

Confronting the Residual Effects of Development on Stormwater



Overview

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 - Traditional approach - death by a thousand cuts
 - The alternative
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 - Rotokauri Development - before and after catchment management planning
 - Councils Erosion Prevention Programme
- Summary

Introduction – By Andrea Phillips

- My colleague Matt Lillis said ‘let’s do a paper on residual effects.’



- Best practice within the development boundaries still leads to residual effects within the receiving environment.
- The Rotokauri CMP required us to address cumulative effects to no further degrade the lake.
- A large development was quadrupling the volume of stormwater into an already eroded stream required us to address volume.

Introduction – By Matt Lillis

- Urban stormwater management is undergoing a paradigm shift.
- Stormwater is no longer seen as a waste, but a vital part of a healthy urban environment.
- While our stormwater toolbox is potent, it is still limited.
- Runoff even from well managed developments generally contains increased contamination, volumes, and erosive flows.
- A strategic approach is required to manage these residual effects.
- Hamilton City Council has carried out projects and strategies that address this. Two are presented as examples in this presentation.

Traditional approach – death by a thousand cuts

- Stormwater management has often dealt with different developments within a catchment in isolation.
- Even where developments do a good job of meeting generic standards for stormwater management, receiving environments can be severely degraded.
- Without assessing and mitigating the cumulative effects of development, stormwater management tools cannot be targeted to meet objectives such as maintaining ecology, preventing erosion, and minimising flooding.

The Alternative – a strategic approach

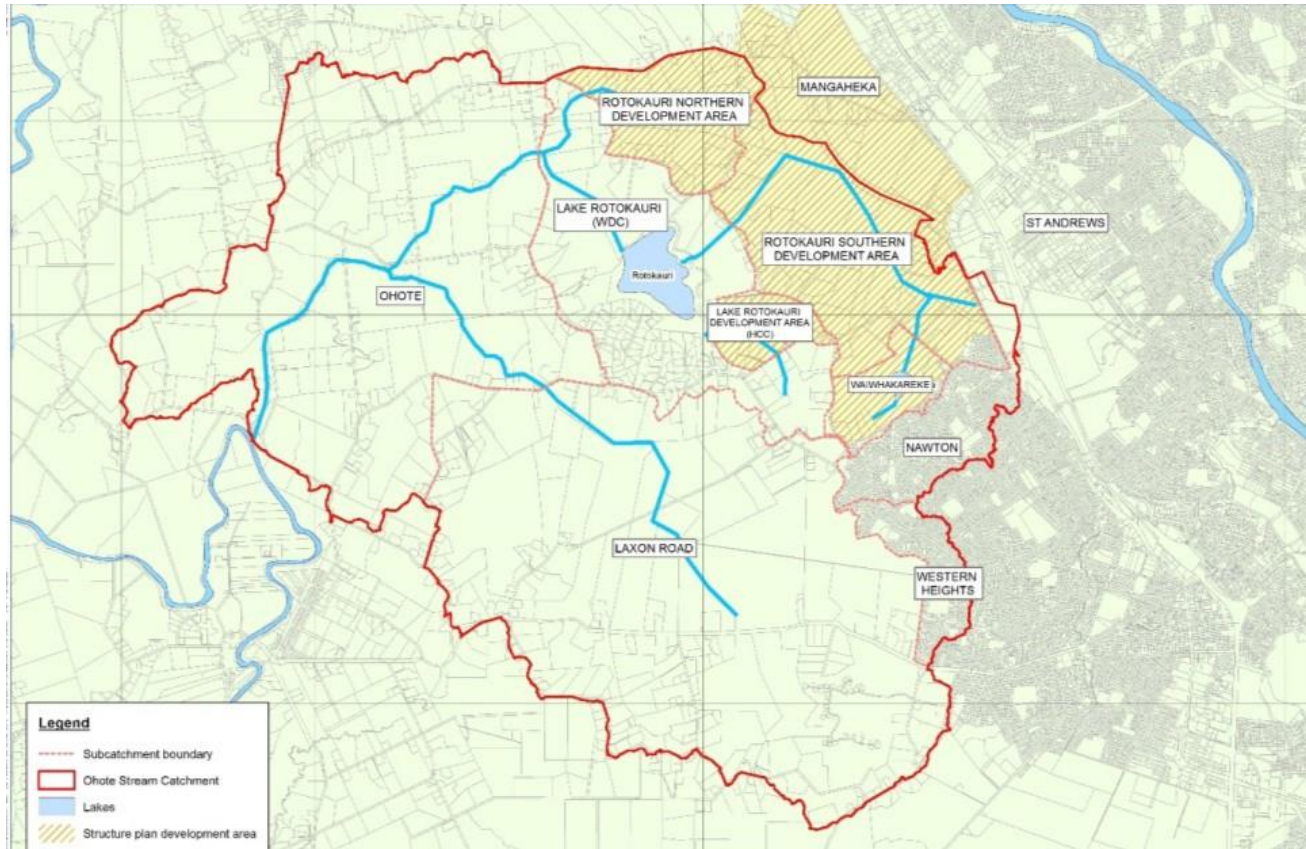
- Addressing cumulative residual effects of development is challenging.
- Most stormwater treatment and attenuation devices will only partially mitigate effects, be they erosive flows, increased contaminant loads, or flooding.
- Creative and strategic approaches are required to deal with the remaining effects, as well as to set and meet coherent objectives for the catchment.
- Hamilton City Council's Integrated Catchment Management Planning programme has provided a framework for tackling these issues.

