Stormwater Management

The combination of urban development and intensified rainfall as a result of climate change can create some serious problems. Stormwater situations are challenges that may be unavoidable, but they can be effectively overcome when the right expertise is applied.

The increasing frequency of costly and damaging floods has highlighted the need for effective water management solutions.

Legislation changes, and an ever-demanding consumer need for a positive environmental impact leads us to consider all water management solutions.

Keyline offer Sustainable Urban Drainage Systems (SUDS), that provide a comprehensive range of options to reduce and control the flood risks and minimise pollution, enabling us to use water in a more sustainable and environmentally beneficial way.
AquaCell Systems: how they work

Stormwater exceeding the capacity of the conventional drainage system is attenuated by the control manhole and channelled into the AquaCell unit assembly. The internal structure of each unit is designed to bring surging water under control and hold it in temporary storage. If the wrap that envelopes the unit assembly is impermeable the water will remain in the unit assembly until such a time as it can flow back into the control chamber and discharge through the outflow control.

However if the wrap is permeable, the temporarily stored water may be released into the surrounding ground, soil conditions permitting. By controlling the stormwater at source and recharging the local groundwater it not only eases the pressure on conventional drainage systems but benefits the local environment as well.
Key Benefits

- Significantly reduced risk of flooding and its consequences
- Controlled and reduced volume discharge into existing main sewer systems and water courses
- Aerobic purification stimulated within the system improves water quality
- Sustainable, cost effective management of the water environment
- Recharging the local ground water
- BBA approved
- Meets the technical requirements of the NHBC
AquaCell Stormwater Attenuation and Infiltration

The Intesio AquaCell unit is modular (1.0m x 0.5m x 0.4m), has a capacity of 190 litres and weighs 9kg. It is 95% void and has a surface area that is 43% perforated. Conical columns within the unit ensure high strength and rigidity. AquaCell units are clipped together in single layers and pegged together in multiple layers. Conventional pipework is connected to the units by means of a number of adaptors.

<table>
<thead>
<tr>
<th>Supplier Code</th>
<th>Description</th>
<th>Keyline Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>6LB100</td>
<td>AquaCell Unit</td>
<td>992674</td>
</tr>
<tr>
<td>6LB350</td>
<td>AquaCell Lite Infiltration Unit</td>
<td>222571</td>
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### Ancillary Items

<table>
<thead>
<tr>
<th>Supplier Code</th>
<th>Description</th>
<th>Keyline Code</th>
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</thead>
<tbody>
<tr>
<td>6UR141</td>
<td>S/S Adaptor - 6UR Socket x 160mm BS EN 1401 Spigot for connection to Osma UltraRibs Infiltration Unit</td>
<td>800828</td>
</tr>
<tr>
<td>6UR099</td>
<td>S/S Level Invert Reducer - to 110mm Osma Drain Pipe</td>
<td>800831</td>
</tr>
<tr>
<td>6TW141</td>
<td>S/S Adaptor - 6TW Socket x 160mm BS EN 1401 Spigot</td>
<td>924181</td>
</tr>
<tr>
<td>6D009</td>
<td>S/S Level Invert Reducer - to 110mm Osma Drain</td>
<td>711803</td>
</tr>
<tr>
<td>4D916</td>
<td>PE Adaptor - 160mm Spigot Connection to Osma Drain</td>
<td>860966</td>
</tr>
<tr>
<td>6LB104</td>
<td>Flange Adaptor - 6UR Socket for Connection of Osma UltraRib to Infiltration Unit for Use in Other Than Preformed Opening</td>
<td>514347</td>
</tr>
<tr>
<td>6LB105</td>
<td>AquaCell Clip (spare) - for Joining Infiltration Units</td>
<td>992675</td>
</tr>
<tr>
<td>6LB102</td>
<td>AquaCell Shear Connector (spare) - for Joining Infiltration Units in Multi Layer Installations</td>
<td>514350</td>
</tr>
<tr>
<td>6LB500</td>
<td>500mm Silt Trap - 1.25m depth</td>
<td>536580</td>
</tr>
<tr>
<td>6LB106</td>
<td>225mm Flange Adapter</td>
<td>700101</td>
</tr>
</tbody>
</table>
AquaCell Eco

Intesio AquaCell Eco has been designed and developed for landscaped and other traffic-free areas where heavy loading capability is not required.

