The Role of Pervious Paving in Meeting the Requirements of the Auckland Unitary Plan

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Outline

• Stormwater management under the Air, Land and Water Plan
  • Greenfields / Brownfields
• Technical changes in the Auckland Unitary Plan (AUP)
• Policy and Rules Framework in the AUP
• Stormwater management under the AUP
  • Greenfields / Brownfields
• Pervious Paving under the AUP

Disclaimer: Some of the content of this presentation are personal views of the presenter, and not necessarily the organisational view of Auckland Council
Stormwater Management Fundamentals

Stormwater Management Fundamentals

Increased imperviousness causes:
- Increased runoff flows
- Increased runoff volumes
- Decreased groundwater recharge
  - Reduced baseflows

*TR2013/035. August 2013. Auckland Council*
Stormwater Management Fundamentals

Imperviousness causes:
• Altered hydrology - increased runoff volume and flows
• Increased loads of contaminants

Effects:
• Erosion
• Flooding
• Ecological impacts
  • Freshwater (*flows and contaminants*)
  • Marine (*contaminants*)
Stormwater Management under the ALWP

Contaminant Management
• 75% TSS removal

Erosion Management
• Extended Detention Volume (EDV)

Flood Management
• Match pre-development peak flow for 2, 10 and 100 year ARI events
Stormwater Management under the ALWP

Greenfields Stormwater Management

- Reclaim all intermittent and some permanent streams
- Catchment scale treatment pond or wetland
  - Contaminant Management
  - Erosion Management
  - Flood Management
- Generally no at-source management
Stormwater Management under the ALWP

Brownfields Stormwater Management

- Cartridge filters
- Detention tanks
  - Above ground
  - Below ground
- Bioretention
Stormwater Management under the ALWP

Issues with the ALWP approach:
- Doesn’t address runoff volume
- Doesn’t address runoff frequency
- Reduces groundwater recharge

Effects:
- Erosion
- Ecological
  - Reduced stream baseflows
  - Extended periods of high flows
  - High frequency of high flows
  - Biofilm scour
  - Elevated temperature
Context of the AUP

Increased focus on freshwater values
  • Driven in-part by NPSFM
  • Increased protection for intermittent streams
  • Increased focus on ecological impacts
  • Appropriate stormwater management
RPS Policy B7.3.2.

*Integrated management of land use and freshwater systems*

(1) Integrate the management of subdivision, use and development and *freshwater systems* by undertaking all of the following:

(a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of new growth or intensification;

(b) ensuring catchment management plans form part of the structure planning process;

(c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and

(d) avoiding development where it will significantly increase adverse effects on freshwater systems, unless these adverse effects can be adequately mitigated.
AUP Regional Policy Statement

RPS Policy **B7.3.2. contd.**

(2) Identify degraded freshwater systems.
(3) Promote the enhancement of freshwater systems identified as being degraded to progressively reduce adverse effects.
(4) **Avoid the permanent loss and significant modification or diversion of lakes, rivers, streams** (excluding ephemeral streams), and wetlands and their margins, unless all of the following apply:

   (a) it is necessary to provide for:
      
      (i) the health and safety of communities; or
      (ii) the enhancement and restoration of freshwater systems and values; or
      (iii) the sustainable use of land and resources to provide for growth and development; or
      (iv) infrastructure;

   (b) no practicable alternative exists;

   (c) mitigation measures are implemented to address the adverse effects arising from the loss in freshwater system functions and values; and

   (d) where adverse effects cannot be adequately mitigated, environmental benefits including on-site or off-site works are provided.
(5) Manage subdivision, use, development, including discharges and activities in the beds of lakes, rivers streams, and in wetlands, to do all of the following:

(a) protect identified Natural Lake Management Areas, Natural Stream Management Areas, and Wetland Management Areas;
(b) minimise erosion and modification of beds and banks of lakes, rivers, streams and wetlands;
(c) limit the establishment of structures within the beds of lakes, rivers and streams and in wetlands to those that have a functional need or operational requirement to be located there; and
(d) maintain or where appropriate enhance:
   (i) freshwater systems not protected under Policy B7.3.2(5)(a);
   (ii) navigation along rivers and public access to and along lakes, rivers and streams;
   (iii) existing riparian vegetation located on the margins of lakes, rivers, streams and wetlands; and
   (iv) areas of significant indigenous biodiversity.

(6) Restore and enhance freshwater systems where practicable when development, change of land use, and subdivision occur.
AUP: Auckland Wide Provisions

E38 Subdivision Policy E38.3.

