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Former School Site, Gwaun-Cau-Gerwen

Drainage Strategy and SuDS Compliance Statement

on

Proposed Residential Development

for

Mr Dylan Davies

Date	December 2021
Document ref no.	21505-R-601-Drainage Strategy & SuDS Compliance Statement - 0

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Document Control

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Checked	Civil Engineer	Matthew Bartlett	20 Dec 2021	
Approval	Director	Andrew Villis		
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Revision History

Revision	Date	Purpose/Status	Approved
0	20 December 2021	Comment	
A			
B			
C			
D			
E			
F			

Distribution

	Function Title	Company	Name
1	SAB Officer	NPT County Council	
2			
3			

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1.0 INTRODUCTION

The site is located off Water Street in Gwaun-Cau-Gerwen (Refer to Figure 1), part of the site previous housed a former school building with associated hard surfaced yard. The existing school site (0.22ha) is fully impermeable hardstanding construction. The additional area of the site is a heavily vegetated / woodland area (0.125ha). The proposal is to clear both areas of the site and construct 10 new dwellings in an arrangement of 5 pairs on semi-detached houses. 6 dwellings will be sited directly off Water Street with the other 4 being accessed via a proposed shared drive off Water Street (Refer to Appendix A for site layout plan).

2.0 DRAINAGE

A schematic drainage layout is appended, detailing the proposals for the drainage strategy outlined in the following sections.

2.1 Existing Surface Water Drainage

The existing school site (0.22ha) is fully impermeable construction draining via a series of gullies and piped network into the culvert located within Water Street. The Culvert discharges into the Garnant Watercourse located circa 70m to the West of the site. The remaining 0.125ha is a currently heavily vegetated greenfield area. The existing brownfield discharge rates for the school site (0.22ha) are calculated as follows (Refer to Appendix G for full calculations).

1 Year	-	22.2l/s
30 Year	-	50.8l/s
100 Year	-	64.0l/s

2.2 Proposed Foul Drainage

The 6 proposed dwellings fronting Water Street will connect directly on the Welsh Water Foul Sewer located within the road. The remaining 4 proposed dwelling will connect on the existing Welsh Water combined sewer crossing the site in the Northwest corner. The combined proposed Foul discharge rates for the development are as follows: -

0.076l/s average flow
0.46l/s peak flow

Based on SFA 7th edition: -

222 l/per/day
3 persons per house
Peak Flow Factor of 6

2.3 Proposed Surface Water Drainage

Permeability tests undertaken on site demonstrated that the ground was not suitable for drainage systems based on fully permeable ground techniques. Further geotechnical site investigation including infiltration testing to BRE365 will be undertaken as part of the site redevelopment

The surface water drainage for the proposal will comply with SAB/SuDS protocols, and work within the site layout & constraints of the proposed development.

The proposed combined surface water discharge rate from the development is 15.5l/s, allowing for a 100-year storm event with 40% allowance for climate change. Utilising the attenuation volumes offered through the sub-base makeup of both private and shared drive areas of the development. The proposed 15.5l/s offers a 30% betterment over the existing 1-year surface water discharge rates. The proposal also offers a betterment of over 75% over the existing 100-year storm event discharge rates. Plots 1-6 will incorporate individual discharge rates of max 1.0l/s for the 100 year event with 40% climate change allowance. Attenuation will be sited within the private drive subbase and individual plot flow control devices prior to direct connections into the existing culvert. This arrangement will allow the SuDs features and infrastructure to be kept private under the responsibility of the homeowners. Plots 7-10 will discharge into their private drives before connecting into the shared drive subbase, again allowing the plot infrastructure to be kept private. The proposed discharge rate for plots 7-10 and the shared drive will be max 9.5l/s, offering a total combined discharge rate of 15.5l/s for the 100 year event plus 40% climate

change allowance. The shared drive will be offered for adoption to the local authority SAB in accordance with Welsh Government statutory guidance.

The following sections detail the design principles that will be incorporated in the development proposals for the scheme, and the measures incorporated to satisfy the requirements for future SAB approval.

3.0 COMPLIANCE WITH THE NATIONAL SuDS STANDARDS S1 – S6

3.1 Standard S1 – Surface Water Run-off Destination

Priority Level 1

The use of a SuDS planter is proposed to intercept roof runoff and act as a point of source control. This will allow a limited re-use of rainwater to facilitate the planter and associated flora.

Priority Level 2: Infiltration to Ground

Ground conditions have been demonstrated to be unsuitable for the use of drainage systems based on permeable ground techniques. Further testing will be carried out to confirm ground water level.

Drainage blankets have been proposed beneath parking areas, which will principally serve to improve water quality for the runoff from these surfaces and act as primary attenuation facilities.

