A Review of Alternative Funding Solutions for Stormwater Management

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A Review of Alternative Funding Solutions for Stormwater Management

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Executive Summary

Background

The Auckland region is a diverse and vibrant area which has a rich and unique natural environment. However, increased growth and intensification of urban areas are altering the natural hydrological characteristics of catchments and resulting in effects on the receiving environment from urban stormwater discharges. Auckland Council is responsible for the safe conveyance, treatment and discharge of stormwater via a $2.5 billion public stormwater network. In order to manage stormwater discharges effectively, Council needs to ensure that existing network functions efficiently to meet the desired levels of service. In addition, networks need to be managed to allow for future growth in order to maintain or enhance the quality of the receiving environment for the benefit of the regional community.

In March 2004, the Boston Consulting Group (BCG) was engaged to review stormwater management in the Auckland region, and to provide an action plan. The BCG report (May 2004) highlighted that there is a funding shortfall for stormwater management of $2.3 billion over the next 20 years. As a result, in September 2004, the former Auckland Regional Council (ARC) approved a Stormwater Action Plan (SWAP). The purpose of the SWAP was to address recognised issues of environmental degradation caused by stormwater discharges, and it was proposed to be implemented over 10 years. The SWAP identified that a greater level of co-operation and expenditure would be required to reduce the decline in the quality of Auckland's receiving environments from water quality effects, and to meet regional community expectations for achieving this. In order to meet the costs associated with implementing the SWAP, an alternative funding sources workstream was identified.

This report includes a stocktake of work done in the Auckland region on alternative means of funding stormwater management, and also investigates funding requirements for the Auckland region. A literature review was undertaken and all funding studies commissioned within the Auckland Region in relation to funding of stormwater management have been documented in Section 2.

The Funding Gap

PriceWaterhouseCoopers (PWC) (2004), BCG (2004), Landcare Research (2005), Hill Young Cooper *et al.* (2007) and Auckland Council (2011) report on an estimated potential additional expenditure required to allow water quantity, water quality and stream management outcomes to be achieved. Table 2 in the main report provides a summary of the estimated funding shortfalls from each of these studies. Detailed discussion surrounding the funding gap, which ranges from $2.1 billion to $9.3 billion, is provided in Section 3. The estimated gap relates to expenditure on the existing stormwater network only (maintenance and retrofitting work), but excludes new networks associated with Greenfield development. All the studies agreed that stormwater CAPEX infrastructure requirements resulting from

growth should be privately funded. The quantum of proposed expenditure in the draft Auckland Council Stormwater AMP (2012) is relatively consistent with the aforementioned funding studies, however, the timeframe for implementation (over 50 years) is different, and thus alternative funding options to reduce this timeframe may well be required.

Alternative Funding Options

Developing an appropriate funding strategy requires balancing a number of key principles to ensure a mix of public and private benefits is provided. Any funding strategy therefore needs to be equitable, economically efficient, sustainable, accepted by the community and easy to implement. Section 4 of this report provides a summary of a variety of alternative funding options for stormwater management. No one option is able to meet all of these funding criteria, and as such a toolbox approach to funding stormwater management will be required. This proposed approach is summarised in the table below and discussed in more detail in Sections 4.2.4 – 4.2.6 of this report.

Summary of funding options to be included in the "Alternative Funding Toolbox"

Funding Option	Status	Comment
General Rates	In use	Decision on whether or not general rates should be reduced by the current annual cost of providing stormwater services in order to reduce potential rates increases if alternative funding sources are utilised.
Development and Financial Contributions	In use	Preferred option as concurs with "polluter-pays" principle. Further exploration around the issue of 'gold-plating'.
Impervious Area Charge	To be investigated	Preferred option as concurs with "polluter-pays" principle. Need to determine an efficient charging level, public: private split, business differential, cost and social implications of implementation.
Uniform Annual General Charge	To be investigated	Could be a way of funding the 'public' portion of the impervious area charge.
Credit and Offset Schemes	To be investigated	Assists in promoting behavioural change.

Funding Option	Status	Comment
Stormwater Road User Charges	To be investigated	Preferred option as concurs with "polluter-pays" principle. Difficult to implement, but could assist in covering the cost of effects of stormwater discharges from roads (non-rateable land).
Negotiated Agreements and Cap & Trade Schemes	To be investigated	Potentially a useful method to improve the efficiency of investment in abatement efforts on a region-wide rather than catchment basis.

The key premise behind each of these funding solutions is that of "polluter-pays". Any new funding regime should be economically efficient, and also assist in creating behavioural change within the community and increase awareness of stormwater effects. Many of the other funding options, including general rates, do not meet either of these goals. It is noted that there are no legislative impediments to the implementation of these solutions. The LGA (2002) and LGRA (2002) and associated amendments clearly allow for and facilitate the use of targeted rates and development contributions. However, to date, only development contribution policies have been implemented by councils within Auckland.

There are pros and cons associated with each type of funding option presented in the "alternative funding toolbox". For example, road user charges would be an equitable means of recouping costs for water quality effects from roads, however, it is likely to be difficult to implement. Conversely, there are no practical barriers to implementing an impervious area charge, however, public acceptability and ability to pay may well preclude its use.

As a result, a number of recommendations have been made in order to assist in further understanding the implications of each option, and their ability to be implemented under the current governance framework. Nonetheless, the proposed investigations would only provide an understanding of each option in isolation of the others. In order to achieve a sustainable, equitable and economically efficient strategy of funding, a toolbox approach is required, and therefore the implementation of and interaction between the options needs to be considered more holistically.

It is therefore recommended that an investigation be undertaken to further understand the cost, resourcing, programming, and governance implications of implementing more than one solution. The risks of implementing one solution, in isolation of the others, and without the safety net of revenue collected from general rates, should also be explored. Finally, the practicality and implementability of the toolbox approach needs to be further investigated.

Table of Contents

1.0 Introduction 1

1.1 Background 1

1.2 Purpose of this Report 2

1.3 Structure of the Report 2

2.0 Literature Review and Timeline 3

2.1 Literature Review 3

2.2 A History of the Funding Workstream 5

3.0 The Stormwater Funding Gap 8

3.1 Background 8

3.2 The Funding Shortfall 9

3.3 Discussion 13

4.0 Alternative Funding Solutions 17

4.1 Background 17

4.2 Assessment of Funding Options 18

5.0 Conclusions and Recommendations 32

5.1 Conclusions 32

5.2 Recommendations 34

6.0 References 37

Appendix A Funding Options A-1

Appendix B Evaluation of Funding Options B-1

Appendix C Targeted Rate Council Initiatives in New Zealand C-1

Appendix D NSCC Cost Estimate for Implementing an Impervious Area Charge D-1

List of Figures

Figure 1 Research Timeline 7
Figure 2 Estimates of expenditure required over the next 20 years to deliver stormwater outcomes (BCG, 2004) 14
Figure 3 Capital expenditure forecast by programme (Auckland Council, 2012) 15
Figure 4 Operational expenditure (Auckland Council, 2012) 16
Figure 5 Capital expenditure – implementation options (Auckland Council, 2012) 16
Figure 6 Total road system costs – user charges, provider and external costs 30

