WASTE TRANSFER STATION, STANDARD ROAD, BUCKLEY

DRAINAGE ASSESSMENT
FINAL REPORT V1.1

November 2020

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Report Title	**Waste Transfer Station, Standard Road, Buckley** Drainage Assessment Final Report v1.1
Client	Axis PED Ltd
Date of issue	13 November 2020

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1 INTRODUCTION

1.1 Purpose of Report

Weetwood Services Ltd ('Weetwood') has been instructed by Axis PED Ltd to prepare a Drainage Assessment (DA) report to accompany a detailed planning application for the proposed redevelopment of the Material Waste Transfer Station (WTS) off Standard Road, Spencer Industrial Estate, Buckley.

The assessment has been undertaken in accordance with the requirements of Technical Advice Note 15 (TAN15).

1.2 Structure of the Report

The report is structured as follows:

Section 1	Introduction and report structure
Section 2	Provides background information relating to the development site, the development proposals, ground conditions, existing site access arrangements
Section 3	Presents national and local drainage planning policy
Section 4	Addresses the effect of the proposed development on surface water runoff and presents an illustrative surface water drainage scheme to ensure that surface water runoff is sustainably managed and flood risk is not increased elsewhere
Section 5	Addresses the effect of the proposed development on the existing public foul drainage infrastructure and the receiving wastewater treatment works
Section 6	Presents a summary of key findings and the recommendations

2 SITE DETAILS AND PROPOSED DEVELOPMENT

2.1 Site Location

The approximately 0.85 hectare (ha) site is located at Spencer Industrial Estate at land off Standard Road, Buckley at Ordnance Survey National Grid Reference SJ 288 650, as shown in **Figure 1**.

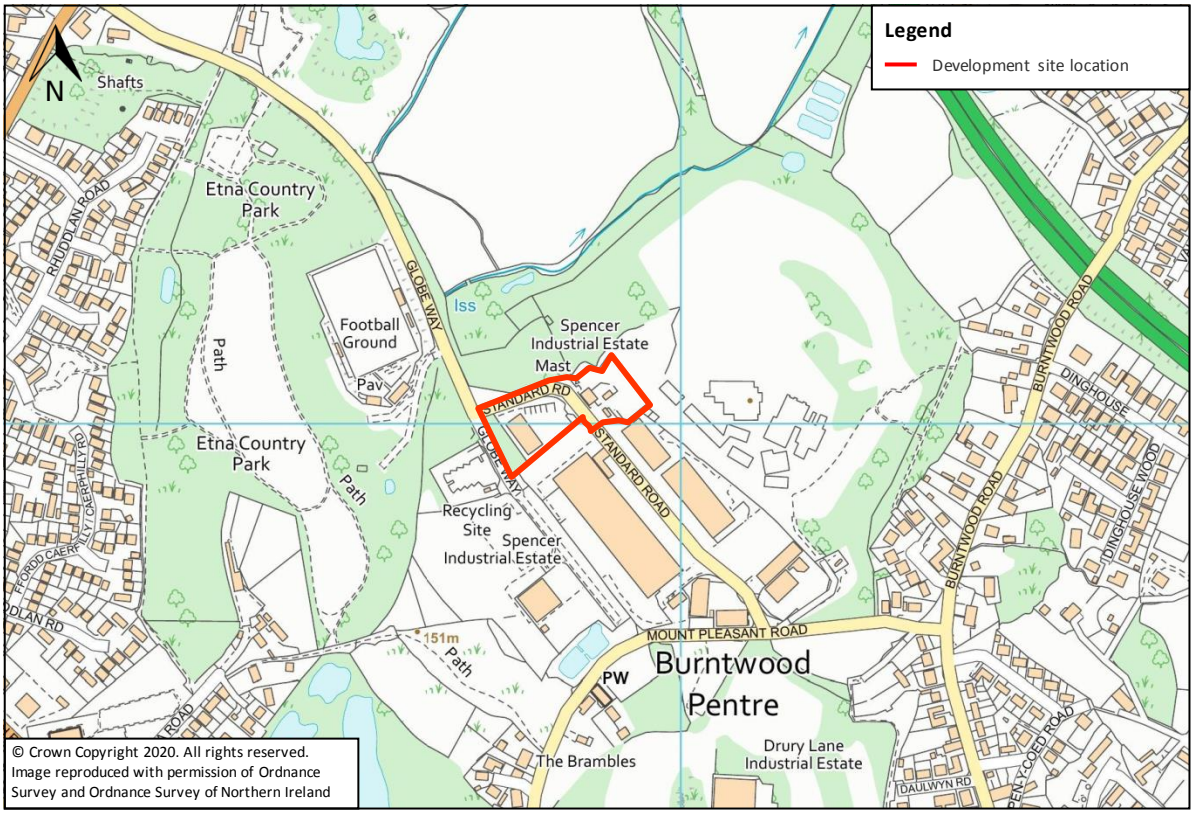


Figure 1: Site Location

2.2 Existing and Proposed Development

The existing site is occupied by a Waste Transfer Station (WTS). The proposed development would involve the demolition of the existing facility and construction of larger WTS and associated development. Other alterations will include modifications to the local road layout, construction of additional car parking spaces and a welfare and visitor centre (**Appendix A**). TAN15 classifies general industry development as Less Vulnerable to flood risk.

2.3 Ground Conditions

According to the Soilscapes soils dataset produced by the Cranfield Soil and AgriFood Institute[1], soil conditions at the site and within the surrounding area are 'slowly permeable seasonally wet acid loamy and clayey soils' which are known to impeded drainage.

British Geological Survey (BGS) mapping of surface geology[2] indicates the underlying bedrock formation comprises of Pennine middle coal measures, overlain by superficial geology of Devensian till. BGS Borehole

1 www.landis.org.uk/soilscapes/
2 http://mapapps.bgs.ac.uk/geologyofbritain/home.html

records[3] indicate 5 boreholes in the vicinity of the site. These borehole records show made ground presumed as colliery backfill material overlaying slate clay and sandstone. A Stage 1 contamination assessment undertaken by Smith Grant LLP, indicates the site is likely to be underlain by colliery spoil and other man made waste.

According to the Natural Resources Wales website, shows the site is not shown to be located within a designated groundwater source protection zone.

2.4 Site Levels

A topographic survey of the site has been undertaken by PM Surveys UK and is provided in **Appendix B**. Site levels range from 141.67 – 144.40 metres Above Ordnance Datum (m AOD). Higher ground is formed by a raised earth bund along the northern boundary of the WTS site and the existing alignment of Standard Road. Levels generally fall to the east.

2.5 Access and Egress

The current access and egress to the site is from the north and south east via Standard Road off Globe Way, Spencer Industrial Park. Levels along this road range from 142.49 – 143.15m AOD. Access to the existing facility is approximately 142.49m AOD.

[3] https://www.bgs.ac.uk/products/onshore/SOBI.html

3 PLANNING POLICY AND GUIDANCE

3.1 National Planning Policy and Guidance

Planning Policy Wales (PPW) sets out government's planning policies for Wales and how these are expected to be applied. TAN15 provides technical guidance which supplements the policy within PPW and seeks to ensure that flood risk is taken into account at all stages in the planning process and is appropriately addressed.

National policy requires that planning applications for new development proposals should incorporate sustainable drainage systems (SuDS) to appropriate operational standards and with maintenance arrangements in place unless there is clear evidence that this would be inappropriate.

Statutory standards for sustainable drainage were published by Welsh Government in October 2018[4] in relation to the design, construction, operation and maintenance of sustainable drainage systems serving new developments of more than one house or where the construction area is equal to or greater than 100 square metres (m^2). These standards set out how surface water runoff generated during the present day 1 in 1, 1 in 30 and 1 in 100 AEP rainfall events and for events exceeding the present day 1 in 100 AEP event should be managed, how peak runoff rates should be restricted and how runoff volumes should be controlled. Approval is subsequently required from the SuDS Approval Body (SAB) before construction can commence.

