



TECHNICAL NOTE D1 – DRAINAGE STRATEGY

DATE:	06 May 2022	CONFIDENTIALITY:	Restricted
SUBJECT:	Drainage Strategy – Expansion of Waste Recycling Centre, Reading		
PROJECT:	70063683	AUTHOR:	Kelly Rose/ Freddie Loveday
CHECKED:	Jonathan Simmonds	APPROVED:	Chris Patmore

INTRODUCTION

WSP has been commissioned by R. Collard Limited (the client) to provide a Drainage Strategy for a proposed shed within an existing Waste Transfer Station (WTS) in Reading, which has been granted Planning Permission (ref: 210007).

This Drainage Strategy has been developed to allow the discharge of Planning Condition 14 which states:

‘No development shall commence on site until a Sustainable Drainage Strategy and associated detailed design, management and maintenance plan of surface water drainage for the site using SuDS methods has been submitted to and approved in writing by the Local Planning Authority. The plan shall include:

- i. a timetable for its implementation; and*
- ii. a management and annual maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.’*

WSP has previously completed a Flood Risk Assessment (FRA) (70063683-WSP-FR-RP-001) and a Preliminary Risk Assessment (PRA) (70063683-PL6), submitted in support of planning in 2021. These reports provide relevant site, flood risk and geotechnical information which is referenced within this Drainage Strategy (DS).

SITE BACKGROUND & PROPOSED DEVELOPMENT

The site area is approximately 0.12Ha and is located at 124 Cardiff Road, Reading. The nearest post code is RG1 8PQ and approximate grid coordinates are 470519, 174152. The site is located within an area comprising mixed commercial and light industrial units.

The site forms part of the existing R Collard Reading Waste Transfer Station (WTS) and proposed works will be contained within this land. The proposed works have to date included the demolition of an existing single storey commercial building and the next stage is the replacement with a new, larger shed plus external staff carparking. The proposed shed will abut an existing shed onsite to extend the waste sorting and storage facilities already provided within that building.

Immediately surrounding the proposed shed within the overall WTS, is the existing shed to the west, outdoor compound to the north and staff parking to the south. Access to the new carparking will be from Commercial Road which forms the southern WTS and site boundary. Trafford Road forms the eastern WTS boundary to the west of the retained western shed and the industrial estate extends north of the WTS. The eastern boundary to the site and WTS is formed by a third-party commercial unit. Vehicle access to the proposed shed will be from the existing site compound to the north.



The development drainage proposal aims to follow the drainage hierarchy as much as is practical and harvest rainwater for use in dust suppression within the existing shed and the DS advises options for capture, storage, treatment and pumping of rainwater to the existing sprinkler system. The DS further aims to balance this reuse against regulatory requirements for surface water (SW) attenuation and controlled discharge. Rainwater harvesting infrastructure will be sited within the proposed shed with storage provided within an existing weigh-station to the north. Additional surface water management to the car park area will incorporate permeable paving and tree pits.

TOPOGRAPHY

The site is *generally flat at approximately 39.2m Ordnance Datum Newlyn (ODN)* and that proposed finished floor level (FFL) for the new unit is 39.23m ODN to create a level threshold internally between the existing warehouse / shed to the west.

Existing levels south of the proposed shed slope downwards at a 1:58 gradient towards Cardiff Road which is approximately 0.5m lower at 38.6m - 38.7m ODN. North of the proposed shed, the outdoor compound grades southwards at an approximate 1:164 slope, with lower points at existing SW gullies. The existing un-used weigh-station within the open area to the north of the proposed shed is proposed for reuse as offline rainwater storage, this has a cover level of 39.08m ODN. It is assumed that the existing levels external to the shed will be retained, although some regrading may be undertaken for vehicle or pedestrian access.

GEOLOGY AND HYDROGEOLOGY

The WSP PRA has identified superficial geology at the site as the Langley Silt Member underlain by Alluvium and the Kempton Park Gravel Member (Secondary A Aquifer). The bedrock geology comprises the Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated) (Chalk Group) (Principal Aquifer).

The PRA has also identified made-ground to a depth of 1.52 below ground level (bgl) which has the potential to contain a wide range of contaminants.

Groundwater has been identified at approximately 1.5m bgl and the PRA preliminary hydrogeological model identifies the potential for contact between groundwater and made-ground. It further suggests that the shallow groundwater is recharged by SW and remains perched above the Langley Silt Member, rather than infiltrating to the underlying aquifers.

The PRA Preliminary Conceptual Site Model identifies that the contaminant risk from made-ground is initially limited by onsite hard standing which prevents SW from entering made-ground; it is then limited by the Langley Silt Member which impedes infiltration and pollutant migration to the underlying aquifer. Potential risk in the absence of the hard-standing during the construction phase should be managed in accordance with the PRA.

Based on this assessment, drainage by infiltration is not being considered.

EXISTING WATERCOURSES

Existing watercourses are identified by the WSP FRA including the River Thames (main river) approximately 600m north of the site and a network of drainage ditches approximately 200m north of the site.

EXISTING SEWER AND DRAINAGE INFRASTRUCTURE

Thames Water (TW) public sewer records illustrate a foul (F) sewer and a surface water (SW) sewer along Cardiff Road flowing in opposite directions, west and east respectively. Within Trafford Road, two SW sewers are shown as short branches flowing in opposite directions, while the foul sewer flows southwards to a connection within Cardiff Road.

South of the site and within Cardiff Road the TW SW manhole (MH5150) has an invert of 37.28m and a 525mm diameter pipe, to which an existing soffit connection from the site is assumed. The plans (**Figure 1**) also show an indicative connection from the site in the vicinity of the proposed shed, to the foul sewer within Cardiff Road at manhole (MH) 5102.

The existing western shed currently has two surface water downpipes. The western downpipe is contained within the building and discharges at the southern end of the building to a connection to the sewer to the South. The eastern downpipe from the building is partially contained within the building with the lower section running external to discharge to the surface (currently not connected to a positive outfall).