List of Tables

Table 1 Allocation of TA resources to stormwater in 2001 (BCG, 2004) 9
Table 2 Summary of funding shortfall estimated through previous research 10
Table 3 Summary of total expenditure proposed in the draft Auckland Council Stormwater AMP (Auckland Council, 2012) 15
Table 4 Summary and explanation of relevant funding criteria (adapted from Landcare Research, 2005) 20
Table 5 Summary of Evaluation of Annual Stormwater Funding Options (from NSCC, 2005) 25
Table 6 Summary of funding options to be included in the "Alternative Funding Toolbox" 33

1.0 Introduction

1.1 Background

The Auckland region is a diverse and vibrant area which has a rich and unique natural environment. The Region has an estimated 16,500 km of permanently flowing streams and rivers (Auckland Council, 2011) which generally have short steep catchments draining to a variety of high energy coastal beaches and/ or low energy tidal inlets. The diverse coastline runs for approximately 2,200 km, and includes three major harbours (the Waitemata, Manukau and Kaipara), and 30 sensitive tidal inlets or estuaries.

In addition to its natural diversity, Auckland city is New Zealand's largest and is home to more than 1.44 million people. It is expected that this growth will continue, thereby increasing the amount of impervious surfaces within the Region, as well as the quantity of contaminants that are generated through urban-related activities.

Increases in impervious area alter the natural hydrological characteristics of catchments and result in a number of effects on the receiving environment. These effects are generally related to the increased volume of water discharged to the receiving environment, as well as the increase in the rate (velocity) of peak discharges. In addition, impervious surfaces collect or generate contaminants, which then become entrained in stormwater and discharged to depositional receiving environments. Furthermore, the increased rate and volume of stormwater destabilises stream channels, causing exacerbated stream channel erosion, compromising freshwater habitat. Managing effects of stormwater discharges is fundamental to the health of the community and the environment, and as such Auckland Council is responsible for ensuring effective conveyance, treatment and management of stormwater. At present, Council is responsible for an estimated $2.5 billion worth of stormwater infrastructure which services over 510,000 rateable properties within 261 catchment management areas. There are a total of 65,000 km of Council owned pipes associated with over 27,000 stormwater catchpits (Auckland Council, 2011).

Effective stormwater management is therefore not only about ensuring the existing network functions efficiently in order to meet the desired levels of service, but also about planning for future growth to maintain or enhance the quality of the receiving environment for the benefit of the regional community.

However, the cost of addressing this challenge is substantial (Landcare Research, 2005). In February of 2004, PriceWaterhouseCoopers (PWC) concluded that management of stormwater infrastructure would be in the order of $1.9 billion over 20 years to maintain the status quo (i.e. focus management efforts primarily on flood mitigation). If water quality outcomes were to be included within stormwater objectives for the Region, PWC (2004) stated that expenditure could rise as high as $11.2 billion over a 20 year planning horizon.

In March 2004, the Boston Consulting Group (BCG) was engaged to review stormwater management in the Auckland region, and to provide an action plan. The BCG report (2004) indicated a funding shortfall

for stormwater management of $2.3 billion over the next 20 years. As a result, in September 2004, the Auckland Regional Council (ARC) approved a Stormwater Action Plan (SWAP). The purpose of the SWAP (ARC, 2004) was to address recognised issues of environmental degradation caused by stormwater discharges, and it was proposed to be implemented over 10 years. The SWAP (ARC, 2004) identified that a greater level of co-operation and expenditure would be required to reduce the decline in the quality of Auckland's receiving environments from water quality effects, and to meet regional community expectations for achieving this. In order to meet the costs associated with implementing the SWAP, an alternative funding sources workstream was identified. As part of this workstream, a number of reports were commissioned to investigate alternative funding options and to ascertain the stormwater funding shortfall. More recently, the Auckland Plan identified a funding shortfall of between $10 and $15 billion to meet infrastructure costs. Whilst the Plan does not quantify how much of this shortfall relates to stormwater infrastructure, it does acknowledge that new innovative funding tools are needed to support the aging infrastructure.

1.2 Purpose of this Report

This report provides a stocktake of work done in the Auckland region on alternative means of funding stormwater management, as well as investigating funding requirements for the Auckland region. This includes work done prior to the release of the SWAP (ARC, 2004), as well as any subsequent work that was undertaken as part of the alternative funding sources workstream. The study is not about recommending alternative funding options or determining a funding shortfall, but rather about collating, documenting, and highlighting key recommendations resulting from these studies.

1.3 Structure of the Report

Following this background section, the report is divided into four main sections:

- Section 2 discusses the literature review that was undertaken and provides a commentary on the history of the former ARC alternative funding workstream;
- Section 3 reviews and quantifies the perceived stormwater funding shortfall based on current literature;
- Section 4 examines a number of different alternative funding options and discusses in detail the preferred funding solutions;
- Section 5 provides a series of recommendations for further research.

2.0 Literature Review and Timeline

2.1 Literature Review

A short literature review was conducted in order to identify previous studies that investigated alternative means of funding stormwater management within the Auckland region. In addition to this, studies researching funding requirements for stormwater within the Auckland Region were also obtained. The literature search was based on six known projects which investigated the issue of funding:

- A PriceWaterhouseCoopers report into funding of stormwater management, completed prior to the ARC Stormwater Action Plan (February 2004);
- Boston Consulting Group (May 2004)
- A North Shore City Council Stormwater Charging Study (March 2005), which also included an international stocktake of stormwater funding mechanisms;
- A report by Landcare Research on alternative funding mechanisms for stormwater (August 2005);
- A Hill Young Cooper, Cranleigh Merchant Bankers, and Pattle Delamore Partners Ltd report on the funding future for the three waters (June 2007);
- An Assessment of alternative finance options (impervious surface charge) by the former Auckland City Council (2004); and
- The Auckland Plan (paragraphs 695, 820 – 826 and Table 14.1) (June 2012).