Priority Level 3: Discharge to a Surface Water Body

As outlined above, the provision will be to collect, treat, attenuate, and discharge to the culvert running in Water Street. This discharge route offers a direct connection and discharge to the Garnant Watercourse located circa 70m to the west of the site

Priority Level 4: Discharge to a Surface Water Sewer, Highway Drain, or other Drainage System

Deemed not required/applicable for this development.

Priority Level 5: Discharge to a Combined Sewer

Deemed not required/applicable for this development.

3.2 Standard S2 – Surface Water Runoff Hydraulic Control

SuDS System Sizing for 100 Year Return Period Rainfall Event, Plus Climate Change

It is proposed that the attenuation system be designed such that it is sufficient to store critical storm duration flows in the 100yr+40% event. Calculations are appended. As noted above there have been no reductions made to the sizing of the attenuation to reflect reductions afforded by the rain gardens or operation of the SuDS planters. Therefore, allowing for a worst-case scenario.

First 5mm Interception

Interception mechanisms will be required to ensure compliance with the requirement of zero runoff for the first 5mm rainfall for 80% of storm events during the summer and 50% in winter.

The provision of SuDS planter features and rain gardens along with flows through permeable drive subbase will contribute to the objective of first 5mm interception. Deemed to comply with the SAB standards.

Exceedance/Blockage

Any exceedance flows will follow surface topography. The topography is such that any excess flows will be directed in a north western directing towards the existing watercourse.

3.3 Standard S3 – Water Quality

The proposed SuDS treatment train devices (SuDS planters, Rain Gardens and Drainage Blankets) will deliver the requisite cleansing and filtration of runoff for this residential (low pollution hazard level) development.

3.4 Standard S4 – Amenity

The soft suds features (SuDS planters, Rain Gardens) will be carefully designed and integrated into the landscaping scheme for the development, to promote aesthetics and well-being as well as any designed drainage function.

Proposed soft landscaping & planting will be augmented and included within the development proposals (refer to Appendix F).

3.5 Standard S5 - Biodiversity

The soft suds features (Bio-Retention Planters, Rain Gardens etc) will be carefully designed with gradients/profiles, planting species and soil properties selected to ensure suitable habitat is delivered to promote biodiversity. Planting information is included within the SUDS planter operational information. These proposals will augment the green infrastructure element of the design proposals to demonstrate a robust response to this Standard.

3.6 Standard S6 - Construction, Operation and Maintenance and Structural Integrity

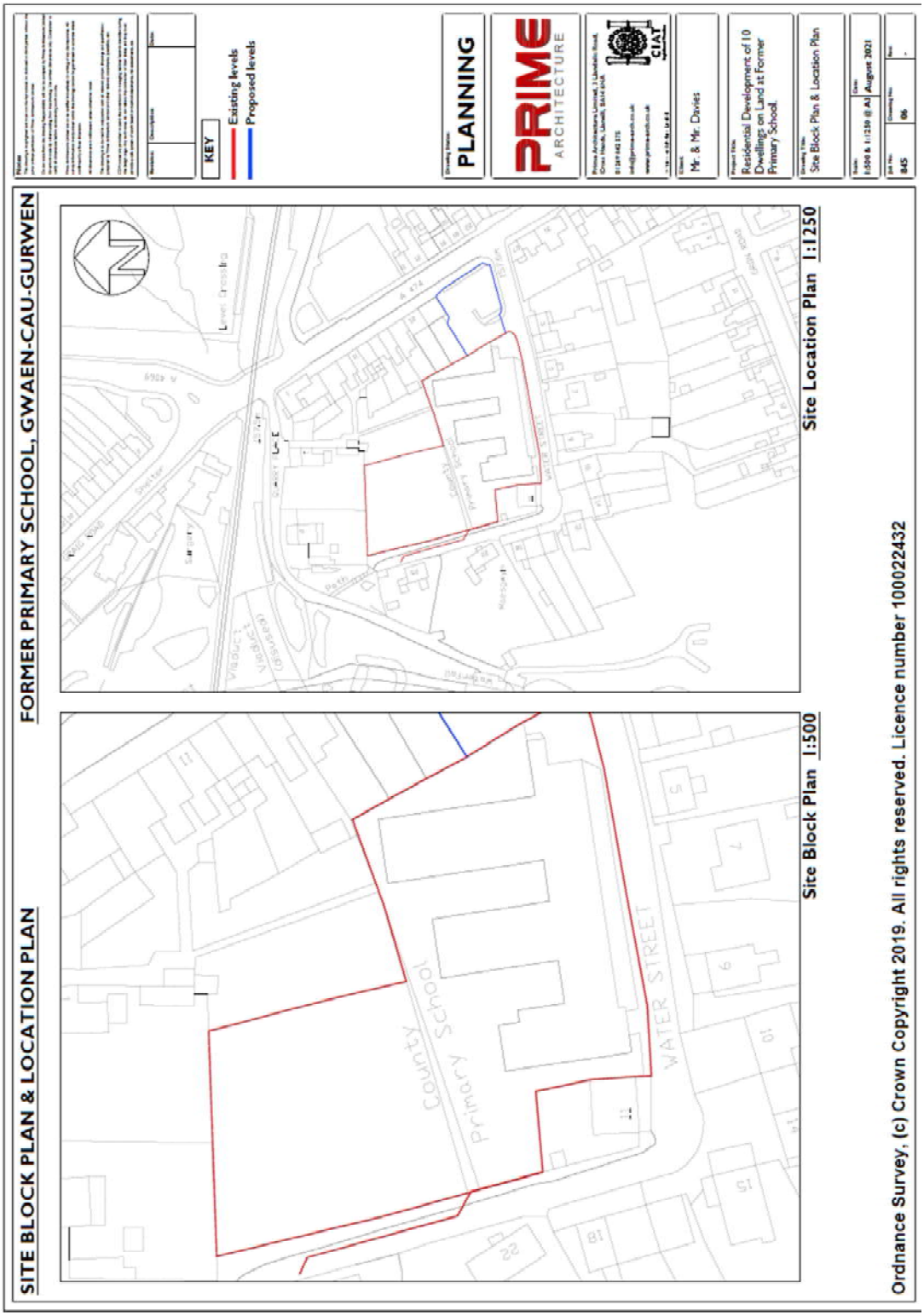
Much of the infrastructure maintenance will be dealt with at a property level as many of the systems employed are contained within a single curtilage application. The online attenuation within the shared drive sub-base) will be offered for adoption through the SAB application process if agreed during pre-SAB discussions. All of the proposed SuDS infrastructure is in accessible areas for ease of maintenance. The surface water network including any land drainage will be designed to be fully roddable and jettable, with suitably positioned rodding eyes and mini-access chambers.