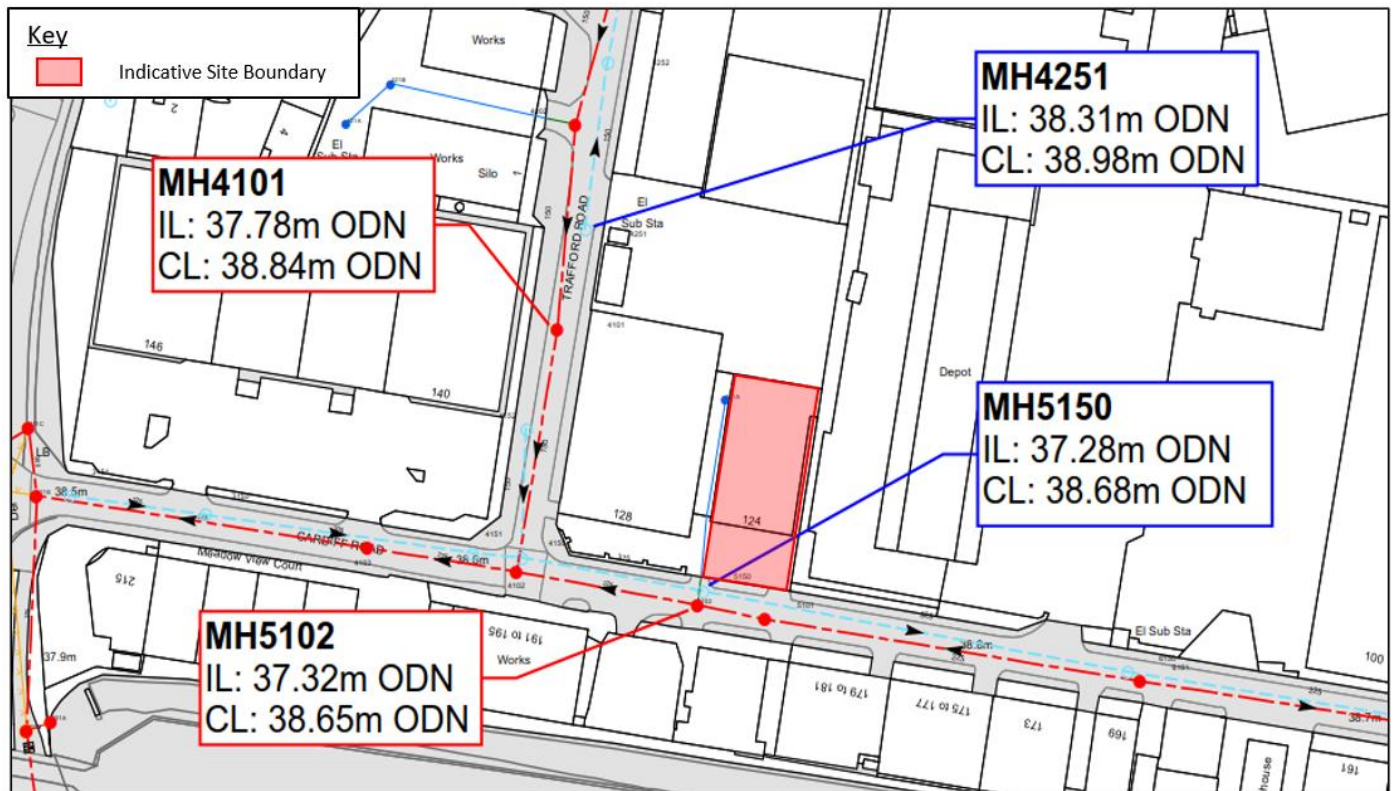


Figure 1 Thames Water public sewer records extract

FLOOD RISK CHARACTERISTICS

Flood risk to the site has been identified and assessed within the WSP FRA (70063683-WSP-FR-RP-001) with key aspects relevant to the drainage strategy highlighted below.

FLUVIAL, TIDAL AND ARTIFICIAL SOURCES OF FLOODING

The WSP FRA identified a low risk of fluvial flooding from the River Thames with mitigation provided by the proposed finished floor level of 39.23m AOD. The report further investigated and concluded that no floodplain compensation is required.



The report concluded that flood risk from tidal watercourses or the sea was negligible and that the flood risk from artificial sources such as reservoirs, is low.

SURFACE WATER FLOODING.

The FRA identified a very low risk of SW flooding with no overland flow routes entering the site from offsite.

An offsite overland flow route is identified within Cardiff Road, however the FRA identified that water depths would not exceed 0.3m up to and including events with a 1:1,000 year return period and therefore offsite flow routes would not enter the site.

The drainage strategy will manage SW generated onsite to ensure the proposed works do not increase SW flooding onsite or offsite.

GROUNDWATER FLOODING

The WSP PRA identified a *moderate to high onsite risk* from groundwater flooding, based on Groundsure mapping. However, the WSP FRA further notes the groundwater level to be at approximately 1.50m bgl and concludes that the risk is *low as there are no basements within the existing site*.

It is therefore assumed that the site is not at risk of groundwater rising above the surface, but the DS will account for the implications to SW discharge and drainage infrastructure including flooding, floatation and associated contamination.

SEWER FLOODING

The existing site and proposed development are situated at a level 0.5m higher than the ground levels above the sewer network along Cardiff Road and as such, the WSP FRA has concluded a low risk of sewer flooding to the site.

The FRA has further identified the requirement for maintenance of the onsite network to manage flood risk from this asset.

DRAINAGE STRATEGY

A surface water (SW) drainage strategy has been developed for management and appropriate discharge of SW generated onsite through rainfall to the proposed shed roof and staff carpark.

A foul water drainage strategy is not required as R Collard have confirmed that no new welfare facilities and no new sources of industrial wastewater will be created by the proposed works.

Treatment and pumping of the harvested rainwater will be undertaken as part of the proposed works and it is assumed that any material collected within the chambers or treatment system will be collected and disposed of appropriately as waste, not discharged to the TW network.

