Defra's Water Availability and Quality Evidence Programme

Comparative Costings for Conventional Drainage and SuDS.

Red Hill C.of E. Primary School, Worcester.

R&D Technical Report
Produced: February 2011
Author: Islington Council, C/o Robert Bray Associates Limited

ROBERT BRAY ASSOCIATES LIMITED
Sustainable Drainage Consultants and Landscape Architects
Fairfield, Coronation Road, Rodborough, Stroud, Glos, GL5 3SB
Tel: 01453 764885 Fax: 01453 765545 Email: bob@robertbrayassociates.co.uk www:sustainabledrainage.co.uk

Company Registered in England Number 4834556 Registered Office Address: Aldreth, Pearcroft Road, Stonehouse, Glos, GL10 2JY

Research contractor: Department for Environment Food and Rural Affairs

Defra project officer: Rachel Boulderstone

Publishing organisation
Department for Environment, Food and Rural Affairs
Water Availability and Quality,
Ergon House,
Horseferry Road
London SW1P 2AL

Tel: 020 7238 3000
Fax: 020 7238 6187

www.defra.gov.uk

© Crown copyright (Defra);(*2010*)
Copyright in the typographical arrangement and design rests with the Crown. This publication (excluding the logo) may be reproduced free of charge in any format or medium provided that it is reproduced accurately and not used in a misleading context. The material must be acknowledged as Crown copyright with the title and source of the publication specified. The views expressed in this document are not necessarily those of Defra. Its officers, servants or agents accept no liability whatsoever for any loss or damage arising from the interpretation or use of the information, or reliance on views contained herein.

Published by the Department for Environment, Food and Rural Affairs (July 2011).

Contents

1.0 Introduction

This report provides a summary of the design and cost implications of incorporating a Sustainable Drainage System (SuDS) in comparison to a conventional drainage system for a new build school in Worcester. The site has been designed following both a SUDS and conventional drainage approach to meet three different quantity parameters as set out below. This provides a broad comparison of the cost implication and wider impacts of use of SUDS versus a traditional approach on such sites.

2.0 Site description

2.1 Development description

The Red Hill C.of E. Primary School is located off the London Road leading into the City of Worcester. The old school which was built in the 1970s was deemed unfit for use and demolished. It was replaced with a new school in about the same location after a temporary re-location to portacabin facilities on the playing field to the south. The new school roughly occupies the footprint of the old school but with additional car parking.

2.2 Drainage characteristics

The old school drained to a new storm sewer that roughly follows the line of the adjacent railway line before crossing to join the sewer running down London Road. All existing natural drainage has been destroyed in the past although there is a memory of a large pond to the west which discharged to a watercourse now lost.

A double row of large Lime trees cross the southern edge of the site and represent the survivors of an old avenue to an adjacent large house. These trees were a constraint to both the school design and the SuDS drainage system.

2.3 Layout characteristics

The site is a lozenge shape falling from the south to a low point in the NE corner.

A flow route analysis identified 2 distinct flow paths for runoff, one running to the south of the school and ending in the copse of Lime trees at the western end of the site and a second flowing along the northern edge of the school and ending in the car park where the connection to the sewer is located.

The copse area and the adjacent school manager's bungalow are slightly lower than the car park and sewer location point so require a robust pipe connection to the storm sewer in the event of heavy rainfall.

3.0 SuDS strategy

The SuDS design identifies the various hard surfaces along the flow route that contribute runoff and selects appropriate SuDS techniques to manage the flow, provide 'treatment stages' and store volumes to meet agreed criteria. All flows are managed within the footprint of the site.

3.1 Quantity

The actual criteria agreed with the Water Company were based on 'betterment' and the capacity of the Storm Sewer to accept flow from the development. The site had discharged unattenuated flow to the sewer in the past so 'betterment' consisted of a reduction of flow to 10L/sec for the 2 hectare site up to the 1 in 10 year return period with an unattenuated overflow when this volume was exceeded.

For the purpose of this exercise the following criteria have been adopted:

The data for the design cases for sites in Worcester with a storm return period of 1:100 years +30% are:

1 Rainfall calculated by FSR method with r= 0.39 and M5-60 = 19mm/h

- Outflow 150 l/s/Ha, critical storm duration 16min, critical rainfall 115.9mm/h, storage required 165.5m3/Ha – 16mm storage for each M^2
- Outflow 50 l/s/Ha, critical storm duration 51min, critical rainfall 55.9mm/h, storage required 322m3/Ha - 32mm storage for each M^2
- Outflow 8 l/s/Ha, critical storm duration 5.42 hours, critical rainfall 14.2mm/h, storage required 612m3/Ha – 60mm storage for each M^2

The FEH method is sometimes required by the EA but is generally considered inappropriate for small sites and short durations as can be seen from the figures given below:

2 Rainfall calculated by FEH method with c=-0.027, d1= 0.329, d2=0.36, d3=0.318, e=0.297, f=2.397. This method has been included for information only.

- Outflow 150 l/s/Ha, critical storm duration 10min, critical rainfall 232.9mm/h, storage required 299m3/Ha (note: a 10min storm is a shorter duration than the validity of the FEH algorithms and the calculated rainfall may not be correct) - 29mm storage for each M^2
- Outflow 50 l/s/Ha, critical storm duration 35min, critical rainfall 86mm/h, storage required 397m3/Ha - 39mm storage for each M^2
- Outflow 8 l/s/Ha, critical storm duration 5.7 hours, critical rainfall 14mm/h, storage required 636m3/Ha - 63mm storage for each M^2

The selection of soft or infiltrating SuDS features usually results in a reduction in volume requirement by at least 5mm/ M^2 as 'interception storage' This is now allowed in the calculation.