Case Studies

Two examples of where Hamilton City Council have addressed residual effects are presented in this paper:

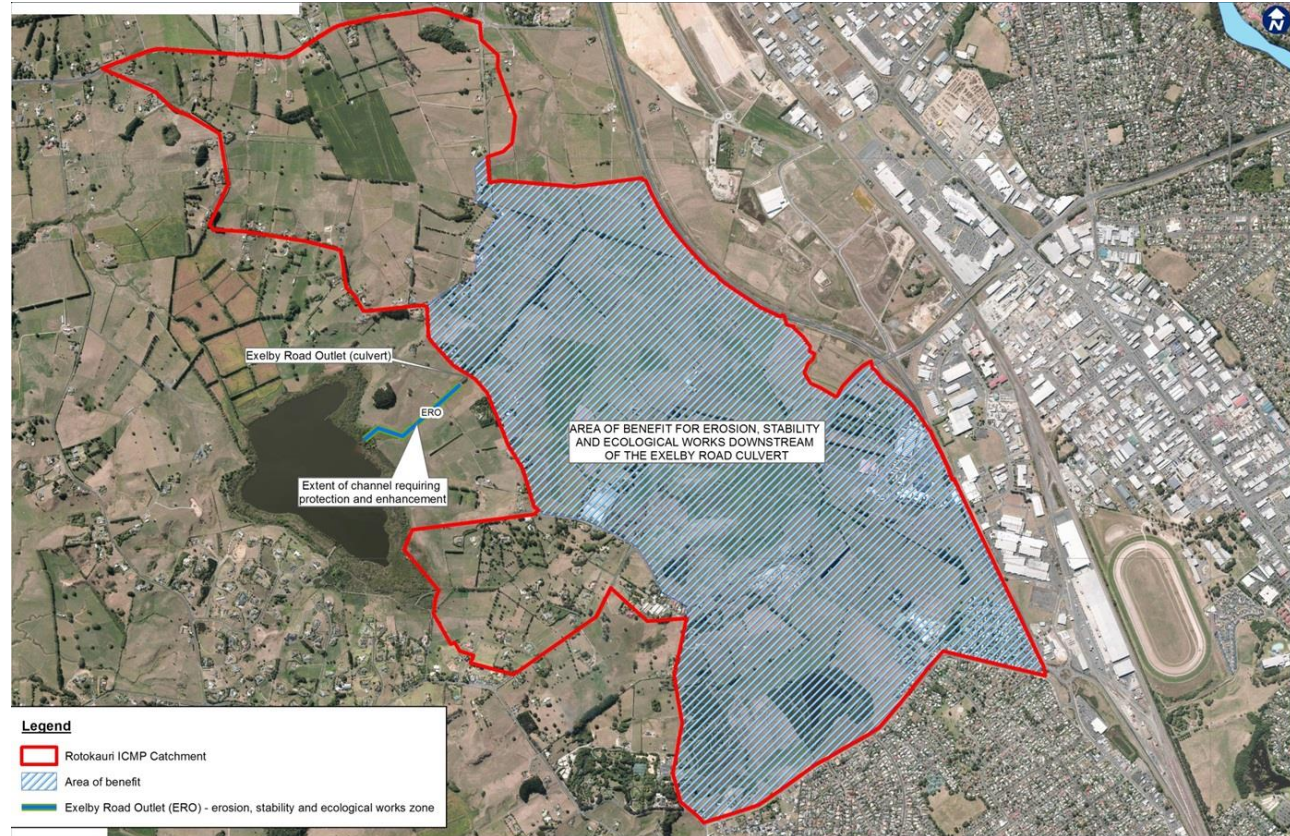
1. Rotokauri – Keeping chlorophyll A levels at or below existing levels in Lake Rotokauri by removing phosphorus from development discharges.
2. Erosion prevention – Developing a programme of erosion prevention works to strengthen watercourses against increased volumes, partially funded through development.