Document H of the Building Regulations: Drainage and Waste Disposal establishes a hierarchy for surface water disposal, which encourages a Sustainable Drainage System (SuDS) approach. This hierarchy stipulates that surface water runoff not collected for reuse must be discharged to one or more of the following in order of priority:

1. Ground (infiltration); or, where not reasonably practicable [NOT PRACTICAL FOR THIS SITE],
2. Surface water body (watercourse / body); or, where not reasonably practicable [NO LOCAL WATERCOURSES AVAILABLE],
3. Surface water sewer, highway drain, or another drainage system; or, where not reasonably practicable,
4. Combined sewer.

As discussed, in addition to this and to assist in minimising the runoff from the site, it is proposed to utilise rainwater harvesting as the first level of surface water management.

PROPOSED SURFACE WATER NETWORK DESCRIPTION

Surface water management for the site will be a combination of rainwater harvesting for reuse and subsequent attenuation and controlled discharge to the TW network for the residual runoff. Please see **Appendix A** for the Drainage Strategy drawing (70063683-WSP-XX-SK-DR-0001) and Long-section (70063683-WSP-XX-SK-DR-0002).

Rainwater will be harvested from the proposed shed roof for offline storage within a repurposed former weigh-station. The storage will drain back to a new pumping chamber before treatment and supply to the existing sprinkler system for use in dust suppression within the existing shed. Roof guttering of the proposed shed will be required to convey all rainwater to the northern end of the shed for capture.

The dimensions of the existing weighbridge proposed for offline rainwater storage, is approximately 15m length, 3m width and 1m storage depth, with a surface slab depth of approximately 200mm, giving an ultimate depth to invert of approximately 1.2m bgl. Due to the shallow nature of the rainwater storage, underground connecting pipes will be shallow and require protection from vehicle loadings.

As rainwater harvesting is relying on a single downpipe, current roof design is for a large capacity gutter flowing South to North within the roof profile and an internal downpipe. Siphonic roof drainage may be required and would be subject to detailed design. All flows will enter the rainwater harvesting network and storage until the network overflows to the SW network for attenuation and controlled discharge to the TW network (See Appendix A for Drainage Strategy drawing (70063683-WSP-XX-SK-DR-0001) and Long-section (70063683-WSP-XX-SK-DR-0002)).

South of the shed, SW runoff from the staff vehicle access will follow the existing topography for collection by permeable carparking spaces at the South-eastern site boundary. Attenuation will be provided within the

underlying subbase before conveyance via a perforated pipe to the flow control. Pipe bedding will be appropriate to allow filtration to the perforated pipe and provide appropriate protection.

Surface water attenuated within the oversized pipe and the permeable carparking will pass through a flow control before discharging via an existing connection to the TW SW network in Cardiff Road.

Adjacent the staff carparking, trees are proposed within the landscape plan which may be suitable for inclusion within the drainage strategy as tree pits, but which will be confirmed in detailed design.

SURFACE WATER DISCHARGE POINT

As discussed above, Approved Document H of the Building Regulations establishes a hierarchy for SW discharge, which encourages a Sustainable Drainage System (SuDS) approach. This hierarchy stipulates that SW runoff not collected for reuse must be discharged to one or more in order of priority.

It is proposed to harvest rainwater for reuse in dust suppression within the existing shed and R Collard has confirmed that at present, no runoff is generated by this activity. Therefore, a separate wastewater collection network and discharge point are not required. Where SW runoff volumes exceed the capacity of the rainwater harvesting system however, SW will be discharged in accordance with the above hierarchy.

Surface water discharge to ground has been deemed unsuitable due to the low permeability of the Langley Silt Member which prevents infiltration and results in perched groundwater, in addition to the associated contamination risk resulting from SW infiltration through the made-ground.

Discharge to a surface water body (e.g. watercourse) has been deemed infeasible due to the distance from existing watercourses and the requirement to cross third party land.

In accordance with the hierarchy, discharge to a SW sewer has been determined to be feasible. The site has an existing connection, which will be utilised, to TW's public SW sewer at MH5150 south of the site in Cardiff Road.

BROWNFIELD RUNOFF RATES

The WSP FRA approved through planning, proposes to maintain existing discharge rates to the TW network which have been estimated below.

The equivalent brownfield rate for the runoff area of 0.114Ha has been estimated using the Modified Rational Method (MRM) (**Appendix B**) as approximately 11l/s during the 1 in 1 year, 15minute duration storm event (**Table 1**). This rate has also been cross-checked and equates to the MRM 30yr 60minute event and is proportional to the Colebrook-White method for the entire site, assuming a 225mm diameter discharge pipe.

Therefore, in accordance with the WSP FRA, it is proposed that a SW discharge rate of 11l/s commensurate with existing brownfield runoff rates, is utilised for the proposed drainage strategy.

Table 1: Estimated Brownfield Discharge Rates for the 15min event

Return Period	Brownfield Runoff Rate (l/s/ha)	Brownfield Runoff Rate for proposed site (0.114ha) (l/s)
1 Year	100.36	11.44
2 Year	129.17	14.73
5 Year	164.86	18.79
30 Year	246.01	28.05
100 Year	323.00	36.82

The site is also offering considerable betterment through rainwater harvesting and reuse which will reduce pressure on the mains water supply and will reduce the *volume* of SW discharging to the TW network.

Table 2 below is an expansion of **Table 1** illustrating the potential additional betterment that the harvesting could achieve.

In addition, R Collard will be providing SW attenuation to mitigate flood risk onsite and off-site for up to the 1 in 100yr event plus 40% uplift allowance for climate change. On the basis of these improvements, it is considered that the cost of restricting flows to less than 11l/s is disproportionate to the benefits, in an industrial estate which is unlikely to be subject to flow restrictions in other locations.

RAINWATER HARVESTING AND USAGE RATES

Rainwater harvesting has been proposed to supply the existing sprinkler system and dust suppression within the existing shed. Daily usage rates have been estimated by R Collard at 1.4 – 1.7m³/ day.