This now enables specifiers, developers and contractors to choose the right product to suit each situation.

The new AquaCell Eco (green unit) offers all the proven installation versatility and functional performance advantages of the original AquaCell blue unit, but it has been specifically engineered to provide a cost-effective option for low-loaded locations.

In addition to features and benefits applicable to BOTH systems those specifically applicable to AquaCell Eco (black unit) include:

- Proven vertical loading capacity: 17.5T/m²
- Proven lateral loading capacity: 4T/m²
- For installation depth (to base of units) of up to 1.5m maximum

- Built in 'hand holes' for easy carrying/handling
- Distinctive BLACK colour – easy to identify & 100% recycled for improved sustainability
- Specifically designed for restricted depth, low loaded, landscaped sites: — ideal for smaller projects.

Note: NOT suitable for locations subject to a high water table.

Typical applications: Domestic gardens, grassed and leisure areas, roundabouts.

See previous page for AquaCell technical information.
**Typical Soakaway Installation**

AquaCell Units

Permeneable Geotextile

Pre-formed Socket

Coarse Sand or Non Angular Granular Material Base and Surround

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**Important**

*If the AquaCell unit is used as a soakaway, wrapping the structure in a geotextile Lornak 2300 should suffice.*

AquaCell - very robust modular units for trafficked installations.
Typical Storage Tank Installation/Attenuation Tank Installation

Important

*Please refer to the Visqueen Geomembrane Section flow chart on the page below.

AquaCell – very robust modular units for trafficked installations. AquaCell Lite – Lighter version designed for non-trafficked installations.
Visqueen Geomembrane Selection Flowchart

Will the storage tank be under a trafficked area?
- Yes
  - Will the area be trafficked by cars only?
    - Yes
      - Select Option 3
    - No
      - Is the ground contaminated?
        - Yes
          - Select Option 3
        - No
          - Seek advice from your local Keyline branch regarding use of AquaCell under heavily trafficked areas

- No
  - Is there a high water table and/or ground movement?
    - Yes
      - Will the storage tank be more than two AquaCell units deep?
        - Yes
          - Will the storage tank be more than two AquaCell units deep?
            - Yes
              - Select Option 2 or 3
            - No
              - Select Option 1 or 2
        - No
          - Select Option 3
    - No
      - Select Option 3

Options from Visqueen
1 = Visqueen Urban Drainage Geomembrane Taping System
2 = Visqueen Urban Drainage Factory-welded Geomembrane panels (finished on site with tape)
3 = Visqueen CX Geomembrane (fully welded on site)

Notes:
1) For options 1 & 2, Visqueen L&D taping joint, corner protection units & protection board (or protective geotextile lined) will be required.
2) In all situations Option 3 would be suitable, especially if it is undesirable to have no taped joints on site.
3) All geomembranes must be installed in accordance with the Visqueen Building Products Instructions.
Visqueen Urban Drainage Geomembrane

- A comprehensive system for use with Stormwater Management Attenuation systems
- Visqueen Urban Drainage Geomembrane is available in factory-welded panels to allow for faster installation times
- Visqueen UDG Taping System allows for flexibility of on-site fabrication for small domestic applications
- Meets the requirements of Wavin Plastics Ltd when installed in accordance with Visqueen Building Products instructions

Description

The Visqueen Urban Drainage Geomembrane System has been specially designed and tested for use with underground stormwater storage systems. Wavin has accepted it for use with their AquaCell Stormwater Management System when installed in accordance with Visqueen Building Products instructions.

Impermeable geomembranes used in stormwater storage systems are subjected to very high hydrostatic pressures during the lifetime of the system. To avoid geomembrane failure in these demanding applications Visqueen Building Products has designed a high performance geomembrane system.