3.2 Local Planning Policy and Guidance

3.2.1 Unitary Development Plan (UDP), Flintshire County Council, September 2011

Flintshire County Council's (FCC) Unitary Development Plan (UDP) is the adopted development plan for the 15 year period running from 2000 to 2015. Although the adopted UDP expired at the end of 2015, it remains the adopted development plan for the county.

FCC is currently in the process of preparing a Local Development Plan (LDP) for the county, which will focus on delivering sustainable development within the county for the period 2015 to 2030.

The following policies are relevant in respect of flood risk and drainage:

Policy EWP 17; Flood Risk

Paragraph 19.79, which pertains to the use of SuDS, states:

'The use of sustainable urban drainage systems (SuDS) can make a significant contribution to reducing the potential for flooding and reducing the scale of flood events. Where practicable, the use of SuDS should be considered in all new development proposals, but particularly within and adjacent to areas which have an existing or potential flooding problem. The use of SuDS will also be appropriate in environmentally sensitive locations in terms of bringing about environmental and amenity enhancements.'

3.3 Environmental Permitting and Land Drainage Consent

Under the Environmental Permitting (England and Wales) Regulations 2016 an Environmental Permit for Flood Risk Activities[5] is required from Natural Resources Wales for any permanent or temporary works:

- In, over or under a designated main river
- Within 8 m of the top of bank of a designated main river or of the landward toe of a flood defence (16 m if it is a tidal main river or a sea defence).

[4] Statutory Standards for Sustainable Drainage Systems – designing, constructing, operating and maintaining surface water drainage systems (https://gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf)

[5] https://naturalresources.wales/permits-and-permissions/environmental-permits/?lang=en

In addition, any permanent or temporary works within the floodplain of a designated main river may also require an Environmental Permit for Flood Risk Activities. A permit is separate to and in addition to any planning permission granted.

Land drainage consent may be required from the lead local flood authority for work to an ordinary watercourse.

If the location of an activity is on an ordinary watercourse that lies within an Internal Drainage District, land drainage consent may be required from Natural Resources Wales.

Undertaking activities controlled by local byelaws also requires the relevant consent.

4 SURFACE WATER MANAGEMENT

4.1 Surface Water Drainage at the Existing Site

According to Dŵr Cymru Welsh Water (DCWW) sewer records (**Appendix C**) there are no adopted assets within the site boundary. The nearest surface water sewer asset is a 225 mm highway drain approximately 20.0 metres to the south of the site.

A utility survey undertaken by CMS Surveys (**Appendix D**) in September 2020 indicates a number of surface water assets are present within and adjacent to the WTS site. The survey suggests there are two main outfalls for surface water runoff from the site – a 225 mm combined sewer and a 475 mm surface water sewer.

Surface water runoff within the existing WTS site is collected by a number of gullies and channel drains. Some of these drainage assets are directed through an interceptor which then discharges to a combined sewer manhole to the south east of the site via a 150 mm diameter surface water sewer. The combined sewer to the south east is 225 mm diameter and is understood to ultimately flow through Buckley Industrial Estate before discharging to a DCWW public combined sewer in Mount Pleasant Road approximately 275 m to the south east.

A 150 mm surface water sewer, increasing in diameter to 225 mm, collects surface water runoff from Standard Road within the site along with runoff from part of the eastern half of the existing development surrounding the weigh bridge. This surface water drainage network connects into a manhole adjacent to the substation within the site. The outlet from this chamber is a 475 mm diameter surface water sewer, which discharges to the north east and off site. According to the CMS Survey team, the chamber was in excess of 8.0 metres in depth and was unable to be accurately surveyed.

4.1.1 Existing Runoff Rates

The site has a total area of 0.85 ha of which 0.70 ha currently comprises impermeable areas and 0.15 ha permeable areas.

The greenfield runoff rate for the site has been calculated using the ICP SUDS method within MicroDrainage. Runoff rates from existing impermeable areas have been calculated using the Modified Rational Method. Details of the input parameters and the output results are provided in **Appendix E** and **Appendix F** respectively**.** The runoff rates from the existing site are presented in **Table 1**.

Table 1: Peak Runoff Rate - Existing Site

AEP of rainfall event	Permeable Runoff Rate 0.15 ha (l/s)	Impermeable Runoff Rate 0.70 ha (l/s)	Total (l/s)
1 in 1	0.7	53.7	54.4
QBAR / 1 in 2	0.8	69.5	70.3
1 in 30	1.4	131.1	132.5
1 in 100	1.7	168.1	169.8

4.2 Surface Water Drainage at the Redeveloped Site

4.2.1 Disposal of Surface Water (Standard S1)

In accordance with Welsh Government guidance[6], surface water runoff should be disposed of according to the following hierarchy: Rainwater collected for use; Into the ground (infiltration); To a surface water body; To a surface water sewer or highway drain; To a combined sewer.

[6] Footnote 4

As part of the drainage strategy on site, a rainwater harvesting system could be considered to collect non-potable water for reuse where possible. This could include the installation of water butts at the visitor's centre, which would reduce demand on potable water supplies. There is minimal scope for the rainwater harvesting at the proposed development. Therefore, Priority Level 1 has been discounted as the primary method for disposal of surface water.

As detailed in **Section 2.3** the site is underlain by soils with impeded drainage. As such the disposal of surface water via infiltration is unlikely to be feasible. Furthermore, a contamination assessment was undertaken by Smith Grant LLP, in January 2020. The assessment indicated the adjacent site consisted of a former colliery containing spoil and other landfill waste, which may be situated adjacent or beneath the site. Given the proposed land use and the reported ground conditions beneath the site, it is assessed that infiltration is an unsuitable method of disposal and Priority Level 2 has been discounted.

There is no adjacent watercourse, so Priority level 3 has been discounted. It is subsequently proposed to direct all surface water runoff from the redeveloped site to the 475mm diameter surface water sewer to the north east of the site i.e. Priority Level 4. No surface water drainage will discharge to the combined sewer following redevelopment.

4.2.2 Post Development Impermeable Area

The area of impermeable surfaces within the proposed development has been calculated to decrease to 0.69 ha, based on the proposed realignment of the private road network at the site.

4.2.3 Peak Flow Control (Standard S2)

It is proposed to restrict surface water runoff to the existing 1 in 1 AEP event rate with a 30% betterment post development, as outlined in **Table 1**. As such runoff will be restricted to 37.6 l/s.

4.2.4 Volume Control (Standard S2)

The volume of runoff is not expected to increase following development given that impermeable areas at the site will not be increasing. In addition, it is proposed to restrict the peak runoff rate to the existing 1 in 1 AEP event rate with a 30% betterment which will also reduce the runoff volume of the site. The 1 in 30 and 1 in 100 AEP events will see a betterment of 71% and 78% respectively.

4.2.5 Attenuation Storage

Attenuation storage will be provided to restrict surface water runoff generated across roofs and hardstanding.

The attenuation storage facility has been modelled using the detailed design module of MicroDrainage (**Appendix G**). The required storage volume has been sized to store the 1 in 100 AEP rainfall event including a 30% increase in rainfall intensity to allow for climate change.

Assuming a peak discharge rate of 37.6 l/s, a total storage volume of up to 325.6 m^3 would be required across the drainage network. The storage volume could be primarily accommodated within a 164.2 m^3 geocellular structure, with an area of 216.0 m^2 and a depth of 0.8 m.

A swale provides some additional storage of up to 124.5 m^3. This would be primarily used as conveyance SuDS feature to collect surface water runoff from the new proposed road layout, whilst also providing some initial treatment. Pipes and manholes provide up to 36.9 m^3 of the drainage network storage volume.

A preliminary drainage layout is provided in **Appendix H**.

4.2.6 Exceedance Routes

Flows resulting from rainfall in excess of the 1 in 100 AEP rainfall event including an allowance for climate change will be managed in exceedance routes. It is assumed that as the development proposals progress, the

design of the site would ensure flood flows are directed towards carriageways, with the site being profiled to ensure that flood flows are directed away from built development.