All the studies were obtained and the reference lists of each report reviewed for any further relevant stormwater funding literature. In addition, two former ARC files (S130-09 and S130-18-20) were found and reviewed. Finally, a number of professionals were approached in order to determine whether any further funding work was undertaken. The following people were contacted:

- Harvey Brookes (now with the Ministry for Economic Development)
- Michael Krausse (Landcare Research)
- Geoff Hunter (JWPrince, Australia)
- Judy Ansen (Auckland Council)
- Chris Stumbles (Auckland Council)
- Ian Mayhew (Andrew Stewart Limited)

- Catherine Syme (Auckland Council)
- Xeno Captain (AECOM)
- Mike McQuillan (Beca)
- Roger Mills (Retired)

The following reports and information, listed alphabetically by author/ organisation, were collected as a result of the literature search:

1. Auckland City Council. 2004. *Stormwater Update: Including the Targeted Rate*. Auckland City Memo to the Annual Plan Direction Setting Meeting from Catherine Temple, and Greg Webb, Treasury.
2. Auckland City Council. 2006. *Stormwater Asset Management Plan 2006/2007*.
3. Auckland Council and Morphum Environmental Ltd. 2011. *Stormwater Management Improvement and Cost Estimation Model: Development Report*.
4. Auckland Council. 2012a. *The Auckland Plan* (paragraphs 695, 820 – 826 and Table 14.1)
5. Auckland Council. 2012b. Draft Stormwater Asset Management Plan: 2012 – 2032 (Section 7)
6. Auckland Regional Council. 1991. *Auckland Regional Stormwater Project: An Economic Overview*. Technical Publication 3/ WR-55.
7. Auckland Regional Council. 2004. *Auckland Regional Council Stormwater Action Plan*.
8. Auckland Regional Council. 2005. *Auckland Regional Council Stormwater Action Strategy*.
9. Auckland Regional Council. 2007. *Alternative Funding Sources: Where ARC is currently and what is the future direction.* Located in File S130-18-20
10. Bell Gully. 2005. Memorandum: Rates – *Stormwater Targeted Rate*. Memorandum to Geoff Hunter, ARC from Tom Bennett/ Alaina Polucha, Bell Gully. Located in File S130-18-20
11. Boston Consulting Group. 2004. *Auckland Regional Stormwater Project: An Action Plan to Deliver Improved Stormwater Outcomes*. Prepared for Infrastructure Auckland
12. Funding Project Team (NZ Government). 2005a. *Local Authority Funding Issues*. Report of the Joint Central Government/ Local Authority Funding Project Team. Located in File S130-09
13. Funding Project Team (NZ Government). 2005b. *Local Government Funding – First Principles Review: Draft*. Report of the Joint Central Government/ Local Authority Funding Project Team Located in File S130-09

14. Hill Young Cooper, Cranleigh Merchant Bankers and Pattle Delamore Partners Ltd. 2007. *Funding Futures: Three Waters – Auckland Region*. Prepared on behalf of the Auckland Regional Council.

15. Landcare Research. 2005. *An Overview of Stormwater Funding Options for the Auckland Region*. Prepared for the ARC. Report No: LC0506/012

16. North Shore City Council. 2004. *Stormwater Strategy 2004 for North Shore City Council*. Section 6.5 – Stormwater Funding.

17. North Shore City Council. 2005. *Stormwater Charging Study*. Prepared by Maunsell Ltd

18. Ouwejan, R., Seyb, R., Paterson, G., Davis, M., Mayhew, I. Kinley, P. and Sharman, B. 2006. *Source Control or Traditional BMPs? An Assessment of Benefits and Costs in Auckland City*.

19. PriceWaterhouseCoopers. 2004. *Funding Auckland Regional Stormwater: An Options Analysis*. Prepared for Infrastructure Auckland.

20. Waitakere City Council. 2004. *Revenue and Financing Policy*. Section 11.7 – Stormwater.

21. Files S130-09 and S130-18-20 contain information which assists in providing background information and correspondence relating to some of the studies mentioned above. They mainly focus on work undertaken up until the end of 2005 as part of the SWAP.

2.2 A History of the Funding Workstream

The literature review highlighted that the most influential report after the implementation of the SWAP was the Landcare Research study (2005) entitled "*An Overview of Stormwater Funding Options for the Auckland Region*". This report was completed in August 2005 and built on work commissioned by Infrastructure Auckland (PWC, 2004; BCG, 2004). It was during this time that the alternative funding workstream within the SWAP merged with transport funding initiatives being undertaken by the Chief Executive's Office at the former ARC. The purpose of this merger was to ensure that the ARC would have a single voice on local government funding issues with the Joint Officers Group (JOG) and the review being undertaken by the Department of Internal Affairs (DIA). At the same time North Shore City Council (NSCC) and Auckland City Council (ACC) had commissioned separate studies to investigate alternative funding sources for territorial authorities (TAs) (ACC, 2004; NSCC, 2005). One of the purposes of these studies was to assist Auckland territorial authorities with their submissions to the JOG and DIA reviews. The JOG reviews recognised that local government was being subjected to significant funding pressures, however, the proportion of this pressure relating to stormwater management was not defined.

In addition to central government initiatives around the local government funding shortfall, the ARC determined that stormwater funding issues should not be considered in isolation of water and

wastewater concerns. Thus, work commissioned subsequent to this date, focussed on the three waters (Hill Young Cooper *et al.*, 2007 – Funding Futures). The Hill Young Cooper *et al.* Report (2007) raised a number of concerns surrounding the quantum of stormwater funding shortfall documented in the Boston Consulting Group Report (BCG) (2004). These concerns mainly surrounded the types of solutions for managing contaminants from stormwater discharges, and as a result investigated a number of different scenarios for stormwater management. Despite their initial concerns, the quantum of funding shortfall was relatively similar to the BCG (2004) report (see section 3.2). By this time questions surrounding regional governance in Auckland were beginning to occur, and the work being undertaken by the ARC's Chief Executive's Office became wrapped up into the regional governance review. As a result, any concerns relating to stormwater funding would need to be considered against other regional priorities through the regional governance review. It is for this reason that very little literature post-2007 exists surrounding alternative funding solutions for stormwater within the Auckland Region (pers comm Catherine Syme).

In order to illustrate this sequence of events, a timeline has been created which highlights key funding requirement or alternative funding source documents. This timeline is shown in Figure 1.