The Visqueen Urban Drainage Geomembrane System has been comprehensively tested to ensure that it is capable of withstanding the hydrostatic pressures anticipated with underground stormwater storage facilities thereby providing an effective impermeable barrier for most stormwater management applications (when installed in accordance with Visqueen Building Products instructions).
Garastor: stormwater attenuation

The Garastor unit is a polypropylene chamber that connects to a water storage reservoir. There are two versions of the Garastor available both of which are 500mm in diameter, the 6SC500 version is 1m deep for garage installations (with a 300mm storage depth capacity) and the 6SC501 is 1.25m deep for use with AquaCell (with a 400mm storage depth capacity). When Garastor is used in conjunction with an AquaCell tank the configuration of units must be no deeper than 1 AquaCell unit. If site conditions are such that a deeper Garastor unit is required, then the 500mm Extension Kit (6SC205 – consisting of a coupler and two ring seals) can be used in conjunction with a shaft of 500mm TwinWall cut to suit, to extend the Garastor unit.

<table>
<thead>
<tr>
<th>Supplier Code</th>
<th>Description</th>
<th>Keyline Code</th>
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</thead>
<tbody>
<tr>
<td>6SC500</td>
<td>1m Deep Unit (for use with garage undercroft)</td>
<td>523522</td>
</tr>
<tr>
<td>6SC501</td>
<td>1.25m Deep Unit (for use with AquaCell)</td>
<td>523523</td>
</tr>
<tr>
<td>6SC205</td>
<td>500mm Extension Unit</td>
<td>861676</td>
</tr>
<tr>
<td>6SC200</td>
<td>Garastor Connection Kit</td>
<td>-</td>
</tr>
</tbody>
</table>
Flow Control Units

The vortex flow control is a self-activating flow control device which induces a vortex motion in the flow to control the rate at which water is allowed to enter downstream drainage systems. The energy inherent in the water flow is harnessed to generate the vortex and hence has no need of external energy requirements. The flow control itself has no moving parts.

The VFC has a superior hydraulic performance when compared to conventional flow controls such as orifice plates, throttle pipes and penstocks. With outlet diameters up to 400% larger than conventional flow control devices, the risk of blockage is minimised. VFCs have a unique head/flow characteristic with a distinctive “S” shaped curve with high flush and kick-back flow points. This characteristic can reduce storage volume requirements thereby lowering project costs.
Applications

- Control of surface water run-off from
  - Housing
  - Industrial developments
  - Infrastructure developments
  - Land drainage

- As part of flood and pollution alleviation schemes within
  - Existing sewerage systems
  - River networks

- Flow balancing in new and existing sewerage systems
  - Sewage treatment works
  - Potable water treatment plants

- Control of pass-on flows from
  - Combined sewer overflows
  - Storage tanks
  - Reservoirs
  - Swales
Where specified, Keyline can supply ACO systems

ACO StormBrixx

ACO StormBrixx is a unique and patented plastic geocellular stormwater management system design for surface water attenuation and infiltration.

- Can be assembled in a variety of different tank configurations to satisfy installation and site requirements
- Patented brick bonded and cross bonding feature provides strong long term installation for optimum stability
- Open cell structure permits 3D inspection access addressing fundamental access and maintenance requirements
- Low flow, draindown and silt management facility
- ACO StormBrixx simplifies delivery, site logistics and installation as a result of its stackable design
- High void ratio minimizes excavation volume
Where specified, Keyline can supply Polypipe systems

Polystorm Modular Cell System

Polypipe’s extensive range of modular cell products provides an efficient and sustainable method of storing large volumes of run-off for water attenuation or soakaway applications.

Because they share the same interlocking mechanism, Polystorm, Polystorm-R, Polystorm Lite and Polystorm Xtra can be combined to form a value-engineered hybrid solution to accommodate a broad range of surface loadings and run-off volumes.

