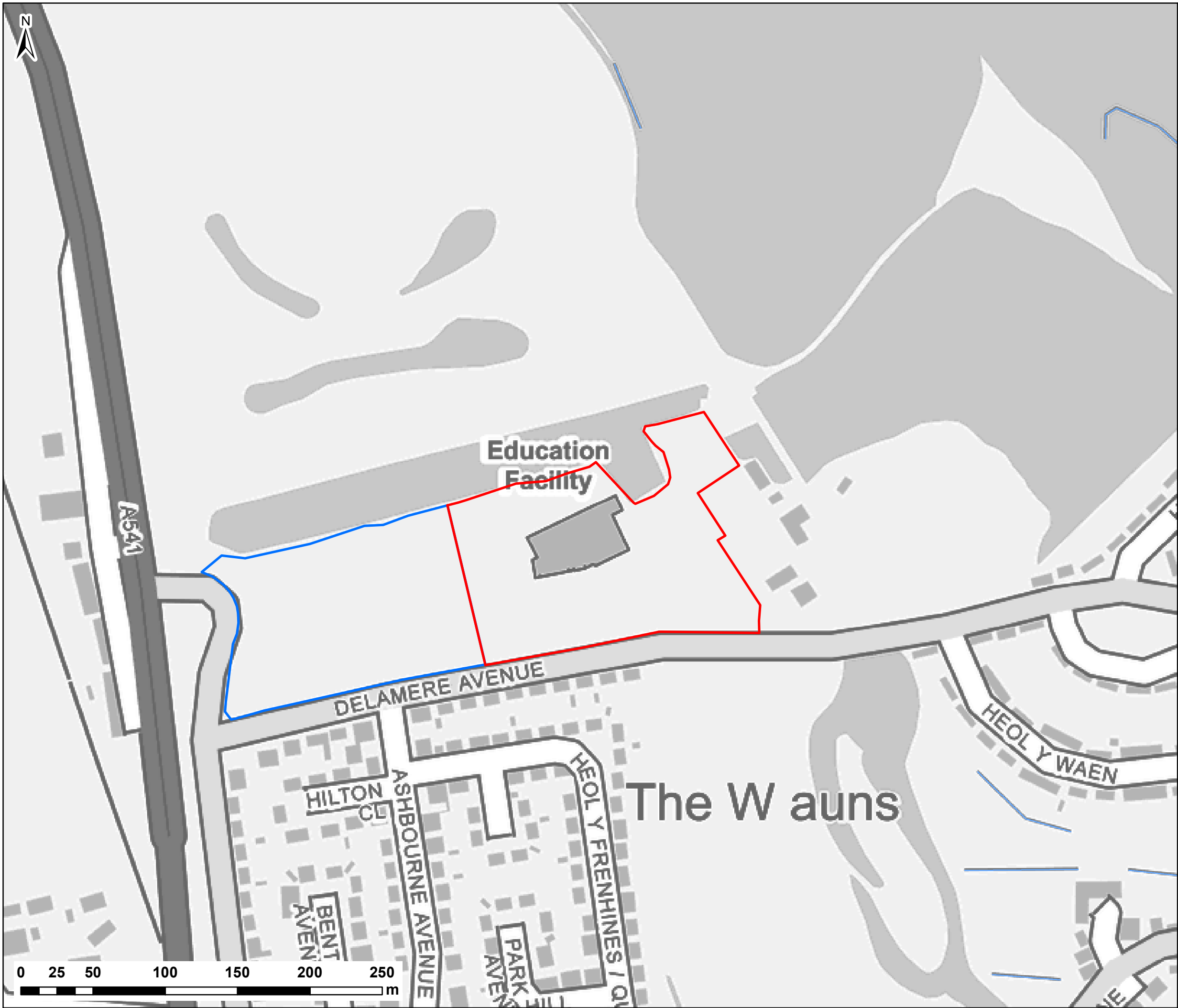
The site owner will be responsible for the maintenance of the drainage system.

A Concept Designer's Risk Assessment (cDRA) has been prepared to inform future designers of any identified hazards associated with the scheme. The cDRA has been included in Appendix K.

Recommendations

1. Submit this Drainage Strategy to the Planning Authority in support of the Planning Application;
2. Set finished floor levels 150mm above surrounding ground levels;
3. Verify the attenuation volumes included in this report when undertaking detailed drainage design.

Appendix A Location Plan and Aerial Image



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Boundary of Additional Ownership
- Watercourses / Water Bodies

CLIENT:

www.waterco.co.uk

SCHEME:

**YSGOL BRO ALUN,
Gwersyllt**

PLOT TITLE:

LOCATION PLAN

PLOT STATUS:		DATE:	
FINAL		03/10/2019	

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
VJ	SP	VG	1:2,500
			(UNLESS STATED OTHERWISE)

PLOT NAME:	REV:
s12394-Location_Plan	-

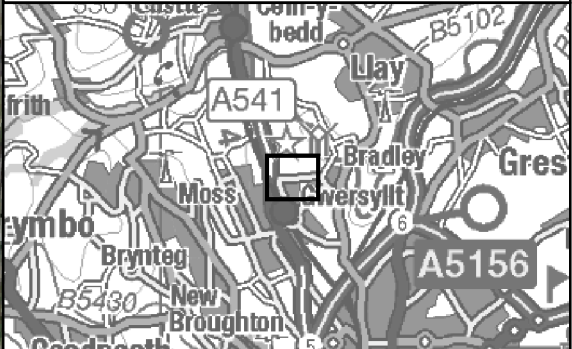


NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

Site Boundary

Boundary of Additional Ownership



CLIENT:



waterco

www.waterco.co.uk

SCHEME:

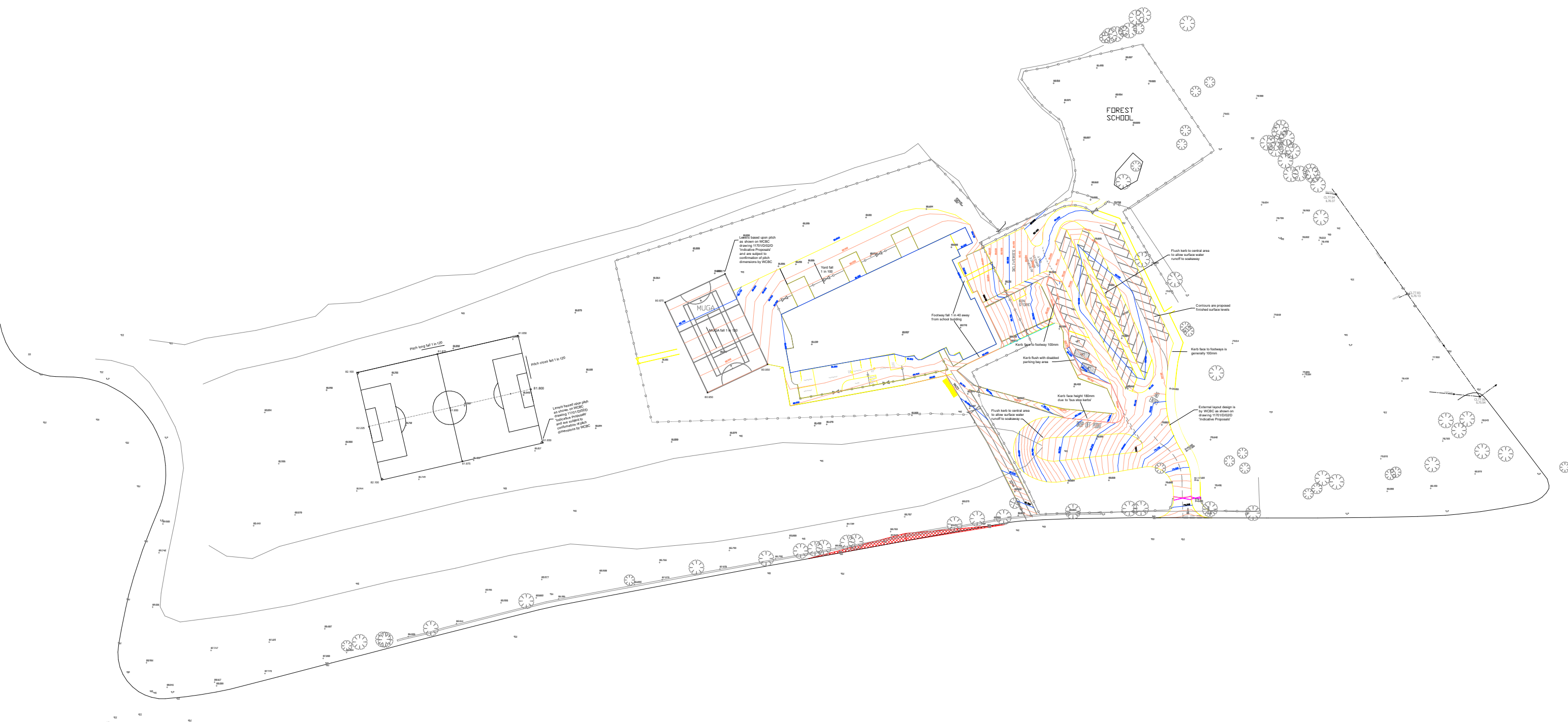
**YSGOL BRO ALUN,
GWERSYLLT**

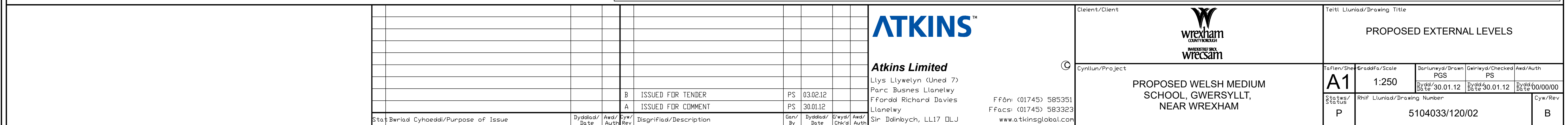
PLOT TITLE:

AERIAL PLAN

PLOT STATUS:		DATE:	
FINAL		03/10/2019	
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
VJ	SP	VG	1:2,500 (UNLESS STATED OTHERWISE)
PLOT NAME:			REV:
s12394-Arial_Plan			-

Appendix B Topographical Data





Appendix C Exploration Hole Location Plan



	Easting	Northing	Level
BH1	332022.15	354043.35	80.60
BH2	332037.69	354007.40	80.67
BH3	332007.60	354011.65	80.95
BH4	331973.42	354016.04	81.26
BH5	331975.53	353991.30	81.29
HP1	331804.20	353954.38	82.12
HP2	331869.89	353995.71	81.51
HP3	331902.27	354037.86	81.38
HP4	331926.06	353983.59	81.20
HP5	331948.77	354011.29	81.29
HP6	332013.87	353985.72	81.15
HP7	332076.90	354008.50	80.11
SA1	332069.09	354029.05	79.92
SA2	332056.46	353987.94	80.84
SA3	331965.43	354046.60	81.33
SA4	331960.31	353990.26	81.34
SA5	331862.23	354017.77	81.61
TP1	332047.59	354042.43	80.11
TP2	332066.74	353975.01	80.63
TP3	332083.87	353989.56	80.07
VS1	332075.90	353966.40	80.14
VS2	331877.43	353971.50	81.39
VS3	331802.14	353999.52	82.05
VS4	331932.58	354047.67	81.37
VS5	332010.03	354064.75	80.92
VS6	332068.23	354097.81	81.67

LEGEND

- BOREHOLE
- WINDOW SAMPLE
- SOAKAWAY
- TRIAL PIT
- HANDPIT

geotechnics

The Geotechnical Centre,
Unit 1, Borders Industrial Park,
River Lane, Salney,
Chester
CH4 8RJ

Phone: 01244 671117
Fax: 01244 671122
Email: mail@geotechnics.co.uk
www.geotechnics.co.uk

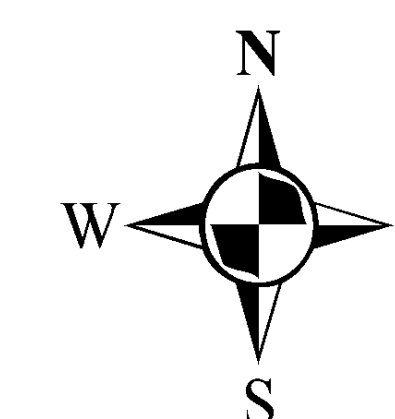
Engineer: ATKINS LIMITED	
Client: WREXHAM COUNTY BOROUGH COUNCIL	
Project: GWERSYLLT PRIMARY SCHOOL, WREXHAM	
Drawing Title: Exploratory Hole Location Plan	
Taken from a drawing supplied by the client	
Scale: 1:500@A1	Date: NOVEMBER 2011
Project No: PN112613	File Name: Geo-PN112613-001

Appendix D DCWW Sewer Plan and Correspondence



Dŵr Cymru
Welsh Water

12394-Ysgol Bro Alyn



LEGEND(Representative of most common features)

Waste network:			
●	Foul chamber	○	Outfall
○	Surface water chamber	□	Lampole
○	Combined chamber	→	Storm Overflow
□	Combined sewer overflow	→	Rising main
□	Special purpose chamber	→	Gravity sewer
□	Treatment works	→	Private sewer
△	Pumping station	→	Private sewer subject to Sect. 104 adoption agreement
REB	Combined	→	Private Sewer Transfer
GREEN	Surface Water	→	Lateral Drain
BROWN	Foul	→	Inspection Chamber
Purple	Former S24 sewers (for indicative purposes only)		

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases, pipe material (other than Asbestos Cement (AC) or Pitch Fibre (PF)) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dŵr Cymru Cyllyngdy (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the basis of the best information available and to the best of its knowledge and belief. The Company is not responsible for the accuracy of the information and is not liable for any loss or damage caused by reliance on the information. The information is supplied for the use of the Company and its subsidiaries and is not to be used for any other purpose. The information is supplied for the use of the Company and its subsidiaries and is not to be used for any other purpose. The information is supplied for the use of the Company and its subsidiaries and is not to be used for any other purpose.

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

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Reproduced by permission of the Ordnance Survey on behalf of HMSSO. © Crown copyright and database right 2017. All rights reserved. Ordnance Survey Licence Number: 100019204

Map Ref: 332119,354173
Map scale: 1:1250
Printed by: John Emma
Printed on: 14 Aug 2019

Miss Sally Pettit
Waterco Ltd
Lon Parcwr Business Park
Ruthin
Denbighshire
LL15 1NJ

Date: 10/09/2019
Our Ref: PPA0004278

Dear Miss Pettit,

Grid Ref: 331958 354010
Site Address: Delamere Avenue, Gwersyllt
Development: 12394-Ysgol Bro Alyn, Gwersyllt

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

SEWERAGE

The foul flows only from the proposed development can be accommodated within the public sewerage system. We advise that the flows should be communicated with to the foul/combined sewer between manholes SJ32530904 and located in SJ32531902 (highway to the South of the site.).

Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account.

However, should you wish for an alternative connection point to be considered please provide further information to us in the form of a drainage strategy, preferably in advance of a planning application being submitted.

The proposed development site is crossed by public 180mm foul water only sewer and a 525mm public surface water sewer, please see copy of indicative public sewer record attached. No operational development is to take place within 3metres either side of the centreline of the sewer. Prior to commencing any operational development we request that the location of this asset is determined. If it is likely that operational development is to take place within 3 metres either side of the centreline of the sewer please stop works and contact us. This asset may be able to be diverted under Section 185 of the

Water Industry Act 1991.

The proposed development may be subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore may require approval of Sustainable Drainage Systems (SuDS) features, in accordance with national standards, and is strongly recommended that the developer engage in pre-application consultation with Torfaen Council, as the relevant SuDS Approval Body (SAB).

Advisory Notes

The proposed development site is crossed by public sewers with the approximate position being marked on the attached Statutory Public Sewer Record. The positions shall be accurately located, marked out on site before works commence and no operational development shall be carried out within a specified easement zone either side of the centreline of the public sewers. The applicant is advised to contact Welsh Water to discuss.

You may need to apply to Dwr Cymru Welsh Water for any connection to the public sewer under Section 106 of the Water industry Act 1991. However, if the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to the Welsh Ministers Standards for Foul Sewers and Lateral Drains, and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect the proposal. In order to assist you may contact Dwr Cymru Welsh Water on 0800 085 3968 to establish the location and status of the apparatus in and around your site. Please be mindful that under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

SEWERAGE TREATMENT

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our



Welsh Water is owned by Glas Cymru – a 'not-for-profit' company.
Mae Dwr Cymru yn eiddo i Glas Cymru – cwmni 'nid-er-elw'.

We welcome correspondence in
Welsh and English

Dŵr Cymru Cyf, a limited company registered in
Wales no 2366777. Registered office: Pentwyn Road,
Nelson, Treharris, Mid Glamorgan CF46 6LY

Rydym yn croesawu gohebiaeth yn y
Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng
Nghymru rhif 2366777. Swyddfa gofrestredig: Heol Pentwyn
Nelson, Treharris, Morgannwg Ganol CF46 6LY.

approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at developer.services@dwrcymru.com

Please quote our reference number in all communications and correspondence.