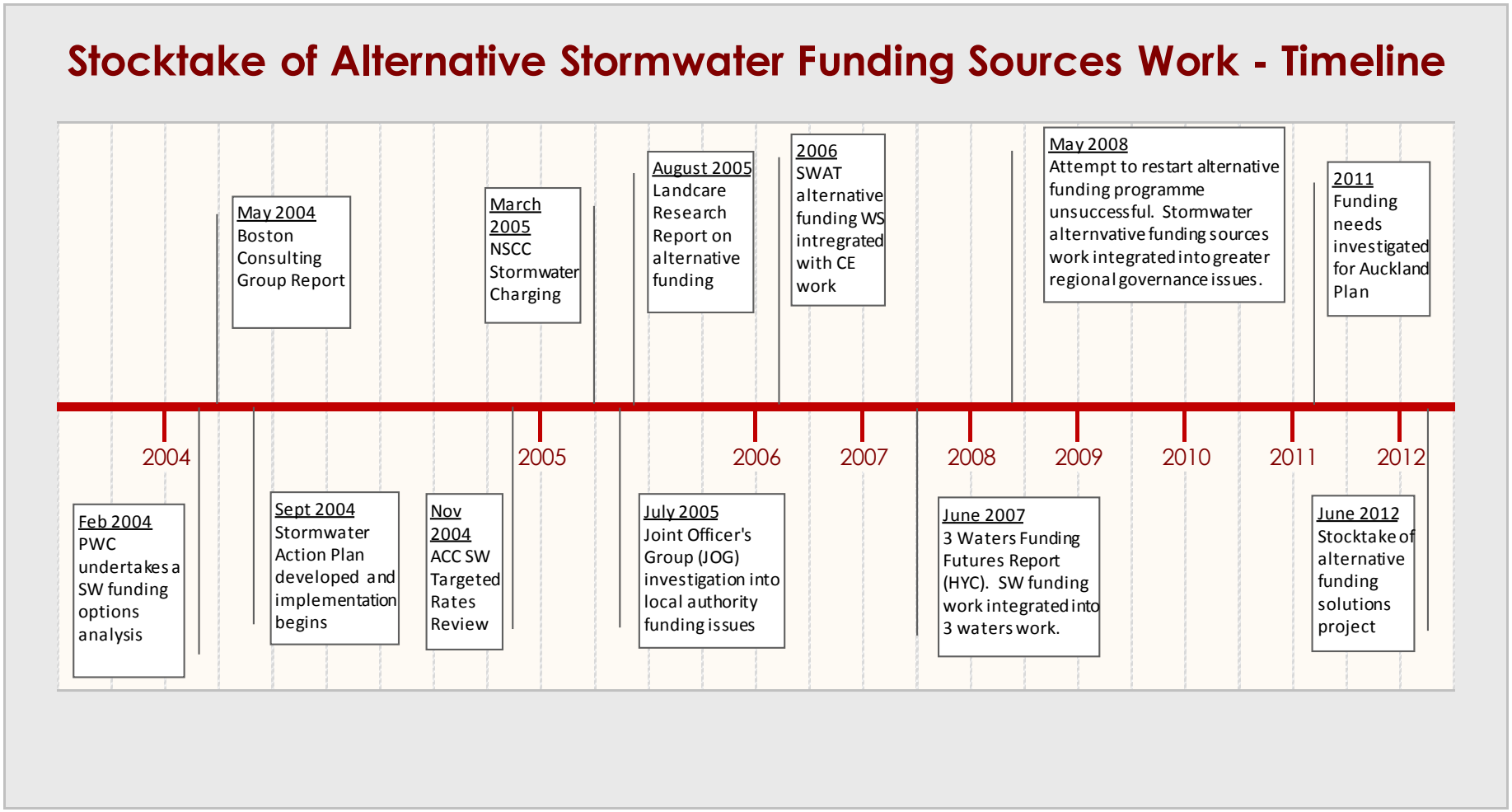

Figure 1 Research Timeline

3.0 The Stormwater Funding Gap

3.1 Background

Auckland's harbours and waterways are a valuable part of the environment of the Auckland region. In an initial report by Ward and Scrimgeour (1991), the annual benefits from the environmental services of the harbours (i.e. the Waitemata and Manukau Harbours) to the Region was estimated at $400 million in 1991. Other intangible benefits such as existence, bequest and aesthetic values were considered to be in addition to this amount. Ward and Scrimgeour (1991) expected that future benefits could be in the order of $800 million (1991 dollar value). This was predicated on ensuring water quality was maintained at 1991 levels.

Despite this estimated value of the harbour areas, implementation of water quality treatment was generally ad hoc in nature until the drafting of the Proposed Auckland Regional Plan: Air Land and Water in 2001. Historically, territorial authorities (TA) focussed on managing water quantity issues and this is reflected (Table 1) within their allocation of resources (BCG, 2004) and more recently within their Long Term Council Community Plans (LTCCPs). It is very unlikely that the "1991" water quality levels stipulated in Ward and Scrimgeour (1991) were maintained.

In 2004 PWC documented that the former ARC environmental monitoring programme of coastal receiving waters showed 32 sites (44%) falling within the green environmental response criteria (ERC)[1] classification, 18 sites (25%) within the amber ERC guideline values, and 22 sites (33%) above the red ERC guideline value (the report merely states that these numbers are an indication of the "contaminant status" of the receiving environment, and does not provide information on the type of contaminant(s) to which these percentages relate). Following on from this, BCG (2004) reported that by 2021 48% of sites would be classified as red, 18% as amber and 34% as green.

More recently, Auckland Council (http://monitorauckland.arc.govt.nz/natural-environment-and-heritage/coastal-management-home/contaminants-in-sediment.cfm, accessed on 5 July 2012) has documented that there is a long term trend of increasing concentrations of zinc in marine sediments, particularly at those sites which are already showing signs of effects.

1.0

[1] The former ARC and current Auckland Council undertakes environmental monitoring of coastal waters in urban areas of Auckland to determine effects of contaminants on the receiving environment. The ERC act like a traffic light system whereby green = healthy; amber low effects to aquatic organisms and may affect up to 10% of species; red = ecological effects range potential is greater than 50%.

Table 1 Allocation of TA resources to stormwater in 2001 (BCG, 2004)

Allocation Of Selected TA Resources To Stormwater In 2001[1]
($ per ratepayer, %)

	WCC[2]		ACC		FDC		MCC		NSCC	
	($)	(%)	($)	(%)	($)	(%)	($)	(%)	($)	(%)
Assets/Ratepayer[3]										
• Quantity	2,218	98	1,149	100	806	100	6,313	98	3,349	97
• Quality	38	2	0	0	0	0	139	2	96	3
• Total	2,256	100	1,149	100	806	100	6,443	100	3,445	100
OPEX / Ratepayer										
• Quantity	27	22	13	12	12	29	21	16	15	15
• Quality	3	3	3	3	0	0	1	1	2	2
• System Planning	21	18	10	9	7	17	11	8	13	14
• Depreciation	55	45	59	56	13	30	90	67	54	55
• Other	15	12	20	20	10	24	10	8	14	14
• Total	121	100	105	100	42	100	133	100	98	100

Largely driven by flooding/ public health

(1) Rodney and Papakura unavailable in this study
(2) WCC 2001 results
(3) Asset Depreciated Replacement Cost
Source: NZ Benchmarking Study 2002

In addition to this documented increase in contamination of the receiving environment, continued rapid growth is placing pressure on the capacity of Auckland's infrastructure (Landcare Research, 2005). These pressures not only relate to increasing contaminant loads, but also to the effects of increased impervious surfaces on the capacity of existing stormwater systems.

Previous investigations (PWC, 2004; BCG, 2004; Landcare Research, 2005) have highlighted that the costs of addressing these issues will be significant. BCG (2004) documented that planned investment in the stormwater system infrastructure and operation from 2004 – 2012 would be in the order of over $800 million (2004 dollar value). More recently, the Auckland Plan (2012) has identified that there is a $10 - $15 billion funding shortfall to meet infrastructure costs, however, it does not quantify how much of this shortfall can be attributed to stormwater (as opposed to water supply and wastewater).

3.2 The Funding Shortfall

The PWC (2004), BCG (2004), Landcare Research (2005), Hill Young Cooper *et al.* (2007) and Auckland Council (2011) reports estimated potential additional expenditure required to allow water quantity, water quality and stream management outcomes to be achieved. The outcomes or levels of service that were estimated differed slightly in each study, however, the quantum of funding shortfall remained relatively similar. Table 2 provides a summary of the estimated funding shortfalls from each of these studies.