The volume of water to be stored for each sq M is therefore:

- 150 l/s/Ha - 16mm storage for each M^2 with 5mm 'interception storage' allowed for use of SUDS techniques =11mm storage for each M^2 impermeable surface
- 50 l/s/Ha - 32mm storage for each M^2 with 5mm 'interception storage' allowed for use of SUDS techniques = 27mm storage for each M^2 impermeable surface
- 8 l/s/Ha - 35mm storage for each M^2 with 5mm 'interception storage' allowed for use of SUDS techniques = 57mm storage for each M^2 impermeable surface

3.2 Quality

All runoff passes through at least one 'treatment stage' and road runoff through 2 stages although the car park demonstrates 2 stages within the construction using stone with box and geotextile systems.

The 'treatment stages' include swales, filter strips, basins, ponds, permeable pavements and a small green roof. The 'treatment stages' are described in the following text.

3.3 Amenity benefits

All surface SuDS features are considered for amenity during the design process. This may include additional features or the use of enhanced materials for visual reasons. These items can be considered as part of the landscape enhancement rather than purely SuDS but it can be difficult to separate out the benefits.

Amenity benefits provided by the SUDS:

- rainharvesting has been used to collect runoff from the school roof but is not included here as a SuDS technique – a bench seat can be lifted to see how the collection occurs.
- runoff from the roof and re-surfaced Key Stage 2 play area enters a chamber that discharges through the wall via a stainless steel 'art' spout that hides overflow and land drainage pipes.
- granite sett channels collect roof runoff from rainwater pipes with 'shoes' on the bottom that form outdoor demarcation to classrooms and link to an open sett conveyance channel to the swale.
- the swale passes under the road to a 'swale maze' basin formed by adding a 300mm high berm to an existing copse area. A number of plank bridges cross a snaking grass channel to create the maze. This is now a major teaching space.
- the ditch leads to a small biodiversity pond which overflows to the sewer
- a sett channel conveys surface runoff from the access road to the grass filter strips that then discharge to the 'swale maze' channels

These amenity and biodiversity benefits use enhanced quality materials like the sett channels and landscape features like the plank bridges but use the basic SuDS features selected to manage runoff as a basis for environmental enhancement.

3.4 Biodiversity benefits

Again all SUDS features are considered for biodiversity and this may require additional features but in many cases is a direct result of SuDS selection. Although the small pond is a specific biodiversity feature it was part of the landscape strategy for the school as well as a SuDS feature.

The natural planting and wildflower seeding of the swale maze and other basins and swales used a small additional seed specification to gain additional biodiversity value.

4.0 The SuDS design process

4.1 The western flow route

This flow route begins with **the existing playground – Key Stage 2** which was retained and resurfaced. It was also the location of a sub-base replacement rainharvesting system, which although part of the sustainability agenda is not considered part of the SuDS in this case. It will however reduce the flow form the site as water is continually being used and a volume is likely to be available for storage at all times. Water flows to a gully in the NE corner of the playground then backwards in a pipe to the retaining wall above **the 'south' teaching terrace.**

In a conventional drainage system there would probably be a drop manhole in this situation. In the SUDS scheme a spout conveys water to a sett channel below the wall. The spout is an ornamental stainless steel feature but could as easily be a simple pipe outlet. Similarly the sett channel could be a simple concrete channel although this is not such a flexible solution. Roof water falls directly, through a downpipe shoe, on to sett channels that link to the main sett conveyance channel. This could be concrete. Runoff flows along an up and down sett channel designed to keep the pipe below as shallow as possible and deal with the single level school frontage. The water leaves the pipe flowing into a short swale before passing under the road into the swale maze. This short swale provides a collector in the event of very heavy rain but would be a pipe connection approx 600mm down in a conventional system.

The **swale maze** accepts all water from the southern flow route through a mitred concrete headwall. It also collects all runoff from the access road which flows across a flush kerb onto a grass filter strip. The flush kerb is part of the road construction and should not be considered as a SuDS cost. The filter strip is 150m topsoil on subsoil and is really part of the existing verge. The

SuDS function takes advantage of this existing landscape feature. Similarly the swale maze is a detention basin formed by the excavation of a ditch maze with spoil forming a 300mm high bund. On many sites this would need to be excavated but in this case the levels allowed it to be formed by simple bunding. This cannot be considered land take as the trees were protected by a TPO (Tree preservation order) and the area was existing amenity space.

A small pond was created as an educational feature. It contributes very little storage and is not necessary for 'treatment' as the basin provides the single 'treatment' stage necessary for the SuDS. Therefore in this case the pond is not a SuDS cost. There is a controlled flow outfall and an overflow grating which link to a control manhole just before the sewer connection.

In a conventional drainage system the piped collection system would link to a gully and pipe collection system in the access road and underground pipe connectors from the roof drainage. These would flow to a storage feature underground such as a geocellular box, oversized pipe or other tank.

4.2 The northern flow route

The flow route begins with a tarmac **access path and Key Stage 1 play space** drained conventionally with a shallow channel drain carrying water to a silt trap before water enters the sub- base of the **permeable pavement car park.** A number of downpipes discharge directly to the permeable surface via sett channels (they could be plain concrete) completing this small sub-catchment. The permeable pavement has additional sub-base replacement box storage to add capacity to the limited storage in the car park

A perforated pipe leads to a control chamber which in turn connects with the chamber linking to the discharge point as long as the sewer has capacity.

5.0 Conventional drainage strategy

A conventional drainage layout has been sketched out to collect rainwater down the south and north of the school roughly following the SuDS flow routes but with pipe runs leading to the car park and discharge point into the storm sewer. The conventional drainage system has been designed to include a petrol interceptor and appropriate storage tanks to attenuate the whole volume of water to be stored for each flow rate from the site (see storage strategy below). Storage has been accommodated in sub-base replacement tanks which was the type of geocellular box used for the Red Hill School site.