R Collard has also proposed to store rainwater within a re-purposed weighbridge onsite, which has an approximate volume of 45m³. Additional offline rainwater storage will be provided within the pumping station.

In the event of a drought in which harvested rainwater is no longer available, the WTS will continue dust suppression using mains water.

Based on this information, the rainwater harvesting network capacity may range from approximately 1.5m³ to 45m³, which cannot be further refined in the absence of detailed rainfall frequency data and analysis. As such, the rainwater storage capacity will not be utilised in the SW attenuation estimates provided below. However, the rainwater harvesting will provide betterment by reducing the volume of site runoff and by reducing pressure on potable water resources.

SURFACE WATER STORAGE ESTIMATES

The WSP FRA proposes maintaining the existing brownfield discharge rate from the proposed site, which has been calculated as 11l/s for the runoff area of 0.114Ha. In order to maintain this maximum rate during events up to the 100year return period plus 40% climate change, MicroDrainage Quick Storage Estimates indicate that 27m³ to 48m³ of attenuation will be required (**Appendix C**).

It is proposed that this attenuation be provided within an oversized pipe and permeable carparking sub-base at the southern end of the site, prior to discharge via an existing connection to the TW SW network in Cardiff Road. All attenuation will be impermeable or lined to prevent infiltration to, or drainage of, the high groundwater and infrastructure will be suitable to combat floatation resulting from high groundwater. There is also potential for inclusion of tree pits in the attenuation subject to detailed design.

The rainwater harvesting system will provide further attenuation and a reduction in the SW volume discharging from the site. However, this has not been used to estimate the attenuation, therefore it will provide additional betterment.

Table 2: Estimated Brownfield Discharge Rates for the 15min event with harvesting

Return Period	Brownfield Runoff Rate for proposed site (0.114ha) (l/s)	Estimated rainfall volume (15 mins x rate) (m3)	Available Storage (m3)	Harvesting Supply (days at 1.5m3/day)
1 Year	11.44	10.30	45.00	6.9 days
2 Year	14.73	13.26	45.00	8.8 days
5 Year	18.79	16.91	45.00	11.3 days
30 Year	28.05	25.26	45.00	16.8 days
100 Year	36.82	33.14	45.00	22.1 days

Dependant on rainfall patterns, there could be significant periods where no surface water is discharged from site, even following the larger storms.

WATER QUALITY

Treatment of SW prior to discharge to the TW network is proposed in accordance with the Ciria SuDS Manual (C753). A review of the simple index approach has identified that SW runoff from the staff vehicle access and carpark will be sufficiently treated by infiltration through the permeable carparking surface. Runoff from the proposed shed roof has a Low 'pollution hazard index' and it is expected that smaller events and the 'first flush' of larger events, which carry the higher pollutant loads, will pass through the rainwater harvesting pumping station, providing opportunities to settle out. Additional catchpits will be fitted to the SW network to provide similar opportunities, should the rainwater harvesting system be full.

Treatment of harvested rainwater by a proprietary system will be undertaken prior to use in order to protect the health and safety of site staff.

EXCEEDANCE EVENTS

In case of more extreme events which may cause the on-site drainage to exceed capacity, it is anticipated that the exceedance flow would be routed via open space to the carriageways, similar to the existing pathways described in the WSP FRA and outlined above.

OWNERSHIP AND MAINTENANCE

The proposed SW drainage features associated with the site will remain private and therefore will be owned and maintained by the site operator.

The proposed SW drainage system will be designed in accordance with appropriate design standards, such as Building Regulations Document H and the SuDS Manual. The general maintenance obligations, informed by the SuDS Manual, for the proposed SW drainage features at the site have been summarised in **Tables 3 to 8** below.

Table 3 General maintenance obligations for drains, manholes, catchpits and flow controls

Element	Ownership	Maintenance schedule	Required Action	Typical Frequency
Drains, Manholes and Catchpits	Private, element to be maintained by site operator	Regular maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action	Monthly for three months then annually
		Occasional maintenance	Inspect catchpits to check for sediment build up. Remove sediment if necessary	Monthly in the first year and then at intervals as required based on monitoring, but at least annually
			Survey pipes and manholes to check for sediment build up. Remove sediment if necessary	Every 5 years or as required
		Remedial actions	Repair physical damage if required	As required
		Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly in the first year and then annually. An inspection should be undertaken annually, after autumn leaf fall, in conjunction with occasional maintenance

Table 4 General maintenance obligations for flow controls

Element	Ownership	Maintenance schedule	Required Action	Typical Frequency
Flow Controls (orifice plates & vortex flow controls)	Private, element to be maintained by site operator	Regular maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action. Remove debris from device and chamber that could cause blockage.	Monthly for three months then every 6 months
		Occasional maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action. Remove debris from device and chamber that could cause blockage.	After significant leaf fall and significant rainfall events.
		Remedial actions	Repair physical damage if required	As required
		Monitoring	Inspect debris accumulation rates and establish appropriate removal frequencies	Monthly in the first year and then annually. An inspection should be undertaken annually, after autumn leaf fall, in conjunction with occasional maintenance

Table 5 General maintenance obligations for linear channels and gullies

Element	Ownership	Maintenance schedule	Required Action	Typical Frequency
Linear Channels and Gullies	Private, element to be maintained by site operator	Regular maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action	Monthly for three months then annually
		Occasional maintenance	Remove sediment and debris from grating and empty silt trap	Monthly in the first year and then at intervals as required based on monitoring, but at least annually
		Remedial actions	Repair physical damage if required	As required
		Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly in the first year and then annually. An inspection should be undertaken annually, after autumn leaf fall, in conjunction with occasional maintenance