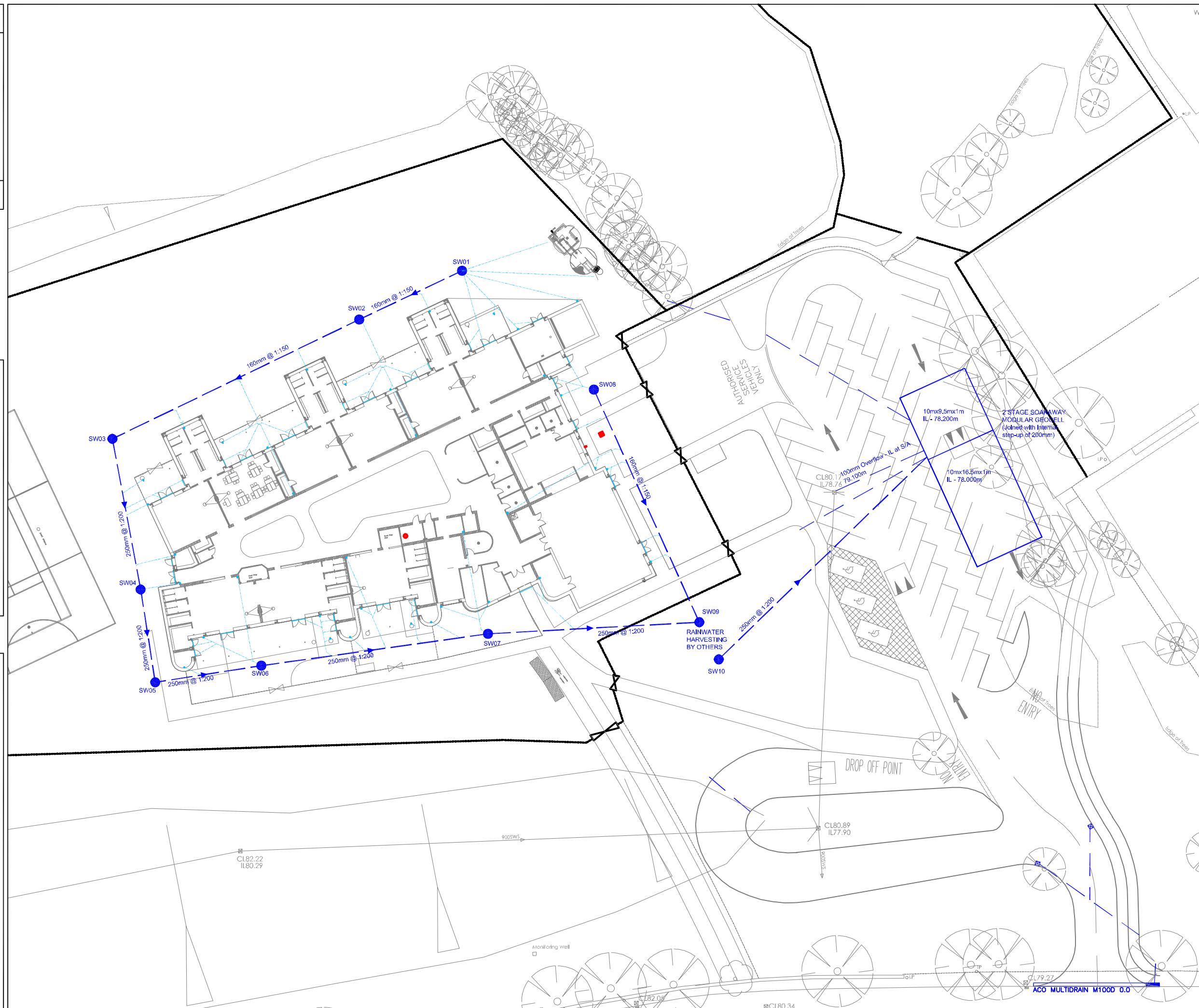
Yours faithfully,



Owain George
Planning Liaison Manager
Developer Services

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

Appendix E Existing Drainage Layout Plans



ATKINS™

NOTES

1. DO NOT SCALE.
2. ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE.
3. ALL LEVELS IN m aod UNLESS NOTED OTHERWISE.
4. ALL DRAINAGE WORKS TO COMPLY WITH THE RELEVANT PROVISIONS OF THE BUILDING REGULATIONS 2002 – PART H AND THE SPECIFICATION.
5. DRAIN RUNS OUTSIDE THE FOOTPRINT OF THE BUILDING TO HAVE A CLASS 5 GRANULAR BED AND SURROUND.
6. PIPEWORK CONNECTING SUB-SURFACE WASTE PIPES FROM FLOOR GULLIES, WASH BASINS, SINKS TO THE MAIN DRAIN RUNS TO BE LAID AT A GRADIENT NO FLATTER THAN 1:40 UNLESS STATED OTHERWISE.
7. PIPEWORK CONNECTING BETWEEN 1 AND 4 WC'S TO THE MAIN DRAIN RUNS TO BE LAID AT A GRADIENT NO FLATTER THAN 1:80.
8. ALL SURFACE WATER DRAINAGE TO BE CONSTRUCTED USING PLASTIC PIPEWORK. CONNECTIONS FROM RWP, GULLY AND FOOTPATH ACO'S TO BE 110mm ϕ . CONNECTIONS FROM HIGHWAY ACO'S TO BE 160mm ϕ .
9. ALL ACO CHANNELS TO BE CONSTANT DEPTH MULTIDRAIN M1000 0.0 OR SIMILAR. FOOTPATH ACO'S TO BE FITTED WITH HEELGUARD COMPOSITE COVERS. HIGHWAY ACO'S TO BE FITTED WITH C250 DI COVERS.
10. ALL GULLY GRATINGS TO BE HINGED D400 COVERS.
11. THE LOCATION, DEPTH AND NATURE OF ALL STATUTORY UNDERTAKERS APPARATUS SHALL BE PROVEN PRIOR TO COMMENCING ANY WORKS. WHERE A CONFLICT EXISTS BETWEEN THE LOCATION OF PERMANENT DRAINAGE WORKS AND OTHER UNDERGROUND APPARATUS THE SITE SUPERVISION PERSONNEL SHALL BE INFORMED IMMEDIATELY.
12. THE ALIGNMENT AND INVERT LEVELS OF ALL EXISTING SEWERS SHALL BE CONFIRMED PRIOR TO ANY WORKS COMMENCING. DISCREPANCIES BETWEEN THE CONFIRMED LINE AND LEVEL AND THE LINE AND LEVEL SHOWN ON THE DRAWING SHALL BE BROUGHT TO THE ATTENTION OF THE SUPERVISING PERSONNEL.
13. THIS IS TO BE READ IN CONJUNCTION WITH THE NBS SPECIFICATION FOR DRAINAGE AND DRAWINGS: –
 - 102 – FOUL MANHOLE SCHEDULE
 - 103 – SURFACE WATER MANHOLE SCHEDULE
 - 104-109 – STANDARD DETAILS
 - 110 – SUDS LAYOUT DRAWING
14. PRIOR TO CONSTRUCTION OF ANY DRAINAGE, INFILTRATION TEST SHOULD BE CARRIED OUT, IN ACCORDANCE WITH BRE365, AT THE FORMATION LEVEL OF EACH SOAKAWAY AND BIO RETENTION TANK. THE RESULTS SHOULD BE REPORTED BACK TO THE DRAINAGE DESIGN TEAM.

- PROPOSED 100mm SURFACE WATER DRAINAGE
 PROPOSED SURFACE WATER SEWER
 PROPOSED SURFACE WATER MANHOLE
 PROPOSED SURFACE WATER GULLY
 PROPOSED ACO CHANNEL

[illegible]

Stat	Purpose of issue	Date	Auth
H	Final Record Drawing	TW 22.07.13	PB GRW
G	Construction Issue	PB 13.12.12	LF GRW
F	Construction Issue	PB 07.12.12	LF GRW

Rev	Description	By	Date	Chk'd	Auth
-----	-------------	----	------	-------	------

ATKINS™

Atkins Limited

Consulting Engineers,
Chadwick House
Birchwood Park
Warrington, Cheshire, England,
WA3 6AE

Tel: (01925) 238000
Fax: (01925) 238500
www.atkinsglobal.com

Client

Project

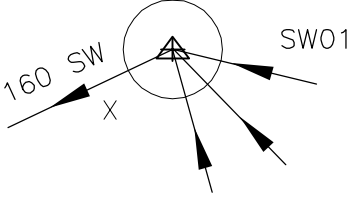
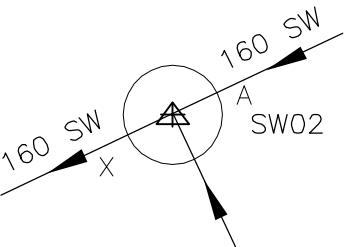
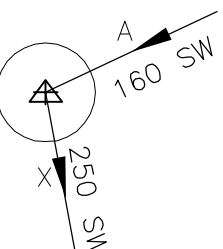
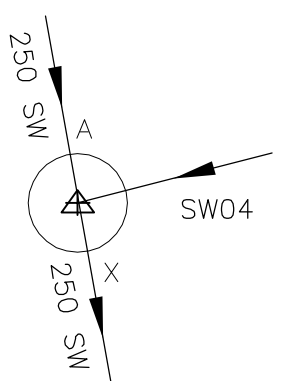
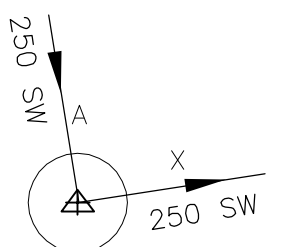
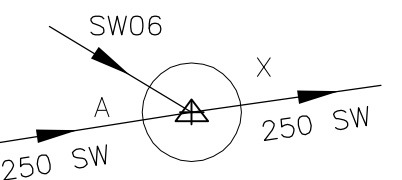
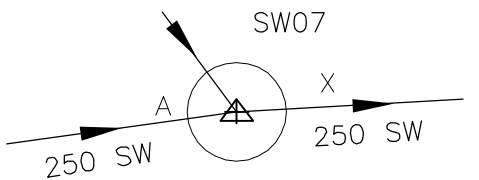
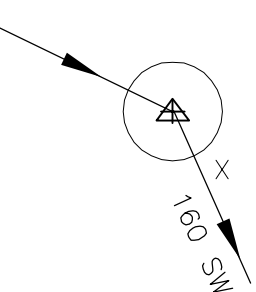
GWERSYLLT WELSH MEDIUM SCHOOL

	Title

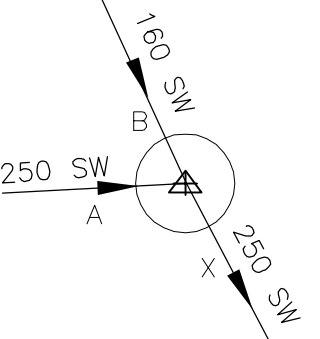
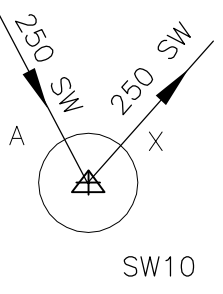
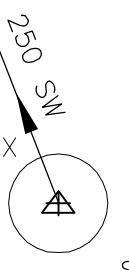
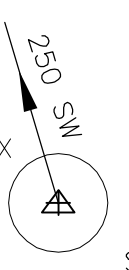
PROPOSED SURFACE WATER DRAINAGE LAYOUT

Sheet Size	Original Scale	Designed/Drawn PB	Checked ZT	Authorised GRW
A1	1:250	Date 15.02.11	Date 15.02.11	Date 15.02.11

Status	Drawing Number	Rev
P	5104033-WA-C-112	H

MANHOLE REF. No.	CO-ORDINATES FOR PIPE INTERSECTION POINT	MANHOLE LEVELS (mAOD)	MANHOLE TYPE	MANHOLE DEPTH	MANHOLE SIZE		COMMENTS
SW 01	E: T.B.C N: T.B.C	CL = 81.000 X = 80.000 (IL)	Type D	1.000m	900mm X 675mm		Class B125 Cover
SW 02	E: T.B.C N: T.B.C	CL = 81.000 A = 79.894 (IL) X = 79.894 (IL)	Type D	1.106m	900mm X 675mm		Class B125 Cover
SW 03	E: T.B.C N: T.B.C	CL = 81.000 A = 79.638 (IL) X = 79.548 (IL)	Type B	1.362m	1.200m		Class B125 Cover
SW 04	E: T.B.C N: T.B.C	CL = 81.000 A = 79.441 (IL) X = 79.441 (IL)	Type B	1.559m	1.200m		Class B125 Cover
SW 05	E: T.B.C N: T.B.C	CL = 81.000 A = 79.370 (IL) X = 79.370 (IL)	Type B	1.630m	1.200m		Class B125 Cover
SW 06	E: T.B.C N: T.B.C	CL = 81.000 A = 79.300 (IL) X = 79.300 (IL)	Type B	1.700m	1.200m		Class B125 Cover
SW 07	E: T.B.C N: T.B.C	CL = 81.000 A = 79.140 (IL) X = 79.140 (IL)	Type B	1.860m	1.200m		Class B125 Cover
SW 08	E: T.B.C N: T.B.C	CL = 81.000 X = 80.000 (IL)	Type D	1.000m	900mm X 675mm		Class B125 Cover

 PIPE INTERSECTION POINT ALONG PIPE CENTRE LINE FOR THE MAJOR PIPE DIAMETERS.
BD BACK DROP

MANHOLE REF. No.	CO-ORDINATES FOR PIPE INTERSECTION POINT	MANHOLE LEVELS (mAOD)	MANHOLE TYPE	MANHOLE DEPTH	MANHOLE SIZE		COMMENTS
SW 09	E: T.B.C N: T.B.C	CL = 81.000 A = 78.959 (IL) B = 79.049 (IL) X = 78.959 (IL)	Type B	2.041m	1.200m		Class D400 Cover Connection to RWH
SW 10	E: T.B.C N: T.B.C	CL = 81.000 A = 78.897 (IL) X = 78.897 (IL)	Type B	2.103m	1.200m		Class D400 Cover Connection to Soakaway 3
SW 11	E: T.B.C N: T.B.C	CL = 81.000 X = 79.750 (IL)	Type B	1.250m	1.200m		Class D400 Cover Connection to Soakaway 2
SW 12	E: T.B.C N: T.B.C	CL = 81.000 X = 80.000 (IL)	Type D	1.000m	900mm X 675mm		Class D400 Cover Connection to Soakaway 1

 PIPE INTERSECTION POINT ALONG PIPE CENTRE LINE FOR THE MAJOR PIPE DIAMETERS.
BD BACK DROP

- NOTES
- DO NOT SCALE.
 - ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE.
 - ALL LEVELS IN m AOD UNLESS NOTED OTHERWISE.
 - TO BE READ IN CONJUNCTION WITH THE NBS SPECIFICATION FOR DRAINAGE AND DRAWINGS:-
104-105 - STANDARD DETAILS
112 - SURFACE WATER LAYOUT

Stat	Purpose of Issue			Date	Auth
Z	FINAL RECORD DRAWING	BJS	12.11.13	PB	GRW
E	FOR CONSTRUCTION	BJS	10.08.12	LF	GRW
D	Tender Issue	BJS	04.04.12	LF	ZT
C	Tender Issue	PB	13.03.12	LF	GRW
B	Tender Issue	PB	24.02.12	LF	GRW
A	FOR INFORMATION	LF	27.01.12	PB	GRW
Rev	Description	By	Date	Chk'd	Auth

ATKINS™

Atkins Limited

Consulting Engineers,
Chadwick House
Birchwood Park
Warrington, Cheshire, England,
WA3 6AE

Tel: (01925) 238000
Fax: (01925) 238500
www.atkinsglobal.com

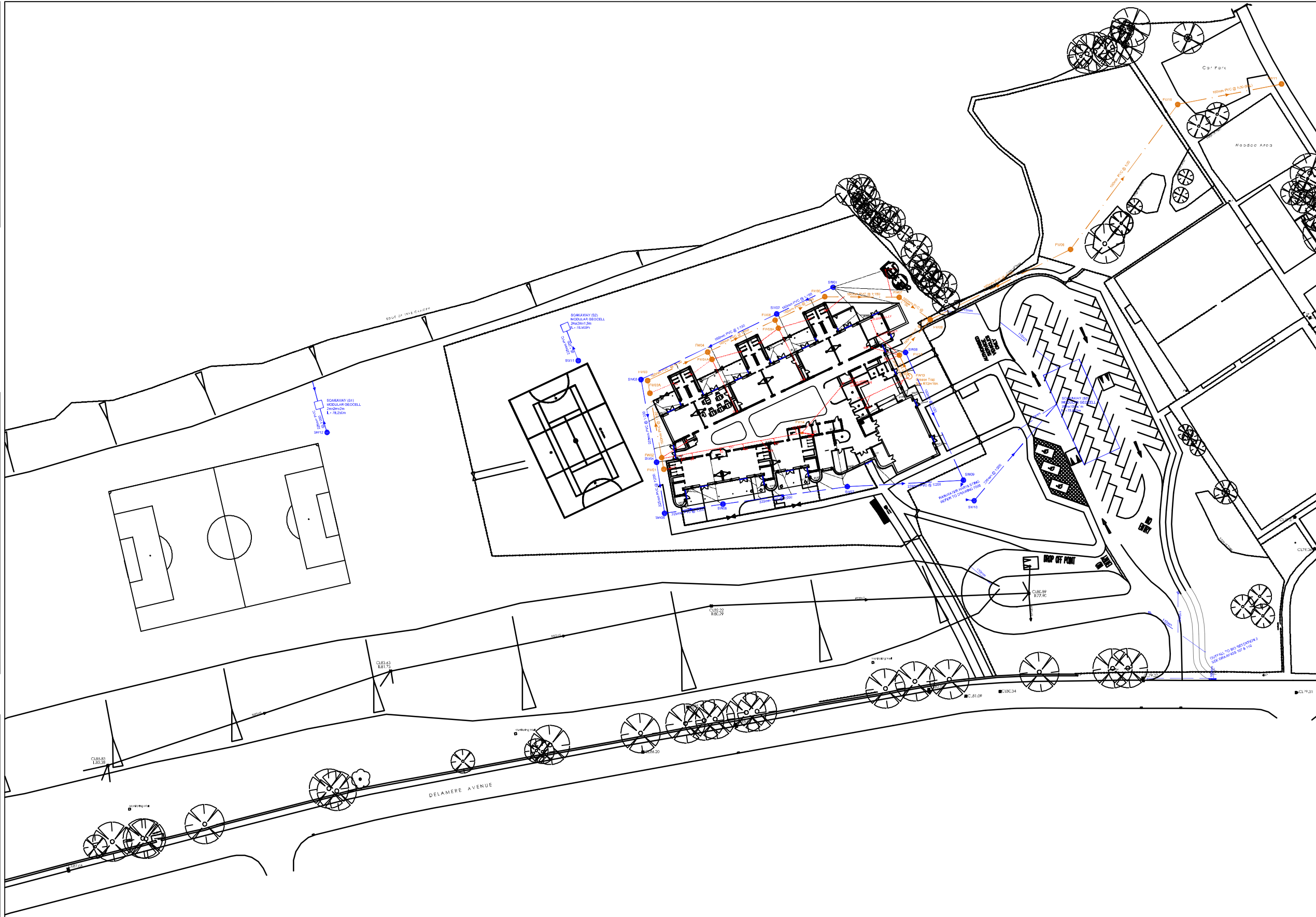
Client

Project					
GWERSYLLT WELSH MEDIUM SCHOOL					
Title					
PROPOSED SURFACE MANHOLE SCHEDULE					

Sheet Size	Original Scale	Designed/Drawn	Checked	Authorised	
A1	N.T.S	LF	PB	GRW	
		Date 27.01.12	Date 27.01.12	Date 27.01.12	
Status	Drawing Number				Rev
P	5104033-WA-C-103				Z