Case Study 1: Rotokauri (Ohote) Catchment



Rotokauri Structure Plan Area

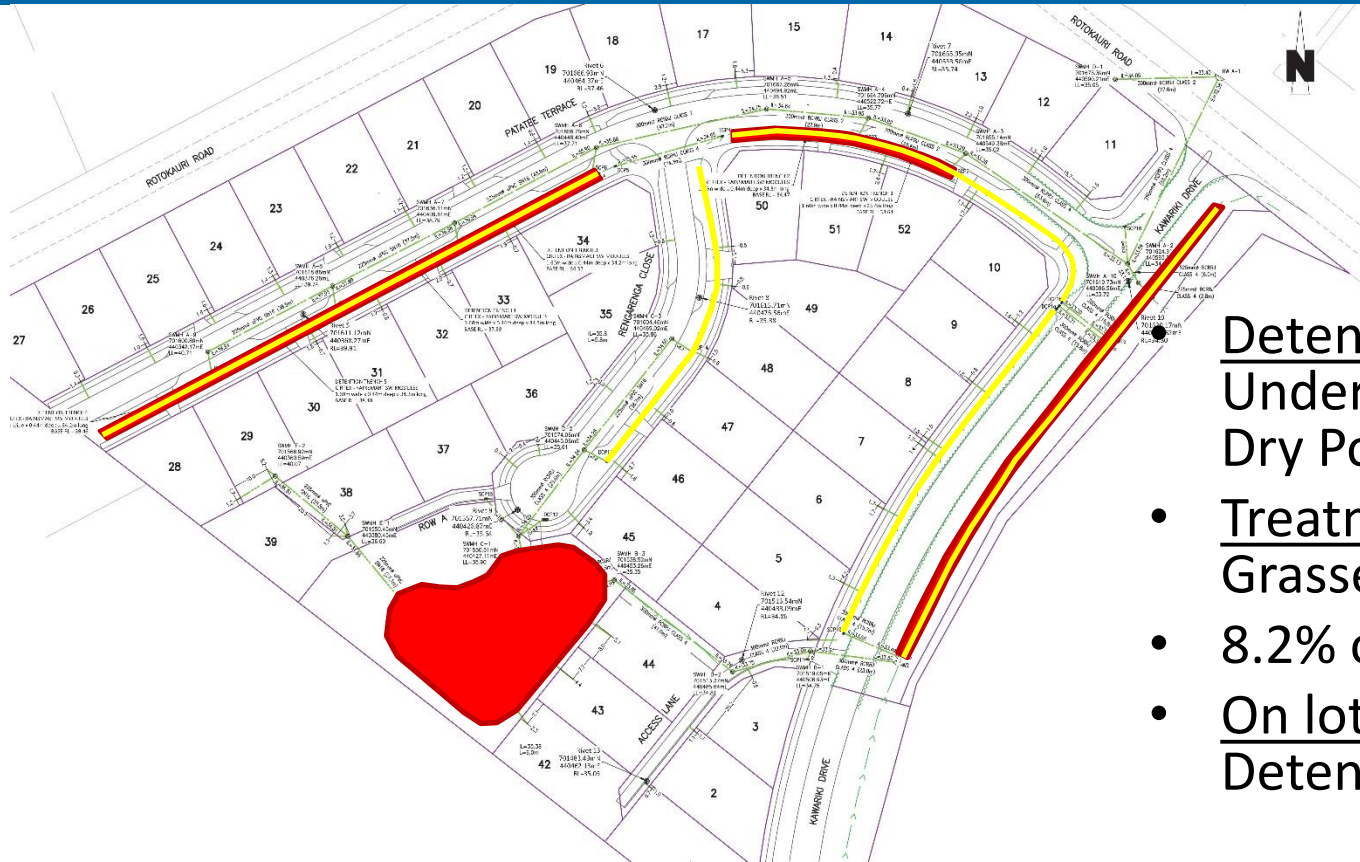
- 480 hectares of new development draining to Lake Rotokauri.
- Approximately 5,000 new dwellings.