4.2.7 Water Quality and Pollution Control (Standard S3)

In accordance with the CIRIA C753 SuDS Manual's simple index approach, the site will generate a 'high' pollution hazard level. Although there is limited scope to provide SuDS features, the incorporation of a swale provides treatment for the new access road predominantly. In order to provide suitable treatment for the whole drainage system, a Class 1 Full Retention Separator will be provided upstream of the main cellular attenuation facility. This will provide the main treatment for surface water from the site. Additional treatment will be provided by catchpit manholes and silt traps within drainage channels and gullies.

4.2.8 Amenity and Biodiversity (Standard S4 and Standard S5)

As outlined in **Section 4.2.5**, the required storage volume will be accommodated within geocellular storage and within the swale on site.

The swale would normally be dry and in certain situations the land may also function as a recreational facility or a habitat for wildlife[7]. It is generally recommended that native vegetation is used to maximise the biodiversity value of these areas. However, it may be valuable to include some non-native vegetation to support pollinators, such as butterflies and bees.

The implementation of soft landscaping will also help provide users of the site with health and wellbeing benefits.

4.2.9 Adoption and Maintenance of SuDS (Standard S6)

The pipe network and SuDS elements within the curtilage of the WTS site would be the responsibility of the owner of the property or may be put forward for adoption with the local SuDS Approving Body (SAB). An indicative maintenance schedule is presented in **Table 2**.

Table 2: Maintenance Requirements

Schedule	Required action	Frequency
Geocellular attenuation storage tank		
Regular maintenance	Inspect and identify any areas that are not operating correctly	Monthly for 3 months, then annually
	Remove debris from the catchment surface	Monthly
	Remove sediment from internal forebays	Annually, or as required
Remedial action	Repair inlet/outlet and vents	As required
Monitoring	Inspect catchpit manholes and note rate of sediment accumulation	Monthly in the first year and then annually
	Inspect inlet/outlet and vents to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years, or as required
Swale		
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required

[7] https://www.susdrain.org/delivering-suds/using-suds/suds-components/swales-and-conveyance-channels/Swales-conveyance-channels.html

Schedule	Required action	Frequency
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear If required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly, or as required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Remedial action	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required, or if bare soil is exposed over 10% or more of the swale treatment area
Monitoring	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils and petrol residues using safe standard practices	As required

5 FOUL WATER MANAGEMENT

5.1 Existing Assets

The Dŵr Cymru Welsh Water (DCWW) public sewer records (**Appendix C**) indicate that there are no foul assets within or adjacent to the site. The following wastewater assets are recorded in the vicinity of the site:

- A 225 mm foul sewer approximately 30.0 m to the south of the site south in Globe Way which flows in a south-easterly direction towards Mount Pleasant Road.
- A 225 mm combined sewer approximately 275m to the south east, which flows along Mount Pleasant Road in an easterly direction.

The utility survey (**Appendix D**) indicates that the site is served by an existing 225 mm diameter foul water sewer, which discharges to the 225 mm combined sewer adjacent to the substation in the south east corner of the site along Standard Road. This is believed to ultimately connect to the DCWW public combined sewer in Mount Pleasant Road.

5.2 Foul Water Loadings

The proposed welfare and visitors centre is anticipated to have minimal increase on foul water loadings at the development. Potential site occupancy rates have yet to be confirmed but it has been assumed that, based on a maximum number of 30 people per day on site, that a peak foul loading would be approximately around 0.2 l/s. This would have minimal impact on the local combined sewer capacity.

The client has confirmed that all waste on site is dry kerbside recyclable material and therefore no leachate drainage is required for the site.

5.3 Point of Connection

Foul flows will discharge into the existing 225 mm combined sewer in Standard Road following redevelopment. A new manhole upstream of the combined manhole will be constructed to receive foul drainage from the proposed redevelopment. See the preliminary drainage layout in **Appendix H** for further details.

6 SUMMARY AND RECOMMENDATIONS

This report has been prepared on behalf of Axis PED Ltd and relates to the proposed redevelopment of the Material Recycling Facility at land at Spencer Industrial Estate, Standard Road, Buckley.

This report has demonstrated that the proposed development may be completed in accordance with the requirements of planning policy.

Surface water runoff from the developed site can be sustainably managed in accordance with planning policy and will discharge to the local surface water sewer.

Foul water drainage will discharge to the local combined sewer network as per existing point of connection.

APPENDIX A

Development Proposals

Mast

Weigh bridge

BALER STORAGE

INCINE

INCINE

CONCRETE

CONTAINER

TANK

TANK

INCINE

INCINE

CRANE

TURBINE

Electric Charging Station Area

FOOTPATH

41,94

STANDARD ROAD

EXIT FOR RCV

FOOD WASTE

37,71

RANGE

PAPER

20,85

PLASTIC

20,95

NO ENTRY

11,86

STRAIGHT AHEAD / STACKING LANE

SLIGHT RAMP

GLASS

20,63

GLASS SKIP

63,59

WELFARE / VISITOR CENTRE

BUS STOP

KEEP CLEAR

NO RAMP

SLOW ARAF

STRAIGHT AHEAD / STACKING LANE

KEEP CLEAR

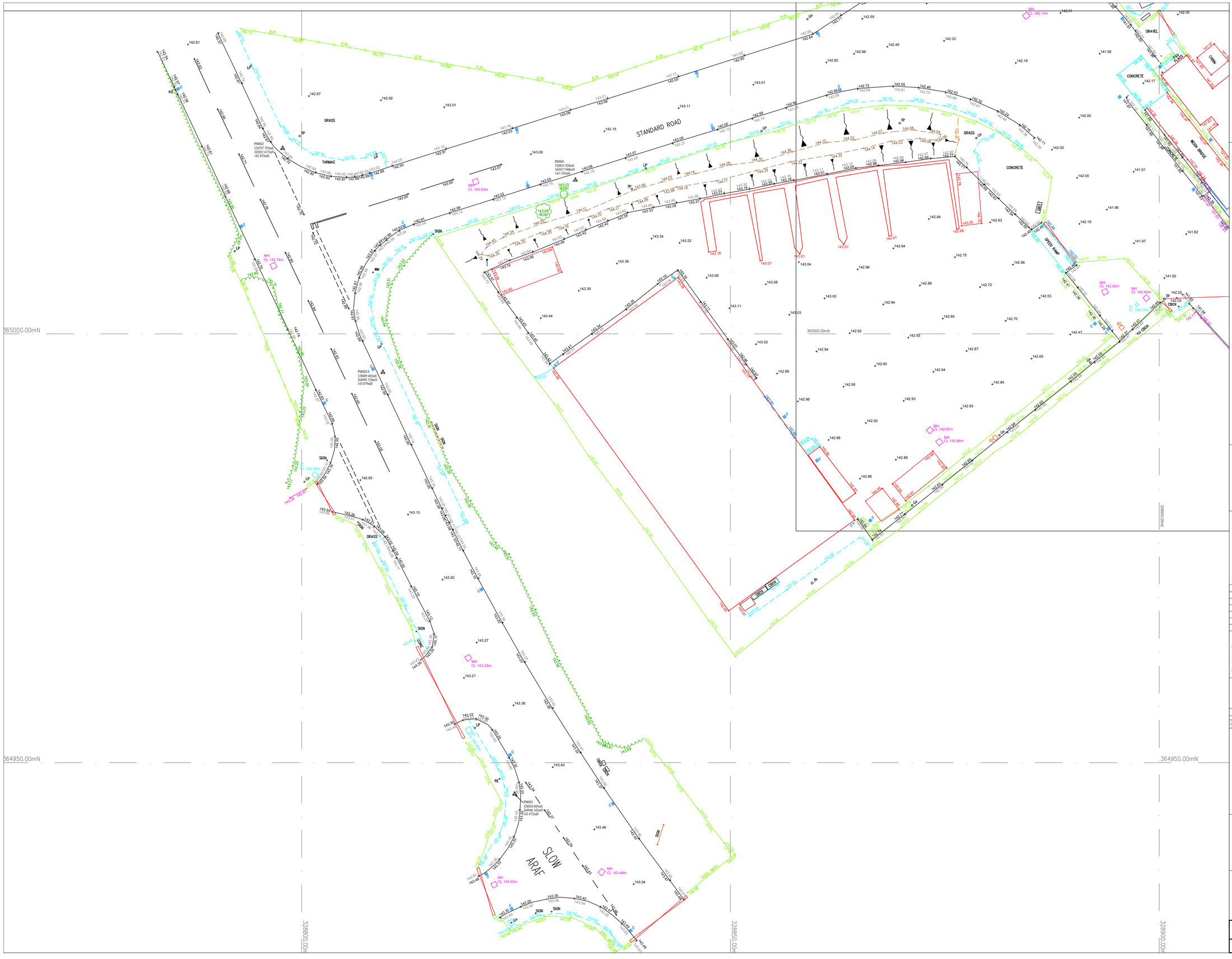
STRAIGHT AHEAD / STACKING LANE

Travelling Crane

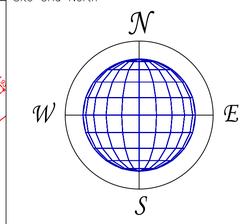
7

APPENDIX B

Topographic Survey



Site Grid North



Symbols/Abbreviations (Where Applicable):