Table 6 General maintenance obligations for the rainwater harvesting system

Element	Ownership	Maintenance schedule	Required Action	Typical Frequency
Rainwater Harvesting System	Private, element to be maintained by site operator	Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices. Overflow areas, pumps, filters	Annually (and following poor performance)
			Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
		Occasional maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)
		Remedial actions	Repair of overflow erosion damage or damage to tank	As required
			Pump repairs	As required
		Monitoring	Initial inspection	Monthly for three months after installation
			Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly in the first year and then annually

Table 7 General maintenance obligations for the porous paving system

Element	Ownership	Maintenance schedule	Required Action	Typical Frequency
Porous Paving System	Private, element to be maintained by site operator	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 manufactures recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as these areas are most likely to collect the most sediment
		Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
			Removal of weeds or management using glyphosate applied directly onto the weeds by an application rather than spraying.	As required – once per year on less frequently used pavement
		Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required
			Remediate work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
			Removal of weeds or management using glyphosate applied directly onto the weeds by an application rather than spraying.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
		Monitoring	Initial inspection	Monthly for three months after installation
			Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three monthly, 48h after large storms in first 6 months
			Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
			Monitor inspection chambers	Annually

Table 8 General maintenance obligations for the proposed tree pits

Element	Ownership	Maintenance schedule	Required Action	Typical Frequency
Tree pits	Private, element to be maintained by site operator	Regular maintenance	Remove litter and debris	Monthly (or as required)
			Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
			Inspect inlets and outlets	Inspect monthly
		Occasional maintenance	Check tree health and manage tree appropriately	Annually
			Remove silt build-up from inlets and surface and replace mulch as necessary	Annually, or as required
			Water	As required (in periods of drought)
		Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Six monthly

CONCLUSIONS

The SW drainage strategy proposes to harvest rainwater for reuse within the existing Waste Transfer Station dust-suppression activities and manage the remaining SW in accordance with Planning Condition 14 and associated regulatory requirements for attenuation and controlled discharge.

The DS has been informed by the WTS opportunities, existing constraints and site conditions including limited space for installation of new above ground drainage features; low permeability and high groundwater with an associated contamination potential from made-ground; plus R Collard's proposal for improved resource management through rainwater harvesting and the existing infrastructure. As such it is proposed that rainwater will be captured and stored offline within a repurposed weigh-station prior to treatment and pumping to the existing sprinkler system. Surface water that is not harvested and reused, is proposed for attenuation within resilient underground infrastructure for a controlled discharge at the existing brownfield rate to an existing connection with the Thames Water SW sewer.



APPENDIX A: DRAWINGS

DRAINAGE STRATEGY

INDICATIVE LONGSECTION

EXTENDED TOPOGRAPHIC SURVEY



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KEY:

RED LINE BOUNDARY

PROPOSED SURFACE WATER PIPE AND CHAMBER

PROPOSED HYDROBRAKE

PROPOSED SURFACE WATER CHANNEL DRAIN

EXISTING RAINWATER ROOF GUTTERING

ROOF RUNOFF CATCHMENT AREA

PROPOSED RAINWATER ROOF GUTTERING

ROOF RUNOFF CATCHMENT AREA

PROPOSED UNDERGROUND RAINWATER PIPE AND CHAMBER

OFFLINE UNDERGROUND RAINWATER STORAGE TANK (REPURPOSED FROM WEIGH-STATION)

PROPOSED PUMPING STATION

PROPOSED RISING MAIN TO SPRINKLER

PROPOSED CONTROL PANEL FOR PUMPING STATION AND WATER QUALITY TREATMENT

PROPOSED PERFORATED PIPE

PROPOSED PERMEABLE CARPARKING AND SUBBASE ATTENUATION

DIRECTION OF SURFACE WATER RUNOFF

PROPOSED KERB

P02	06/05/2022	KR	DRAINAGE STRATEGY – FOR PLANNING	JS	CP
P01	18/03/2022	KR/FL	REQUEST FOR INFORMATION	JS	CP
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
S0 - WORK IN PROGRESS

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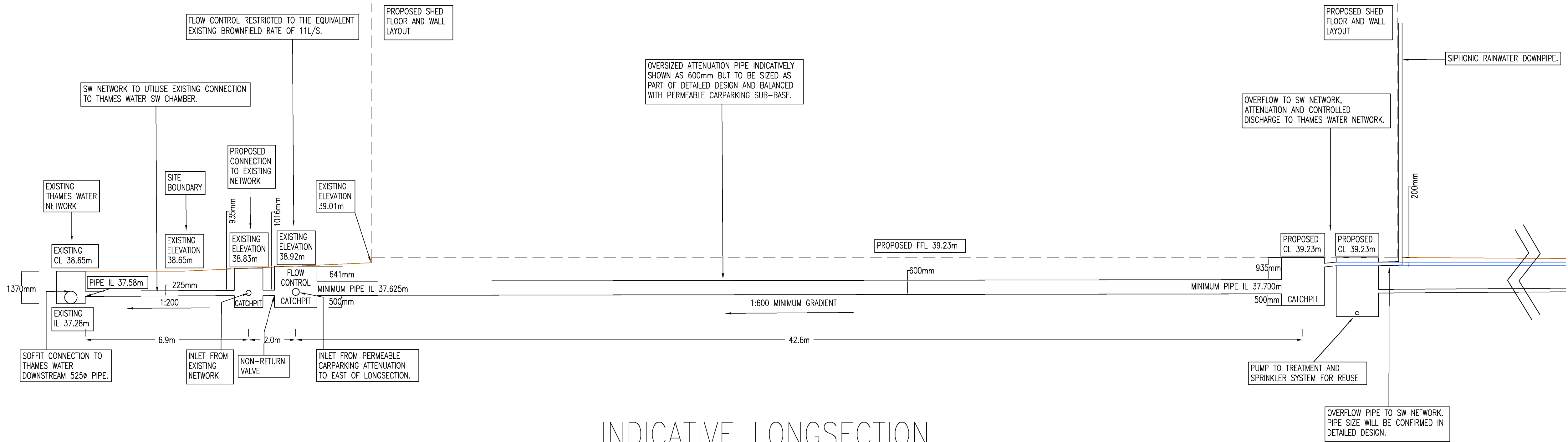
SITE/PROJECT:
WASTE RECYCLING CENTRE EXPANSION