Rotokauri – Before Integrated Catchment Management Planning (ICMP)

- Best practice was TP10, generally resulting in the following design parameters per single application site:
 - Standard Water Quality (single device, approximately 30-40% P removal)
 - Extended Detention (24mm over 24 hours)
 - 75% Suspended Solids
 - Attenuation of 2 & 10 year storm events
 - Attenuation to 80% of the 100 year storm event.

Rotokauri – Pre ICMP

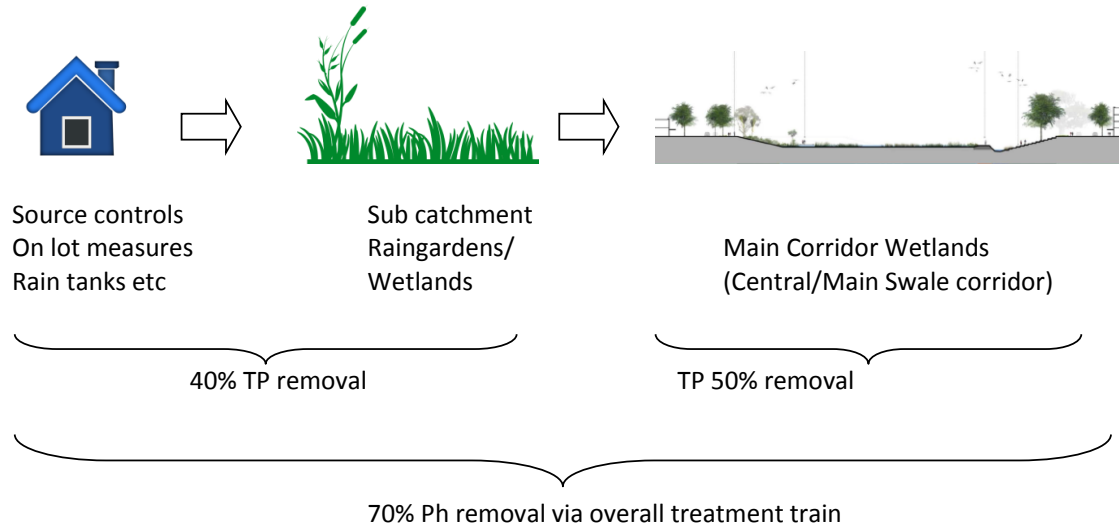


Detention:
Underground Cells,
Dry Pond & Swales

- Treatment:
Grassed Swales
- 8.2% of site area
- On lot:
Detention Tanks

Rotokauri – The ICMP Approach

- Cumulative effects were considered resulting in:
 - Overall Water Quality to remove 70% P
 - Extended Detention, Attenuation and Flood Control to generally occur in a centralised swale, also providing other benefits.