DO NOT SCALE

A1



ATKINS™

NOTES

- DO NOT SCALE.
- ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE.
- ALL LEVELS IN m AOD UNLESS NOTED OTHERWISE.
- ALL DRAINAGE WORKS TO COMPLY WITH THE RELEVANT PROVISIONS OF THE BUILDING REGULATIONS 2002 - PART H AND THE SPECIFICATION.
- THE LOCATION, DEPTH AND NATURE OF ALL STATUTORY UNDERTAKERS APPARATUS SHALL BE PROVEN PRIOR TO COMMENCING ANY WORKS. WHERE A CONFLICT EXISTS BETWEEN THE LOCATION OF PERMANENT DRAINAGE WORKS AND OTHER UNDERGROUND APPARATUS THE SITE SUPERVISION PERSONNEL SHALL BE INFORMED IMMEDIATELY.
- THE ALIGNMENT AND INVERT LEVELS OF ALL EXISTING SEWERS SHALL BE CONFIRMED PRIOR TO ANY WORKS COMMENCING. DISCREPANCIES BETWEEN THE CONFIRMED LINE AND LEVEL AND THE LINE AND LEVEL SHOWN ON THE DRAWING SHALL BE BROUGHT TO THE ATTENTION OF THE SUPERVISING PERSONNEL.
- TO BE READ IN CONJUNCTION WITH THE NBS SPECIFICATION FOR DRAINAGE AND DRAWINGS:-
 - 102 - FOUL MANHOLE SCHEDULE
 - 103 - SURFACE WATER MANHOLE SCHEDULE
 - 104-109 - STANDARD DETAILS
 - 110 - SUDS LAYOUT DRAWING
 - 111 - FOUL WATER LAYOUT
 - 112 - SURFACE WATER LAYOUT
- PRIOR TO CONSTRUCTION OF ANY DRAINAGE, INFILTRATION TEST SHOULD BE CARRIED OUT, IN ACCORDANCE WITH BRE365, AT THE FORMATION LEVEL OF EACH SOAKAWAY. THE RESULTS SHOULD BE REPORTED BACK TO THE DRAINAGE DESIGN TEAM.

KEY:

- PROPOSED INTERNAL SURFACE WATER DRAINAGE
- PROPOSED SURFACE WATER SEWER
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER GULLY
- PROPOSED ACO CHANNEL
- PROPOSED INTERNAL FOUL WATER DRAINAGE
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL WATER MANHOLE

Stat	Purpose of Issue			Date	Auth	
F	Tender Issue	PB	13.03.12	LF	GRW	
E	Tender Issue	PB	24.02.12	LF	GRW	
D	Tender Issue	PB	15.02.11	ZT	GRW	
C	Tender Issue	PH	9.02.2012	JP	GRW	
B	FOR INFORMATION	PB	31.01.12	LF	GRW	
A	FOR INFORMATION	LF	27.01.12	PB	GRW	

ATKINS™

Atkins Limited
Consulting Engineers,
Chadwick House
Birchwood Park
Warrington, Cheshire, England,
WA3 6AE
Tel: (01925) 238000
Fax: (01925) 238500
www.atkinsglobal.com

Project
GWERSYLLT WELSH MEDIUM SCHOOL

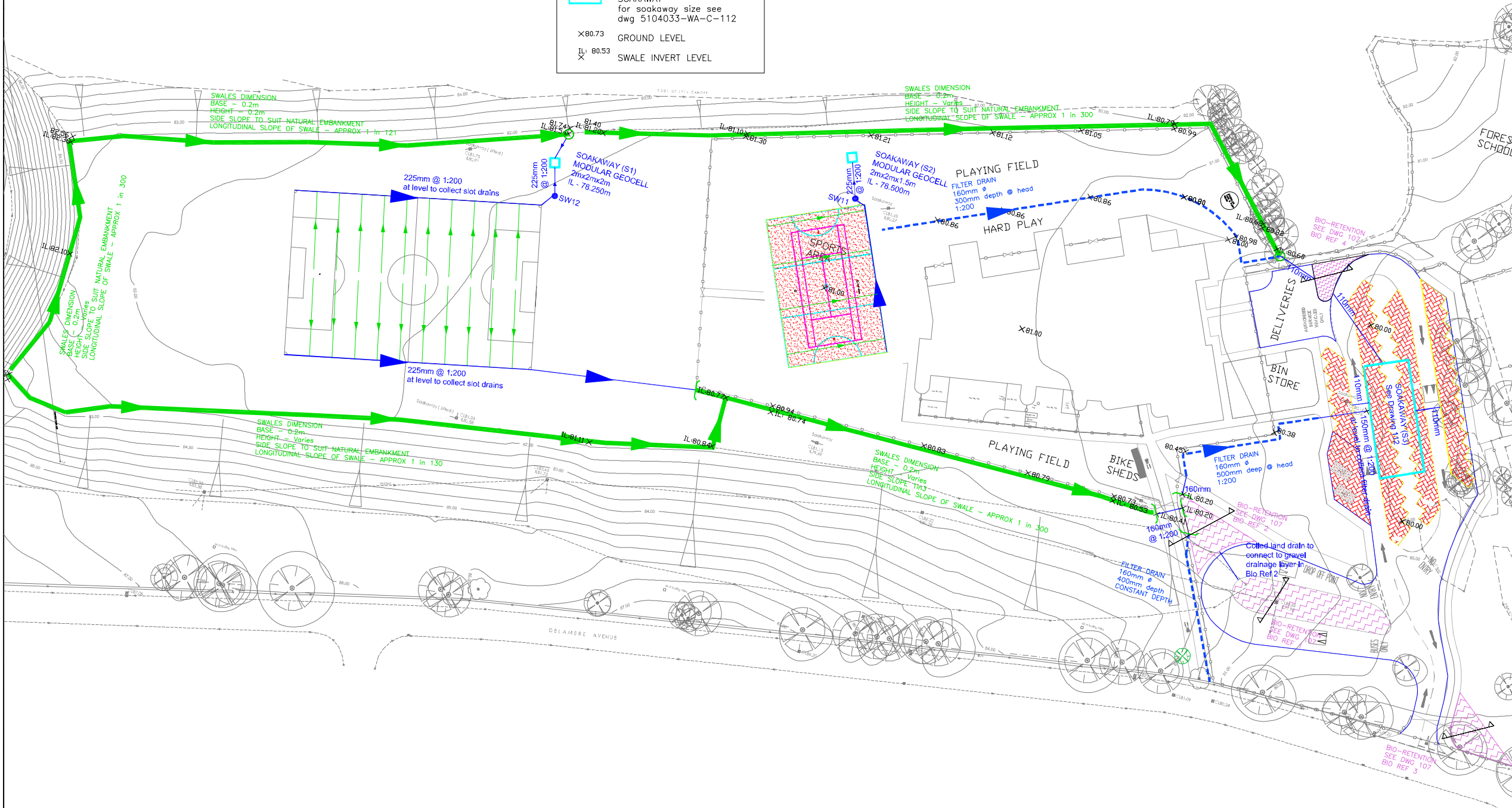
Title
PROPOSED DRAINAGE LAYOUT
OVERVIEW

Sheet Size	Original Scale	Designed/Drawn	Checked	Authorised
A1	1:500	LF	PB	GRW
Status	Drawing Number	Date	Date	Date
P	5104033-WA-C-101	27.01.12	27.01.12	27.01.12
				Rev
				F



KEY

OPEN TEXTURED MACADAM
HARD GAMES COURT

SWALE

- NOTES
1. DO NOT SCALE.

2. ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE.

3. ALL LEVELS IN m AOD UNLESS NOTED OTHERWISE.

4. THE LOCATION, DEPTH AND NATURE OF ALL STATUTORY UNDERTAKERS APPARATUS SHALL BE PROVEN PRIOR TO COMMENCING ANY WORKS. WHERE A CONFLICT EXISTS BETWEEN THE LOCATION OF PERMANENT DRAINAGE WORKS AND OTHER UNDERGROUND APPARATUS THE SITE SUPERVISION PERSONNEL SHALL BE INFORMED IMMEDIATELY.

5. THE ALIGNMENT AND INVERT LEVELS OF ALL EXISTING SEWERS SHALL BE CONFIRMED PRIOR TO ANY WORKS COMMENCING. DISCREPANCIES BETWEEN THE CONFIRMED LINE AND LEVEL AND THE LINE AND LEVEL SHOWN ON THE DRAWING SHALL BE BROUGHT TO THE ATTENTION OF THE SUPERVISING PERSONNEL.

6. LOCATION AND DEPTH OF SWALES ARE INCLUDED IN THE EARTHWORK PACKAGE.

7. PRIOR TO CONSTRUCTION OF ANY DRAINAGE, INFILTRATION TEST SHOULD BE CARRIED OUT, IN ACCORDANCE WITH BRE365, AT THE FORMATION LEVEL OF EACH SOAKAWAY. THE RESULTS SHOULD BE REPORTED BACK TO THE DRAINAGE DESIGN TEAM.

8. TO BE READ IN CONJUNCTION WITH THE NBS SPECIFICATION FOR DRAINAGE AND DRAWINGS:-
104-108 STANDARD DETAILS
112 SURFACE WATER LAYOUT DRAWING

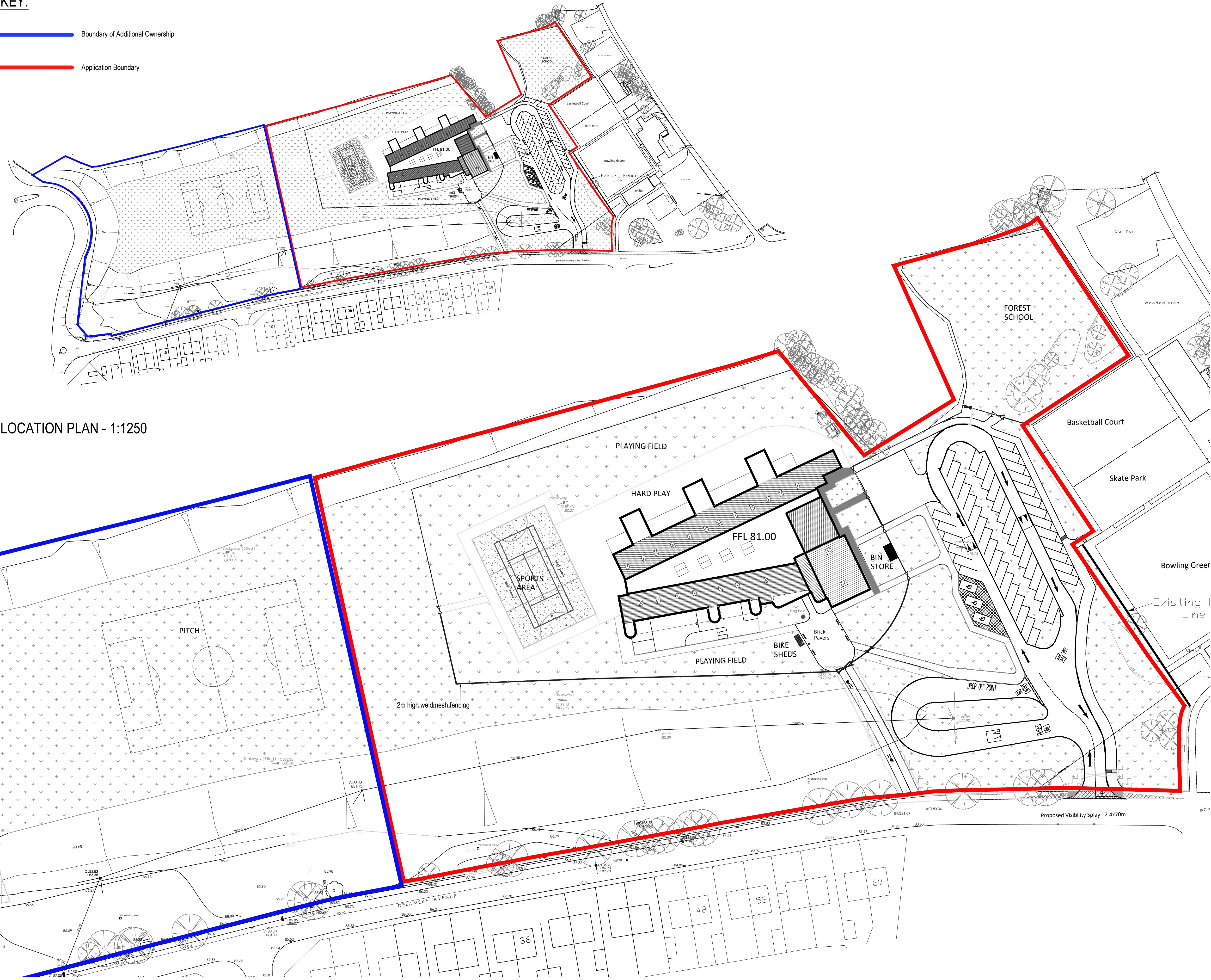
																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----

Appendix F Existing and Proposed Plans

Existing

KEY:

- Boundary of Additional Ownership
- Application Boundary



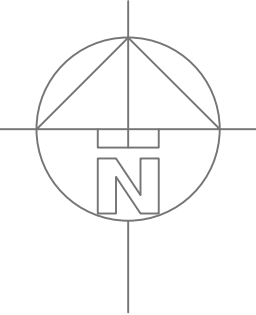
SITE BLOCK PLAN - 1:500

LOCATION PLAN - 1:1250

Construction (Design & Management) Regulations 2015

Design risk assessments are carried out throughout the design stage of this project in accordance with company procedures and manuals. Where reasonably possible all areas of risk applicable to design and end use of the construction have been identified and then eliminated, mitigated or recorded as a residual risk.

Note that general risks of which a competent designer or contractor should be aware are not included. This drawing is to be read in conjunction with the Pre Construction Information and all related documents prepared in accordance with the current Construction (Design and Management) Regulations 2015 and all applicable Health and Safety legislation as currently amended.