Table 2 Summary of funding shortfall estimated through previous research

Study Reference	Scenarios Modelled	Key Assumptions[1]	Estimated Costs
PriceWaterhouseCoopers (2004)	Scenario 1 (Status Quo)	Current planned funding as provided in the TAs AMPs.	Capex: $1.2 bil Opex: $776 mil over 20 yrs TOTAL: $1.9 bil NZ$ @ 2004
	Scenario 2 (9 Priority Areas)[2]	The nine priority catchments identified through the Infrastructure Auckland Annual Plan will be treated to a high level, with the remaining receiving environments treated as per Scenario 1, the status quo. Treatment to be provided via wetland ponds being retrofitted into urbanised land and so that at least 40% of the total land area would receive 75% TSS removal. Riparian planting on natural flowpaths where wetlands are not feasible.	Capex: $2.8 bil Opex: $1.36 bil over 20 yrs TOTAL: $4.2 bil **FUNDING GAP: $2.3 bil** NZ$ @ 2004
	Scenario 3 (All Areas)	Treatment as per scenario 2, but for all receiving environments.	Capex: $7.8 bil Opex: $2.5 bil over 20 yrs TOTAL: $11.2 bil **FUNDING GAP: $9.3 bil** NZ$ @ 2004
Boston Consulting Group (2004)	-	TA estimates of ARP:ALW requirements over the next 20 years (see Figure 2).	$2.3 bil over 20 years NZ$ @ 2004
Landcare Research	-	No estimate of funding shortfall – report based on BCG and PWC reports	

Study Reference	Scenarios Modelled	Key Assumptions[1]	Estimated Costs
Hill Young Cooper *et al.* (2007)[3]	Level of Service 1 (additional CAPEX)	Flooding: 50 yr flood and 10 yr pipe capacity (new); existing resolved to 50 yr. Contaminants: 30% TSS removal for estuaries and open coasts (ponds & sandfilters) Streams: existing and enhanced for 30% of stream length for high value streams and 5% for moderate value streams	Flooding: $130 mil[4] Contaminants: $1.9 bil[5] Streams: $27 mil **FUNDING GAP: $2.1 bil** NZ$ @ 2007
	Level of Service 2 (additional CAPEX)	Flooding: 100 yr flood and 10 yr pipe capacity (new); existing resolved to 100 yr. Contaminants: 50% TSS removal for estuaries and open coasts (ponds & sandfilters) Streams: existing and enhanced for 60% of stream length for high value streams and 10% for moderate value streams	Flooding: $202 mil[4] Contaminants: $3.4 bil Streams: $54 mil **FUNDING GAP: $3.7 bil** NZ$ @ 2007
	Level of Service 3 (additional CAPEX)	Contaminants: 75% TSS removal for estuaries and open coasts (ponds & sandfilters) (Gap based on flooding and streams from LoS 2)	$5.9 bil **FUNDING GAP: $6.2 bil** NZ$ @ 2007
Auckland Council (2011)	Low Cost	- A "day one" cost requirement (i.e. only capex costs have been included) - Only includes costs of potential improvements to existing issues (a "fix it all now" approach) - Excludes costs associated with new problems, catchpits or pipes which drain roads, low impact design	Flooding: $2.9 bil Contaminants: $991 mil Streams: $442 mil **TOTAL[6]: $4.36 bil** NZ$ @ 2011

Study Reference	Scenarios Modelled	Key Assumptions[1]	Estimated Costs
	Medium Cost	As above	Flooding: $2.93 bil Contaminants: $2.06 bil Streams: $452 mil **TOTAL: $5.48 bil** NZ$ @ 2011
	High Cost	As Above	Flooding: $5.25 bil Contaminants: $2.42 bil Streams: $452 mil **TOTAL: $8.119 bil** NZ$ @ 2011
TOTAL FUNDING GAP RANGE			$2.1 billion - $9.3 billion
MEAN GAP		Inflated to 2012 dollar values using a 2% inflation rate	$5.8 bil

[1]Detailed assumptions of the outcomes/ levels of service modelled can be found in full in each of the referenced studies.

[2]Preferred Scenario.

[3]Levels of service were based on what was deemed to be realistic, not what is necessarily desired or appropriate.

[4]The expenditure gap for flooding was considered to be a low estimate both due to the lack of information regarding existing flooding of habitable floors and the large amount of expenditure that had been set aside in Auckland City Council's LTCCP to remediate flooding issues. In addition, the review did not take account of non-habitable floor flooding and no private costs were considered (i.e. costs relating to growth).

[5]Costs relating to roof painting and replacement are provided, however, are considered private costs and are not included in the overall funding shortfall.

[6]The cost of growth is not included within the total estimates for the low, medium and high cost scenarios. The Stormwater Cost Estimation Model states that costs associated with network growth range from $4.1 billion to $5.7 billion. A funding shortfall was not estimated.

3.3 Discussion

The funding shortfalls estimated in Table 2 range from $2.1 billion to $9.3 billion. The most extensive modelling exercises to estimate the funding shortfall were undertaken by PWC (2004) and Hill Young Cooper *et al.* (2007). Both reports investigated the estimated expenditure associated with achieving a range of outcomes, from maintaining the status quo, to providing treatment of all urban areas to 75% total suspended solids (TSS) removal on a long term average basis. The PWC (2004) report was more aspirational in terms of outcomes, whereas the Hill Young Cooper *et al.* (2007) study was based on outcomes that were deemed 'achievable' by the TAs.

The majority of studies noted that the additional spend required for water quantity control was smaller than that for water quality management (for example: see BCG, 2004 and Figure 2). The focus on flooding was the key reason provided for this difference. In terms of future expenditure to address existing stormwater management issues, the Auckland Council (2011) stormwater cost estimation model also focusses expenditure on water quantity control. The model showed that the quantum of spend on water quantity control is far higher than that for contaminant management, and the report (Auckland Council, 2011) provides three reasons for this focus. Firstly, the model assumed that any pipe not meeting its level of service needed to be upgraded, irrespective of whether or it was causing a flooding problem. Secondly, the study focussed primarily on solving existing stormwater management issues, and costs associated with growth would be dealt with separately. Thirdly, retrofitting stormwater treatment was not included in the model. Despite the focus on flood mitigation, the study provides a useful estimation of the likely expenditure needed to maintain the status quo.

An additional observation regarding the range in expenditure for water quality management is that the type of management options chosen (e.g. wetlands, ponds, sand filters), significantly influences the final cost estimate. This could account for the differences between the PWC (2004) and Hill Young Cooper *et al.* (2007) cost estimates when compared with the $2.3 billion funding gap identified in the BCG (2004) report (Table 2). Both PWC (2004) and Hill Young Cooper *et al.* (2007) considered retrofitting ponds, wetlands, and in the case of the latter, sand filters. In terms of retrofitting stormwater quality treatment in existing urban environments, all these options are exceptionally expensive. The BCG report (2004) states that the water quality estimate was undertaken by the TAs using a "best practicable option" (BPO) approach. Unfortunately no further information as to what the "BPO" may constitute is provided.