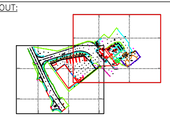
- AV: AIR VALVE
- BB: BELISHA BEACON
- BH: BOREHOLE
- BM: BENCHMARK
- BOL: BOLLARD
- B/S: BUS STOP
- CAM: CAMERA
- CS: CABLE STAY
- CATV: C.A.T.V INSPECTION CHAMBER
- CBOX: ELECTRICITY BOX, CABLE BOX, ETC.
- CCTV: C.C.T.V CAMERA
- C.PIT: CATCH PIT
- EC: ELECTRICITY COVER
- EP: ELECTRICITY POLE
- ER: EARTH ROD
- FH: FIRE HYDRANT
- FP: FLAG POLE
- G: GULLY
- G: GULLY (ROUND)
- GV: GAS VALVE
- IC: INSPECTION COVER (SQUARE)
- IC: INSPECTION COVER (ROUND)
- IL: INVERT LEVEL
- KO: KERB OUTLET
- LB: LETTER BOX
- LC: LIGHTING COLUMN
- LP: LAMP POST
- LP/BS: LAMP POST/BUS STOP
- MH: MANHOLE (SQUARE)
- MH: MANHOLE (ROUND)
- MKR: MARKER
- P: POST
- RE: RODDING EYE
- R/S: ROAD SIGN
- S/P: SIGN POST
- SNP: STREET NAME PLATE
- ST: STOP TAP
- SV: STOP VALVE
- TCB: TELEPHONE CALL BOX
- T/IC: TELECOM INSPECTION COVER
- TL: TRAFFIC LIGHT
- TP: TELEGRAPH POLE
- TP/EP: TELEGRAPH POLE/ELECTRIC POLE
- WO: WATER OUTLET
- WM: WATER METER
- GATE
- DEFINED POINT
- CONTROL POINT
- TREE (CONIFEROUS)
- TREE (DECIDUOUS)
- FOLIAGE
- HEDGE

DPC 99.99m DAMP PROOF COURSE LEVEL
EL 99.99m EAVES LEVEL
FL 99.99m FLOOR LEVEL
RL 99.99m RIDGE LEVEL
SL 99.99m SOFFIT LEVEL
TL 99.99m THRESHOLD LEVEL

FENCE DESCRIPTIONS:

B/W:	BARBED WIRE FENCE
C/B:	CLOSE BOARDED FENCE
C/L:	CHAIN LINK FENCE
C/P:	CHESTNUT PALING FENCE
CONC/P:	CONCRETE PANEL FENCE
I/R:	IRON RAILING FENCE
P/R:	POST AND RAIL FENCE
P/W:	POST AND WIRE FENCE
P/C:	POST AND CHAIN FENCE
S/PAL:	STEEL PALISADE FENCE
S/B:	SAFETY BARRIER
T/PAL:	TIMBER PALISADE FENCE

SITE LAYOUT:



Revision Information

Rev	Date	Description

INFORMATION

1) Ordnance Survey co-ordinates and level are derived from OSTN02 and OSGM02, transformed from WGS84.

2) Only services located during the site survey are shown on this plan. Further investigation may be required to ascertain the full extent of the site services.

3) Copyright of this drawing remains the property of PM Surveys UK Ltd. Do not scale from this drawing. In the event of any discrepancy, refer query to PM Surveys UK Ltd.

NOTES

Ordnance Survey Bench Mark Used

	Location	Type	Value
1			
2			

PM SURVEYS UK

PM Surveys UK Ltd
Unit 3, Queensferry Industrial Estate
Queensferry
Flintshire. CH5 2DJ
Tel: 01244 952477
Email: info@pmsurveys.co.uk

Client Info

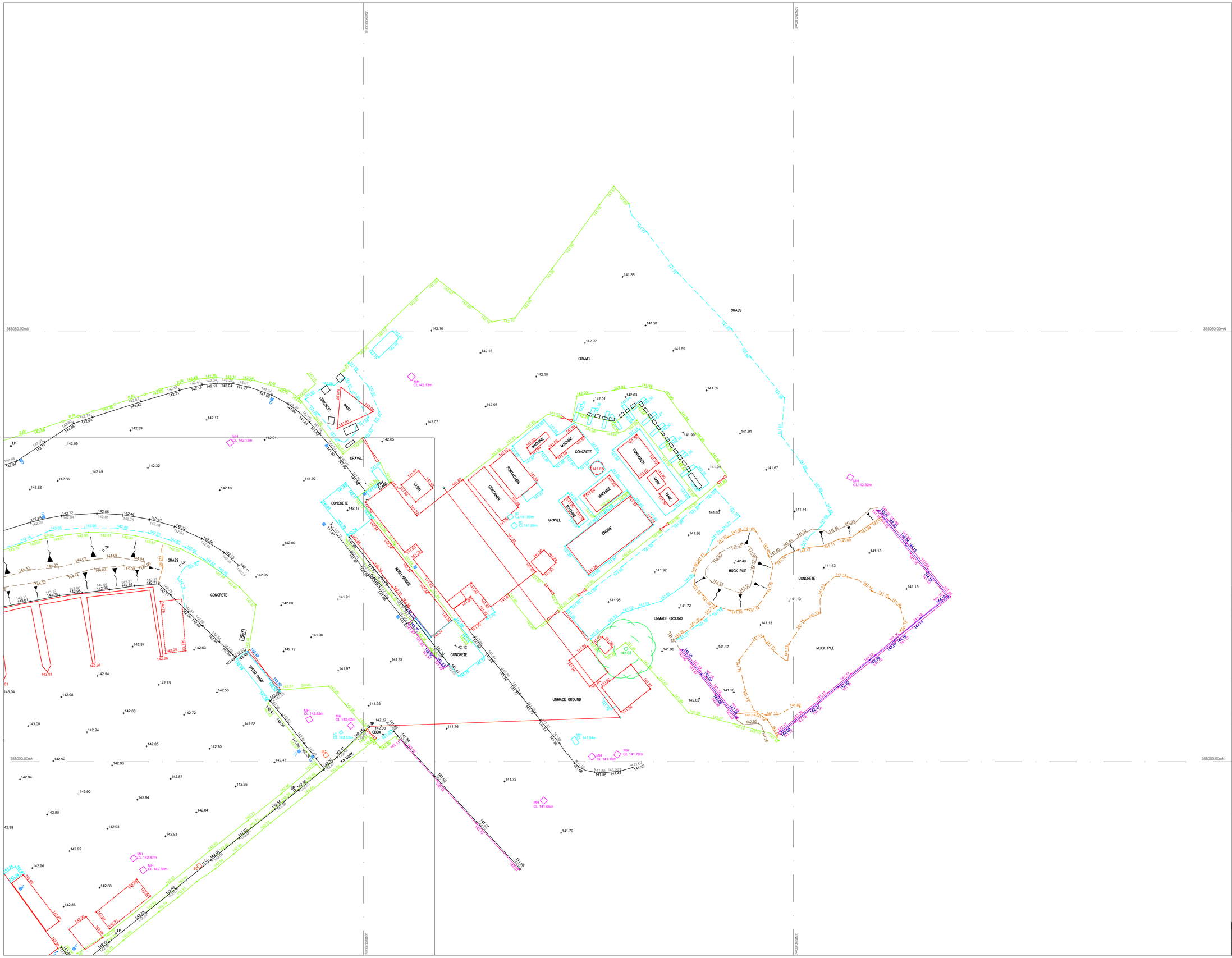
Flintshire County Council

Tel:
Email: nic.houston@flintshire.gov.uk

Project

Globe Way, Buckley

Project No PMS20111	*Sheet:* A1	*Surveyed By:*	AL
	Scale: 1:200	*Drawn By:*	JW
		Approved By:	PM
Dwg PMS20111-02		*Issued:*	26/06/20