P01 - INITIAL ISSUE	19/09/19
REV. DESCRIPTION BY / CHK / APP	DATE
RIBA PLAN OF WORK 2013 WORKSTAGE	LEVEL OF MODEL DEFINITION (LOD)
PURPOSE OF ISSUE - FIT FOR ...	APPROVAL



CARDIFF: 020 2076 2511
LONDON: 0207 138 3560
WREXHAM: 01978 357 887
www.lawray.co.uk

CLIENT
WREXHAM COUNTY BOROUGH COUNCIL

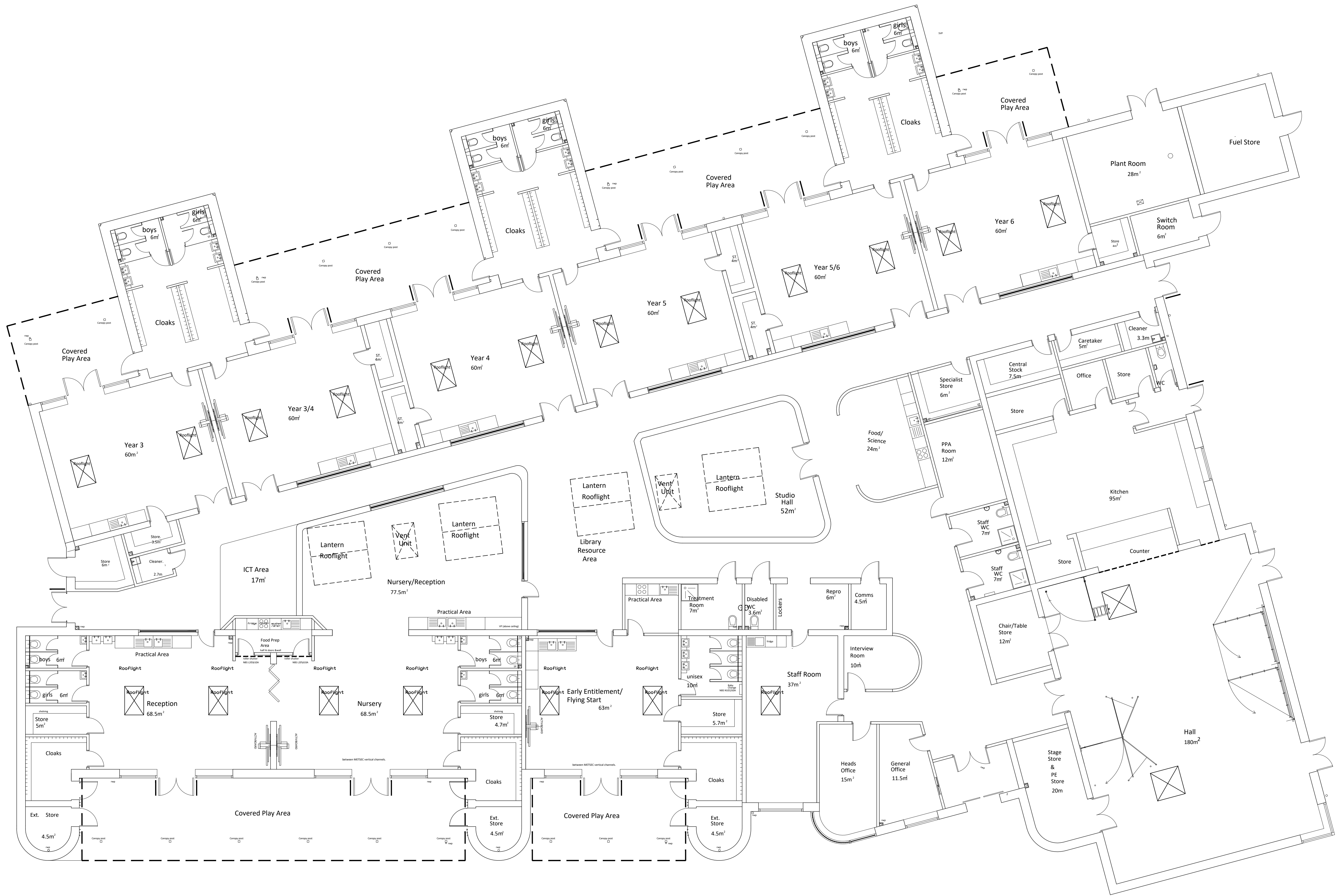
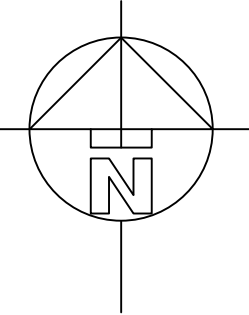
PROJECT TITLE
EXTENSION TO YSGOL BRO ALUN, RHODFA
DELAMERE, GWERSYLLT, WRECSAM, LL11 4NG

DRAWING TITLE
LOCATION AND EXISTING SITE BLOCK PLAN

DATE: 09.19
SCALE: 1:1250 & 1:500
DRAWN: CB
CHECKED: -
APPROVED: -

PROJECT No: 19138
DRAWING No: 19138-001
PROJECT - ORIGINATOR - ZONE - LEVEL - TYPE - ROLE - CLASSNUMBER
19138 YBA-LAW-XX-XX-DSP-A-910001 P01

DO NOT SCALE. Any discrepancy or query concerning this drawing should be referred to the Architect.
Copyright © LAWRAY LIMITED
Registered Office: Greenmeadow Springs, CARDIFF CF15 7AB. Reg. Co. No. 2724178. VAT Reg. No. 134 2146 06



P11 INITIAL ISSUE
REV. DESCRIPTION BY / CHK / APP
RIBA PLAN OF WORK 2013 WORKSTAGE LEVEL OF MODEL DEFINITION (LOD)

PURPOSE OF ISSUE - FIT FOR ... APPROVAL

lawray architects
penseiri

CARDIFF 020 2076 2511
LONDON 0207 138 3560
WREXHAM 01978 357 887
www.lawray.co.uk

CLIENT
WREXHAM COUNTY BOROUGH COUNCIL

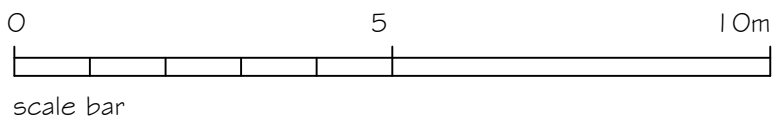
PROJECT TITLE
EXTENSION TO YSGOL BRO ALUN, RHODFA
DELAMERE, GWERSYLLT, WRECSAM, LL11 4NG

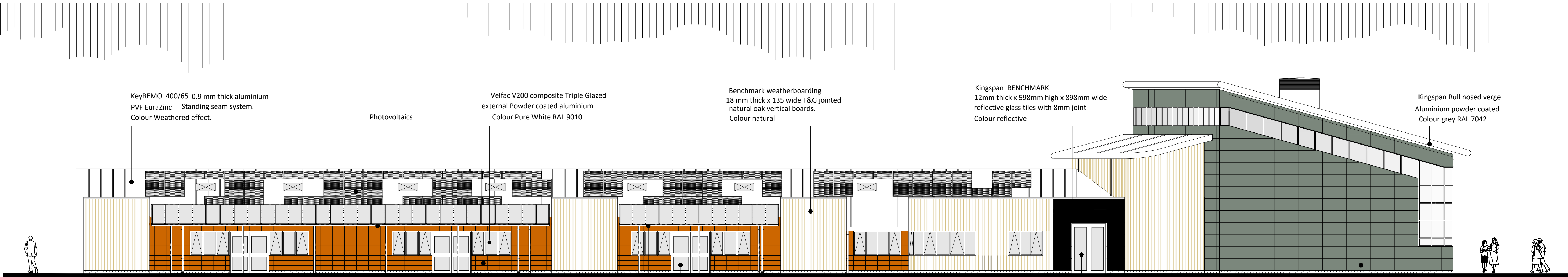
DRAWING TITLE
EXISTING GROUND FLOOR PLAN

DATE 09.19 SCALE @ A1 1:100 DRAWN CB CHECKED - APPROVED -

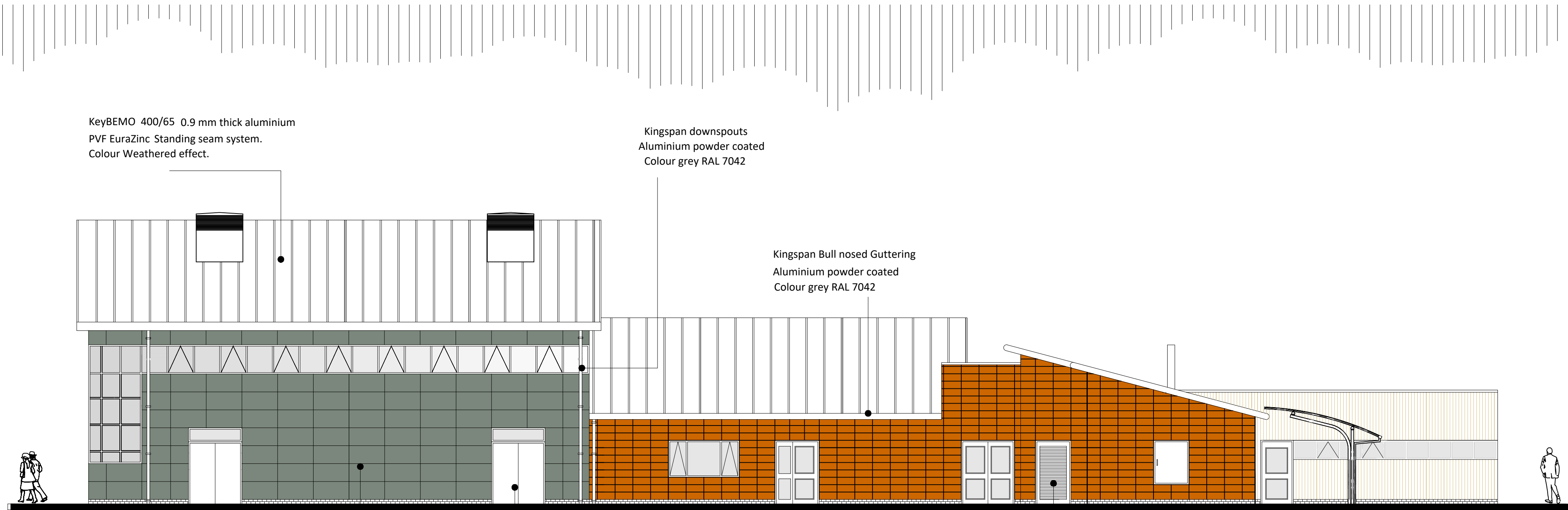
PROJECT No. 19138
DRAWING No. 0019138-001
PROJECT - ORIGINATOR - ZONE - LEVEL - TYPE - ROLE - CLASSNUMBER
19138 YBA-LAW-XX-G00-DFP-A-061001 P01

DO NOT SCALE Any discrepancy or query concerning this drawing should be referred to the Architect.
Copyright © LAWRAY LIMITED
Registered Office: Greenmeadow Springs, CARDIFF CF15 7AB Reg. Co. No. 2724178, VAT Reg. No. 134 2146 06



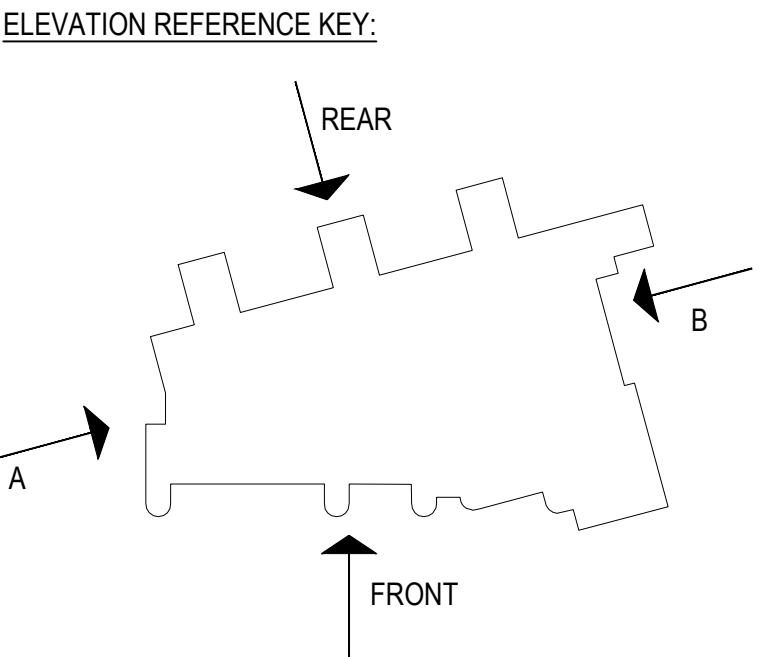


Front Elevation



Side B Elevation

P01	INITIAL ISSUE	25.10.19
REV.	DESCRIPTION / BY / CHK / APP	DATE
RIBA PLAN OF WORK 2013 WORKSTAGE	LEVEL OF MODEL DEFINITION (LOD)	
PURPOSE OF ISSUE - FIT FOR ...	APPROVAL	





lawray architects
penseiri

CARDIFF
029 2076 2511
www.lawray.co.uk

LONDON
0207 138 3560

WREXHAM
01978 357 887

CLIENT
WREXHAM COUNTY BOROUGH COUNCIL

PROJECT TITLE
EXTENSION TO YSGOL BRO ALUN, RHODFA
DELAMERE, GWERSYLLT, WRECSAM, LL11 4NG

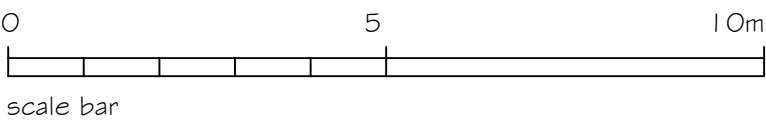
DRAWING TITLE
EXISTING ELEVATIONS - SHEET 1

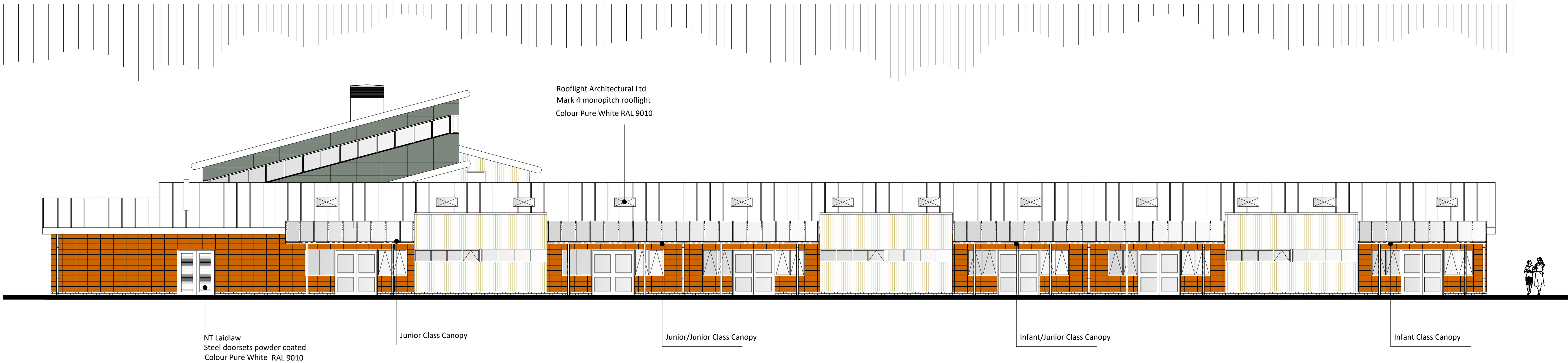
DATE	SCALE @ A1	DRAWN	CHECKED	APPROVED
09.19	1:100	CB	-	-

PROJECT No. 19138
DRAWING No. 001192/2019
PROJECT - ORIGINATOR - ZONE - LEVEL - TYPE - ROLE - CLASSNUMBER
19138 YBA-LAW-XX-XX-DEL-A-062001 P01

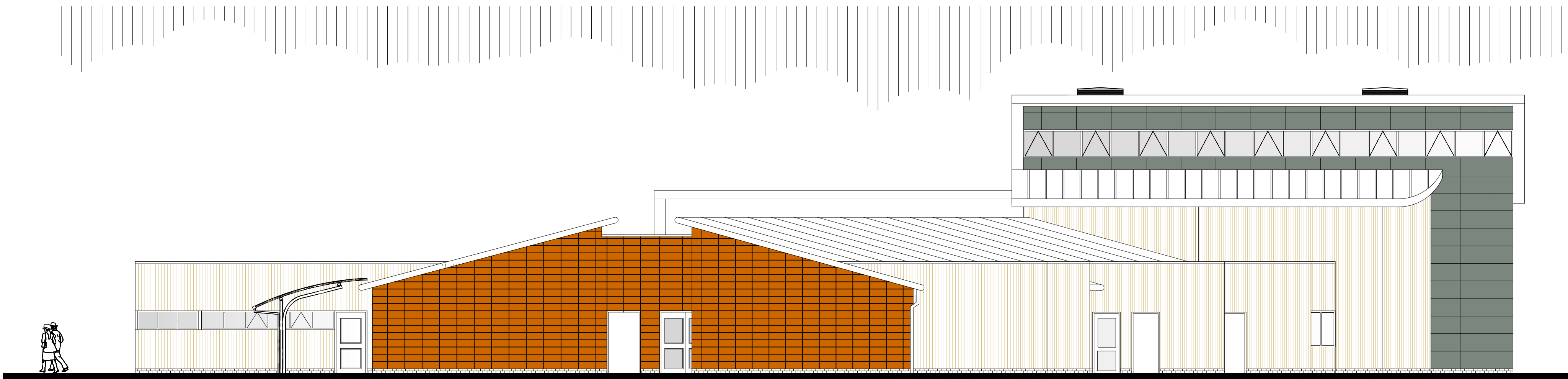
DO NOT SCALE Any discrepancy or query concerning this drawing should be referred to the Architect.

Copyright © LAWRAY LIMITED
Registered Office: Greenmeadow Springs, CARDIFF CF15 7AB Reg. Co. No. 2724178, VAT Reg. No. 134 2146 06



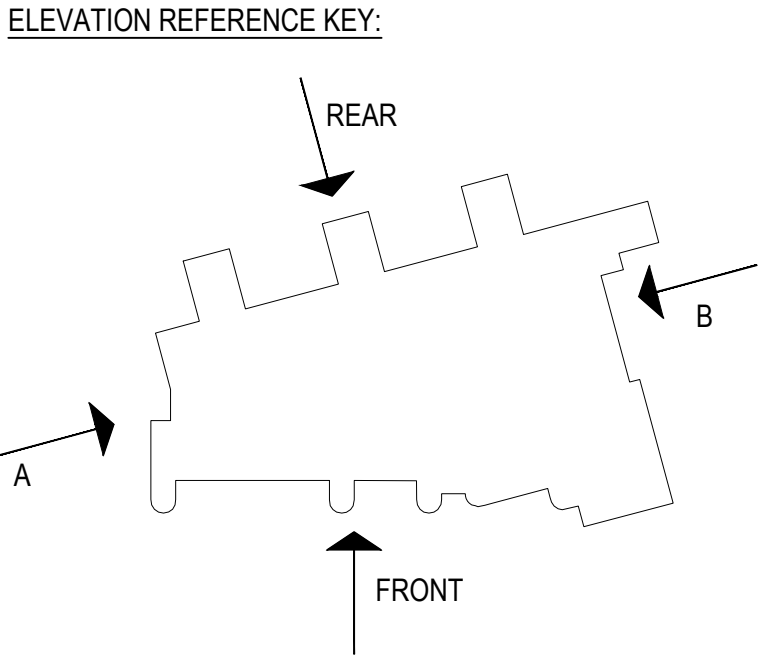


Rear Elevation



Side A Elevation

P01	INITIAL ISSUE	25.10.19
REV	DESCRIPTION BY / CHK / APP	DATE
RIBA PLAN OF WORK 2013 WORKSTAGE	LEVEL OF MODEL DEFINITION (LOD)	
PURPOSE OF ISSUE - FIT FOR ...	APPROVAL	





lawray architects
penseiri

CARDIFF
020 2076 2511
www.lawray.co.uk

LONDON
0207 138 3560

WREXHAM
01978 357 887

CLIENT
WREXHAM COUNTY BOROUGH COUNCIL

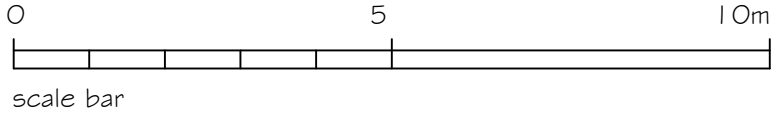
PROJECT TITLE
EXTENSION TO YSGOL BRO ALUN, RHODFA
DELAMERE, GWERSYLLT, WRECSAM, LL11 4NG

DRAWING TITLE
EXISTING ELEVATIONS - SHEET 2

DATE 09.19	SCALE @ A1 1:100	DRAWN CB	CHECKED -	APPROVED -
PROJECT No 19138	DRAWING No YBA-LAW-XX-XX-DEL-A-062002	PROJECT - ORIGINATOR - ZONE - LEVEL - TYPE - CLASSNUMBER	REV P01	

DO NOT SCALE Any discrepancy or query concerning this drawing should be referred to the Architect.