TITLE:
DRAINAGE STRATEGY
RAINWATER AND SURFACE WATER

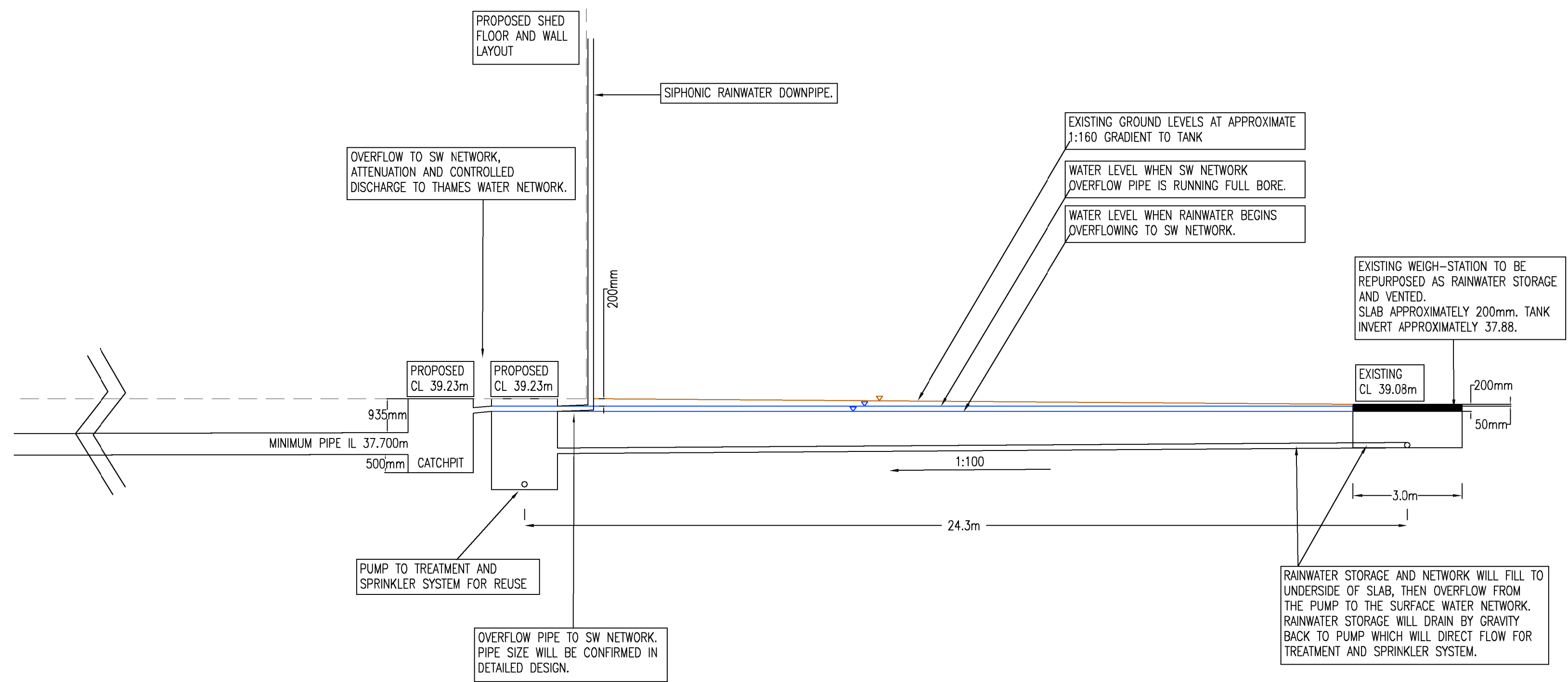
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PROJECT NO: 70063683	DESIGNED: KR/FL	DRAWN: KR/FL
DATE: March 22		REV: P02

DRAWING No:
70063683-WSO-XX-SKETCH-DR

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INDICATIVE LONGSECTION
SURFACE WATER NETWORK
1:100



INDICATIVE LONGSECTION
RAINWATER HARVESTING NETWORK
1:100

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P01	19/04/2022	KR	FIRST ISSUE	JS	CP
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:	S0 - WORK IN PROGRESS
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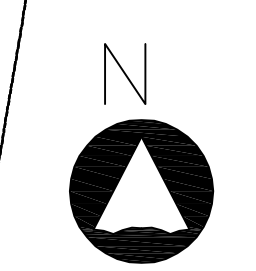
SITE/PROJECT:	WASTE RECYCLING CENTRE EXPANSION
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TITLE:	INDICATIVE LONGSECTION RAINWATER HARVESTING AND SURFACE WATER NETWORK
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PROJECT NO:	70063683	DESIGNED:	KR	DRAWN:	KR
				DATE:	APRIL 22

DRAWING NO:	70063683-WSO-XX-SKETCH-DR_0002	REV:	P01
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Works