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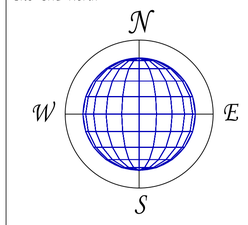

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MKR:	MARKER
P:	POST
RE:	RODDING EYE
R/S:	ROAD SIGN
S/P:	SIGN POST
SNP:	STREET NAME PLATE
ST:	STOP TAP
SV:	STOP VALVE
TCB:	TELEPHONE CALL BOX
T/IC:	TELECOM INSPECTION COVER
TL:	TRAFFIC LIGHT
TP:	TELEGRAPH POLE
TP/EP:	TELEGRAPH POLE/ELECTRIC POLE
WO:	WATER OUTLET
WM:	WATER METER
	GATE
	DEFINED POINT
	CONTROL POINT
	TREE (CONIFEROUS)
	TREE (DECIDUOUS)
	FOLIAGE
S2525	HEDGE
DPC 99.99m	DAMP PROOF COURSE LEVEL
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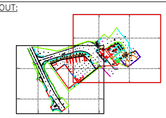

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Rev	Date	Description

INFORMATION

1) Ordnance Survey co-ordinates and level are derived from OSTN02 and OSGM02, transformed from WGS84.

2) Only services located during the site survey are shown on this plan. Further investigation may be required to ascertain the full extent of the site services.

3) Copyright of this drawing remains the property of PM Surveys UK Ltd. Do not scale from this drawing. In the event of any discrepancy, refer query to PM Surveys UK Ltd.

NOTES

Ordnance Survey Bench Mark Used

	Location	Type	Value
1			
2			

PM SURVEYS UK

PM Surveys UK Ltd
Unit 3, Queensferry Industrial Estate
Queensferry
Flintshire, CH5 2DJ
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Client Info

Flintshire County Council

Tel:
Email: nic.houston@flintshire.gov.uk

Project

Globe Way, Buckley

Project No PMS20111	Sheet: A1	Surveyed By:	AL
	Scale: 1:200	Drawn By:	JW
		Approved By:	PM
Dwg PMS20111-02		Issued:	26/06/20

APPENDIX C

Public Sewer Records

Dŵr Cymru
Welsh Water

Globe Way

N
W E
S

LEGEND(Representative of most common features)

Waste network:

Foul chamber		Outfall	
Surface water chamber		Lamphole	LH
Combined chamber		Storm Overflow	
Combined sewer overflow	CO	Rising main	
Special purpose chamber	SPC	Gravity sewer	
Treatment works		Private sewer	P
Pumping station		Private sewer subject to Sect. 104 adoption agreement	S 104 P
		Private Sewer Transfer	T
		Lateral Drain	L
		Inspection Chamber	

NB: Sewer symbol colour indicates the type.

RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

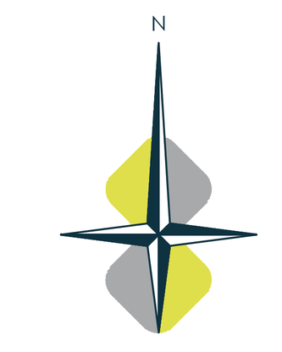
Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF) . It is therefore advisable that the possible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

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Map Ref:	328907,365023
Map scale:	1:2500
Printed by:	John Emma
Printed on:	03 Jan 2020

APPENDIX D

Utility Survey



PLAN GRID NORTH

File Name: EN20035 - PAS128 Survey Buckley WTS.dwg

LEGEND

AV	AIR VALVE
BT	BT INSPECTION COVER
CB	CONTROL BOX
CCTV	CCTV CAMERA POST
COM	COMMUNICATIONS COVER
CTV	CABLE TV COVER
DC	DRAINAGE CHANNEL
DP	DOWN PIPE
DR	DRAIN
EIC	ELEC INSPECTION COVER
ELB	ELECTRIC BOX
ER	EARTH ROD
EP	ELECTRICITY POLE
FFL	FINISHED FLOOR LEVEL
FH	FIRE HYDRANT
G	GULLY
GLT	GROUND LIGHT
GST	GAS TAP
GSV	GAS VALVE
IC	INSPECTION COVER
IL	INVERT LEVEL
KO	KERB OUTLET
LP	LAMP POST
MH	MANHOLE
MKR	MARKER
OP	OUTFALL PIPE
PN	PYLON
PP	PETROL PUMP
RE	RODDING EYE
RWP	RAINWATER PIPE
SOF	SOFFIT LEVEL
SV	STOP VALVE
TCB	TELEPHONE CALL BOX
TL	TRAFFIC LIGHT
TLB	TRAFFIC LIGHT BOX
TP	TELEGRAPH POLE
WM	WATER METER
WO	WATER OUTLET
WST	WATER STOP TAP
WSV	WATER STOP VALVE
EOT	END OF TRACE
OSA	OUT OF SURVEY AREA
UTL	UNABLE TO LIFT
UTS	UNABLE TO SONDE
UTT	UNABLE TO TRACE
S/L	SIGNAL LOSS
BLK	BLOCKED
NFH	NO FURTHER GPR CONTACTS
BD	BACKDROP PIPE
NVP	NO VISIBLE PIPE
ToP	TOP OF PIPE
└┘	EOT SYMBOL

CABLE DUCT	DU-A
CABLE TV	CA-A
CCTV	CC-A
TELECOMS	TC-A
EARTH ROD STRIP	ER-A
ELECTRIC	EL-A
FIBRE-OPTICS	FO-A
FUEL LINE	FL-A
GPR DETECTION LINE	GPR
MAINS GAS	GM-A
MAINS WATER	WM-A
SEWER CW	CW-A
SEWER FW	FW-A
SEWER SW	SW-A
TRAFFIC SIGNAL CABLE	TS-A
UNIDENTIFIED TRACE	UI-A
UNIDENTIFIED CABLE	UC-A
UNIDENTIFIED PIPE	UP-A
VEHICLE DETECTION CABLE	VD-A
SURVEY BOUNDARY	▬ ▬ ▬

QUALITY LEVEL

A – Verification

B1 – Horizontal/Vertical location using multiple techniques

B2 – Horizontal/Vertical location using a single technique

B3 – Horizontal location using a single technique

B4 – Assumed route

C – Site Reconnaissance

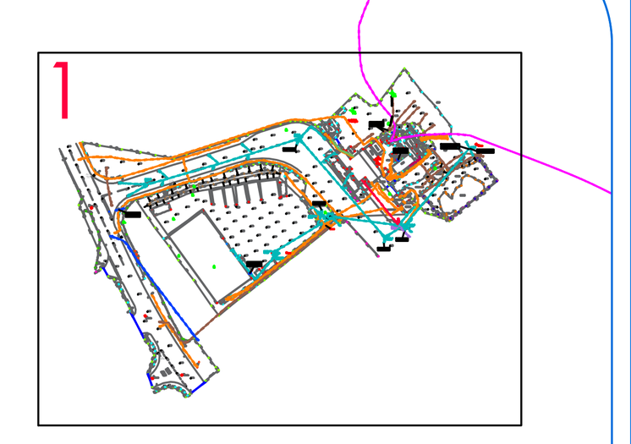
D – Desktop utility records search

NOTES:

All levels relate to O.S (Newlyn) Datum, Established using network RTK. Survey plotted on a plane local grid, orientated to National Grid.