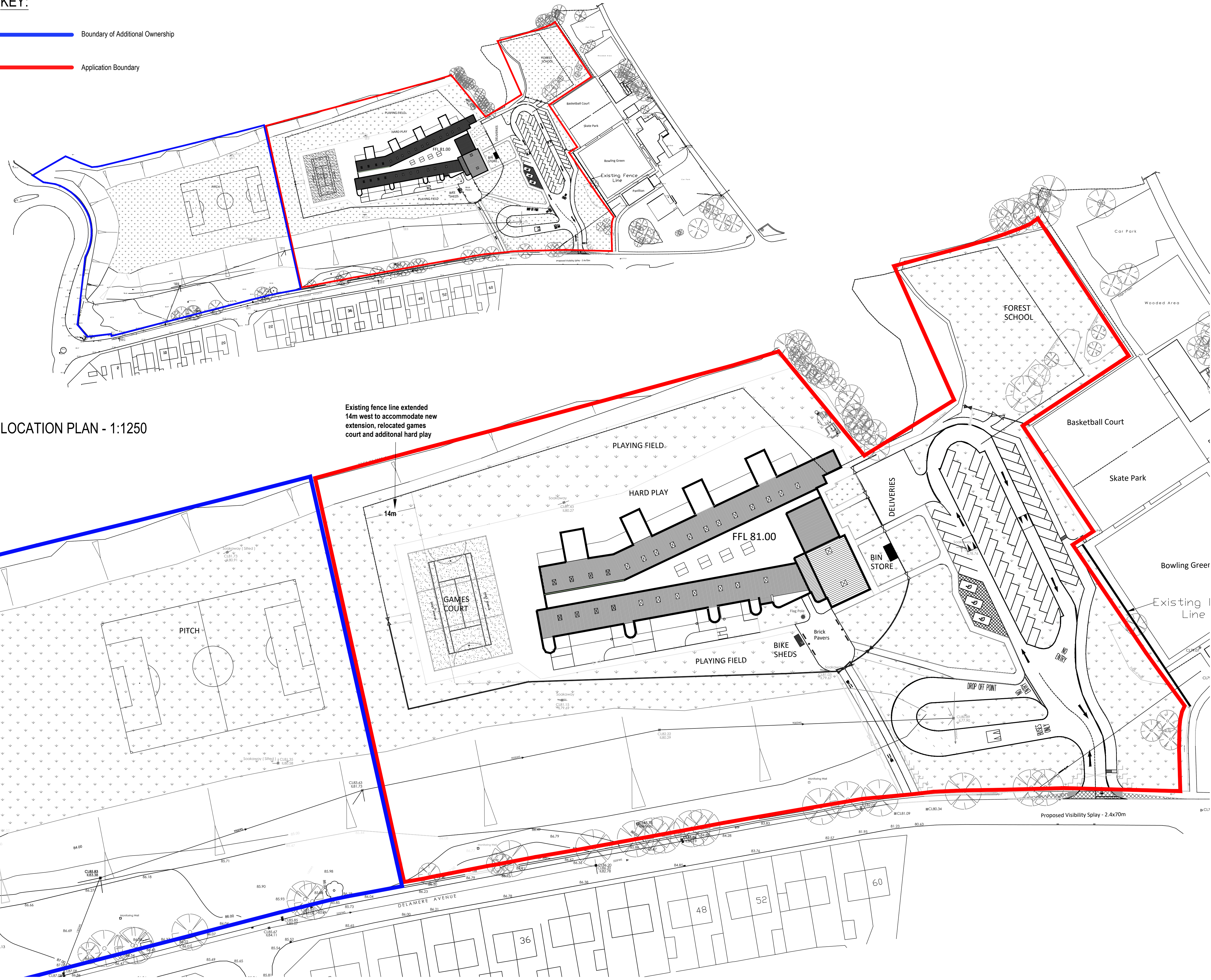
Copyright © LAWRAY LIMITED
Registered Office: Greenmeadow Springs, CARDIFF CF15 7AB Reg. Co. No. 2724178, VAT Reg. No. 134 2146 06



Proposed

KEY:

- Boundary of Additional Ownership
- Application Boundary



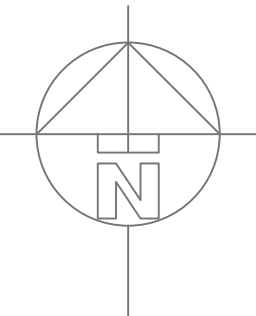
SITE BLOCK PLAN - 1:500

LOCATION PLAN - 1:1250

Construction (Design & Management) Regulations 2015

Design risk assessments are carried out throughout the design stage of this project in accordance with company procedures and manuals. Where reasonably possible all areas of risk applicable to design and end use of the construction have been identified and then eliminated, mitigated or recorded as a residual risk.

Note that general risks of which a competent designer or contractor should be aware are not included. This drawing is to be read in conjunction with the Pre Construction Information and all related documents prepared in accordance with the current Construction (Design and Management) Regulations 2015 and all applicable Health and Safety legislation as currently amended.



P01	INITIAL ISSUE	19/09/19
REV	DESCRIPTION BY / CHK / APP	DATE
RIBA PLAN OF WORK 2013 WORKSTAGE	LEVEL OF MODEL DEFINITION (LOD)	
PURPOSE OF ISSUE - FIT FOR ...	APPROVAL	



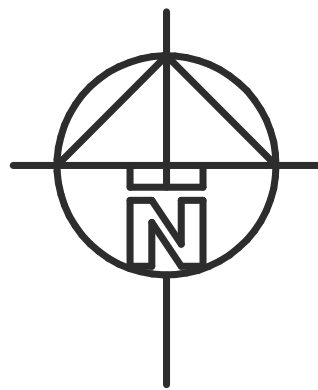
CARDIFF: 020 2076 2511
LONDON: 0207 138 3560
WREXHAM: 01978 357 887
www.lawray.co.uk

CLIENT
WREXHAM COUNTY BOROUGH COUNCIL

PROJECT TITLE
EXTENSION TO YSGOL BRO ALUN, RHODFA
DELAMERE, GWERSYLLT, WRECSAM, LL11 4NG

DRAWING TITLE
LOCATION AND PROPOSED SITE BLOCK PLAN

DATE	SCALE @ A1	DRAWN	CHECKED	APPROVED
09.19	1:1250 & 1:500	CB	-	-
PROJECT No	DRAWING No	PROJECT - ORIGINATOR - ZONE - LEVEL - TYPE - ROLE - CLASS NUMBER	REV	
19138	YBA-LAW-XX-XX-DSP-A-910101		P01	
DO NOT SCALE. Any discrepancy or query concerning this drawing should be referred to the Architect.				
Copyright © LAWRAY LIMITED				
Registered Office: Greenmeadow Springs, CARDIFF CF15 7AB, Reg. Co. No. 2724178, VAT Reg. No. 134 2146 06				



KEY



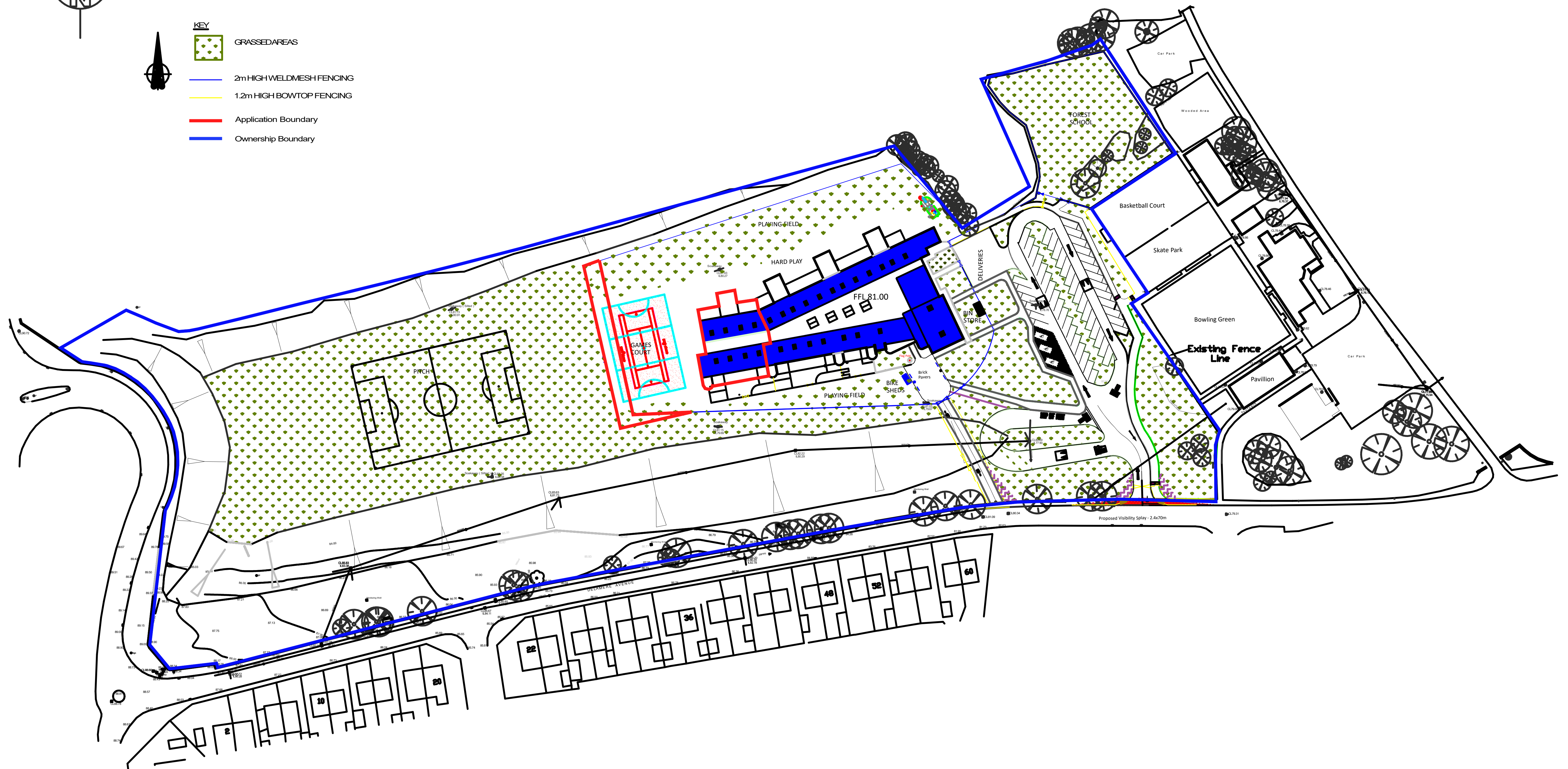
GRASSED AREAS

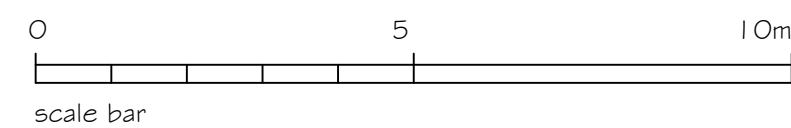
2m HIGH WELDMESH FENCING

1.2m HIGH BOWTOP FENCING

Application Boundary

Ownership Boundary



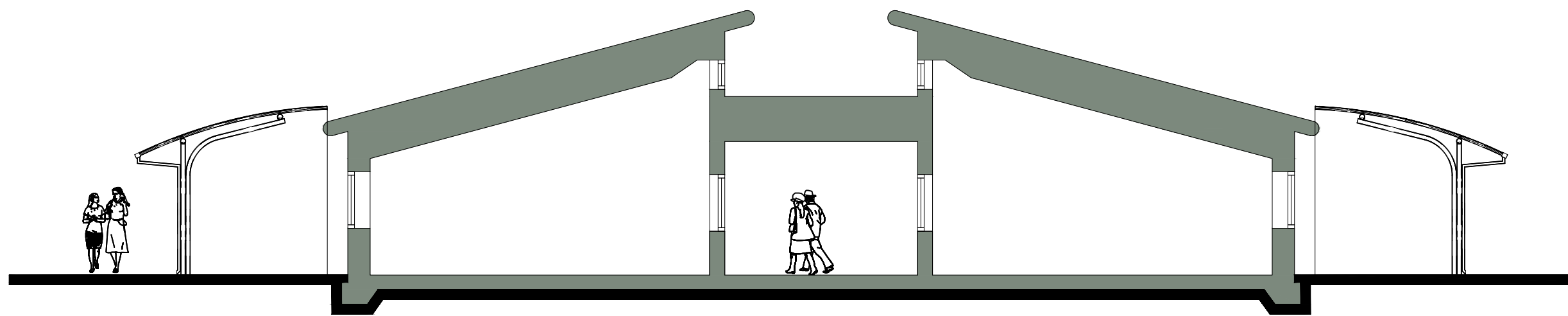


Velfac V200 composite Triple Glazed external Powder coated aluminium Colour Pure White RAL 9010

Benchmark weatherboarding 18 mm thick x 135 wide T&G jointed natural oak vertical boards. Colour natural

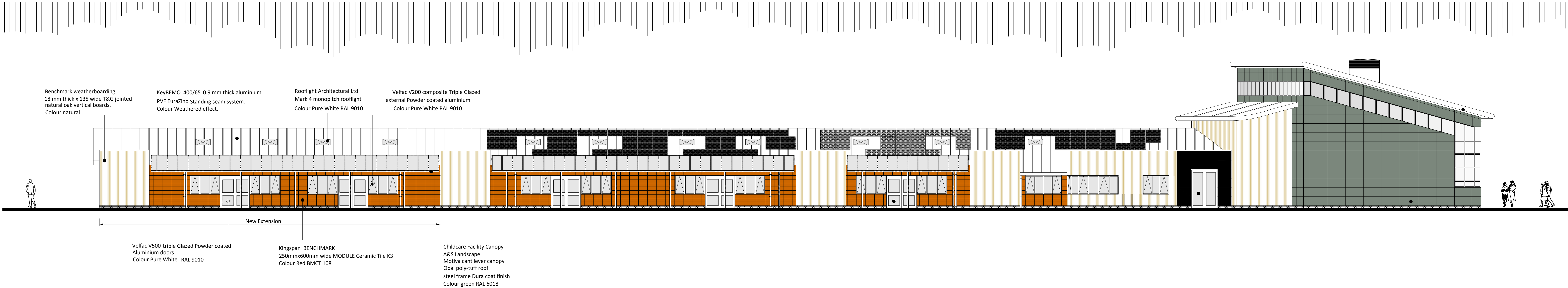
New Extension

Year 1/2 Canopy
A&S Landscape
Motiva cantilever canopy
Opal poly-tuff roof
steel frame Dura coat finish
NBS ref Q50/205 Colour green RAL 6018

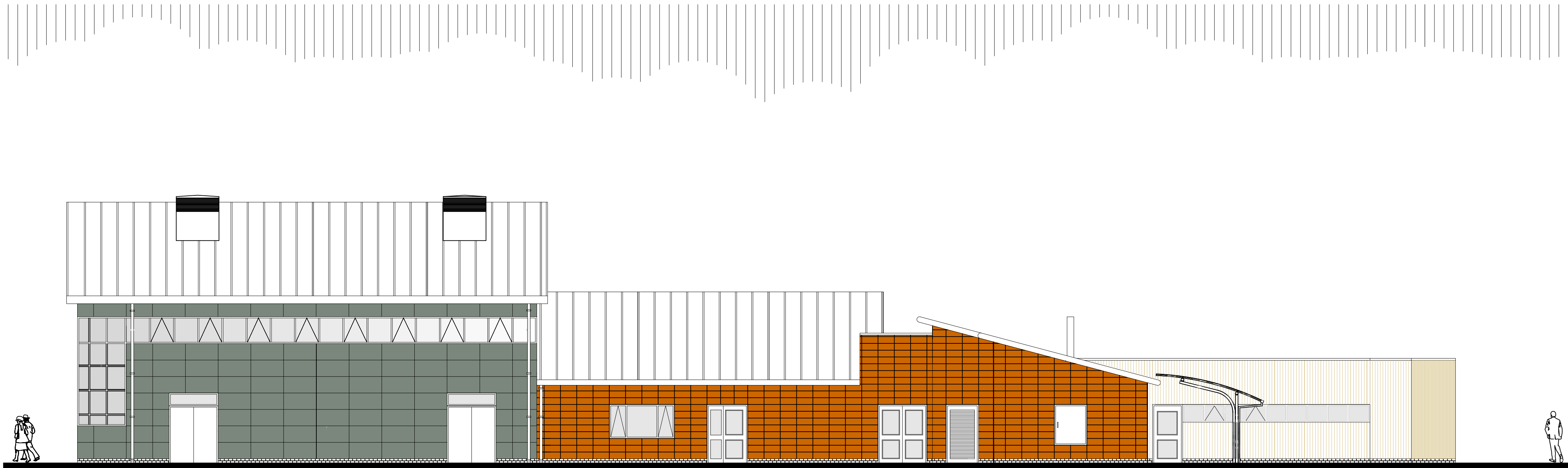


Typical Section Through Proposed Extension

P01 INITIAL ISSUE	25.09.19
REV DESCRIPTION BY CHK APP	DATE
RIBA PLAN OF WORK 2013 WORKSTAGE	LEVEL OF MODEL DEFINITION (LOD)
PURPOSE OF ISSUE - FIT FOR...	APPROVAL