6.0 Storage strategy

6.1 SuDS storage

The western flow route

The Key stage 2 – Hard Play of 906M^2 would have collected its own runoff if it had been constructed as a permeable play surface as recommended in SAPCA guidance. There would also have been capacity for some roofwater. However in this situation the play surface was existing and following remedial work it was reinstated.

Therefore the 906M^2 runoff is conveyed with the 2487M^2 roof runoff (no allowance for rainharvesting) to the 'swale maze' detention basin. The basin has a capacity of 931M^2 at approximately 200mm deep = 186.2M^3 and collects the combined volume of 3393M^2.

The storage for each flow rate option is the flow rate x 3393:

	8L/sec/ha - 0.055	50L/sec/ha - 0.027	150L/sec/ha – 0.011
186.20M^3 capacity	186.61M^3	91M^3	37M^3

Therefore the basin requires an additional 0.41M^3 for the 8L/sec/ha flow rate storage which can be easily achieved by excavation. The basin accommodates the volume required for the other volumes.

The eastern flow route

The key stage 1 Hard Play together with the adjacent roof and car park contribute 861M^2 and 363M^2 = 1224M^2. The storage for each flow rate option is the flow rate x 1224:

	8L/sec/ha - 0.055	50L/sec/ha - 0.027	150L/sec/ha – 0.011
Car Park capacity 54.45M^3 (363x.150 storage)	67.32M^3	33.0M^3	13.46M^3

Therefore this sub-catchment requires an additional 12.87M^3 which can be provided by sub-base replacement box storage in the car park for the 8L/sec/ha flow rate.

6.2 Conventional drainage storage

A storage requirement for conventional drainage would require a below ground containment as the pipe system delivers the runoff at least 1M below the surface.

Areas 3393M^2 + 1224M^2 = 4617M^2

The storage required for each flow rate uses the primary figure as no allowance can be made for 'interception storage'. The storage for each flow rate option is the flow rate x 4617:

	8L/sec/ha - 0.060	50L/sec/ha - 0.032	150L/sec/ha – 0.016
Storage required	277.02M^3	147.74M^3	73.87M^3

The storage is provided by sub-base replacement boxes in this case study as this was the type used on Red Hill. This type of box storage is not the cheapest type but was selected as they require less excavation and can take sufficient vehicle loadings. Their use could be reviewed to take into account the fact that cheaper options are available.

Figure 1: The swale maze and biodiversity pond

Figure 2: The stainless steel spout feature and sett apron leading to a sett channel

7.0 Conclusions

The table below sets out the estimated costs for both the traditional drainage and SuDS solution for the Red Hill School site. This demonstrates the significantly reduced cost of implementing SuDS over traditional drainage at all runoff rates examined. SuDS are considerably cheaper due to the storage provided within landscape features, which reduces the need for expensive boxed storage. The cost estimates do suggest a relatively small increase in cost for the SuDS solution to

achieve greenfield runoff rate (8l/s/ha) as additional boxed storage is needed in this scenario; however the cost is still low, being a little over half that of the conventional drainage scenario achieving the much higher runoff rate of 150l/s/ha.

	150 l/s/ha		50 l/s/ha		8 l/s/ha	
	Traditional Drainage	S.U.D.S.	Traditional Drainage	S.U.D.S.	Traditional Drainage	S.U.D.S.
Cost	99,100	46,900	151,000	46,900	237,000	55,100
Less Amenity Works on S.U.D.S.		-2,400		-2,400		-2,400
Preliminaries	9,900	4,900	15,100	4,900	23,700	5,800
Contingency	5,000	2,500	7,600	2,500	11,900	2,900
Estimated Construction Total	**114,000**	**51,900**	**173,700**	**51,900**	**272,600**	**61,400**

SuDS also provides significant opportunity to increase the value of the scheme through use of landscape features such as ponds and wetlands, although the cost of these has been removed from within the estimate (see above). For a relatively minor cost, these features add significant educational and biodiversity to the school; and in practice have created popular teaching and play facilities. Such features would also assist in compliance with other planning requirements such as around biodiversity.

Evidence available also suggests SuDS solutions have lower maintenance costs than comparable traditional drainage solutions; this is likely to be particularly true where they are surface features which can be easily maintained as part of standard maintenance contracts (eg pavement sweeping, mowing, etc).

The cost exercise demonstrates the potential for suburban school sites to incorporate SuDS to meet even the most stringent quantity criteria for a significantly reduced cost over traditional drainage scenarios. Similar design solutions could be applied to the majority of schools, even in urban areas, through the design of play areas or parking facilities as multifunctional spaces with a drainage function.

8.0 Lessons learnt

The incorporation of SuDS from an early stage of design is crucial to ensure costs are minimised. On a site such as Red Hill, a number of opportunities exist to integrate SuDS from the concept stage as a key part of decision making around site layout, to minimise costs and maximise amenity benefits. The case study demonstrates the huge potential of SuDS to provide amenity, educational and biodiversity benefits to schools by bringing water to the surface for use in safe, fun and instructive ways.

The design should also take maintenance requirements into account to ensure these are minimised and can be carried out wherever possible by existing maintenance contractors. In the case of Red Hill School, maintenance is carried out by the landscape contractor with occasional inspections by the on-site manager.