The suds devices are low maintenance surface/shallow items with established regular maintenance regimes.

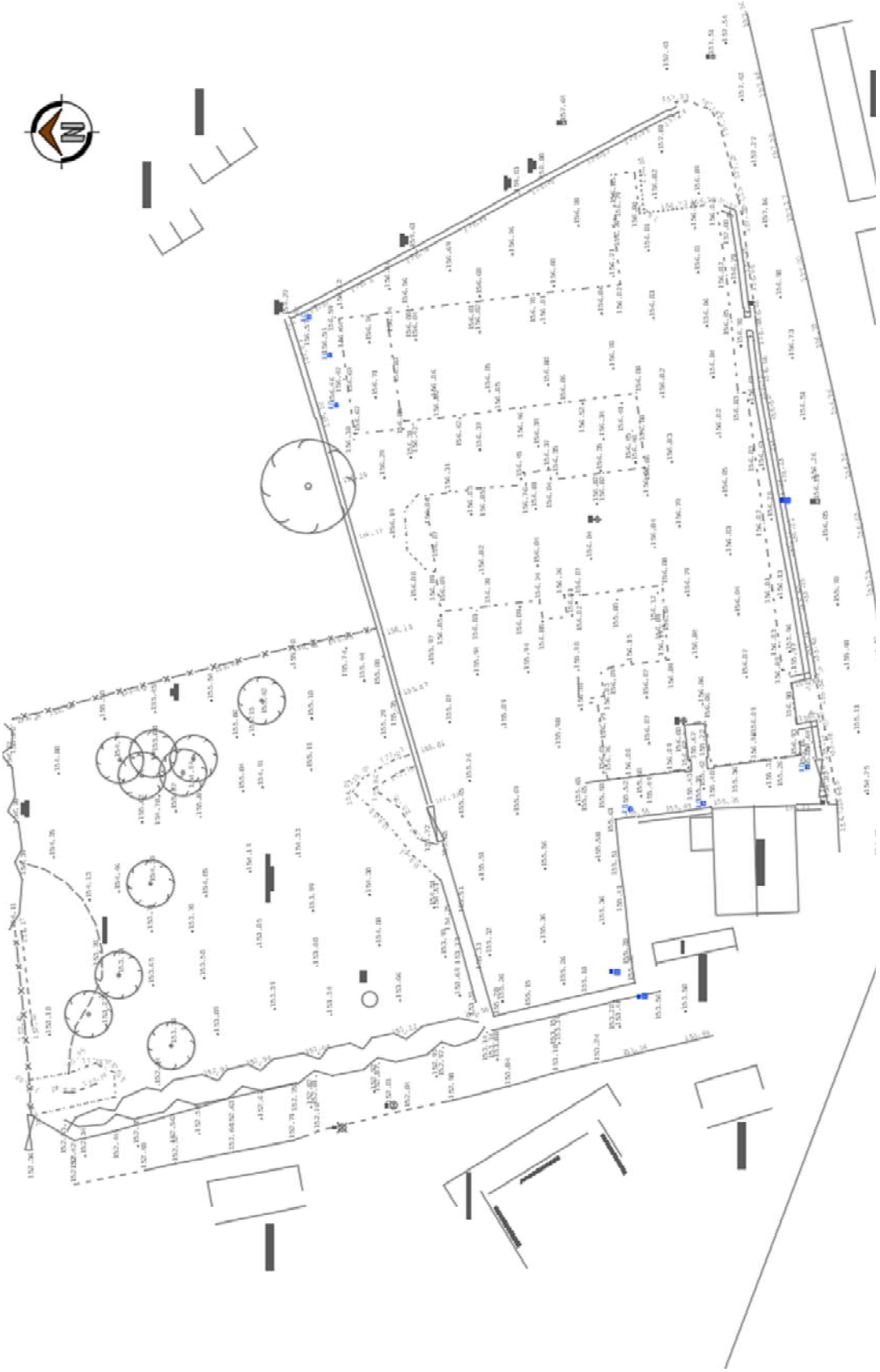
The proposed design solution has been designed in accordance with the SuDS manual and is generally served by shallow SuDs features and accessible details. There are no inherent safety issues with the proposed scheme.