Front Elevation



Side B Elevation

REV	DESCRIPTION	BY	CHK	APP	DATE
P01	INITIAL ISSUE				25.09.19
P02	REVISION				
P03	REVISION				
P04	REVISION				
P05	REVISION				
P06	REVISION				
P07	REVISION				
P08	REVISION				
P09	REVISION				
P10	REVISION				
P11	REVISION				
P12	REVISION				
P13	REVISION				
P14	REVISION				
P15	REVISION				
P16	REVISION				
P17	REVISION				
P18	REVISION				
P19	REVISION				
P20	REVISION				
P21	REVISION				
P22	REVISION				
P23	REVISION				
P24	REVISION				
P25	REVISION				
P26	REVISION				
P27	REVISION				
P28	REVISION				
P29	REVISION				
P30	REVISION				
P31	REVISION				
P32	REVISION				
P33	REVISION				
P34	REVISION				
P35	REVISION				
P36	REVISION				
P37	REVISION				
P38	REVISION				
P39	REVISION				
P40	REVISION				
P41	REVISION				
P42	REVISION				
P43	REVISION				
P44	REVISION				
P45	REVISION				
P46	REVISION				
P47	REVISION				
P48	REVISION				
P49	REVISION				
P50	REVISION				
P51	REVISION				
P52	REVISION				
P53	REVISION				
P54	REVISION				
P55	REVISION				
P56	REVISION				
P57	REVISION				
P58	REVISION				
P59	REVISION				
P60	REVISION				
P61	REVISION				
P62	REVISION				
P63	REVISION				
P64	REVISION				
P65	REVISION				
P66	REVISION				
P67	REVISION				
P68	REVISION				
P69	REVISION				
P70	REVISION				
P71	REVISION				
P72	REVISION				
P73	REVISION				
P74	REVISION				
P75	REVISION				
P76	REVISION				
P77	REVISION				
P78	REVISION				
P79	REVISION				
P80	REVISION				
P81	REVISION				
P82	REVISION				
P83	REVISION				
P84	REVISION				
P85	REVISION				
P86	REVISION				
P87	REVISION				
P88	REVISION				
P89	REVISION				
P90	REVISION				
P91	REVISION				
P92	REVISION				
P93	REVISION				
P94	REVISION				
P95	REVISION				
P96	REVISION				
P97	REVISION				
P98	REVISION				
P99	REVISION				
P100	REVISION				

PURPOSE OF ISSUE - FIT FOR...	APPROVAL
-------------------------------	----------



CLIENT
WREXHAM COUNTY BOROUGH COUNCIL

PROJECT TITLE
EXTENSION TO YSGOL BRO ALUN, RHODFA
DELAMERE, GWERSYLLT, WRECSAM, LL11 4NG

DRAWING TITLE
EXISTING ELEVATIONS - SHEET 1

DATE	SCALE @ A2	DRAWN	CHECKED	APPROVED
09.19	1:100	CB	-	-
PROJECT No.	DRAWING No.	DATE	BY	REV
19138	YBA-LAW-XX-XX-DEL-A-062101			P01
DO NOT SCALE. Any discrepancy of scale concerning this drawing should be referred to the architect.				
Copyright © LAWRAY LIMITED				
Registered Office: Chermadon Springs, CAREFF 0715 748 Reg. Co. No. 2724176, V07 Reg. No. 19124616				

Appendix G ReFH2 Greenfield Runoff Rates

DOCUMENT VERIFICATION RECORD	
Project:	Ysgol Bro Alun, Gwersyllt
Client:	Wrexham County Borough Council
Report Title:	Proposed school extension – Drainage Strategy
Date:	9 th October 2019

DOCUMENT REVIEW & APPROVAL	
Author:	Sally Pettit BSc (Hons)
Checker:	Aled Williams BSc (Hons)
Approver:	Victoria Griffin BSc (Hons) MSc CEnv MEnvSc

Return Period (Years)	As-rural Peak Flow (l/s)
1	0.182447438
2	0.213113306
5	0.326334262
10	0.421558244
30	0.614513401
50	0.727847309
75	0.829639416
100	0.908053851
200	1.115704843
1000	1.68799424

*Runoff Rates printed from the ReFH Flood Modelling software package

Appendix H MicroDrainage Storage Volumes

Waterco Ltd				Page 1	
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ		12394 -Ysgol Bro Alun 1 in 100 year +20% CC Excluding MUGA			
Date 10/10/2019 File 1 in 100 year +20%CC 1...		Designed by SJP Checked by AW			
XP Solutions		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+20%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.437	0.437	1.9	32.8	O K
30 min Summer	9.585	0.585	1.9	43.9	O K
60 min Summer	9.735	0.735	1.9	55.1	Flood Risk
120 min Summer	9.819	0.819	1.9	61.4	Flood Risk
180 min Summer	9.843	0.843	1.9	63.2	Flood Risk
240 min Summer	9.842	0.842	1.9	63.1	Flood Risk
360 min Summer	9.817	0.817	1.9	61.3	Flood Risk
480 min Summer	9.787	0.787	1.9	59.0	Flood Risk
600 min Summer	9.756	0.756	1.9	56.7	Flood Risk
720 min Summer	9.725	0.725	1.9	54.4	Flood Risk
960 min Summer	9.662	0.662	1.9	49.6	O K
1440 min Summer	9.524	0.524	1.9	39.3	O K
2160 min Summer	9.360	0.360	1.9	27.0	O K
2880 min Summer	9.250	0.250	1.9	18.7	O K
4320 min Summer	9.133	0.133	1.8	10.0	O K
5760 min Summer	9.088	0.088	1.6	6.6	O K
7200 min Summer	9.073	0.073	1.4	5.5	O K
8640 min Summer	9.064	0.064	1.2	4.8	O K
10080 min Summer	9.059	0.059	1.1	4.4	O K
15 min Winter	9.491	0.491	1.9	36.8	O K
30 min Winter	9.659	0.659	1.9	49.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	133.924	0.0	34.1	17	
30 min Summer	91.187	0.0	46.5	32	
60 min Summer	59.268	0.0	60.4	62	
120 min Summer	35.455	0.0	72.3	120	
180 min Summer	26.059	0.0	79.7	180	
240 min Summer	20.877	0.0	85.1	240	
360 min Summer	15.197	0.0	93.0	300	
480 min Summer	12.088	0.0	98.6	362	
600 min Summer	10.099	0.0	103.0	428	
720 min Summer	8.707	0.0	106.5	498	
960 min Summer	6.871	0.0	112.1	636	
1440 min Summer	4.892	0.0	119.7	894	
2160 min Summer	3.465	0.0	127.2	1256	
2880 min Summer	2.710	0.0	132.7	1588	
4320 min Summer	1.913	0.0	140.4	2288	
5760 min Summer	1.506	0.0	147.4	2944	
7200 min Summer	1.277	0.0	156.3	3672	
8640 min Summer	1.132	0.0	166.3	4408	
10080 min Summer	1.036	0.0	177.5	5136	
15 min Winter	133.924	0.0	38.2	17	
30 min Winter	91.187	0.0	52.0	31	
©1982-2019 Innovyze					

Waterco Ltd				Page 2	
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ		12394 -Ysgol Bro Alun 1 in 100 year +20% CC Excluding MUGA			
Date 10/10/2019 File 1 in 100 year +20%CC 1...		Designed by SJP Checked by AW			
XP Solutions		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+20%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	9.830	0.830	1.9	62.2	Flood Risk
120 min Winter	9.931	0.931	1.9	69.8	Flood Risk
180 min Winter	9.965	0.965	2.0	72.4	Flood Risk
240 min Winter	9.972	0.972	2.0	72.9	Flood Risk
360 min Winter	9.946	0.946	2.0	70.9	Flood Risk
480 min Winter	9.907	0.907	1.9	68.0	Flood Risk
600 min Winter	9.868	0.868	1.9	65.1	Flood Risk
720 min Winter	9.826	0.826	1.9	61.9	Flood Risk
960 min Winter	9.738	0.738	1.9	55.3	Flood Risk
1440 min Winter	9.539	0.539	1.9	40.4	O K
2160 min Winter	9.301	0.301	1.9	22.6	O K
2880 min Winter	9.172	0.172	1.9	12.9	O K
4320 min Winter	9.081	0.081	1.5	6.1	O K
5760 min Winter	9.062	0.062	1.2	4.6	O K
7200 min Winter	9.053	0.053	1.0	4.0	O K
8640 min Winter	9.048	0.048	0.9	3.6	O K
10080 min Winter	9.045	0.045	0.8	3.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	59.268	0.0	67.7	60	
120 min Winter	35.455	0.0	81.0	118	
180 min Winter	26.059	0.0	89.3	176	
240 min Winter	20.877	0.0	95.4	232	
360 min Winter	15.197	0.0	104.1	336	
480 min Winter	12.088	0.0	110.4	380	
600 min Winter	10.099	0.0	115.3	458	
720 min Winter	8.707	0.0	119.3	534	
960 min Winter	6.871	0.0	125.6	692	
1440 min Winter	4.892	0.0	134.1	968	
2160 min Winter	3.465	0.0	142.5	1316	
2880 min Winter	2.710	0.0	148.6	1616	
4320 min Winter	1.913	0.0	157.3	2244	
5760 min Winter	1.506	0.0	165.1	2944	
7200 min Winter	1.277	0.0	175.1	3672	
8640 min Winter	1.132	0.0	186.2	4384	
10080 min Winter	1.036	0.0	198.9	5048	
©1982-2019 Innovyze					

Waterco Ltd		Page 3
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	12394 -Ysgol Bro Alun 1 in 100 year +20% CC Excluding MUGA	
Date 10/10/2019 File 1 in 100 year +20%CC 1...	Designed by SJP Checked by AW	
XP Solutions Source Control 2019.1		

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 332003 354018	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.136

Time (mins)	Area
From:	To: (ha)
0	2 0.136

©1982-2019 Innovyze

Waterco Ltd		Page 4
Eden Court	12394 -Ysgol Bro Alun	
Lon Parcwr Business Park	1 in 100 year +20% CC	
Denbighshire LL15 1NJ	Excluding MUGA	
Date 10/10/2019	Designed by SJP	
File 1 in 100 year +20%CC 1...	Checked by AW	
XP Solutions	Source Control 2019.1	

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	75.0	1.000	75.0

Hydro-Brake® Optimum Outflow Control

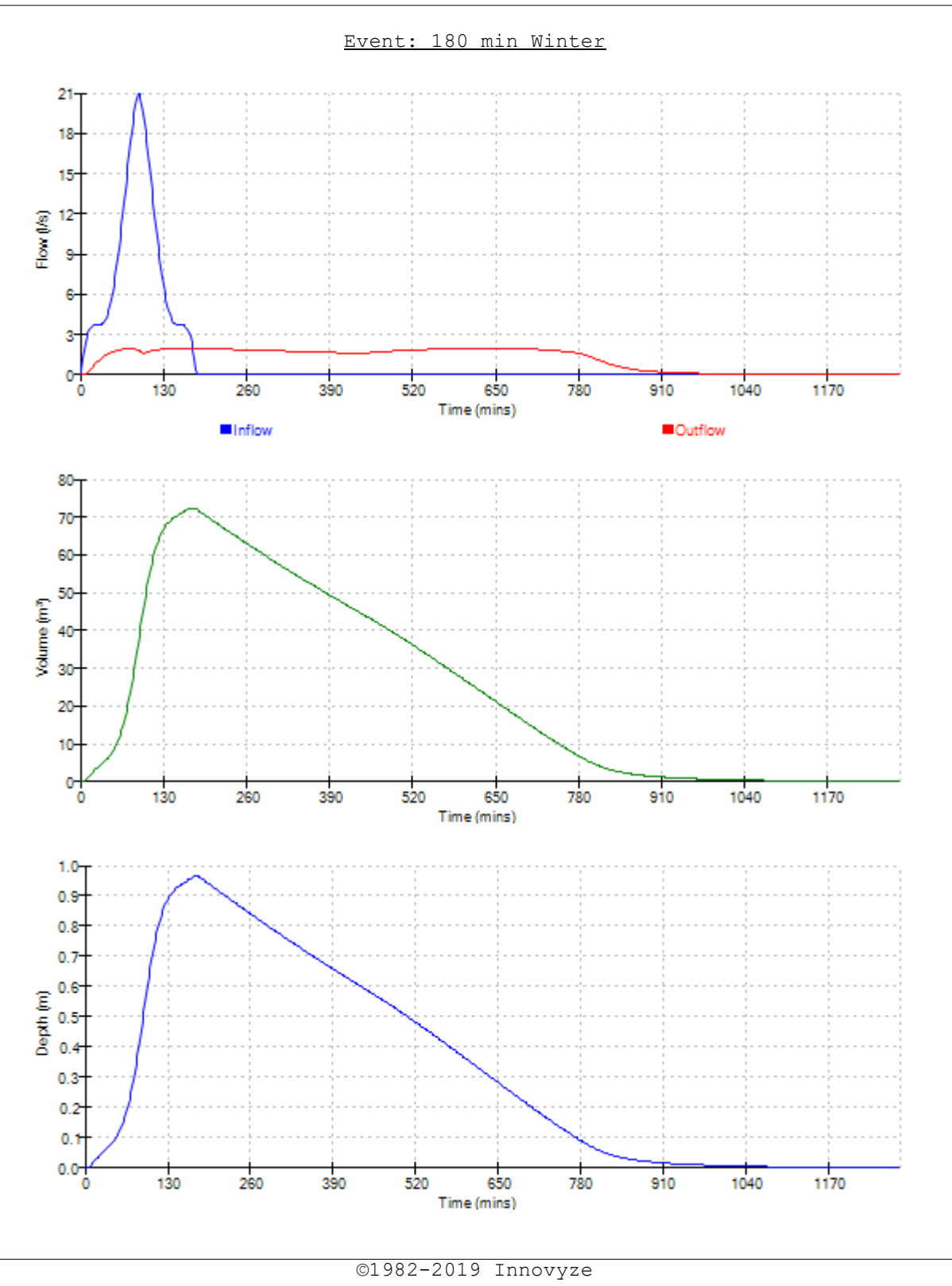
Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	8.995
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

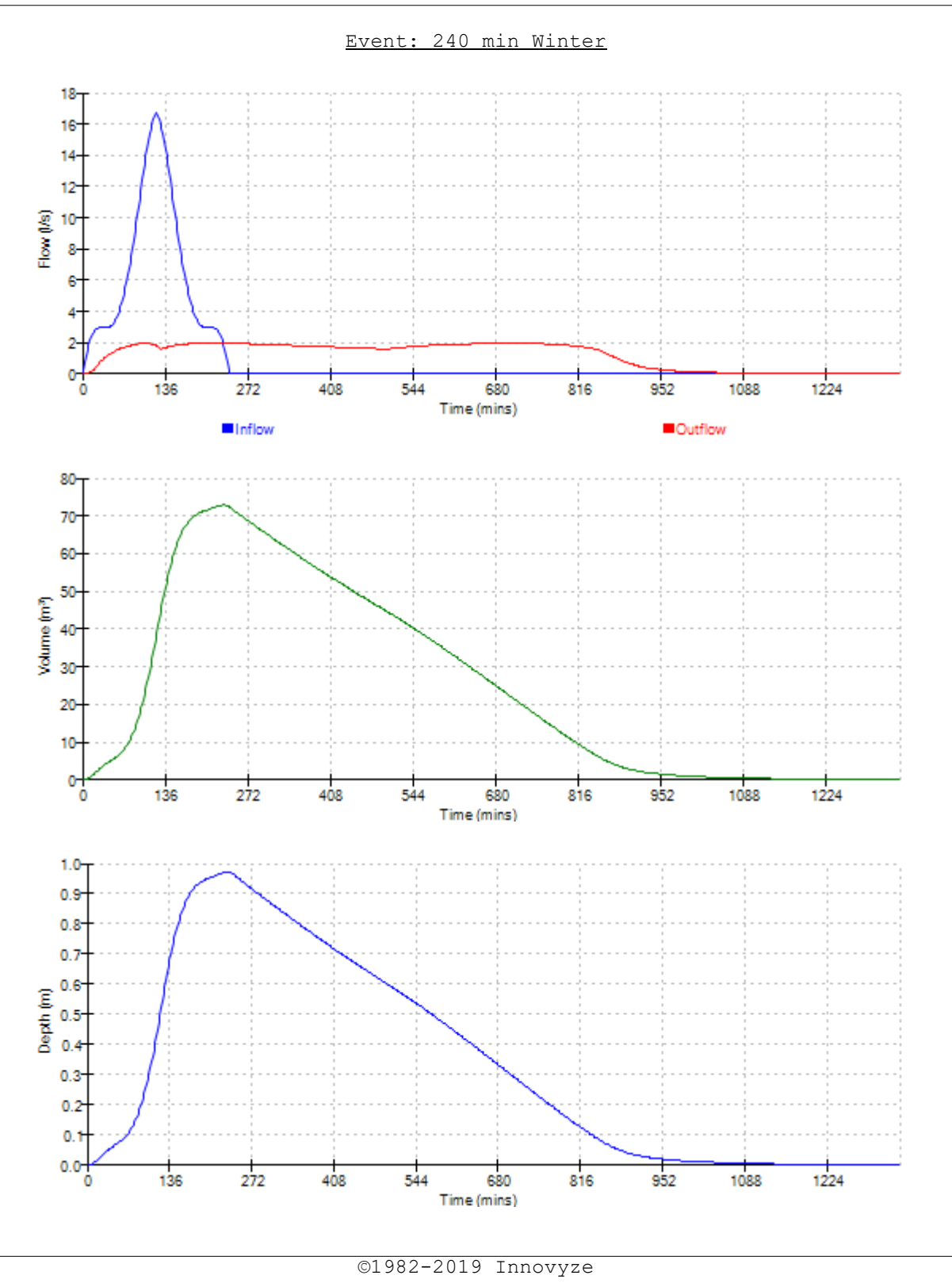
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