Rotokauri – Post ICMP



- Detention:
Conveyance Swale, Wetland and interim storage
- Treatment:
Raingardens, wetland
- On lot:
Raingardens (or with Reuse Tanks)
- 14% of site area

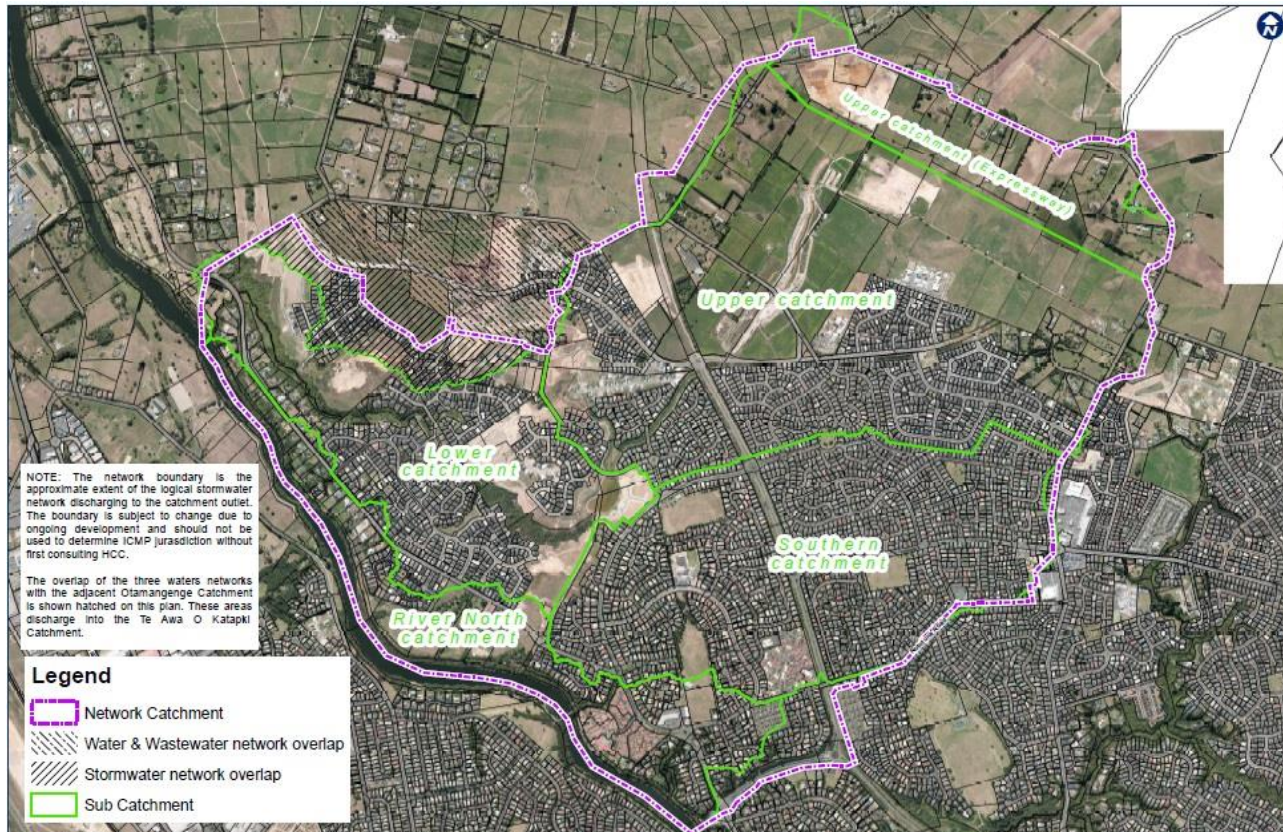
Case Study 1: conclusion

- P removal increased from around 40% under traditional to 70%.
- Site treatment areas are larger, but this is now understood.
- The on lot measure is now targeting the contaminant of concern.
- We have a better chance to no further degrade the lake.

Case Study 2: Erosion Prevention

- Where soakage/re-use are not options, the best tools in the stormwater tool box have little impact on the volume of stormwater discharge.
- Even well managed developments generally create increased stormwater runoff volumes.
- In many environments this leads to increased erosion.
- Council has found that cumulative volume increases can exacerbate erosion that can be extremely expensive to remediate.