In terms of the allocation of expenditure, all studies were in agreement regarding private funding of stormwater infrastructure requirements resulting from growth. In addition, *Hill Young Cooper et al.* (2007) recommended that costs emanating from roof painting ($636 million - $1.7 billion over 20 years, 2007 NZ$ value) and replacement initiatives ($818 million - $2.14 billion over 20 years, 2007 NZ$ value) should also be borne by private individuals. However, the study did acknowledge that public funding may be necessary to assist promoting roof painting/ replacement initiatives.

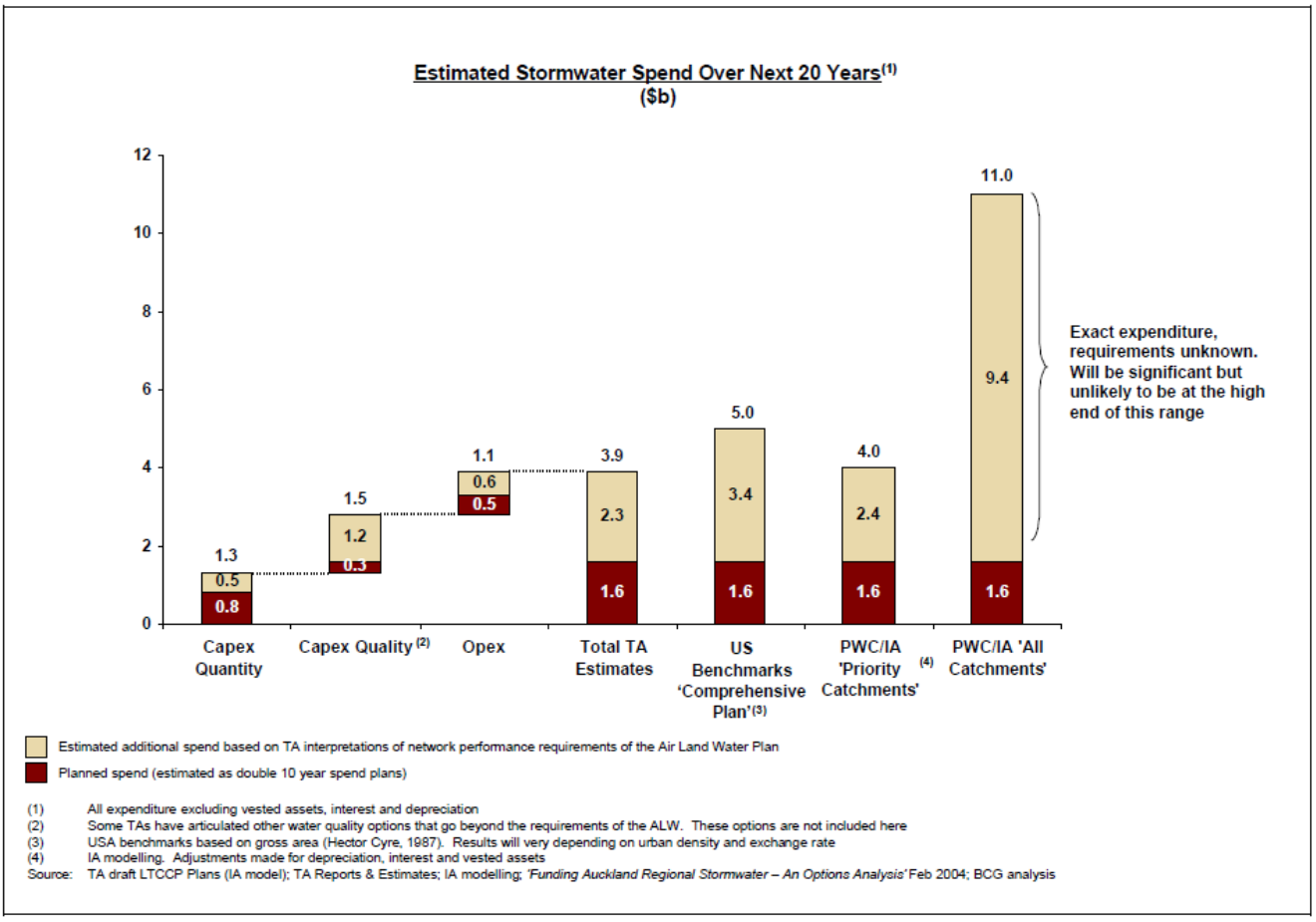

Figure 2 Estimates of expenditure required over the next 20 years to deliver stormwater outcomes (BCG, 2004)

Auckland Council has recently completed the draft Stormwater Asset Management Plan (AMP) for 2012 – 2032. Section 7 of the draft Stormwater AMP (2012) provides a summary of proposed capital and maintenance expenditure over the next 20 years. A summary of the proposed capital and maintenance expenditure is provided in Table 3 and Figures 3 and 4. It should be noted that the source of cost data within the draft AMP (2012) is primarily the Auckland Council Cost Estimation Study (2011) as shown in Table 2.

Whilst the cost estimates are draft and may be subject to change, it is interesting to note that the 20 year expenditure ($4.9 billion) is $1 billion short of the mean funding gap determined through the reviewed studies. In addition, the draft AMP (2012) considered implementation timeframes for capital projects expenditure, and it is noted that the improvements will be implemented over a 50 year timeframe (Figure 5). The draft AMP (2012) states that a 30 year timeframe results in unsustainably high levels of expenditure, whilst if expenditure remained at 2011 levels, it would take over 200 years to resolved identified stormwater issues. BCG (2004) and PWC (2004), however, considered implementation over 10-20 years. Whilst it therefore appears as if the quantum of proposed expenditure in the draft AMP is relatively consistent with the aforementioned funding studies, the

timeframe for implementation is different, and thus alternative funding options to reduce this timeframe may well be required.