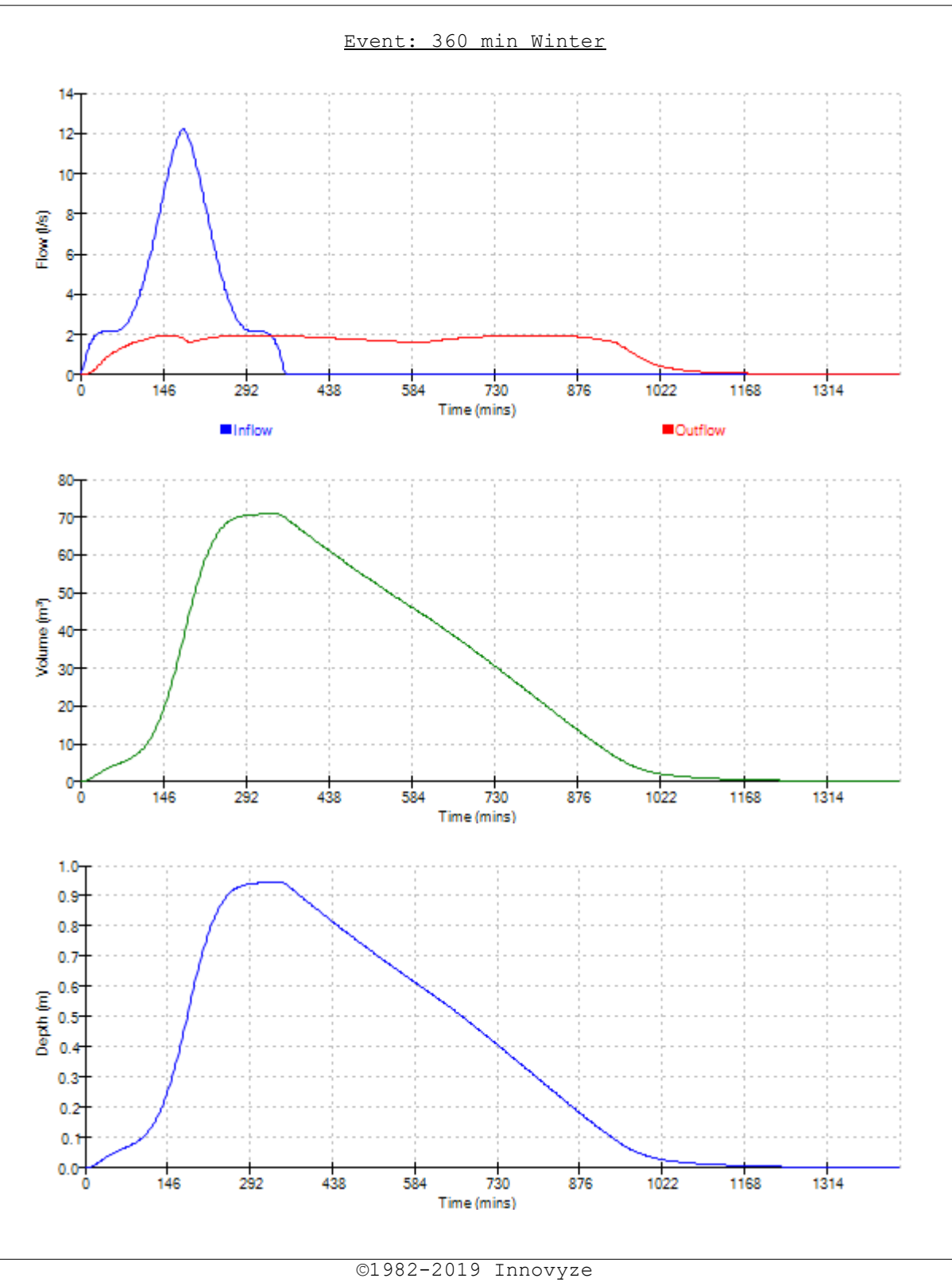
Waterco Ltd		Page 5
Eden Court	12394 -Ysgol Bro Alun	
Lon Parcwr Business Park	1 in 100 year +20% CC	
Denbighshire LL15 1NJ	Excluding MUGA	
Date 10/10/2019	Designed by SJP	
File 1 in 100 year +20%CC 1...	Checked by AW	
XP Solutions	Source Control 2019.1	



Waterco Ltd		Page 6
Eden Court	12394 -Ysgol Bro Alun	
Lon Parcwr Business Park	1 in 100 year +20% CC	
Denbighshire LL15 1NJ	Excluding MUGA	
Date 10/10/2019	Designed by SJP	
File 1 in 100 year +20%CC 1...	Checked by AW	
XP Solutions	Source Control 2019.1	



Waterco Ltd		Page 7
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	12394 -Ysgol Bro Alun	
	1 in 100 year +20% CC Excluding MUGA	
Date 10/10/2019	Designed by SJP	
File 1 in 100 year +20%CC 1...	Checked by AW	
XP Solutions	Source Control 2019.1	



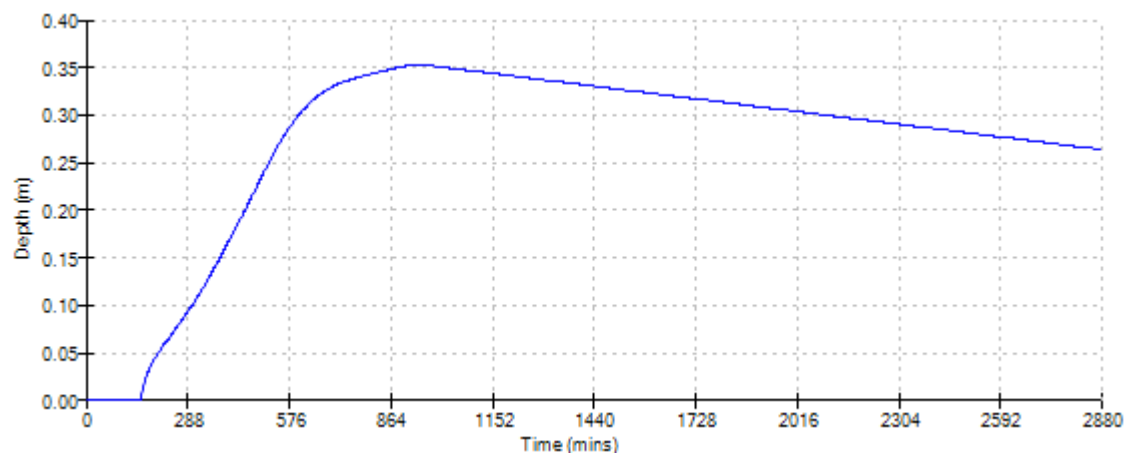
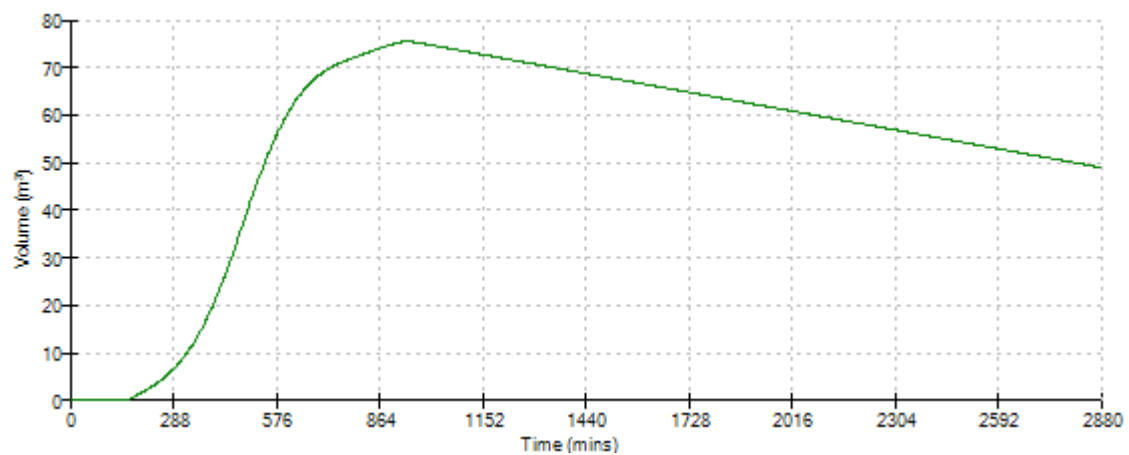
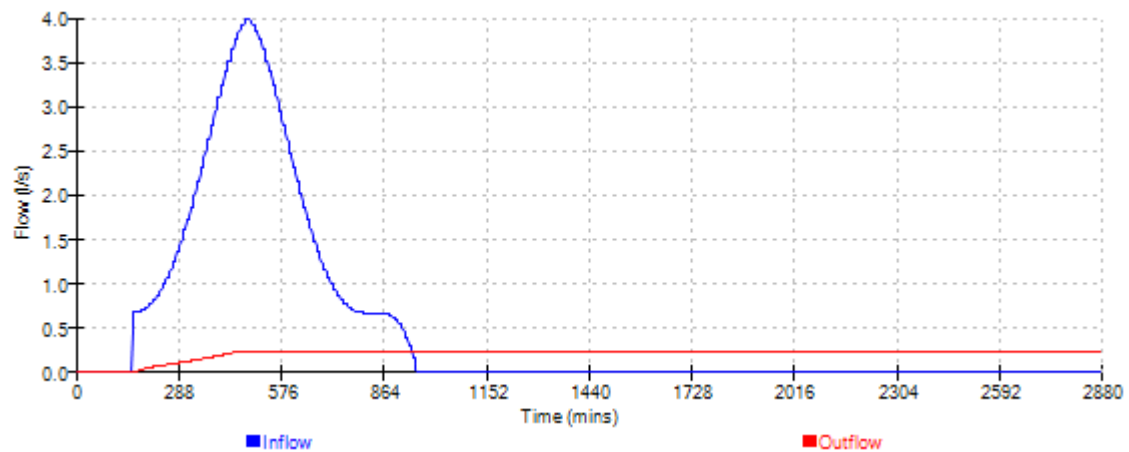
Waterco Ltd			Page 1																																																																																																																																																																																																																			
Eden Court		12394																																																																																																																																																																																																																				
Lon Parcwr Business Park		Ysgol Bro Alun, Gwersyllt																																																																																																																																																																																																																				
Denbighshire LL15 1NJ		1 in 100 year +20%CC infilt																																																																																																																																																																																																																				
Date 14/10/2019		Designed by SJP																																																																																																																																																																																																																				
File 12394-1 in 100 year + 2...		Checked by AW																																																																																																																																																																																																																				
XP Solutions		Source Control 2019.1																																																																																																																																																																																																																				
<u>Summary of Results for 100 year Return Period (+20%)</u> Half Drain Time : 2791 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>0.802</td><td>0.162</td><td>0.2</td><td>19.8</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>0.835</td><td>0.195</td><td>0.2</td><td>28.6</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>0.868</td><td>0.228</td><td>0.2</td><td>38.4</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.895</td><td>0.255</td><td>0.2</td><td>46.4</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.911</td><td>0.271</td><td>0.2</td><td>51.2</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.922</td><td>0.282</td><td>0.2</td><td>54.5</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>0.937</td><td>0.297</td><td>0.2</td><td>58.8</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>0.946</td><td>0.306</td><td>0.2</td><td>61.6</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.952</td><td>0.312</td><td>0.2</td><td>63.4</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.957</td><td>0.317</td><td>0.2</td><td>64.6</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.961</td><td>0.321</td><td>0.2</td><td>65.9</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.961</td><td>0.321</td><td>0.2</td><td>66.1</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.953</td><td>0.313</td><td>0.2</td><td>63.6</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>0.945</td><td>0.305</td><td>0.2</td><td>61.3</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>0.930</td><td>0.290</td><td>0.2</td><td>56.7</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>0.918</td><td>0.278</td><td>0.2</td><td>53.1</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>0.911</td><td>0.271</td><td>0.2</td><td>51.2</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>0.908</td><td>0.268</td><td>0.2</td><td>50.2</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>0.907</td><td>0.267</td><td>0.2</td><td>49.9</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>0.814</td><td>0.174</td><td>0.2</td><td>22.7</td><td>Flood Risk</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>133.924</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>91.187</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>59.268</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>35.455</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>26.059</td><td>0.0</td><td>184</td></tr><tr><td>240 min Summer</td><td>20.877</td><td>0.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>15.197</td><td>0.0</td><td>364</td></tr><tr><td>480 min Summer</td><td>12.088</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>10.099</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>8.707</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>6.871</td><td>0.0</td><td>962</td></tr><tr><td>1440 min Summer</td><td>4.892</td><td>0.0</td><td>1440</td></tr><tr><td>2160 min Summer</td><td>3.465</td><td>0.0</td><td>1964</td></tr><tr><td>2880 min Summer</td><td>2.710</td><td>0.0</td><td>2276</td></tr><tr><td>4320 min Summer</td><td>1.913</td><td>0.0</td><td>3024</td></tr><tr><td>5760 min Summer</td><td>1.506</td><td>0.0</td><td>3808</td></tr><tr><td>7200 min Summer</td><td>1.277</td><td>0.0</td><td>4616</td></tr><tr><td>8640 min Summer</td><td>1.132</td><td>0.0</td><td>5448</td></tr><tr><td>10080 min Summer</td><td>1.036</td><td>0.0</td><td>6264</td></tr><tr><td>15 min Winter</td><td>133.924</td><td>0.0</td><td>19</td></tr></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.802	0.162	0.2	19.8	Flood Risk	30 min Summer	0.835	0.195	0.2	28.6	Flood Risk	60 min Summer	0.868	0.228	0.2	38.4	Flood Risk	120 min Summer	0.895	0.255	0.2	46.4	Flood Risk	180 min Summer	0.911	0.271	0.2	51.2	Flood Risk	240 min Summer	0.922	0.282	0.2	54.5	Flood Risk	360 min Summer	0.937	0.297	0.2	58.8	Flood Risk	480 min Summer	0.946	0.306	0.2	61.6	Flood Risk	600 min Summer	0.952	0.312	0.2	63.4	Flood Risk	720 min Summer	0.957	0.317	0.2	64.6	Flood Risk	960 min Summer	0.961	0.321	0.2	65.9	Flood Risk	1440 min Summer	0.961	0.321	0.2	66.1	Flood Risk	2160 min Summer	0.953	0.313	0.2	63.6	Flood Risk	2880 min Summer	0.945	0.305	0.2	61.3	Flood Risk	4320 min Summer	0.930	0.290	0.2	56.7	Flood Risk	5760 min Summer	0.918	0.278	0.2	53.1	Flood Risk	7200 min Summer	0.911	0.271	0.2	51.2	Flood Risk	8640 min Summer	0.908	0.268	0.2	50.2	Flood Risk	10080 min Summer	0.907	0.267	0.2	49.9	Flood Risk	15 min Winter	0.814	0.174	0.2	22.7	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	133.924	0.0	19	30 min Summer	91.187	0.0	34	60 min Summer	59.268	0.0	64	120 min Summer	35.455	0.0	124	180 min Summer	26.059	0.0	184	240 min Summer	20.877	0.0	244	360 min Summer	15.197	0.0	364	480 min Summer	12.088	0.0	482	600 min Summer	10.099	0.0	602	720 min Summer	8.707	0.0	722	960 min Summer	6.871	0.0	962	1440 min Summer	4.892	0.0	1440	2160 min Summer	3.465	0.0	1964	2880 min Summer	2.710	0.0	2276	4320 min Summer	1.913	0.0	3024	5760 min Summer	1.506	0.0	3808	7200 min Summer	1.277	0.0	4616	8640 min Summer	1.132	0.0	5448	10080 min Summer	1.036	0.0	6264	15 min Winter	133.924	0.0	19
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																	
15 min Summer	0.802	0.162	0.2	19.8	Flood Risk																																																																																																																																																																																																																	
30 min Summer	0.835	0.195	0.2	28.6	Flood Risk																																																																																																																																																																																																																	
60 min Summer	0.868	0.228	0.2	38.4	Flood Risk																																																																																																																																																																																																																	
120 min Summer	0.895	0.255	0.2	46.4	Flood Risk																																																																																																																																																																																																																	
180 min Summer	0.911	0.271	0.2	51.2	Flood Risk																																																																																																																																																																																																																	
240 min Summer	0.922	0.282	0.2	54.5	Flood Risk																																																																																																																																																																																																																	
360 min Summer	0.937	0.297	0.2	58.8	Flood Risk																																																																																																																																																																																																																	
480 min Summer	0.946	0.306	0.2	61.6	Flood Risk																																																																																																																																																																																																																	
600 min Summer	0.952	0.312	0.2	63.4	Flood Risk																																																																																																																																																																																																																	
720 min Summer	0.957	0.317	0.2	64.6	Flood Risk																																																																																																																																																																																																																	
960 min Summer	0.961	0.321	0.2	65.9	Flood Risk																																																																																																																																																																																																																	
1440 min Summer	0.961	0.321	0.2	66.1	Flood Risk																																																																																																																																																																																																																	
2160 min Summer	0.953	0.313	0.2	63.6	Flood Risk																																																																																																																																																																																																																	
2880 min Summer	0.945	0.305	0.2	61.3	Flood Risk																																																																																																																																																																																																																	
4320 min Summer	0.930	0.290	0.2	56.7	Flood Risk																																																																																																																																																																																																																	
5760 min Summer	0.918	0.278	0.2	53.1	Flood Risk																																																																																																																																																																																																																	
7200 min Summer	0.911	0.271	0.2	51.2	Flood Risk																																																																																																																																																																																																																	
8640 min Summer	0.908	0.268	0.2	50.2	Flood Risk																																																																																																																																																																																																																	
10080 min Summer	0.907	0.267	0.2	49.9	Flood Risk																																																																																																																																																																																																																	
15 min Winter	0.814	0.174	0.2	22.7	Flood Risk																																																																																																																																																																																																																	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																			
15 min Summer	133.924	0.0	19																																																																																																																																																																																																																			
30 min Summer	91.187	0.0	34																																																																																																																																																																																																																			
60 min Summer	59.268	0.0	64																																																																																																																																																																																																																			
120 min Summer	35.455	0.0	124																																																																																																																																																																																																																			
180 min Summer	26.059	0.0	184																																																																																																																																																																																																																			
240 min Summer	20.877	0.0	244																																																																																																																																																																																																																			
360 min Summer	15.197	0.0	364																																																																																																																																																																																																																			
480 min Summer	12.088	0.0	482																																																																																																																																																																																																																			
600 min Summer	10.099	0.0	602																																																																																																																																																																																																																			
720 min Summer	8.707	0.0	722																																																																																																																																																																																																																			
960 min Summer	6.871	0.0	962																																																																																																																																																																																																																			
1440 min Summer	4.892	0.0	1440																																																																																																																																																																																																																			
2160 min Summer	3.465	0.0	1964																																																																																																																																																																																																																			
2880 min Summer	2.710	0.0	2276																																																																																																																																																																																																																			
4320 min Summer	1.913	0.0	3024																																																																																																																																																																																																																			
5760 min Summer	1.506	0.0	3808																																																																																																																																																																																																																			
7200 min Summer	1.277	0.0	4616																																																																																																																																																																																																																			
8640 min Summer	1.132	0.0	5448																																																																																																																																																																																																																			
10080 min Summer	1.036	0.0	6264																																																																																																																																																																																																																			
15 min Winter	133.924	0.0	19																																																																																																																																																																																																																			
©1982-2019 Innovyze																																																																																																																																																																																																																						