The on-property drainage infrastructure will be managed by the Tenant. The principal issue is the management of the SuDS planters, which primarily involves periodic inspection to check the overflows are clear and ensure the free-flowing operation. These inspections will also serve to monitor the build-up of any silt in the system to facilitate any cleaning required.

APPENDIX A
EXSITING SITE LOCATION AND LAYOUT PLAN

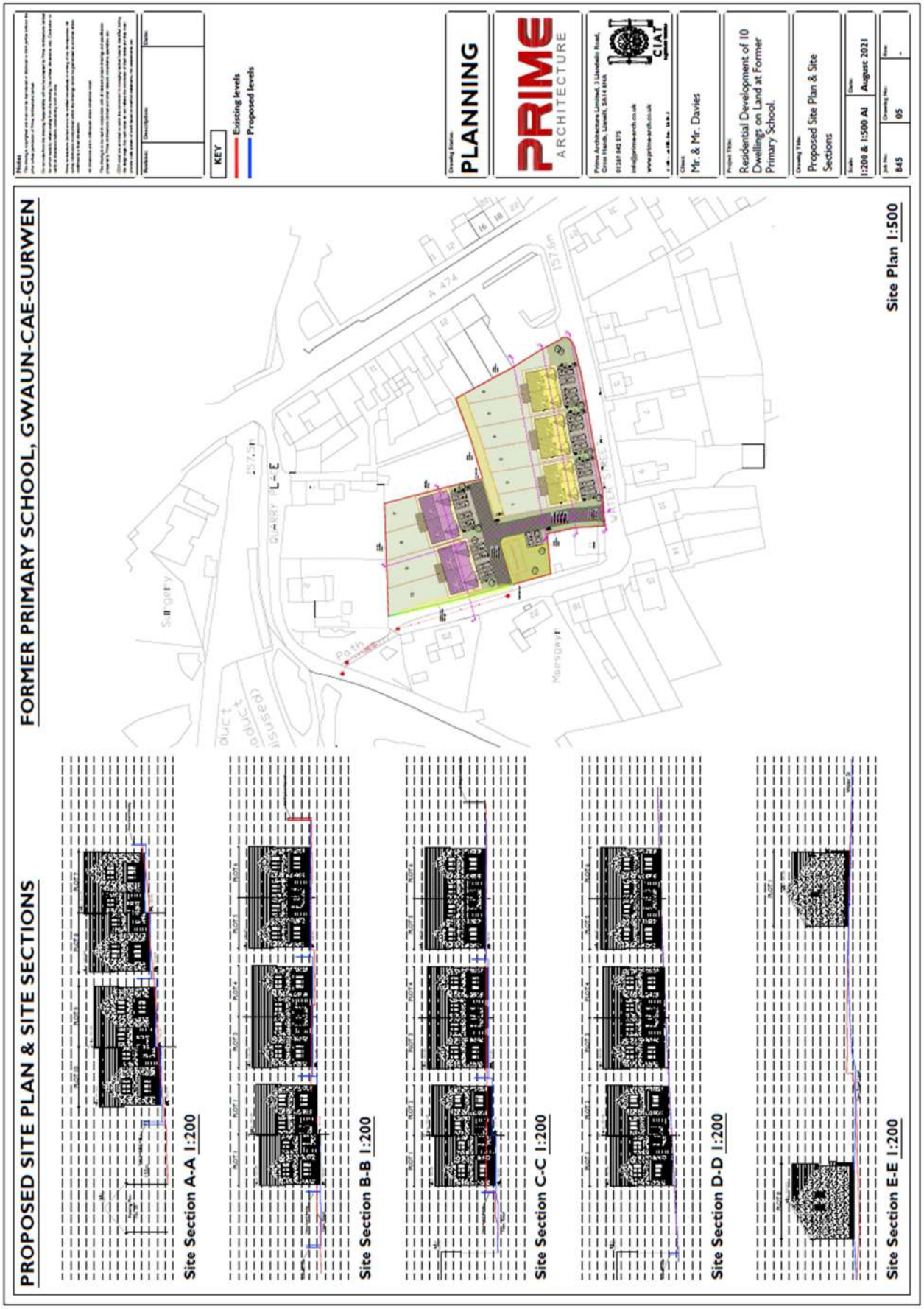

SITE BLOCK PLAN & LOCATION PLAN
FORMER PRIMARY SCHOOL, GWAEN-CAU-GURWEN
County School
Primary
WATER STREET
Site Block Plan 1:500
Site Location Plan 1:1250
Ordnance Survey, (c) Crown Copyright 2019. All rights reserved. Licence number 100022432
KEY
Existing levels
Proposed levels
PLANNING
PRIME
ARCHITECTURE
CIAT
Mr. & Mr. Davies
Residential Development of 10 Dwellings on Land at Former Primary School.
Site Block Plan & Location Plan
1:500 & 1:1250 @ A3 August 2021
845
06