This Underground Utilities survey was conducted in compliance with the BSI PAS128:2014 standards.
Services linetypes display text indicating first an abbreviation of the services' function (eg. EL = Electric Cable) followed by the Quality Level to which that service was located (eg. B4 = Assumed route).
Lines annotated as GPR were located using only the Ground Penetrating Radar and should be considered as Quality Level B2.

Quality Level descriptions shown in the above legend are for reference purposes only and are not intended as detailed descriptions.
For full information on Quality Levels, please consult the BSI PAS128:2014 standards document.



SHEET LAYOUT

0 2m 4m 8m 12m 16m

SCALE BAR

REV	DATE	DESCRIPTION

CMS SURVEYS
Complete Mapping Solutions

Client
Geotechnics
Unit 1B, Borders Ind Park
River Lane
Saltney
Chester
CH4 8RJ

Project Title
PAS128 Survey of Land at:
Buckley Waste Transfer Station
Buckley

Surveyed	Drawn	Checked
C.Scouler	C.Scouler	L.Scouler

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	Sept 20	EN20035	01	A0	R0

APPENDIX E

Greenfield Runoff Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	807	Region Number	Region 9

Results l/s

QBAR Rural	5.2
QBAR Urban	5.2
Q100 years	11.3
Q1 year	4.6
Q30 years	9.1
Q100 years	11.3

APPENDIX F

Peak Runoff Rate from Existing Site

The peak discharge rates of surface water runoff from the impermeable areas at the site have been calculated based on the Modified Rational Method[8] and an assessment of the pipe capacities. The lower of the two values has determined the existing discharge rates from the impermeable areas at the existing site.

The following parameters have been obtained from the maps in Volume 3 of the Wallingford Procedure:

M5-60 minute rainfall depth:	18.0 mm
Ratio of M5-60 to M5-2 day rainfall:	0.34
Average Annual Rainfall:	807 mm
Winter Rain Acceptance Potential/ Soil Type :	0.45 / 4
The Urban Catchment Wetness Index (UCWI) value:	85.0

A time of concentration of 15 minutes has been used. A rainfall estimation calculation has been carried out to convert the M5-60 minute rainfall to the 15-minute duration rainfall for the 1 in 1, 1 in 2, 1 in 30 and 1 in 100 annual exceedance probability (AEP) rainfall events. The calculated rainfall intensities for these events are 26.7,34.6, 65.2 and 83.6 mm/hr respectively.

The flow rate as given by the Modified Rational Method is:

$Q=2.78 \times C_v \times C_r \times$ rainfall intensity x impermeable area

where:

C_v is the volumetric runoff coefficient = P_r/PIMP = 0.79
where P_r is Percentage Runoff and PIMP is Percentage Impermeable Area
C_r is the routing coefficient = 1.3
Impermeable Area = 0.70 ha

The peak discharges of surface runoff from impermeable areas of the existing site are shown in the table below:

AEP of rainfall event	Peak discharge for 0.70 ha impermeable area (l/s)
1 in 1	53.7
1 in 2	69.5
1 in 30	131.1
1 in 100	168.1

[8] The Wallingford Procedure, Volume 4, 1981

APPENDIX G

Surface Water Attenuation - Storage Volume Calculation

Manhole Schedules for 4700 SW Drainage Network P1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	143.030	1.350	Open Manhole	600	S1.000	141.680	150				
S2	143.130	2.090	Open Manhole	1200	S1.001	141.040	225	S1.000	141.040	150	
S3	142.150	1.350	Open Manhole	1200	S2.000	140.800	225				
S4	142.050	1.450	Open Manhole	1200	S2.001	140.600	225	S2.000	140.600	225	
S5	143.000	1.800	Open Manhole	1200	S3.000	141.200	225				
S6	141.950	1.650	Open Manhole	1500	S1.002	140.300	300	S1.001	140.700	225	325
								S2.001	140.375	225	
								S3.000	140.375	225	
S7	142.800	1.200	Open Manhole	1200	S4.000	141.600	150				
S8	142.000	1.900	Open Manhole	1200	S1.003	140.100	300	S1.002	140.100	300	
								S4.000	140.250	150	
S9	141.700	1.350	Open Manhole	1200	S5.000	140.350	150				
S10	141.700	1.800	Open Manhole	1200	S1.004	139.900	300	S1.003	139.900	300	
								S5.000	140.050	150	
S11	141.800	2.100	Open Manhole	600	S1.005	139.700	300	S1.004	139.800	300	100
S12	141.900	2.400	Open Manhole	1500	S1.006	139.500	-4	S1.005	139.600	300	
S13	141.700	2.300	Open Manhole	1500	S1.007	139.400	300	S1.006	139.400	-4	
S	141.800	2.500	Open Manhole	0		OUTFALL		S1.007	139.300	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	328820.298	365017.755	328820.298	365017.755	Required	
S2	328884.492	365037.098	328884.492	365037.098	Required	
S3	328911.375	365045.892	328911.375	365045.892	Required	
S4	328900.159	365036.445	328900.159	365036.445	Required	
S5	328846.129	364994.890	328846.129	364994.890	Required	
S6	328894.668	365025.569	328894.668	365025.569	Required	

Manhole Schedules for 4700 SW Drainage Network P1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S7	328884.371	365006.233	328884.371	365006.233	Required	
S8	328917.206	365014.192	328917.206	365014.192	Required	
S9	328943.880	365028.922	328943.880	365028.922	Required	
S10	328933.904	365020.612	328933.904	365020.612	Required	
S11	328938.667	365014.894	328938.667	365014.894	Required	
S12	328943.430	365009.176	328943.430	365009.176	Required	
S13	328950.444	365030.598	328950.444	365030.598	Required	
S	328954.444	365030.598			No Entry	

PIPELINE SCHEDULES for 4700 SW Drainage Network P1

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	143.030	141.680	1.200	Open Manhole	600
S1.001	o	225	S2	143.130	141.040	1.865	Open Manhole	1200
S2.000	o	225	S3	142.150	140.800	1.125	Open Manhole	1200
S2.001	o	225	S4	142.050	140.600	1.225	Open Manhole	1200
S3.000	o	225	S5	143.000	141.200	1.575	Open Manhole	1200
S1.002	o	300	S6	141.950	140.300	1.350	Open Manhole	1500
S4.000	o	150	S7	142.800	141.600	1.050	Open Manhole	1200
S1.003	o	300	S8	142.000	140.100	1.600	Open Manhole	1200
S5.000	o	150	S9	141.700	140.350	1.200	Open Manhole	1200
S1.004	o	300	S10	141.700	139.900	1.500	Open Manhole	1200
S1.005	o	300	S11	141.800	139.700	1.800	Open Manhole	600
S1.006	[]	-4	S12	141.900	139.500	2.000	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	67.045	104.8	S2	143.130	141.040	1.940	Open Manhole	1200
S1.001	15.378	45.2	S6	141.950	140.700	1.025	Open Manhole	1500
S2.000	14.664	73.3	S4	142.050	140.600	1.225	Open Manhole	1200
S2.001	12.184	54.2	S6	141.950	140.375	1.350	Open Manhole	1500
S3.000	57.422	69.6	S6	141.950	140.375	1.350	Open Manhole	1500
S1.002	25.247	126.2	S8	142.000	140.100	1.600	Open Manhole	1200
S4.000	33.787	25.0	S8	142.000	140.250	1.600	Open Manhole	1200
S1.003	17.889	89.4	S10	141.700	139.900	1.500	Open Manhole	1200
S5.000	12.984	43.3	S10	141.700	140.050	1.500	Open Manhole	1200
S1.004	7.442	74.4	S11	141.800	139.800	1.700	Open Manhole	600
S1.005	7.442	74.4	S12	141.900	139.600	2.000	Open Manhole	1500
S1.006	3.100#	31.0	S13	141.700	139.400	1.900	Open Manhole	1500

PIPELINE SCHEDULES for 4700 SW Drainage Network P1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.007	o	300	S13	141.700	139.400	2.000	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.007	4.000	40.0	S	141.800	139.300	2.200	Open Manhole	0