Te Awa O Katapaki: Erosion



- 764 hectare catchment draining to a single outlet.
- Approx. 210ha unmanaged brownfields.
- Approx. 554ha developing greenfields.

Case Study - Erosion



- Single culvert followed by 300m stretch of watercourse draining to the Waikato River.
- Increased erosion from many influences.
- Approx \$2.5M project for remediation underway.

Case Study - Erosion

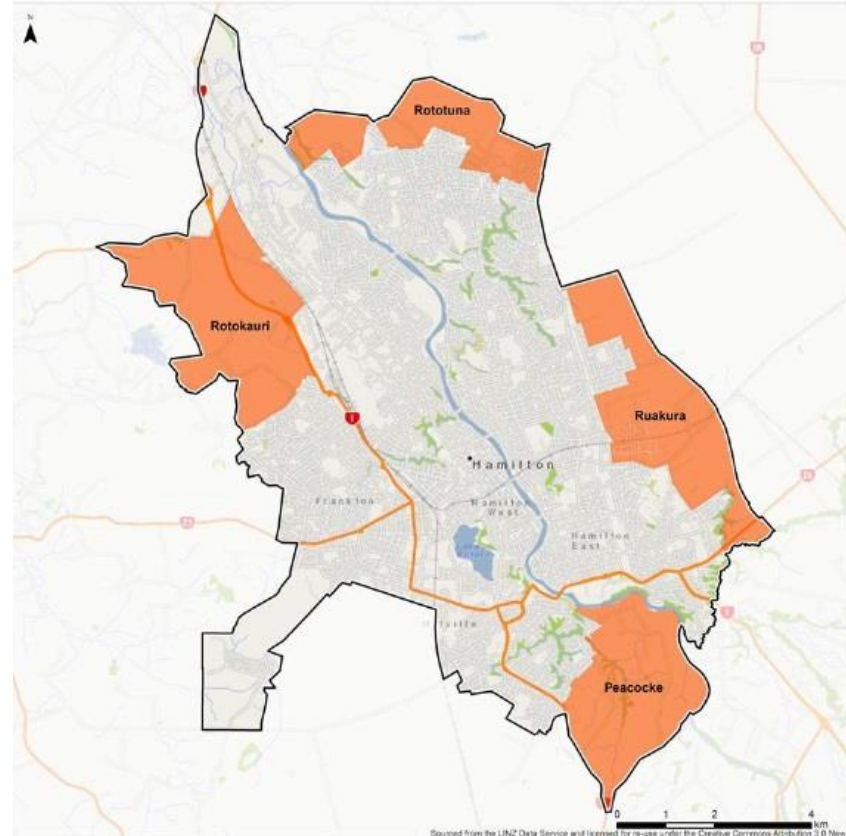


Council's Erosion Programme

- Hamilton has 16 catchments draining into, or out of, the City.
- A concept programme of works has been created for most greenfield catchments through a watercourse assessment. It considers a split between greenfield and brownfield contributions.
- The programme has been put forward in the 10 Year Plan, totalling over \$10 million, on a catchment basis.

Council's Erosion Programme

- The programme has been used as a tool for financial contributions to allow developers to demonstrate mitigation of residual downstream effects from volume increase.
- The contributions will be topped up by other funding and implemented over time, considering monitoring, risk and other factors.



Case Study 2: conclusion

- We have a tool that can be used to demonstrate mitigation of effects, and have successfully conditioned over \$1million in a year. Growth is able to contribute to downstream effects for the first time in Hamilton.
- This money will be combined with rates and used in the catchment where the growth is occurring.

Summary

- Residual effects of development on receiving environments are sometimes written off as less than minor.
- This may not be the case where cumulative effects are present.
- Ambitious, strategic approaches which consider cumulative effects can manage residual effects at a catchment scale.
- Through Council's work managing phosphorus loading to lake Rotokauri, and city wide erosion programme, we have demonstrated strategic catchment or district wide approaches to known issues can be found. At a cost.
- The next frontier in strategic stormwater management will be improving the way we address these residual effects.