APPENDIX B
EXISTING SITE TOPOGRAPHICAL SURVEY



APPENDIX C
EXISTING CULVERT SURVEY

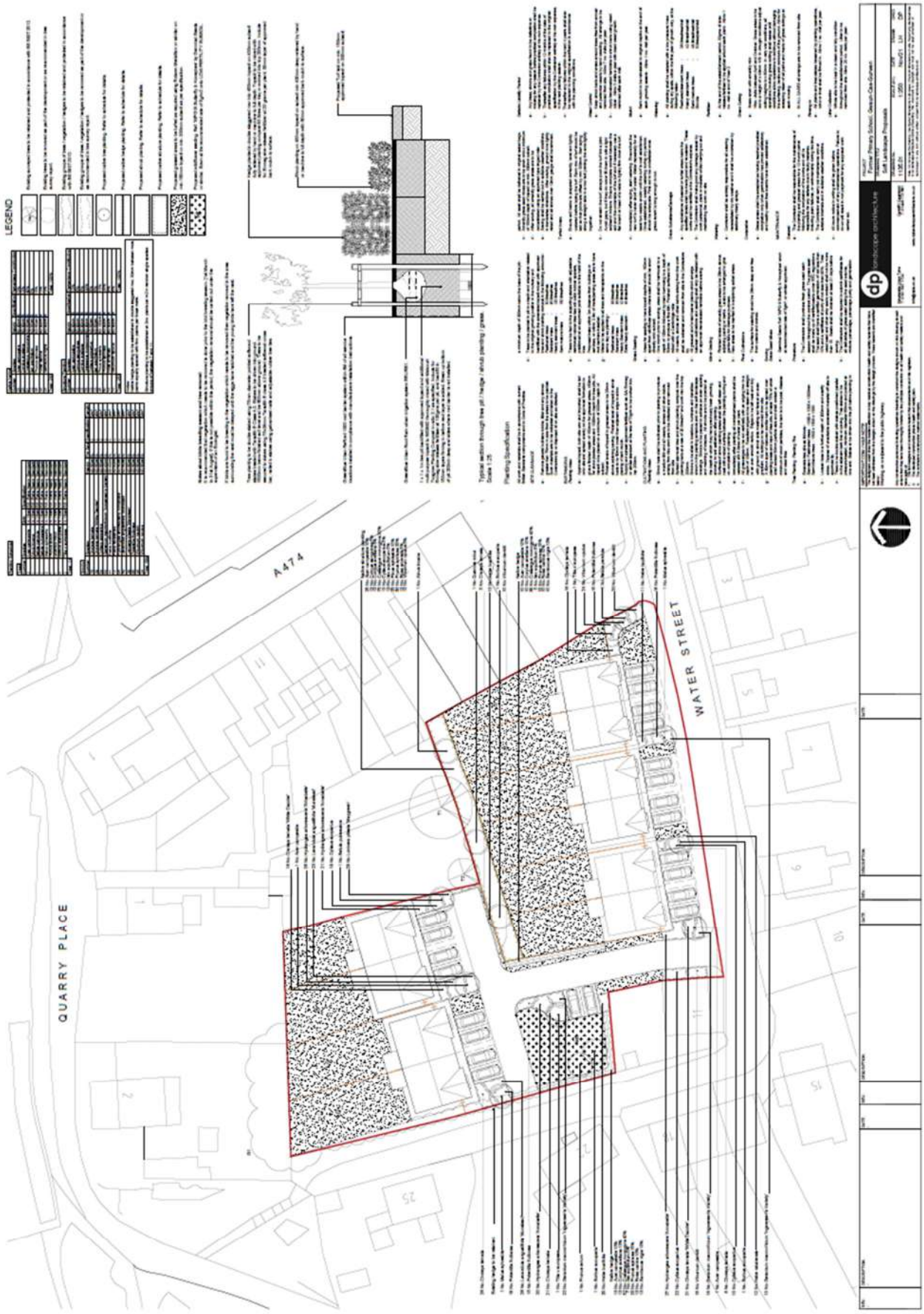
APPENDIX D
PROPOSED SITE LAYOUT


FORMER PRIMARY SCHOOL, GWAUN-CAE-GURWEN
PROPOSED SITE PLAN & SITE SECTIONS
Site Section A-A 1:200
Site Section B-B 1:200
Site Section C-C 1:200
Site Section D-D 1:200
Site Section E-E 1:200
Site Plan 1:500
KEY
Existing levels
Proposed levels
PLANNING
PRIME
ARCHITECTURE
Mr. & Mr. Davies
Residential Development of 10 Dwellings on Land at Former Primary School.
Proposed Site Plan & Site Sections
1:200 & 1:500 A1
August 2021
845
05

APPENDIX E
PROPOSED DRAINAGE STRATEGY PLAN

LEGEND - SUDS FEATURES
IMPERMEABLE SHARED DRIVE (SERVICE STRIP)
PERMEABLE DRIVE WITH SUB-BASE ATTENUATION
PIPED SURFACE WATER NETWORK
RODDING EYE ACCESS
CATCHPIT / SILT TRAP CHAMBER
BIO RETENTION PLANTER
DIFFUSER UNIT
RAIN GARDEN
HYDROBREAK FLOW CONTROL CHAMBER
EXISTING WATERCOURSE
EXISTING CULVERT
EXISTING DCWW ADOPTED FOUL NETWORK
GENERAL NOTES
WATER STREET
Plots 1-6 (1.0l/s per plot)
Discharge Rate Max 6.0l/s
Plots 7-10 and Shared Drive
Discharge Rate Max 9.5l/s
Total Discharge Rate Max 15.5l/s
Waterfall
QuadConsult
Mr D Davies
Gwaun Cau Gerwen
Drainage Strategy Plan
COMMENT
21505-C-001-0

APPENDIX F
LANDSCAPE ARCHITECTS LAYOUT PLAN


LEGEND
A474
QUARRY PLACE
WATER STREET

APPENDIX G
EXISTING BROWNFILED SURFACE WATER DISCHARGE RATES

QuadConsult Ltd		Page 1
Columbus House Greenmeadow Springs Business... Cardiff, CF15 7NE	Former School Site GCG Ammanford	Micro Drainage
Date 15/12/2021 10:57 File 21505-CA-702-BROWNFIELD...	Designed by ML Checked by	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.202	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	65	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.156	4-8	0.044

Total Area Contributing (ha) = 0.200

Total Pipe Volume (m³) = 0.398

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Columbus House Greenmeadow Springs Business... Cardiff, CF15 7NE	Former School Site GCG Ammanford	Micro Drainage
Date 15/12/2021 10:57 File 21505-CA-702-BROWNFIELD...	Designed by ML Checked by	
Innovyze	Network 2020.1.3	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.200