Estimated

Ref	Description	Qty	Unit	Rate	Amount
6F	**DRAINAGE**				
	DISPOSAL SYSTEMS				
	R12 DRAINAGE BELOW GROUND				
	Drain runs				
	Excavating trench in soft landscaped area; earthwork support; 100 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	95	m	36.00	3,420.00
	Excavating trench in hard landscaped area; earthwork support; 100 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	316	m	45.00	14,220.00
	Excavating trench in hard landscaped area; earthwork support; 100 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	81	m	55.00	4,455.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Excavating trench in soft landscaped area; earthwork support; 150 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	53	m	42.00	2,226.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	26	m	51.00	1,326.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	12	m	60.00	720.00
	Clay / aluminium accessories				
	Clayware gulley; 100 outlet; rodding eye and stopper; two 100 nominal diameter clayware bends; jointing outlet to 100 nominal diameter clay drain; cast aluminium grating; bedding and surrounding 150 thick with insitu concrete GEN3; additional excavation, necessary formwork etc.				
	rainwater gulley	11	Nr	90.00	990.00
	yard gulley	18	Nr	90.00	1,620.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Clayware gulley; 100 outlet; rodding eye and stopper; two 100 nominal diameter clayware bends; jointing outlet to 100 nominal diameter clay drain; cast iron heavy duty grating and frame; bedding and surrounding 150 thick with insitu concrete GEN3; additional excavation, necessary formwork etc.				
	300 diameter x 600 deep road gulley	15	Nr	300.00	4,500.00
	Manholes and Interceptors				
	Clayware petrol interceptor; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site				
	petrol interceptor	1	Nr	2,500.00	2,500.00
	Brick manhole; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, step irons, channels, three quarter section branch bends, benching, building in ends of drains to walls, access covers, brick kerbs etc.				
	1240 x 675 x 1000 deep to invert internal size	15	Nr	975.00	14,625.00
	Storage and Attenuation System				
	Brick chamber; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, step irons, building in ends of drains to walls, access covers, brick kerbs etc.				
	inlet settlement chamber	1	Nr	400.00	400.00
	outlet chamber; including stainless steel flow restrictor	1	Nr	700.00	700.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Storage chamber; including all necessary additional excavation, earthwork support, compacting, 150 deep permavoid geocellular boxes with prefabricated sealed Sel-flex geomembrane and Sel-tex geotextile surround, 50 mm thick clean crushed stone cover bed etc., backfilling, disposal of excavated material by removing from site				
	150 l/s/ha; 150 mm deep (1 layer); 74 m³ storage volume (assumed 1 layer of 150 deep boxes in areas of pedestrian paving - 1 layer laid in granular sub-base no additional excavation required)	494	m²	95.00	46,930.00
	Warning sign				
	restricted rodding in manhole	2	Nr	50.00	100.00
	Installation				
	Cleaning, testing and commissioning				
	of complete installation		Item	350.00	350.00

EXTERNAL WORKS - TRADITIONAL DRAINAGE 150 l/s/ha

Estimated

Ref	Description	Amount
	SUMMARY	
	Page No. 1/1	22,095.00
	Page No. 1/2	6,882.00
	Page No. 1/3	22,725.00
	Page No. 1/4	47,380.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
6F	**DRAINAGE**				
	DISPOSAL SYSTEMS				
	R12 DRAINAGE BELOW GROUND				
	Drain runs				
	Excavating trench in soft landscaped area; earthwork support; 100 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	95	m	36.00	3,420.00
	Excavating trench in hard landscaped area; earthwork support; 100 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	316	m	45.00	14,220.00
	Excavating trench in hard landscaped area; earthwork support; 100 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	81	m	55.00	4,455.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Excavating trench in soft landscaped area; earthwork support; 150 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	53	m	42.00	2,226.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	26	m	51.00	1,326.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	750 - 1000 average depth	12	m	60.00	720.00
	Clay / aluminium accessories				
	Clayware gulley; 100 outlet; rodding eye and stopper; two 100 nominal diameter clayware bends; jointing outlet to 100 nominal diameter clay drain; cast aluminium grating; bedding and surrounding 150 thick with insitu concrete GEN3; additional excavation, necessary formwork etc.				
	rainwater gulley	11	Nr	90.00	990.00
	yard gulley	18	Nr	90.00	1,620.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Clayware gulley; 100 outlet; rodding eye and stopper; two 100 nominal diameter clayware bends; jointing outlet to 100 nominal diameter clay drain; cast iron heavy duty grating and frame; bedding and surrounding 150 thick with insitu concrete GEN3; additional excavation, necessary formwork etc.				
	300 diameter x 600 deep road gulley	15	Nr	300.00	4,500.00
	Manholes and Interceptors				
	Clayware petrol interceptor; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site				
	petrol interceptor	1	Nr	2,500.00	2,500.00
	Brick manhole; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, step irons, channels, three quarter section branch bends, benching, building in ends of drains to walls, access covers, brick kerbs etc.				
	1240 x 675 x 1000 deep to invert internal size	15	Nr	975.00	14,625.00
	Storage and Attenuation System				
	Brick chamber; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, step irons, building in ends of drains to walls, access covers, brick kerbs etc.				
	inlet settlement chamber	1	Nr	400.00	400.00
	outlet chamber; including stainless steel flow restrictor	1	Nr	700.00	700.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Storage chamber; including all necessary additional excavation, earthwork support, compacting, 150 deep permavoid geocellular boxes with prefabricated sealed Sel-flex geomembrane and Sel-tex geotextile surround, 50 mm thick clean crushed stone cover bed etc., backfilling, disposal of excavated material by removing from site				
	50 l/s/ha; 300 mm deep (2 layers); 148 m³ storage volume (assumed 2 layers of 150 deep boxes in areas of pedestrian paving - 1 layer laid in granular sub-base 1 layer requiring additional excavation 150 total depth)	494	m²	200.00	98,800.00
	Warning sign				
	restricted rodding in manhole	2	Nr	50.00	100.00
	Installation				
	Cleaning, testing and commissioning				
	of complete installation		Item	350.00	350.00