KEY

Topographical Abbreviations

A/R	Assumed Route	MKR	Marker
BH	Borehole	MT	Mercury Telecom Cover
BOL	Bollard	OHC	Overhead Cable
BT	British Telecom Cover	OHP	Overhead Pipe
BW	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark
BWK	Brickwork	PB	Post Box
CATV	Cable TV Cover	PGM	Permanent Ground Marker
CB	Close Boarded Fence	PR	Post & Rail Fence
CCTV	Closed Circuit TV	PW	Post & Wire Fence
CHLK	Chainlink Fence	PWM	Post & Wire Mesh Fence
CHPL	Chainstrut Paling Fence	RE	Rodding Eye
CL	Cover Level	RG	Road Gully
CM	Cable Marker	RN	Road Name
CP	Catch Pit	RS	Road Sign
CPL	Catch Pit Base Level	RW	Retaining Wall
DIA	Diameter	RWP	Rain Water Pipe
DK	Drop Kerb	SAP	Sapling
DP	Down Pipe	SC	Stop Cock
EJB	Electricity Junction Box	SPR	Spread
EC	Electricity Cover	STA	Traverse Station
EP	Electricity Pole	SV	Stop Valve
ER	Earthing Rod	SVP	Soil Vent Pipe
EH	Fire Hydrant	SW	Storm Water
FIG	Feed Into Ground	TB	Telephone Box
FW	Foul Water	TBM	Temporary Bench Mark
G	Gully	TFR	Taken From Records
GV	Gas Valve	TJB	Telephone Junction Box
HT	Height	TPT	Trial Pit
IC	Inspection Cover	TL	Traffic Light
IL	Invert Level	TP	Telephone Pole
IR	Iron Railing Fence	UTL	Unable To Lift
KO	Kerb Outlet	UTT	Unable To Trace
LB	Litter Bin	VP	Vent Pipe
LC	Lamp Column	WKH	Water Key Hole
LP	Lamp Post	WM	Water Meter
MH	Manhole	WV	Water Valve

Survey Station Information				
STA No.	Easting	Northing	Level	Type
STA001	470464.757	174138.179	38.586	PK Nail
STA002	470504.637	174130.660	38.871	PK Nail
STA003	470484.960	174210.908	39.049	Hilti Nail
STA004	470506.738	174206.196	39.098	PK Nail

Notes
The Grid is related to OS using GPS.
All Levels are related to OS using GPS.
— Downloaded OS Line Work — Buildings
— Downloaded OS Line Work — Other Detail

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Serial reference number :01080000

Base data taken from topographical survey undertaken by Warner Land Surveys Ltd. Ref. Drawing No. T11 / 0152 / P / 0001

Base data taken from topographical survey undertaken by Warner Land Surveys Ltd. Ref. Drawing No. T11 / 0152 / P / 0001

Rev	Date	Comments
A	16/01/12	Updating MRF Buildings size & location

CLIENT
M C Collard Waste Management Ltd

PROJECT
128 Cardiff Road
Reading
Berkshire
RG1 8PG

TITLE
Proposed Layout
Replacement Industrial Building
and Offices

DRG No: MC3669 / 3	SCALE: 1:200 @ A1	DATE: Nov 2011
DRAWN BY: AMCH	CHECKED BY: SDF	APPROVED BY: SDF

Planning & Development Consultants
Wharf House, Wharf Road,
Guildford, Surrey, GU1 4RP.
Tel: 01483 579098 Fax: 01483 504399
Email: support@alliance-plan.co.uk



140

Dep

128 CARDIFF ROAD

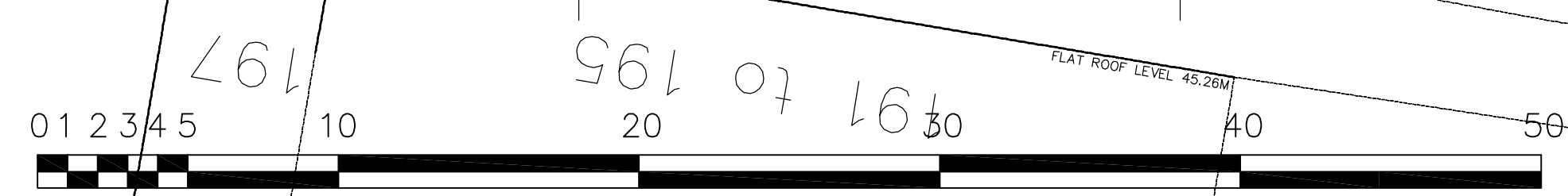
124 CARDIFF ROAD

38.6m +

CARDIFF ROAD

CARDIFF ROAD

Works



APPENDIX B: BROWNFIELD RUNOFF CALCULATIONS

The Modified Rational Method has been used to calculate runoff from existing developed areas. The Modified Rational Method uses the following formula to calculate peak runoff:

$$Q = 2.78 * C_v * C_r * R_i * A$$

Where Q = Flow rate (l/s)

C_v = Volumetric Runoff Coefficient

C_r = Routing Coefficient (taken as 1.3)

R_i = Rainfall intensity (mm/hr)

A = Area (ha)

Under summer rainfall conditions, C_v ranges from 0.6–0.9, with the lower values representative of rapidly draining soils and the higher values of heavy clay soils. For fully impermeable areas an average C_v value of 0.95 should be used and as such, this will be applied to the site.

The routing coefficient C_r varies between 1 and 2 and accounts for the effect of rainfall characteristics and catchment shape on the peak runoff magnitude. The SuDS Manual (CIRIA C753) recommends a fixed value for C_r of 1.30 for design.

Rainfall intensity has been calculated based on rainfall statistics obtained from maps contained within the Wallingford Procedure Volume 4, as follows:

- 60 minute, 5 year (M5-60) Rainfall Depth = 18.5 mm
- r value of 0.4
- Z₁ value of 0.63

Rainfall intensities for a range of return periods have been calculated using growth curves obtained from the Wallingford Procedure, as follows:

1 Year:	M1-15 = (18.5 * 0.64 * 0.63)/(15/60) = 29.231 mm
	R _i = 29.231 mm/hr
2 Year:	M2-15 = (18.5 * 0.81 * 0.63)/(15/60) = 37.622 mm
	R _i = 37.622 mm/hr
5 Year:	M5-15 = (18.5*0.103*0.63)/(15/60) = 48.019 mm
	R _i = 48.019 mm/hr
30 Year:	M30-15 = (18.5*1.537*0.63)/(15/60) = 71.655 mm
	R _i = 28.435 mm/hr
100 Year:	M100-15 = (18.5* 2.018*0.63)/(15/60) = 94.079 mm
	R _i = 94.079 mm/hr

The discharge rates in litres per second per hectare are summarised in the table below then applied to the existing and proposed areas of brownfield.