Table 3 Summary of total expenditure proposed in the draft Auckland Council Stormwater AMP (Auckland Council, 2012)

Category	3 years	10 years	20 years
Capital Expenditure	$226 mil	$1.3 bil	$2.9 bil
Operational Expenditure	$266 mil	$945 mil	$2 bil

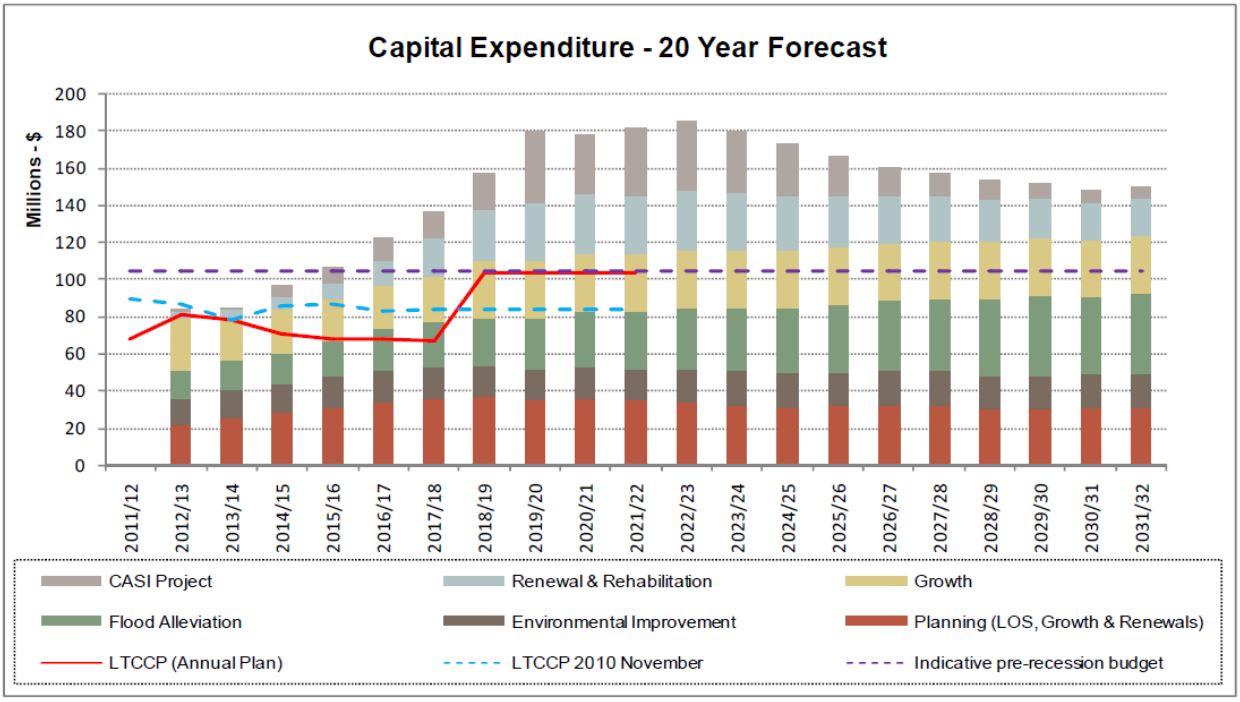

Figure 3 Capital expenditure forecast by programme (Auckland Council, 2012)

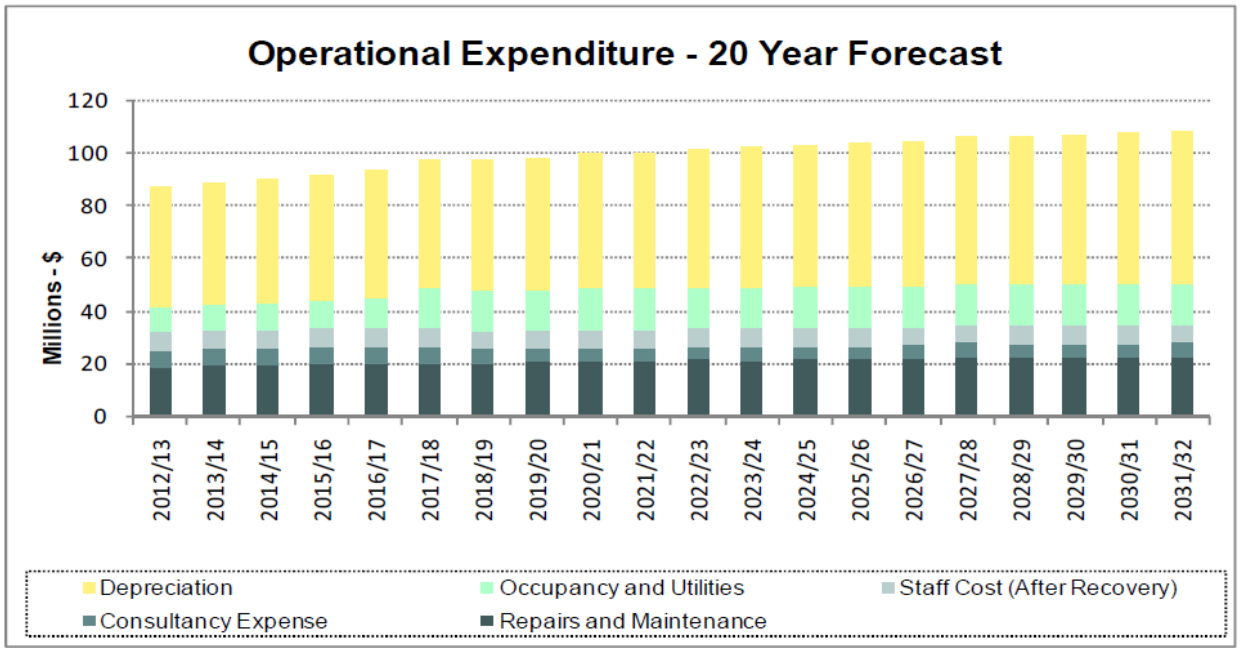

Figure 4 Operational expenditure (Auckland Council, 2012)

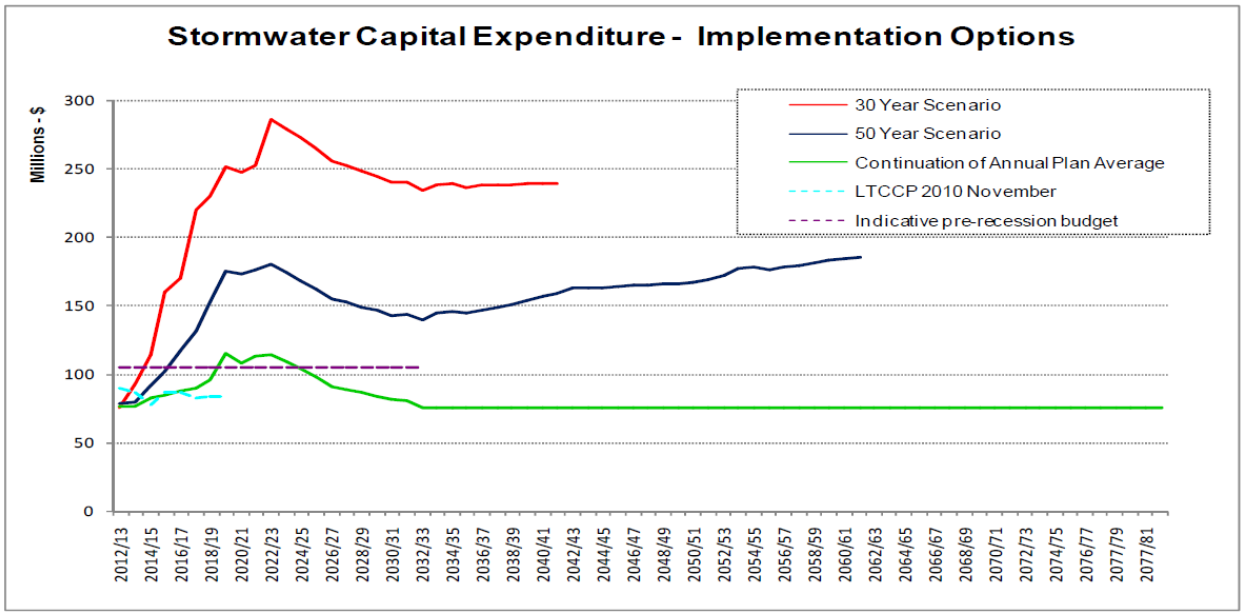

Figure 5 Capital expenditure – implementation options (Auckland Council, 2012)