EXTERNAL WORKS - TRADITIONAL DRAINAGE 50 l/s/ha

Estimated

Ref	Description	Amount
	SUMMARY	
	Page No. 2/1	22,095.00
	Page No. 2/2	6,882.00
	Page No. 2/3	22,725.00
	Page No. 2/4	99,250.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
6F	**DRAINAGE**				
	DISPOSAL SYSTEMS				
	R12 DRAINAGE BELOW GROUND				
	Drain runs				
	Excavating trench in soft landscaped area; earthwork support; 100 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
A	750 - 1000 average depth	95	m	36.00	3,420.00
	Excavating trench in hard landscaped area; earthwork support; 100 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
B	750 - 1000 average depth	316	m	45.00	14,220.00
	Excavating trench in hard landscaped area; earthwork support; 100 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
C	750 - 1000 average depth	81	m	55.00	4,455.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Excavating trench in soft landscaped area; earthwork support; 150 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
A	750 - 1000 average depth	53	m	42.00	2,226.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
B	750 - 1000 average depth	26	m	51.00	1,326.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter flexible jointed clayware drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
C	750 - 1000 average depth	12	m	60.00	720.00
	Clay / aluminium accessories				
	Clayware gulley; 100 outlet; rodding eye and stopper; two 100 nominal diameter clayware bends; jointing outlet to 100 nominal diameter clay drain; cast aluminium grating; bedding and surrounding 150 thick with insitu concrete GEN3; additional excavation, necessary formwork etc.				
D	rainwater gulley	11	Nr	90.00	990.00
E	yard gulley	18	Nr	90.00	1,620.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Clayware gulley; 100 outlet; rodding eye and stopper; two 100 nominal diameter clayware bends; jointing outlet to 100 nominal diameter clay drain; cast iron heavy duty grating and frame; bedding and surrounding 150 thick with insitu concrete GEN3; additional excavation, necessary formwork etc.				
A	300 diameter x 600 deep road gulley	15	Nr	300.00	4,500.00
	Manholes and Interceptors				
	Clayware petrol interceptor; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site				
B	petrol interceptor	1	Nr	2,500.00	2,500.00
	Brick manhole; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, step irons, channels, three quarter section branch bends, benching, building in ends of drains to walls, access covers, brick kerbs etc.				
C	1240 x 675 x 1000 deep to invert internal size	15	Nr	975.00	14,625.00
	Storage and Attenuation System				
	Brick chamber; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, step irons, building in ends of drains to walls, access covers, brick kerbs etc.				
D	inlet settlement chamber	1	Nr	400.00	400.00
E	outlet chamber; including stainless steel flow restrictor	1	Nr	700.00	700.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Storage chamber; including all necessary additional excavation, earthwork support, compacting, 150 deep permavoid geocellular boxes with prefabricated sealed Sel-flex geomembrane and Sel-tex geotextile surround, 50 mm thick clean crushed stone cover bed etc., backfilling, disposal of excavated material by removing from site				
F	8 l/s/ha; 450 mm deep (3 layers); 277 m³ storage volume (assumed 3 layers of 150 deep boxes in areas of pedestrian paving - 1 layer laid in granular sub-base 2 layers requiring additional excavation 300 total depth)	616	m²	300.00	184,800.00
	Warning sign				
B	restricted rodding in manhole	2	Nr	50.00	100.00
	Installation				
	Cleaning, testing and commissioning				
D	of complete installation		Item	350.00	350.00

EXTERNAL WORKS - TRADITIONAL DRAINAGE 8 l/s/ha

Estimated

Ref	Description	Amount
	SUMMARY	
	Page No. 3/1	22,095.00
	Page No. 3/2	6,882.00
	Page No. 3/3	22,725.00
	Page No. 3/4	185,250.00

 CARRIED TO FINAL SUMMARY £ 236,952.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
6B	**ROADS AND PATHS**				
	GROUNDWORK				
	D20 EXCAVATING AND FILLING				
	Surface treatments				
	Compacting bottoms of excavations				
	generally Spec Q20/145	71	m²	0.50	35.50
	Surface treatments Spec Q20/130				
	Herbicide				
	generally	71	m²	0.50	35.50
	WATERPROOFING				
	J40 FLEXIBLE SHEET TANKING/DAMP PROOFING				
	Geotextile membrane Spec Q20/170				
	Coverings				
	generally; to bottom of excavation	71	m²	1.50	106.50
	PAVING / PLANTING / FENCING / SITE FURNITURE				
	Q20 HARDCORE/GRANULAR/CEMENT BOUND BASES/SUB-BASES TO ROADS/PAVINGS				
	Granular material Spec 210				
	Filling to make up levels				
	not exceeding 250 average thick; depositing in layers 150 maximum thickness; compacting	7	m³	40.00	280.00
	Surface treatments Spec 250				
	Compacting filling				
	generally	71	m²	0.50	35.50