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.100 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%	30/15 Summer				156.113
S1.001	S2	15 Winter	1	+0%	30/15 Summer				156.013

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.112	0.000	0.49			21.9	OK	
S1.001	S2	-0.112	0.000	0.50			22.2	OK	

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Columbus House Greenmeadow Springs Business... Cardiff, CF15 7NE	Former School Site GCG Ammanford	Micro Drainage
Date 15/12/2021 10:57 File 21505-CA-702-BROWNFIELD...	Designed by ML Checked by	
Innovyze	Network 2020.1.3	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.200
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.100 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+0%	30/15 Summer				156.281
S1.001	S2	15 Winter	30	+0%	30/15 Summer				156.147

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.056	0.000	1.15			51.2	SURCHARGED	
S1.001	S2	0.022	0.000	1.14			50.8	SURCHARGED	

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Columbus House Greenmeadow Springs Business... Cardiff, CF15 7NE	Former School Site GCG Ammanford	Micro Drainage
Date 15/12/2021 10:57 File 21505-CA-702-BROWNFIELD...	Designed by ML Checked by	
Innovyze	Network 2020.1.3	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.200
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.100 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+0%	30/15 Summer				156.442
S1.001	S2	15 Winter	100	+0%	30/15 Summer				156.227

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.217	0.000	1.45			64.4	SURCHARGED	
S1.001	S2	0.102	0.000	1.44			64.0	SURCHARGED	

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APPENDIX H
PROPOSED SURFACE WATER CALCULATIONS

Individual Plot (1-6) Calculations (Max discharge rate 1.0l/s)

CAUSEWAY	Quadconsult Ltd	File: 21505-CA-703-SINGLE PLOT ATTENUATIO Network: Storm Network Mark Llewellin 20/12/2021	Page 1

Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	0.900
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	0.750	Connection Type	Level Soffits		
Time of Entry (mins)	10.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.010	10.00	157.300	450	229.202	156.181	0.600
S2			157.300	450	233.287	156.868	0.670
S3			157.300	150	234.743	149.633	0.794