Area Summary for 4700 SW Drainage Network P1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.037	0.037	0.037
1.001	-	-	100	0.042	0.042	0.042
2.000	-	-	100	0.046	0.046	0.046
2.001	-	-	100	0.025	0.025	0.025
3.000	-	-	100	0.122	0.122	0.122
1.002	-	-	100	0.057	0.057	0.057
4.000	-	-	100	0.161	0.161	0.161
1.003	-	-	100	0.055	0.055	0.055
5.000	-	-	100	0.076	0.076	0.076
1.004	-	-	100	0.070	0.070	0.070
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.691	0.691	0.691

Free Flowing Outfall Details for 4700 SW Drainage Network P1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	S	141.800	139.300	0.000	0	0

Online Controls for 4700 SW Drainage Network P1

Hydro-Brake® Optimum Manhole: S13, DS/PN: S1.007, Volume (m³): 4.4

Unit Reference	MD-SHE-0258-3760-1200-3760
Design Head (m)	1.200
Design Flow (l/s)	37.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	258
Invert Level (m)	139.400
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	37.6	Kick-Flo®	0.876	32.3
Flush-Flo™	0.428	37.6	Mean Flow over Head Range	-	31.4

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	8.3	1.200	37.6	3.000	58.5	7.000	88.3
0.200	26.5	1.400	40.5	3.500	63.0	7.500	91.3
0.300	36.8	1.600	43.2	4.000	67.2	8.000	94.2
0.400	37.6	1.800	45.7	4.500	71.2	8.500	97.0
0.500	37.4	2.000	48.1	5.000	74.9	9.000	99.8
0.600	36.9	2.200	50.3	5.500	78.5	9.500	102.5
0.800	34.5	2.400	52.5	6.000	81.9		
1.000	34.5	2.600	54.6	6.500	85.1		

Storage Structures for 4700 SW Drainage Network P1

Swale Manhole: S7, DS/PN: S4.000

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	100.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	200.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	142.000	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.5	Include Swale Volume	Yes

Cellular Storage Manhole: S12, DS/PN: S1.006

Invert Level (m)	139.500	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	216.0	0.0	0.801	0.0	0.0
0.800	216.0	0.0			

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
S1.000	S1	0.382	1.169	0.000	1.551
S1.001	S2	2.364	0.558	0.000	2.921
S2.000	S3	1.527	0.535	0.000	2.062
S2.001	S4	1.640	0.431	0.000	2.071
S3.000	S5	2.036	2.229	0.000	4.265
S1.002	S6	2.916	1.689	0.000	4.605
S4.000	S7	1.357	0.576	124.500	126.433
S1.003	S8	2.149	1.180	0.000	3.329
S5.000	S9	1.527	0.208	0.000	1.735
S1.004	S10	2.036	0.462	0.000	2.498
S1.005	S11	0.594	0.452	0.000	1.046
S1.006	S12	4.241	0.320	164.228	168.790
S1.007	S13	4.064	0.230	0.000	4.294
Total		26.832	10.039	288.728	325.599

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 4700 SW Drainage Network P1

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.340
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

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%	100/15 Summer				141.732
S1.001	S2	15 Winter	1	+0%	100/15 Summer				141.092
S2.000	S3	15 Winter	1	+0%	30/15 Summer				140.848
S2.001	S4	15 Winter	1	+0%	30/15 Summer				140.654
S3.000	S5	15 Winter	1	+0%	100/15 Summer				141.275
S1.002	S6	15 Winter	1	+0%	30/15 Summer				140.433
S4.000	S7	15 Winter	1	+0%	30/15 Summer				141.680
S1.003	S8	15 Winter	1	+0%	30/15 Summer				140.267
S5.000	S9	15 Winter	1	+0%	30/15 Summer				140.413
S1.004	S10	15 Winter	1	+0%	30/15 Summer				140.132
S1.005	S11	15 Winter	1	+0%	30/15 Summer				139.933
S1.006	S12	30 Winter	1	+0%	100/15 Summer				139.617
S1.007	S13	30 Winter	1	+0%	30/15 Summer				139.621

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	-0.098	0.000	0.24			4.1	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 4700 SW Drainage Network P1

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.001	S2	-0.173	0.000	0.12			8.3	OK	
S2.000	S3	-0.177	0.000	0.10			5.4	OK	
S2.001	S4	-0.171	0.000	0.13			7.9	OK	
S3.000	S5	-0.150	0.000	0.23			14.1	OK	
S1.002	S6	-0.167	0.000	0.41			35.9	OK	
S4.000	S7	-0.070	0.000	0.55		6	18.8	OK	
S1.003	S8	-0.133	0.000	0.59			60.0	OK	
S5.000	S9	-0.087	0.000	0.36			8.9	OK	
S1.004	S10	-0.068	0.000	0.95			75.0	OK	
S1.005	S11	-0.067	0.000	0.95			74.9	OK	
S1.006	S12	-0.283	0.000	0.13		15	29.8	OK	
S1.007	S13	-0.079	0.000	0.36			28.6	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 4700 SW Drainage Network P1

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.340
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

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%	100/15 Summer				141.767
S1.001	S2	15 Winter	30	+0%	100/15 Summer				141.130
S2.000	S3	15 Winter	30	+0%	30/15 Summer				141.089
S2.001	S4	15 Winter	30	+0%	30/15 Summer				141.070
S3.000	S5	15 Winter	30	+0%	100/15 Summer				141.325
S1.002	S6	15 Winter	30	+0%	30/15 Summer				141.046
S4.000	S7	15 Winter	30	+0%	30/15 Summer				142.112
S1.003	S8	15 Winter	30	+0%	30/15 Summer				140.903
S5.000	S9	15 Winter	30	+0%	30/15 Summer				140.796
S1.004	S10	15 Winter	30	+0%	30/15 Summer				140.626
S1.005	S11	15 Winter	30	+0%	30/15 Summer				140.253
S1.006	S12	30 Winter	30	+0%	100/15 Summer				139.878
S1.007	S13	30 Summer	30	+0%	30/15 Summer				139.918

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	-0.063	0.000	0.59			10.1	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 4700 SW Drainage Network P1

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
S1.001	S2	-0.135	0.000	0.32			22.2	OK	
S2.000	S3	0.064	0.000	0.23			12.2	SURCHARGED	
S2.001	S4	0.245	0.000	0.28			17.0	SURCHARGED	
S3.000	S5	-0.100	0.000	0.57			34.5	OK	
S1.002	S6	0.446	0.000	0.86			75.9	SURCHARGED	
S4.000	S7	0.362	0.000	0.99		3	34.1	SURCHARGED	
S1.003	S8	0.503	0.000	1.18			118.9	SURCHARGED	
S5.000	S9	0.296	0.000	0.75			18.6	SURCHARGED	
S1.004	S10	0.426	0.000	1.91			151.3	SURCHARGED	
S1.005	S11	0.253	0.000	1.91			151.2	SURCHARGED	
S1.006	S12	-0.022	0.000	0.21		23	46.1	OK	
S1.007	S13	0.218	0.000	0.47			37.4	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 4700 SW Drainage Network P1

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.340
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

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	+30%	100/15 Summer				142.412
S1.001	S2	15 Winter	100	+30%	100/15 Summer				142.002
S2.000	S3	15 Winter	100	+30%	30/15 Summer				142.031
S2.001	S4	15 Winter	100	+30%	30/15 Summer				142.001
S3.000	S5	15 Winter	100	+30%	100/15 Summer				142.415
S1.002	S6	15 Winter	100	+30%	30/15 Summer				141.949
S4.000	S7	15 Winter	100	+30%	30/15 Summer				142.324
S1.003	S8	15 Winter	100	+30%	30/15 Summer				141.634
S5.000	S9	15 Winter	100	+30%	30/15 Summer				141.608
S1.004	S10	15 Winter	100	+30%	30/15 Summer				141.184
S1.005	S11	15 Winter	100	+30%	30/15 Summer				140.534
S1.006	S12	60 Winter	100	+30%	100/15 Summer				140.298
S1.007	S13	60 Winter	100	+30%	30/15 Summer				140.430