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Q24 INTERLOCKING BRICK/BLOCK ROADS/PAVINGS				
	Permeable concrete block paving Spec 115A				
	Extra over rate of non permeable concrete block paving (80 thick blocks, 50 thick sand bed, 200 thick Type 1 granular material) for permeable concrete block paving (additional excavation, removing excavated material from site, 80 thick Aquaflow ml blocks, 50 thick bed of 5mm clean stone, Inbitex non woven geotextile separating layer, 100 thick bed of 20-5mm stone, 350 thick bed of 63-10mm stone, geotextile protection layer, 1mm polypropylene liner with heat welded joints, geotextile protection layer, and also to sides geotextile protection layer, 1mm polypropylene liner with heat welded joints, geotextile protection layer) Drawing No 485-05 Detail 25				
	level or to falls	384	m²	23.25	8,928.00
	Q25 SLAB/BRICK/BLOCK/SETT/COBBLE PAVINGS				
	Granite setts Spec 500A				
	Channel				
	level or to falls; to sub-base; including concrete base and mortar bedding and jointing; as drawing Nr 485-05 detail 20	98	m	56.00	5,488.00
	level or to falls; to sub-base; including concrete base, Plaswood posts and concrete backfill, pea gravel filling and geotextile membrane; as drawing Nr 485-05 detail 21	46	m	275.00	12,650.00
	Extra over for gulley grating, brick support and clay channel	4	Nr	90.00	360.00
	Sett bowl feature				
	level or to falls; to sub-base; including lean mix concrete and mortar bedding, Plaswood posts and concrete backfill, pea gravel filling and geotextile membrane; as drawing Nr 485-05 detail 26; retaining wall, drainage channel, fin drain and gargoyle included elsewhere	1	Nr	1,700.00	1,700.00
	water spout / gargoyle feature Drawing No. 485-05 Detail 26	1	Nr	500.00	500.00

EXTERNAL WORKS - SUDS SYSTEM 50 and 150 l/s/ha

Estimated

Ref	Description	Amount
	COLLECTION - ROADS AND PATHS	
	Page No. 1/1	493.00
	Page No. 1/2	29,626.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
6E	**HORTICULTURAL WORK**				
	GROUNDWORK				
	D20 EXCAVATING AND FILLING				
	Swales				
	Excavating trenches to form swale 3700 wide x 450 deep overall				
	as Drawing Nos. 485-05 detail 16 and 485-07; including fully biodegradable coir blanket (topsoil and seed included elsewhere)	10	m	42.65	426.50
	Swale inlet				
	as Drawing No. 485-05 detail 05; including stainless steel inlet basket, paving slabs, 100 hardcore base, additional excavation, cart away etc (drain pipe included elsewhere)	1	Nr	225.98	225.98
	Swale outlet				
	as Drawing No. 485-05 detail 04; including stainless steel outlet basket, stone filling, geotextile material, paving slabs, 100 hardcore base, stainless steel flow control tube, forming micro pool, additional excavation, cart away etc (drain pipe included elsewhere)	1	Nr	408.27	408.27
	Woodland channels				
	Excavating trenches to form woodland channel 1200 wide x 300 deep overall				
	as Drawing Nos. 485-05 detail 17 and 485-07; existing trees to remain (topsoil and seed included elsewhere)	105	m	14.87	1,561.35
	Sleeper bridge Spec Q50/385A				
	as Drawing No. 485-05 detail 08; including 150 granular material type 1 footing, additional excavation, cart away etc	3	Nr	213.26	639.78
	Wetland crossing				
	as Drawing No. 485-05 detail 22; including pegs, coach bolts, 150 granular material type 1 footing, additional excavation, cart away etc	1	Nr	367.07	367.07

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Woodland channel inlet				
	as Drawing No. 485-05 detail 05; including stainless steel inlet basket, paving slabs, 100 hardcore base, additional excavation, cart away etc (drain pipe included elsewhere)	1	Nr	224.90	224.90
	Pond				
	Excavating to form pond 1050 maximum deep				
	as Drawing Nos. 485-05 detail 9 and 485-07; including polypropylene liner, geotextile membranes, 300 subsoil filling in making up levels (topsoil and seed included elsewhere)	1	Nr	1,719.03	1,719.03
	Flood relief chamber				
	as Drawing No. 485-05 detail 23; including brick chamber, grating, concrete and hardcore base, excavation, cart away etc (drain pipe included elsewhere)	1	Nr	635.91	635.91
	Pond outlet and outfall control chamber				
	as Drawing No. 485-05 detail 24; including stainless steel outlet basket, stone filling, geotextile material, 150 diameter perforated pipe with mesh guard, 150 diameter interconnecting pipe with coupler, 450 diameter polypipe chamber with 150 diameter coupler, bend and polymer sheet base and support, chamber cover, stainless steel flow control tube, paving slab and 100 hardcore base, additional excavation, backfilling, cart away etc (outlet drain pipe included elsewhere)	1	Nr	620.40	620.40

EXTERNAL WORKS - SUDS SYSTEM 50 and 150 l/s/ha

Estimated

Ref	Description	Amount
	COLLECTION - HORTICULTURAL WORK	
	Page No. 1/4	3,628.95
	Page No. 1/5	3,200.24

Estimated

Ref	Description	Qty	Unit	Rate	Amount
6F	**DRAINAGE**				
	DISPOSAL SYSTEMS				
	R12 DRAINAGE BELOW GROUND				
	Drain runs				
	Excavating trench in soft landscaped area; earthwork support; 150 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	250 - 500 average depth	27	m	32.00	864.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	250 - 500 average depth	45	m	37.00	1,665.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	250 - 500 average depth	44	m	47.00	2,068.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Excavating trench in soft landscaped area; earthwork support; 225 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	1000 - 1250 average depth	20	m	46.00	920.00
	Excavating trench in hard landscaped area; earthwork support; 225 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
	1000 - 1250 average depth	30	m	83.00	2,490.00
	Clay / cast aluminium accessories				
	Gulley; 100 outlet; rodding eye and stopper; two 100 nominal diameter clayware bends; jointing outlet to 100 nominal diameter clay drain; cast aluminium grating; bedding and surrounding 150 thick with insitu concrete GEN3; additional excavation, necessary formwork etc.				
	yard gulley	1	Nr	90.00	90.00
	Chambers				
	Gulley; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, building in ends of drains to walls, galvanised steel lockable grating, brick kerbs etc.				
	drawing No. 485-05 Detail 36	1	Nr	200.00	200.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Silt trap; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, building in ends of drains to walls, access covers, brick kerbs etc.				
	drawing No. 485-05 Detail 30	1	Nr	675.00	675.00
	Manholes and Interceptors				
	Brick manhole; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, step irons, channels, three quarter section branch bends, benching, building in ends of drains to walls, access covers, brick kerbs etc.				
	1240 x 675 x 1000 deep to invert internal size (MH24)	1	Nr	975.00	975.00