Node S2 Online Orifice Control

Flap Valve	x	Invert Level (m)	156.630	Design Flow (l/s)	1.0	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Depth (m)	0.600	Diameter (m)	0.025		

Node S1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	5.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	156.700	Length (m)	4.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	49	Slope (1:X)	60.0		

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CAUSEWAY	Quadconsult Ltd	File: 21505-CA-703-SINGLE PLOT ATTENUATIO Network: Storm Network Mark Llewellin 20/12/2021	Page 2

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	S1	44	156.764	0.064	0.8	0.2171	0.0000	OK
60 minute winter	S2	44	156.764	0.134	0.9	0.0212	0.0000	SURCHARGED
15 minute summer	S3	1	156.506	0.000	0.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S1	1.000	S2	0.9	0.446	0.113	0.0271	
60 minute winter	S2	Orifice	S3	0.5				1.2

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CAUSEWAY	Quadconsult Ltd	File: 21505-CA-703-SINGLE PLOT ATTENUATIO Network: Storm Network Mark Llewellin 20/12/2021	Page 3

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	S1	48	156.898	0.198	1.8	1.0856	0.0000	SURCHARGED
60 minute winter	S2	48	156.897	0.267	0.7	0.0424	0.0000	SURCHARGED
15 minute summer	S3	1	156.506	0.000	0.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S1	1.000	S2	0.7	0.446	0.095	0.0324	
60 minute winter	S2	Orifice	S3	0.7				2.8

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CAUSEWAY	Quadconsult Ltd	File: 21505-CA-703-SINGLE PLOT ATTENUATIO Network: Storm Network Mark Llewellin 20/12/2021	Page 4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	S1	51	157.106	0.406	3.2	2.4380	0.0000	FLOOD RISK
60 minute winter	S2	51	157.105	0.475	1.1	0.0755	0.0000	FLOOD RISK
15 minute summer	S3	1	156.506	0.000	0.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S1	1.000	S2	1.1	0.461	0.137	0.0324	
60 minute winter	S2	Orifice	S3	0.9				5.0

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CAUSEWAY	Quadconsult Ltd	File: 21505-CA-705-Shared Drive ATTENUATIO Network: Storm Network Mark Llewellin 20/12/2021	Page 1

Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	0.900
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	0.750	Connection Type	Level Soffits		
Time of Entry (mins)	10.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.038	10.00	4.0	157.300	450	229.202	156.181	0.600
S2				157.300	1200	233.287	156.868	0.670
S3				157.300	150	234.743	149.633	0.794

Node S2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	156.630	Product Number	CTL-SHE-0147-9500-0600-9500
Design Depth (m)	0.600	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	9.5	Min Node Diameter (mm)	1200

Node S1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	3.600	Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	156.700	Length (m)	50.000	Inf Depth (m)
Safety Factor	2.0	Time to half empty (mins)	24	Slope (1:X)	60.0	

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CAUSEWAY	Quadconsult Ltd	File: 21505-CA-703-SINGLE PLOT ATTENUATIO Network: Storm Network Mark Llewellin 20/12/2021	Page 2

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	S1	44	156.764	0.064	0.8	0.2171	0.0000	OK
60 minute winter	S2	44	156.764	0.134	0.9	0.0212	0.0000	SURCHARGED
15 minute summer	S3	1	156.506	0.000	0.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S1	1.000	S2	0.9	0.446	0.113	0.0271	
60 minute winter	S2	Orifice	S3	0.5				1.2

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CAUSEWAY	Quadconsult Ltd	File: 21505-CA-705-Shared Drive ATTENUATIO Network: Storm Network Mark Llewellin 20/12/2021	Page 3

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S1	25	156.873	0.173	12.3	1.2354	0.0000	OK
60 minute winter	S2	39	156.876	0.246	20.6	0.2780	0.0000	SURCHARGED
15 minute summer	S3	1	156.506	0.000	9.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	S1	1.000	S2	14.6	0.572	0.215	0.1503	
60 minute winter	S2	Hydro-Brake®	S3	9.5				82.5

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CAUSEWAY	Quadconsult Ltd	File: 21505-CA-705-Shared Drive ATTENUATIO Network: Storm Network Mark Llewellin 20/12/2021	Page 4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	S1	48	157.102	0.402	16.1	5.8293	0.0000	FLOOD RISK
60 minute winter	S2	48	157.099	0.469	15.2	0.5308	0.0000	FLOOD RISK
15 minute summer	S3	1	156.506	0.000	9.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S1	1.000	S2	15.2	0.572	0.225	0.1647	
60 minute winter	S2	Hydro-Brake®	S3	9.5				90.6