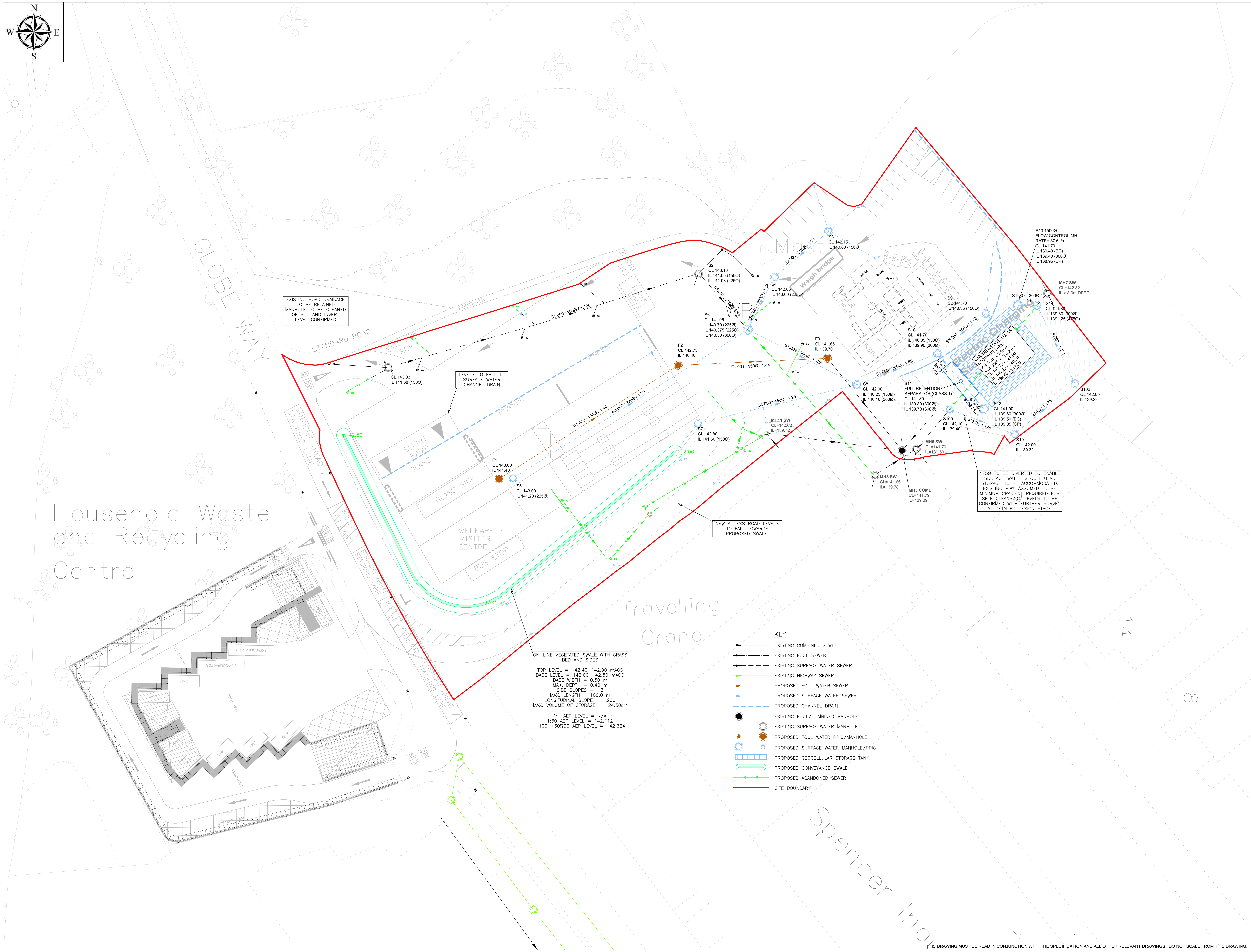
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.582	0.000	0.82			14.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 4700 SW Drainage Network P1

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
S1.001	S2	0.737	0.000	0.40			27.5	SURCHARGED	
S2.000	S3	1.006	0.000	0.31			16.3	FLOOD RISK	
S2.001	S4	1.176	0.000	0.40			24.4	FLOOD RISK	
S3.000	S5	0.990	0.000	0.75			44.9	SURCHARGED	
S1.002	S6	1.349	0.000	1.26			111.0	FLOOD RISK	
S4.000	S7	0.574	0.000	1.15		6	39.4	SURCHARGED	
S1.003	S8	1.234	0.000	1.50			151.2	SURCHARGED	
S5.000	S9	1.108	0.000	1.19			29.5	FLOOD RISK	
S1.004	S10	0.984	0.000	2.53			200.8	SURCHARGED	
S1.005	S11	0.534	0.000	2.53			200.4	SURCHARGED	
S1.006	S12	0.398	0.000	0.24		50	52.9	SURCHARGED	
S1.007	S13	0.730	0.000	0.47			37.5	SURCHARGED	

APPENDIX H

Indicative Surface Water Drainage Layout


N
S
E
W
GLOBE WAY
STANDARD ROAD
FOOTPATH
Household Waste and Recycling Centre
Travelling Crane
Spencer Ind
EXISTING ROAD DRAINAGE TO BE RETAINED MANHOLE TO BE CLEANED OF SILT AND INVERT LEVEL CONFIRMED
LEVELS TO FALL TO SURFACE WATER CHANNEL DRAIN
NEW ACCESS ROAD LEVELS TO FALL TOWARDS PROPOSED SWALE.
475Ø TO BE DIVERTED TO ENABLE SURFACE WATER GEOCELLULAR STORAGE TO BE ACCOMMODATED. EXISTING PIPE ASSUMED TO BE MINIMUM GRADIENT REQUIRED FOR SELF CLEANSING. LEVELS TO BE CONFIRMED WITH FURTHER SURVEY AT DETAILED DESIGN STAGE.
ON-LINE VEGETATED SWALE WITH GRASS BED AND SIDES
TOP LEVEL = 142.40-142.90 mAOD
BASE LEVEL = 142.00-142.50 mAOD
BASE WIDTH = 0.50 m
MAX. DEPTH = 0.40 m
SIDE SLOPES = 1:3
MAX. LENGTH = 100.0 m
LONGITUDINAL SLOPE = 1:200
MAX. VOLUME OF STORAGE = 124.50m³
1:1 AEP LEVEL = N/A
1:30 AEP LEVEL = 142.112
1:100 +30%CC AEP LEVEL = 142.324
S13 1500Ø FLOW CONTROL MH RATE= 37.6 l/s CL 141.70 IL 139.40 (BC) IL 139.40 (300Ø) IL 138.95 (CP)
S11 FULL RETENTION SEPARATOR (CLASS 1) CL 141.80 IL 139.80 (300Ø) IL 139.70 (300Ø)
KEY
EXISTING COMBINED SEWER
EXISTING FOUL SEWER
EXISTING SURFACE WATER SEWER
EXISTING HIGHWAY SEWER
PROPOSED FOUL WATER SEWER
PROPOSED SURFACE WATER SEWER
PROPOSED CHANNEL DRAIN
EXISTING FOUL/COMBINED MANHOLE
EXISTING SURFACE WATER MANHOLE
PROPOSED FOUL WATER PPIC/MANHOLE
PROPOSED SURFACE WATER MANHOLE/PPIC
PROPOSED GEOCELLULAR STORAGE TANK
PROPOSED CONVEYANCE SWALE
PROPOSED ABANDONED SEWER
SITE BOUNDARY

NOTES

1. This drawing to be read in conjunction with all relevant Weetwood drawings.

Rev	Date	Description	Drawn	Check
P2	13.11.20	Foul network amended	MD	TB
P1	12.11.20	Issued for information	MD	TB

THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ALL OTHER RELEVANT DRAWINGS. DO NOT SCALE FROM THIS DRAWING.

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Client: AXIS PED LTD

Drawing Status: PRELIMINARY

Date: NOV 2020

Scale (A0): 1:250

Drawn: MD

Checked: TB

Project: MATERIAL RECYCLING FACILITY (MRF) STANDARD ROAD, BUCKLEY

Project No: 4700

Title: DRAINAGE LAYOUT

Drawing No: C100

Revision: P2

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