EXTERNAL WORKS - SUDS SYSTEM 50 and 150 l/s/ha

Estimated

Ref	Description	Amount
	COLLECTION - DRAINAGE	
	Page No. 1/7	4,597.00
	Page No. 1/8	3,700.00
	Page No. 1/9	1,650.00

CARRIED TO SUMMARY £ 9,947.00

EXTERNAL WORKS - SUDS SYSTEM 50 and 150 l/s/ha

Estimated

Ref	Description		Amount
	SUMMARY		
	Page No. 1/3	ROADS AND PATHS	30,119.00
	Page No. 1/6	HORTICULTURAL WORK	6,829.19
	Page No. 1/10	DRAINAGE	9,947.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
6B	**ROADS AND PATHS**				
	GROUNDWORK				
	D20 EXCAVATING AND FILLING				
	Surface treatments				
	Compacting bottoms of excavations				
A	generally Spec Q20/145	71	m²	0.50	35.50
	Surface treatments Spec Q20/130				
	Herbicide				
B	generally	71	m²	0.50	35.50
	WATERPROOFING				
	J40 FLEXIBLE SHEET TANKING/DAMP PROOFING				
	Geotextile membrane Spec Q20/170				
	Coverings				
C	generally; to bottom of excavation	71	m²	1.50	106.50
	PAVING / PLANTING / FENCING / SITE FURNITURE				
	Q20 HARDCORE/GRANULAR/CEMENT BOUND BASES/SUB-BASES TO ROADS/PAVINGS				
	Granular material Spec 210				
	Filling to make up levels				
D	not exceeding 250 average thick; depositing in layers 150 maximum thickness; compacting	7	m³	40.00	280.00
	Surface treatments Spec 250				
	Compacting filling				
E	generally	71	m²	0.50	35.50

Ref	Description	Qty	Unit	Estimated Rate	Amount
	Q24 INTERLOCKING BRICK/BLOCK ROADS/PAVINGS				
	Permeable concrete block paving Spec 115A				
	Extra over rate of non permeable concrete block paving (80 thick blocks, 50 thick sand bed, 200 thick Type 1 granular material) for permeable concrete block paving (additional excavation, removing excavated material from site, 80 thick Aquaflow ml blocks, 50 thick bed of 5mm clean stone, Inbitex non woven geotextile separating layer, 100 thick bed of 20-5mm stone, 350 thick bed of 63-10mm stone, geotextile protection layer, 1mm polypropylene liner with heat welded joints, geotextile protection layer, and also to sides geotextile protection layer, 1mm polypropylene liner with heat welded joints, geotextile protection layer) Drawing No 485-05 Detail 25				
A	level or to falls	384	m²	23.25	8,928.00
	Q25 SLAB/BRICK/BLOCK/SETT/COBBLE PAVINGS				
	Granite setts Spec 500A				
	Channel				
B	level or to falls; to sub-base; including concrete base and mortar bedding and jointing; as drawing Nr 485-05 detail 20	98	m	56.00	5,488.00
C	level or to falls; to sub-base; including concrete base, Plaswood posts and concrete backfill, pea gravel filling and geotextile membrane; as drawing Nr 485-05 detail 21	46	m	275.00	12,650.00
D	Extra over for gulley grating, brick support and clay channel	4	Nr	90.00	360.00
	Sett bowl feature				
E	level or to falls; to sub-base; including lean mix concrete and mortar bedding, Plaswood posts and concrete backfill, pea gravel filling and geotextile membrane; as drawing Nr 485-05 detail 26; retaining wall, drainage channel, fin drain and gargoyle included elsewhere	1	Nr	1,700.00	1,700.00
F	water spout / gargoyle feature Drawing No. 485-05 Detail 26	1	Nr	500.00	500.00

EXTERNAL WORKS - SUDS SYSTEM 8 l/s/ha

Estimated

Ref	Description	Amount
	COLLECTION - ROADS AND PATHS	
	Page No. 2/1	493.00
	Page No. 2/2	29,626.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
6E	**HORTICULTURAL WORK**				
	GROUNDWORK				
	D20 EXCAVATING AND FILLING				
	Swales				
	Excavating trenches to form swale 3700 wide x 450 deep overall				
A	as Drawing Nos. 485-05 detail 16 and 485-07; including fully biodegradable coir blanket (topsoil and seed included elsewhere)	10	m	42.65	426.50
	Swale inlet				
B	as Drawing No. 485-05 detail 05; including stainless steel inlet basket, paving slabs, 100 hardcore base, additional excavation, cart away etc (drain pipe included elsewhere)	1	Nr	225.98	225.98
	Swale outlet				
C	as Drawing No. 485-05 detail 04; including stainless steel outlet basket, stone filling, geotextile material, paving slabs, 100 hardcore base, stainless steel flow control tube, forming micro pool, additional excavation, cart away etc (drain pipe included elsewhere)	1	Nr	408.27	408.27
	Woodland channels				
	Excavating trenches to form woodland channel 1200 wide x 300 deep overall				
D	as Drawing Nos. 485-05 detail 17 and 485-07; existing trees to remain (topsoil and seed included elsewhere)	105	m	14.87	1,561.35
	Sleeper bridge Spec Q50/385A				
E	as Drawing No. 485-05 detail 08; including 150 granular material type 1 footing, additional excavation, cart away etc	3	Nr	213.26	639.78
	Wetland crossing				
F	as Drawing No. 485-05 detail 22; including pegs, coach bolts, 150 granular material type 1 footing, additional excavation, cart away etc	1	Nr	367.07	367.07