Waterco Ltd				Page 2	
Eden Court		12394			
Lon Parcwr Business Park		Ysgol Bro Alun, Gwersyllt			
Denbighshire LL15 1NJ		1 in 100 year +20%CC infilt			
Date 14/10/2019		Designed by SJP			
File 12394-1 in 100 year + 2...		Checked by AW			
XP Solutions		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+20%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.849	0.209	0.2	32.6	Flood Risk
60 min Winter	0.886	0.246	0.2	43.7	Flood Risk
120 min Winter	0.916	0.276	0.2	52.7	Flood Risk
180 min Winter	0.935	0.295	0.2	58.1	Flood Risk
240 min Winter	0.947	0.307	0.2	61.8	Flood Risk
360 min Winter	0.964	0.324	0.2	66.8	Flood Risk
480 min Winter	0.975	0.335	0.2	70.0	Flood Risk
600 min Winter	0.982	0.342	0.2	72.2	Flood Risk
720 min Winter	0.987	0.347	0.2	73.7	Flood Risk
960 min Winter	0.993	0.353	0.2	75.5	Flood Risk
1440 min Winter	0.996	0.356	0.2	76.2	Flood Risk
2160 min Winter	0.989	0.349	0.2	74.3	Flood Risk
2880 min Winter	0.978	0.338	0.2	71.0	Flood Risk
4320 min Winter	0.958	0.318	0.2	65.0	Flood Risk
5760 min Winter	0.941	0.301	0.2	60.0	Flood Risk
7200 min Winter	0.930	0.290	0.2	56.8	Flood Risk
8640 min Winter	0.923	0.283	0.2	54.6	Flood Risk
10080 min Winter	0.919	0.279	0.2	53.5	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	91.187	0.0	34		
60 min Winter	59.268	0.0	64		
120 min Winter	35.455	0.0	122		
180 min Winter	26.059	0.0	182		
240 min Winter	20.877	0.0	240		
360 min Winter	15.197	0.0	358		
480 min Winter	12.088	0.0	476		
600 min Winter	10.099	0.0	594		
720 min Winter	8.707	0.0	710		
960 min Winter	6.871	0.0	942		
1440 min Winter	4.892	0.0	1400		
2160 min Winter	3.465	0.0	2056		
2880 min Winter	2.710	0.0	2652		
4320 min Winter	1.913	0.0	3284		
5760 min Winter	1.506	0.0	4160		
7200 min Winter	1.277	0.0	5048		
8640 min Winter	1.132	0.0	5960		
10080 min Winter	1.036	0.0	6856		
©1982-2019 Innovyze					

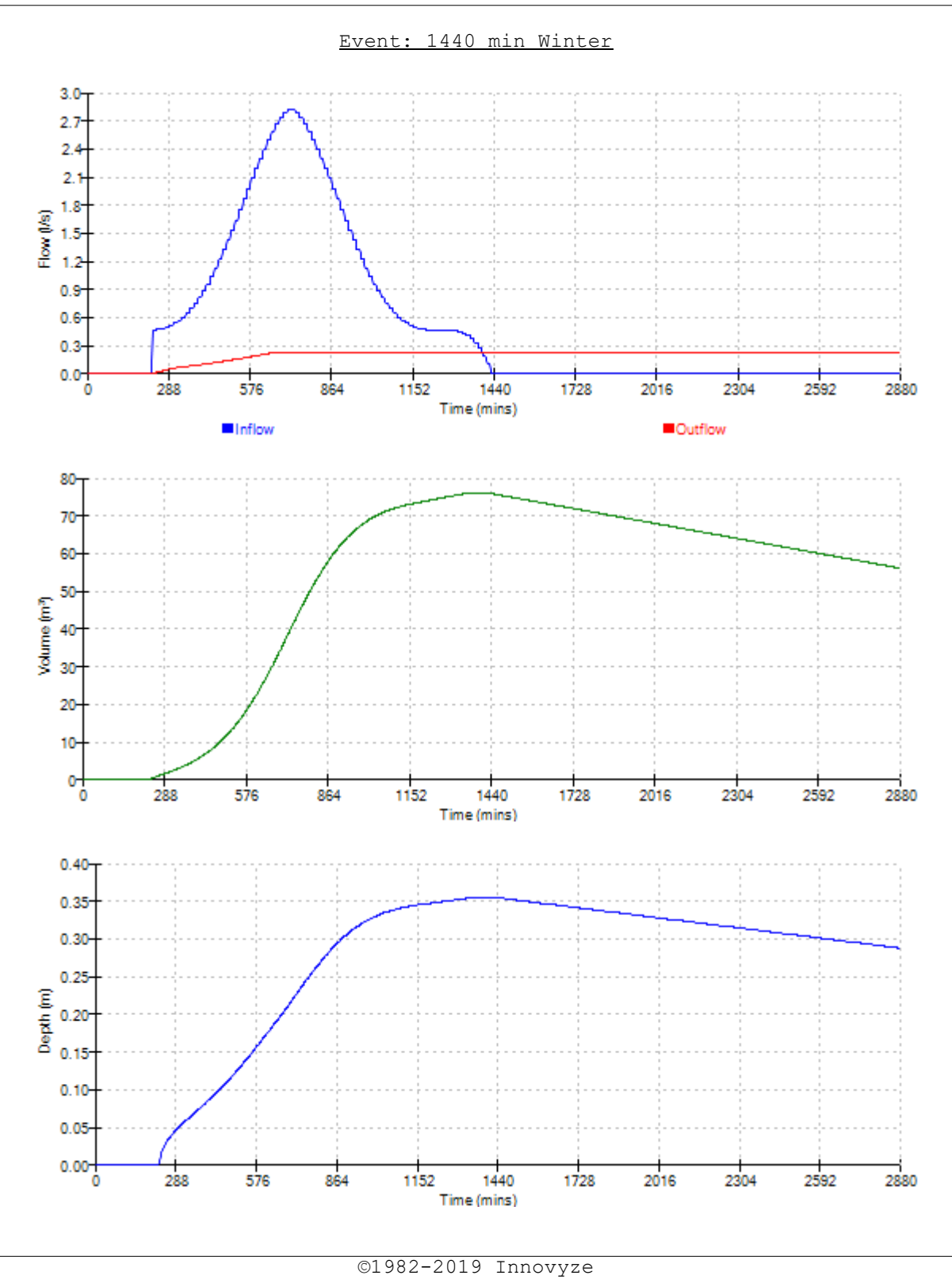
Waterco Ltd		Page 4																								
Eden Court	12394																									
Lon Parcwr Business Park	Ysgol Bro Alun, Gwersyllt																									
Denbighshire LL15 1NJ	1 in 100 year +20%CC infilt																									
Date 14/10/2019	Designed by SJP																									
File 12394-1 in 100 year + 2...	Checked by AW																									
XP Solutions	Source Control 2019.1																									
<u>Model Details</u> Storage is Online Cover Level (m) 1.000 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00100</td> <td>Width (m)</td> <td>10.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>99.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>275.0</td> <td>Slope (1:X)</td> <td>500.0</td> </tr> <tr> <td>Safety Factor</td> <td>1.2</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.640</td> <td>Membrane Depth (m)</td> <td>0</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00100	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	99.0	Max Percolation (l/s)	275.0	Slope (1:X)	500.0	Safety Factor	1.2	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	0.640	Membrane Depth (m)	0
Infiltration Coefficient Base (m/hr)	0.00100	Width (m)	10.0																							
Membrane Percolation (mm/hr)	1000	Length (m)	99.0																							
Max Percolation (l/s)	275.0	Slope (1:X)	500.0																							
Safety Factor	1.2	Depression Storage (mm)	5																							
Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	0.640	Membrane Depth (m)	0																							
©1982-2019 Innovyze																										

Waterco Ltd		Page 5
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	12394	
	Ysgol Bro Alun, Gwersyllt 1 in 100 year +20%CC infilt	
Date 14/10/2019	Designed by SJP	
File 12394-1 in 100 year + 2...	Checked by AW	
XP Solutions	Source Control 2019.1	

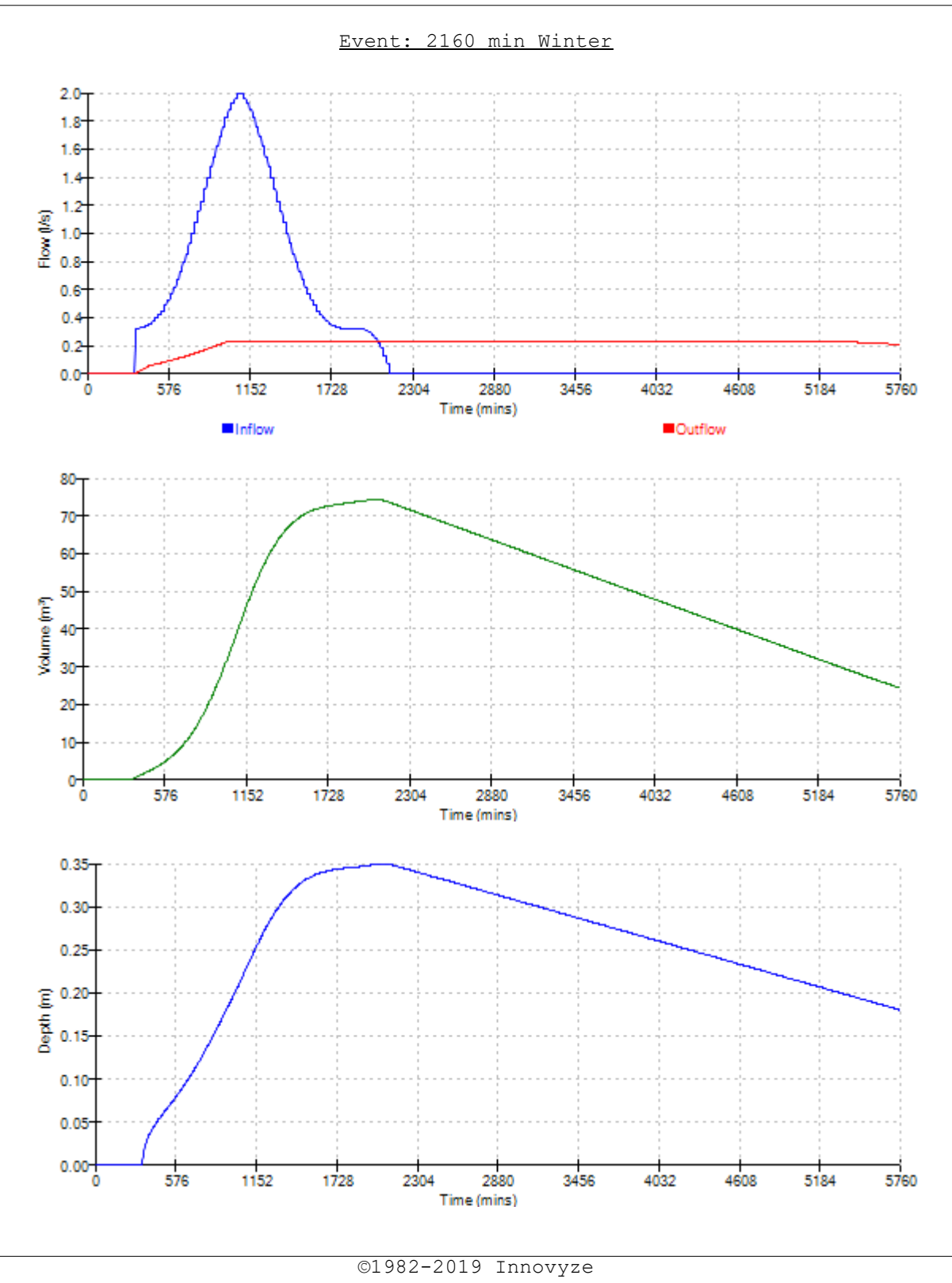
Event: 960 min Winter



Waterco Ltd		Page 6
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	12394	
	Ysgol Bro Alun, Gwersyllt 1 in 100 year +20%CC infilt	
Date 14/10/2019	Designed by SJP	
File 12394-1 in 100 year + 2...	Checked by AW	
XP Solutions	Source Control 2019.1	



Waterco Ltd		Page 7
Eden Court Lon Parcwr Business Park Denbighshire LL15 1NJ	12394	
	Ysgol Bro Alun, Gwersyllt 1 in 100 year +20%CC infilt	
Date 14/10/2019	Designed by SJP	
File 12394-1 in 100 year + 2...	Checked by AW	
XP Solutions	Source Control 2019.1	



Appendix I Concept Drainage Sketch

Appendix J Maintenance Schedules

Operation and Maintenance Requirements for Permeable Paving

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and move contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level or the paving	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and / or weed growth – if required, take remedial action	Three-monthly, 48hr after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Ref. Table 20.15, CIRIA C753 'The SuDS Manual'

The maintenance requirements detailed above are to be undertaken by the site owner.

Name :

Position :

Date :

Signed on behalf of the site owner :

Appendix K Concept Designer's Risk Assessment

Project: Ysgol Bro Alun, Gwersyllt
Client: Wrexham County Borough Council
Report Reference: 12394-Drainage Strategy-01

Project No: 12394

Prepared by:	Sally Pettit	Date:	09/10/2019
Checked by:	Aled Williams	Date:	14/10/2019
Reviewed by:	Victoria Griffin	Date:	16/10/2019

Requirement:

The Construction (Design and Management) Regulations 2015 (CDM 2015) place an obligation on the Designer to take all reasonable steps to provide, with the design, sufficient information about the design, construction or maintenance of the structure, to adequately assist the client, other designers and contractors to comply with their duties under CDM. The Designer has undertaken this assessment to identify any extra-ordinary risks, or those that would not be expected on this particular project by an experienced and competent Contractor. The aim is to avoid needless paperwork and bureaucracy and ensure the assessment is project specific, relevant and proportionate to the risk.

DRA Summary

Each of the following risk areas has been considered using the question below. Is a risk present which is considered to be **extra-ordinary or unexpected** in this instance?

If **YES** - A detailed risk assessment is required at design stage

If **UNKNOWN** - Insufficient information has been provided at concept design stage and the risks are unknown. Further consideration must be given at design stage(s)

If **NO** - No further action is required.

Hazard Ref.	Risk Areas	YES, UNKNOWN or NO	Comments
1	Ground Conditions	Unknown	No identified risk in Geo Enviromental report
2	Hazardous Environment	Unknown	
3	Existing Working Environment	Yes	Existing use as a school
4	Existing Services	Unknown	
5	Proximity to Other Structure(s)	Unknown	
6	Near Waterbody / flood risk	Unknown	No identified watercourses within close proximity of the site
7	Proximity to Other Activities	Unknown	
8	Sequence of Construction	Unknown	
9	Access	Unknown	
10	Interfaces	Unknown	
11	Confined Space Working	Unknown	
12	Maintenance Considerations	Unknown	
13	Working at Height	Unknown	
14	Steep Slopes	Unknown	
15	Demolition / Refurbishment / Repair	Unknown	
16	Welfare	Unknown	
17	Occupational Health	Unknown	
18	Environmental Issues	Unknown	
19	Other Significant Hazards not Identified Above	Unknown	
20	Residual Risk to Future Users	Unknown	