



UNIVERSITAT POLITÈCNICA DE VALÈNCIA

Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos

- TRABAJO FINAL DE MÁSTER -



“STUDY OF ALTERNATIVES FOR THE DESIGN OF SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS) AT CATHEDRAL STREET (GLASGOW, UNITED KINGDOM)”

Introduction

Urban development processes bring about a series of changes and alterations in natural conditions, increasing runoff flows. This resulted in flooding and degradation of water quality.

This problem raises the idea of modifying stormwater management from a different perspective that considers environmental, hydrological, economic and social aspects. This thesis considers the application of Sustainable Urban Drainage Systems in the study area.

Study Area

Cathedral Street is located in the area of Strathclyde University (Glasgow, United Kingdom). Regarding the study area, it includes the surrounding whose runoff ends in Cathedral Street.



SuDS Studied Alternatives

Alternatives studied have sought to maximize soil permeability, water reuse and minimize the use of conventional sewage networks.

- **A0:** Current situation with no SuDS
- **A1:** Green roof installation in gymnasium and library buildings
- **A2:** Installation of permeable pavements on the pavements of Cathedral Street.
- **A3:** Create storage areas with geocellular systems under car parks
- **A4:** Construction of a retention basin in the university's student halls area
- **A5:** Combination of alternatives A1 to A4

All alternatives have been studied through the execution of SWMM models that allow the simulation of the quantity and quality of runoff in urban areas.



A0: Current situation



A1: Green roofs



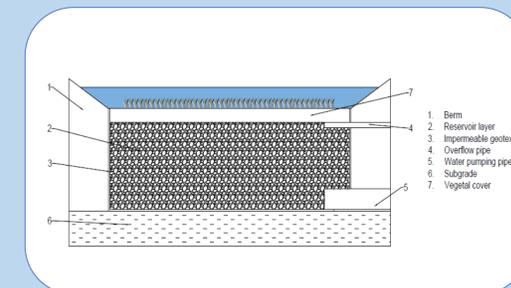
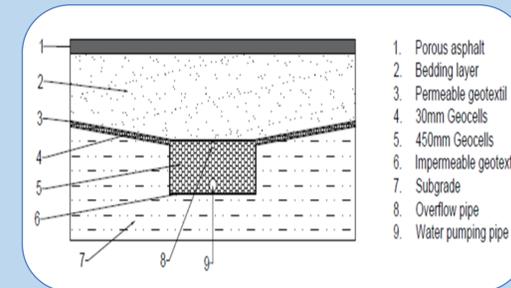
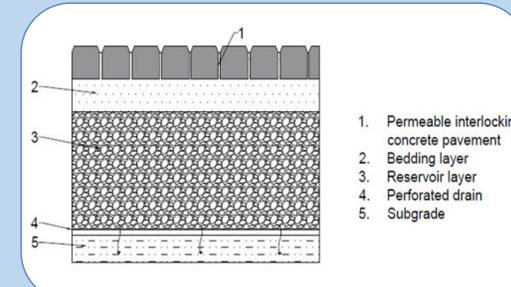
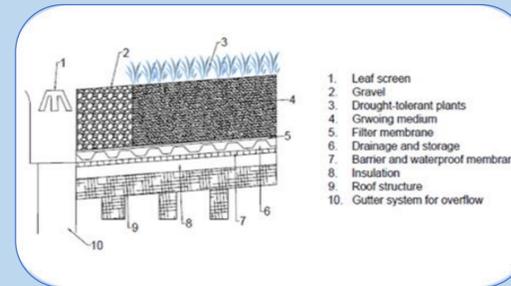
A2: Permeable pavements



A3: Geocellular systems



A4: Retention basin



Results

For each option, construction and maintenance costs and hydraulic results have been obtained at two drainage points. Ratios have been obtained that allow comparison of the alternatives studied.

Alternative	Node	Cost £/year	Total Volume Variation %	Ratio £/year%
A0	Out 1	0	-	-
	Out 2	0	-	-
A1	Out 1	151,905	-0.25	607,620
	Out 2	95,114	-0.12	792,617
A2	Out 1	133,640	-5.8	23,041
	Out 2	72,115	-2.67	27,009
A3	Out 1	-	0.00	-
	Out 2	139,654	-6.98	20,008
A4	Out 1	-	0.00	-
	Out 2	11,895	-1.34	8,877
A5	Out 1	285,545	-6.21	45,981
	Out 2	318,778	-12.57	25,360

Conclusions

This projects enables to know how the area of study responds to different rainfall events.

Having a look on the different sustainable drainage systems, it can be concluded that the geocellular storage systems adapts better than any other of the systems purposed, to the objectives of this study. The system outstands because it minimizes the use of the conventional drainage network, while at the same time permits storing water which can be reused. Thus, the impact and costs derived from sewage treatment plants can be reduced. Apart from that, alternative 3 also offers good results and a clear competitive advantage in terms of price when compared to the others.

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