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Woodland channel inlet				
A	as Drawing No. 485-05 detail 05; including stainless steel inlet basket, paving slabs, 100 hardcore base, additional excavation, cart away etc (drain pipe included elsewhere)	1	Nr	224.90	224.90
	Pond				
	Excavating to form pond 1050 maximum deep				
B	as Drawing Nos. 485-05 detail 9 and 485-07; including polypropylene liner, geotextile membranes, 300 subsoil filling in making up levels (topsoil and seed included elsewhere)	1	Nr	1,719.03	1,719.03
	Flood relief chamber				
C	as Drawing No. 485-05 detail 23; including brick chamber, grating, concrete and hardcore base, excavation, cart away etc (drain pipe included elsewhere)	1	Nr	635.91	635.91
	Pond outlet and outfall control chamber				
D	as Drawing No. 485-05 detail 24; including stainless steel outlet basket, stone filling, geotextile material, 150 diameter perforated pipe with mesh guard, 150 diameter interconnecting pipe with coupler, 450 diameter polypipe chamber with 150 diameter coupler, bend and polymer sheet base and support, chamber cover, stainless steel flow control tube, paving slab and 100 hardcore base, additional excavation, backfilling, cart away etc (outlet drain pipe included elsewhere)	1	Nr	620.40	620.40

EXTERNAL WORKS - SUDS SYSTEM 8 l/s/ha

Estimated

Ref	Description	Amount
	COLLECTION - HORTICULTURAL WORK	
	Page No. 2/4	3,628.95
	Page No. 2/5	3,200.24

 CARRIED TO SUMMARY £ 6,829.19

Estimated

Ref	Description	Qty	Unit	Rate	Amount
6F	**DRAINAGE**				
	DISPOSAL SYSTEMS				
	R12 DRAINAGE BELOW GROUND				
	Drain runs				
	Excavating trench in soft landscaped area; earthwork support; 150 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
A	250 - 500 average depth	27	m	32.00	864.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
B	250 - 500 average depth	45	m	37.00	1,665.00
	Excavating trench in hard landscaped area; earthwork support; 150 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
C	250 - 500 average depth	44	m	47.00	2,068.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Excavating trench in soft landscaped area; earthwork support; 225 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with imported approved granular material; backfilling above beds and surrounds up to ground level with selected excavated material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
A	1000 - 1250 average depth	20	m	46.00	920.00
	Excavating trench in hard landscaped area; earthwork support; 225 nominal diameter plastics (Osma Ultrarib) drain pipe including all necessary fittings (e.g. bends, junctions, rocker pipes etc.); bedding and surrounding 150 thick with insitu concrete GEN3 including 18 thick compressible board expansion joint precut to profile of drain pipe joints; backfilling above beds and surrounds up to ground level with imported approved granular material compacted in layers; service warning marker tape; spreading and levelling surplus excavated material close at hand				
B	1000 - 1250 average depth	30	m	83.00	2,490.00
	Clay / cast aluminium accessories				
	Gulley; 100 outlet; rodding eye and stopper; two 100 nominal diameter clayware bends; jointing outlet to 100 nominal diameter clay drain; cast aluminium grating; bedding and surrounding 150 thick with insitu concrete GEN3; additional excavation, necessary formwork etc.				
C	yard gulley	1	Nr	90.00	90.00
	Chambers				
	Gulley; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, building in ends of drains to walls, galvanised steel lockable grating, brick kerbs etc.				
D	drawing No. 485-05 Detail 36	1	Nr	200.00	200.00

Estimated

Ref	Description	Qty	Unit	Rate	Amount
	Silt trap; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, building in ends of drains to walls, access covers, brick kerbs etc.				
A	drawing No. 485-05 Detail 30	1	Nr	675.00	675.00
	Diffuser boxes				
	Storage chamber; including all necessary additional excavation, earthwork support, compacting, 150 deep permavoid geocellular boxes with prefabricated sealed Sel-flex geomembrane and Sel-tex geotextile surround, 50 mm thick clean crushed stone cover bed etc., backfilling, disposal of excavated material by removing from site				
B	8 l/s/ha; 150 mm deep (1 layer); 12.87 m³ storage volume (assumed 1 layer of 150 deep boxes in areas of pedestrian paving - 1 layer laid in granular sub-base no additional excavation required)	86	m²	95.00	8,170.00
	Manholes and Interceptors				
	Brick manhole; including all necessary excavation, earthwork support, compacting, backfilling, disposal of excavated material by removing from site, 150 thick concrete beds, brickwork, reinforced concrete slabs, formwork, step irons, channels, three quarter section branch bends, benching, building in ends of drains to walls, access covers, brick kerbs etc.				
C	1240 x 675 x 1000 deep to invert internal size (MH24)	1	Nr	975.00	975.00

EXTERNAL WORKS - SUDS SYSTEM 8 l/s/ha

Estimated

Ref	Description	Amount
	COLLECTION - DRAINAGE	
	Page No. 2/7	4,597.00
	Page No. 2/8	3,700.00
	Page No. 2/9	9,820.00

EXTERNAL WORKS - SUDS SYSTEM 8 l/s/ha

Estimated

Ref	Description		Amount
	SUMMARY		
	Page No. 2/3	ROADS AND PATHS	30,119.00
	Page No. 2/6	HORTICULTURAL WORK	6,829.19
	Page No. 2/10	DRAINAGE	18,117.00