(22) Require subdivision to be designed to manage stormwater:
(a) in accordance with any approved stormwater discharge consent or network discharge consent;
(b) in a manner consistent with stormwater management policies in E1 Water quality and integrated management;
(c) by applying an integrated stormwater management approach to the planning and design of development in accordance with stormwater management policies in E1 Water quality and integrated management;
(d) to protect natural streams and maintain the conveyance function of overland flow paths;
(e) to maintain, or progressively improve, water quality;
(f) to integrate drainage reserves and infrastructure with surrounding development and open space networks; and
(g) in an integrated and cost-effective way.
Stormwater management
Avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal water by:
   (a) ...
   (b) ...
   (c) minimising or mitigating changes in hydrology, including loss of infiltration, to:
      (i) minimise erosion and associated effects on stream health and values;
      (ii) maintain stream baseflows; and
      (iii) support groundwater recharge;
   (d) where practicable, minimising or mitigating the effects on freshwater systems arising from changes in water temperature caused by stormwater discharges; and
   (e)....
SMAF Hydrology Controls

Stormwater Management Areas – Flow (SMAF)
- Apply in certain catchments in existing urban area (see AUP controls overlay)
- May also be imposed by Precinct provisions or under the Auckland Council Network Discharge Consent
- Require volume control (retention), as well as flow control (detention)
SMAF Hydrology Controls

From Table E10.6.3.1.1 Hydrology mitigation requirements

| Stormwater management area – Flow 1 | (a) provide retention (volume reduction) of at least 5mm runoff depth for the impervious area for which hydrology mitigation is required; and
|                                  | (b) provide detention (temporary storage) and a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes from the 95th percentile, 24 hour rainfall event minus the 5 mm retention volume or any greater retention volume that is achieved, over the impervious area for which hydrology mitigation is required. |

- 5 mm ‘retention’ equates to approximately one third of annual runoff volume
- 95th percentile storm is approximately 35 mm storm event
- Applies to:
  - New impervious areas
  - Redeveloped impervious areas
  - Entire sites where the area of development or redevelopment comprises more than 50% of the site area.
### Meeting SMAF Requirements

<table>
<thead>
<tr>
<th>Device</th>
<th>Detention</th>
<th>SMAF Retention</th>
<th>Quality</th>
<th>Flooding</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pervious paving</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
<td>✗</td>
<td>Avoid impervious surfaces At source</td>
</tr>
<tr>
<td>Living Roof</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
<td>✗</td>
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<tr>
<td>Bioretention (Unlined)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✗</td>
<td>Mitigate for impervious surfaces created at source</td>
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<tr>
<td>Bioretention (Lined)</td>
<td>✔</td>
<td>✗</td>
<td>✔</td>
<td>✗</td>
<td></td>
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<tr>
<td>Reuse</td>
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<td>✔</td>
<td>✗</td>
<td>✗</td>
<td></td>
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<tr>
<td>Wetlands (&amp; Ponds)</td>
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<td>✗</td>
<td>✔</td>
<td>✔</td>
<td>Communal device</td>
</tr>
</tbody>
</table>

- 5 mm ‘retention’ equates to approximately one third of annual runoff volume.
- 95th percentile storm is approximately 35 mm storm event.
**SMAF: Mitigating Impervious Area**

Rainwater re-use tank
- Approx. 2.5 m³ per 100 m² of imperviousness

Bioretention
- Approx. 5 m² area per 100 m² of imperviousness
SMAF: The role of pervious paving

Auckland Unitary Plan Definition: Impervious area
An area with a surface which prevents or significantly retards the soakage of water into the ground.
Includes:
• roofs;
• paved areas including driveways and sealed/compacted metal parking areas, patios;
• sealed and compacted metal roads; and
• layers engineered to be impervious such as compacted clay.
Excludes:
• grass and bush areas;
• gardens and other vegetated areas;
• porous or permeable paving and living roofs;
• permeable artificial surfaces, fields or lawns;
• slatted decks;
• swimming pools, ponds and dammed water; and
• rain tanks.
Greenfields Hydrology Management

What is the BPO?

• Roads: treated with rain gardens
• Private lots:
  • Roofs mitigated with re-use tanks
  • Driveways require mitigation if impervious
Greenfields Hydrology Management: Belmont SHA

- Receiving Environments
- Detention and flood attenuation basins
- Roads: Retention only
- Lots: Retention and detention on site
Greenfields Hydrology Management: Belmont SHA

- Roof area (130 m²) treated with 3.9 m³ retention / detention tank
- Pervious paving for all paved areas (70 m²)