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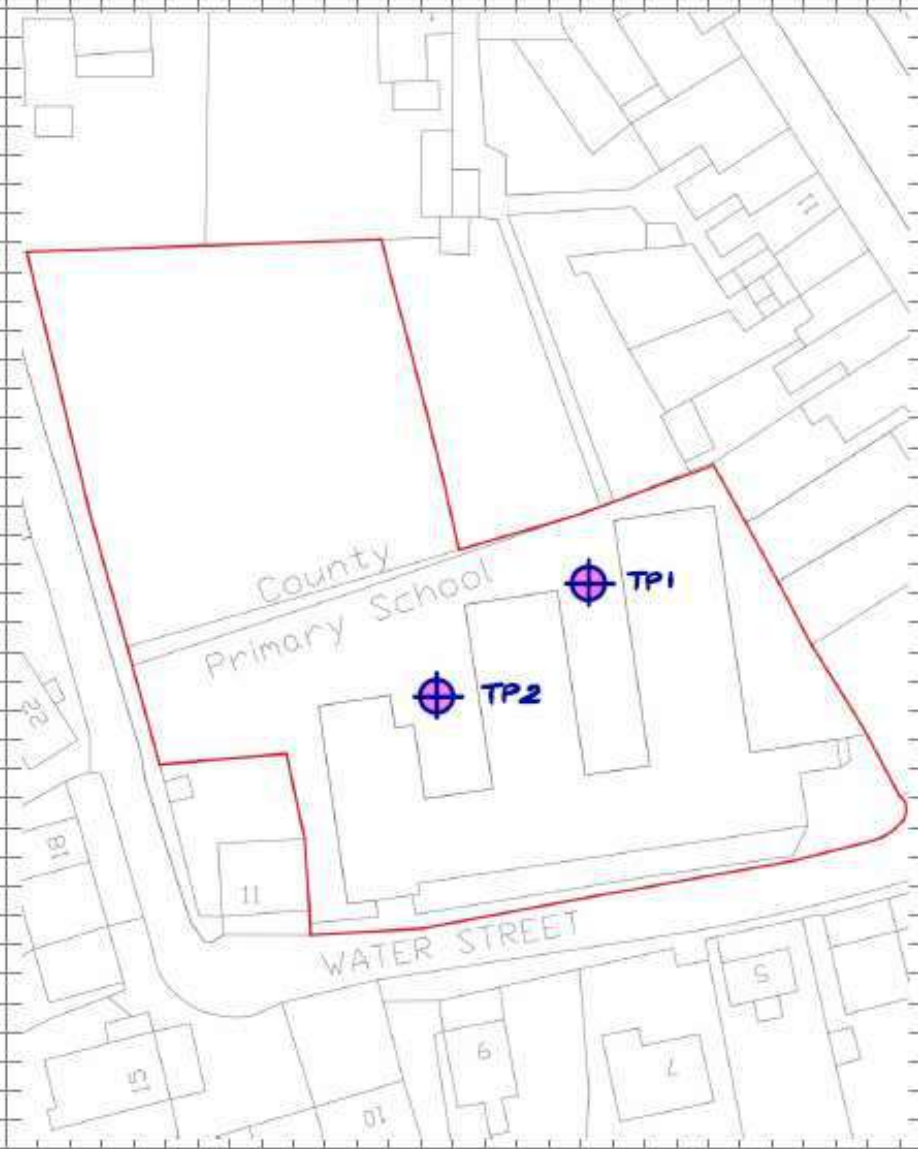
APPENDIX I
INFILTRATION TESTING RESULTS

bg	Project : FORMER PRIMARY SCHOOL, GCG				Ref : 3129
	Title : TRIAL PIT LOCATIONS				
By :	Ckd :	Appd :	Date :	Doc ref :	Revision :

Ref	Calculations	Output



Project :	Ref :
Former Primary School, CGC	3129
Title : Soakaway Test Results - TP1	

By :	Ckd :	Appd :	Date :	Doc ref :	Revision :
HG	NG	NG	26/03/2019		

Ref	Calculations	Output

depth of pit 2500mm
width of pit 450mm
length of pit 1500mm

Test Photos

Test Pit 1

Test Results

Test 1

Time	Depth to water (mm)
10.09	710
10.26	710
10.54	710
11.09	710
11.24	710
11.39	710
12.07	710
13.35	710
14.00	710
15.05	710
16.00	710
16.34	710

Project :					Ref :
Former Primary School, CGC					3129
Title : Soakaway Test Results - TP1					
By : HG	Ckd : NG	Appd : NG	Date : 28/03/2019	Doc ref :	Revision :

Ref	Calculations	Output

Test Photos

Test Pit 2

depth of pit 2500mm
width of pit 450mm
length of pit 1500mm

Test Results

Test 1

Time	Depth to water (mm)	
10.21	950	(after filling)
10.40	940	
10.52	940	
11.06	940	
11.17	940	
11.24	940	
11.39	940	
12.07	940	
13.35	940	
14.00	940	
15.05	940	
16.00	940	
16.34	940	