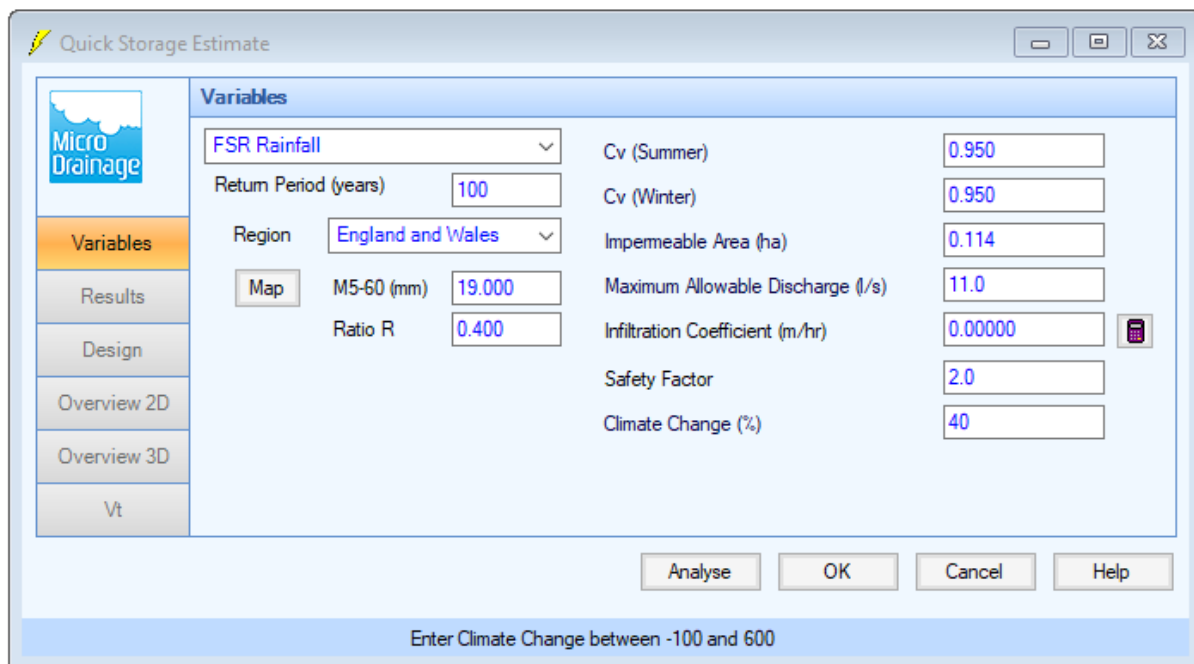
$$Q = 2.78 * C_v * C_r * R_i * A$$

Table A1. Estimated Brownfield Discharge Rates for the 15min event

Return Period	Brownfield Runoff Rate (l/s/ha)	Brownfield Runoff Rate for proposed site (0.114ha) (l/s)
1 Year	100.36	11.44
2 Year	129.17	14.73
5 Year	164.86	18.79
30 Year	246.01	28.05
100 Year	323.00	36.82

APPENDIX C:

MICRODRAINAGE QUICK STORAGE ESTIMATE



Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years)

Region

Map

Ratio R

Cv (Summer)

Cv (Winter)

Impervious Area (ha)

Maximum Allowable Discharge (l/s)

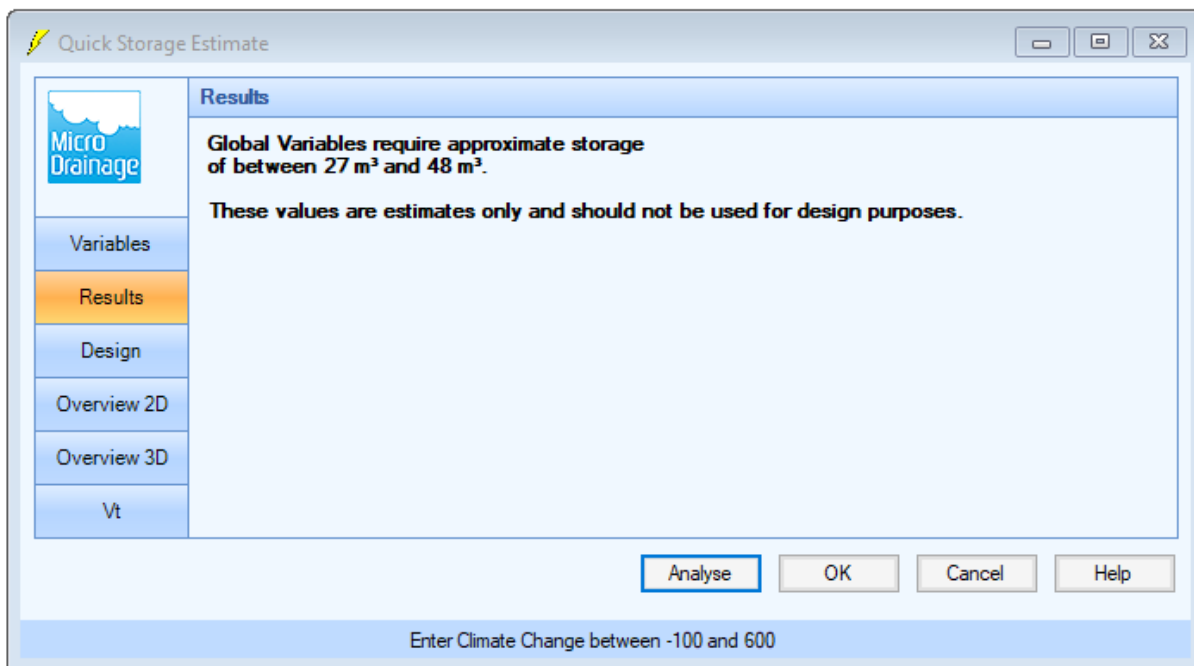
Infiltration Coefficient (m/hr)

Safety Factor

Climate Change (%)

Analyse OK Cancel Help

Enter Climate Change between -100 and 600



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 27 m³ and 48 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Climate Change between -100 and 600