- Range: Spans from 20 tonnes per square metre to 80 tonnes per square metre load bearing capacity
- 95% void ratio - providing greater water storage capacity and reduced excavation and disposal costs
- Modular units - allows flexibility of shape
- Light weight yet robust - excellent Health and Safety and Installation benefits

- Easy to handle – unique rounded corners for ease of handling and reduces likelihood of punctures to membranes
- Cost effective - especially when used as a hybrid, value engineered system
- Recyclable - 100% recyclable at the end of its useful life
- Suitable for both attenuation and soakaway systems
- Manages water at source
- 50 year design life
- BBA Approved
- Hybrid Solutions available
Polypipe Large Diameter Twinwall and Bespoke Fabrication

Ridgistorm-XL is Polypipe’s large diameter pipe range for Civils and Infrastructure projects.

Available in a range of sizes from 750mm right up to 2100mm, it is a sustainable, cost effective and durable alternative to clay or concrete systems, offering rapid installation, improved leak tightness and resistance to settlement and ground loads.

Ridgistorm-XL can be value engineered to suit any application. By analysing the site conditions and installation parameters, Polypipe’s design engineers can create a solution with the appropriate profile strength and stiffness that is neither over nor under engineered.
Aquaflo® Permeable Paving System

Aquaflo® is the permeable paving SUD’s system from Hanson Formpave, combining the functionality and aesthetics of the Aquasett and Aquapave paving collections with the sustainable credentials of surface water management, making a key contribution to the environment.

The Aquaflo® system consists of a specifically designed and constructed sub-base incorporating Inbitex®, a unique geotextile membrane developed specifically for Hanson Formpave. Inbitex® is used as a filter/separation layer to optimise the cleansing of water entering a permeable paving attenuation system, providing:

- Direct infiltration to the ground
- Discharge into storm water drains or
- Store water within sub base and harvest via a sump and pump

Concrete block permeable paving with infiltration to the ground.

Concrete block permeable paving with pipe to drains or harvesting system.
AquaSett Permeable Combined Paving

Colours available:

- Traditional
- Venetian
- Pennant
- Red Brindle
- Balmoral

**Technical Information**

<table>
<thead>
<tr>
<th>Block depth</th>
<th>60mm</th>
<th>80mm*</th>
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<tbody>
<tr>
<td>Quantity per pack – small blocks – 100 x 150mm</td>
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<td>90</td>
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<tr>
<td>Quantity per pack – medium blocks – 150 x 150mm</td>
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<tr>
<td>Quantity per pack – large blocks – 250 x 150mm</td>
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<td>Coverage per pack (M²)</td>
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<tr>
<td>Weight per pack (tonnes)</td>
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</table>

Finishes: Olden/Textured

*80mm ideal for heavy loads – most suitable for commercial applications
AquaPave Permeable Paving

Colours available:
- Burnt Red
- Golden Brindle
- Red Brindle
- Charcoal
- Natural

Technical Information

<table>
<thead>
<tr>
<th></th>
<th>80mm</th>
<th>80mm*</th>
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<tbody>
<tr>
<td>Quantity per pack - standard rectangular blocks, 100 x 200mm</td>
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<td>296</td>
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<tr>
<td>Coverage per pack (MF)</td>
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<tr>
<td>Weight per pack (tonnes)</td>
<td>1.10</td>
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</tr>
</tbody>
</table>

Finishes: Standard

*80mm ideal for heavy loads – most suitable for commercial applications.
Marshalls Priora Block Paving

Sustainable urban drainage systems (SUDs) are now key considerations in the design of new developments, to counter the growing issues of flooding, drought and water pollution. Marshalls Priora marries an innovative block paving system with a specific design methodology and sub-base specification to deal with surface water runoff at source. This eliminates the requirement for additional drainage systems whilst at the same time recharging the natural groundwater, creating a cost-effective and environmentally friendly solution to the management of surface water runoff.

The Priora range is now extended to include Tegula, Mistral and the rustic Olde options, combining the unique engineering benefits of the patented Priora nib with the aesthetics of those popular products. The products are supported by Marshalls’ comprehensive design and technical advisory service.

- 4 finishes
- Up to 9 colours
- Up to 3 plan sizes
- Suitable for a wide range of laying patterns
Big on Safety

Making injuries rare is an integral part of our corporate strategy and vision. We recognise that staying safe is not simply important, but is absolutely essential in a quality, customer focused organisation such as ours.