4.0 Alternative Funding Solutions

4.1 Background

Given the funding shortfall estimated in Section 3, PWC (2004), BCG (2004) and Landcare Research (2005) all recommended that a funding strategy should be developed. The reports identified that there is a heavy dependency on general property rates to fund stormwater activities, and that other funding solutions should be sought to either complement or replace the use of general rates funds for stormwater management. It was identified that this dependency on general rates meant that the funding source is vulnerable to changing political processes and priorities.

Landcare Research (2005 – p.6) identified that any funding strategy should be based on five guiding principles:

1. **Sufficiency:** The need to secure adequate funds to renew existing infrastructure, improve service levels consistent with public priorities, and provide for growth.
2. **Certainty:** The need to ensure that sufficient funds will be available when required.
3. **Equity:** The principle of exacerbator pays, i.e. those that generate additional demand for stormwater services should significantly contribute to its provision. This includes developers. It is noted that the BCG (2004) report recommends that developers contribute 50% – 100% of growth related investment. It also includes road users as roads are significant sources of increased runoff and contaminants.
4. **Efficiency:** The principle that a funding mechanism should provide incentives for behaviour consistent with the goal of reducing stormwater and contaminant flows to levels that achieve the desired environmental and social outcomes.
5. **Acceptability:** The likelihood that the recommended strategy would be politically acceptable.

All the funding reports recommend that a wider range of funding options be critically reviewed in order to identify a toolbox of methods able to meet the above five principles. This chapter discusses the resultant reviews. More specifically, it provides an overview of the legal framework surrounding funding mechanisms for councils, the funding options available, and the preferred method for funding stormwater management.

4.2 Assessment of Funding Options

4.2.1 Legislative Background

In 2002 the Local Government Act (LGA) and Local Government Rating Act (LGRA) facilitated the collection of revenue by both targeted rates and development contributions (Landcare Research, 2005). Section 103 of the LGA 2002 includes the following funding options:

2 (a) general rates, including—

(i) choice of valuation system; and

(ii) differential rating; and

(iii) uniform annual general charges:

(b) targeted rates:

(ba) lump sum contributions:

(c) fees and charges:

(d) interest and dividends from investments:

(e) borrowing:

(f) proceeds from asset sales:

(g) development contributions:

(h) financial contributions under the Resource Management Act 1991:

(i) grants and subsidies:

(j) any other source.

Landcare Research (2005) reports that all funding options under the LGA (2002), with the exception of development contributions, can be used to fund both capital and operating expenditure. Development contributions can only be used to fund capital expenditure.

4.2.2 Funding Options Currently in Use

Landcare Research (2005) and NSCC (2005) undertook a literature review to determine those funding mechanisms which are currently in use here in New Zealand and internationally. The list provided below includes options that are or could be used in New Zealand under the LGA 2002 (Landcare Research, 2005):

1 Mechanisms that can be used for funding capital works only under the LGA 2002:

a. Borrowing (loads or bonds)

b. Vested asset or financial contributions

c. Development contributions

2 Mechanisms that can be used to fund capital or operational and maintenance works:

a. Allocations and grants (eg from national roading charge revenues)

b. Regional sales tax

c. General rate based on property value

d. Uniform annual general charge

e. Targeted rate based on land area

f. Targeted rate based on impervious area

g. Targeted rate based on hydrological contribution

h. Fees and charges

i. Penalties

3 Other funding-related mechanism that could be used to reduce stormwater runoff:

a. Voluntary offset credit and incentive schemes

b. Negotiated agreements

c. Market based quantity instruments.

Appendix A provides a summary of each of the different funding options.

NSCC (2005) determined that cities in the United States of America (USA), Canada and Germany are experiencing similar problems relating to urban stormwater effects and funding of stormwater management to Auckland. In the USA and Canada, stormwater utilities have been set up by approximately 600 city/ district authorities with an aim to improve stormwater services. In general, the most used mechanism for funding these utilities has been through user-pays service fees. NSCC (2005) reports that a typical annual service fee for a residential property is between $36 - $48 (2005 dollar value - it should be noted that the report does not stipulate whether this is US$ or NZ$ costs). For commercial or industrial properties, the typical fee is $144 - $192 (2005 dollar value) per 1000m^2 of impervious coverage. However, many of these utilities have to supplement this funding source through development charges, regional sales tax and bonding. In addition, their experience shows that stormwater service fees alone are insufficient to induce behavioural change.

In Germany, increasing environmental awareness and pressure from residential ratepayers and environmental groups has encouraged the separation of stormwater and wastewater charges, and

approximately 60% of the urban residents now pay separately for the provision of stormwater services (NSCC, 2005). Payment is based on impervious area targeted rates, and in some cases subsidies are provided for reducing impervious areas.

As of 2005 (NSCC), no city councils within Australia charged for the provision of annual stormwater management services. However, with the focus on stormwater as a water supply tool, an increasing effort is being made to educate the public on the benefits of stormwater re-use.

Within New Zealand, the predominant method of charging for stormwater services is through general rates and development contributions. In addition, borrowing and vested assets are widely used methods of financing stormwater debt. Whilst many councils apply a targeted rate, that rate tends to be based on land or capital value, or is a fixed charge per property. In 2005, no council in New Zealand was using a targeted rate based on a user-pays principle (NSCC, 2005). Both the former Auckland City and North Shore City Councils considered the introduction of a targeted rate based on impervious area (NSCC, 2005), however, neither was implemented. Fees and penalties are also used in New Zealand, however, they generally do not generate significant funds for development as the level of fines tend to be set by the Court and are rarely punitive.

4.2.3 Criteria for Evaluating Funding Options

The PWC (2004), BCG (2004), NSCC (2005) and Landcare Research (2005) reports all stipulate the necessity for first establishing the goals of the desired funding approach, as the goals assist in refining relevant funding criteria. Despite some slight variations, the four abovementioned reports use similar criteria for evaluating the funding options outlined in Section 4.2.2. The funding criteria are presented in Table 4. When assessing funding options, it is important to firstly start with the requirements for an economically efficient pricing system, and then consider deviations from that system based on the strengths and weaknesses of the other criteria (Landcare Research, 2005).

Table 4 Summary and explanation of relevant funding criteria (adapted from Landcare Research, 2005)

Funding Criteria	Explanation
Appropriateness and Legislative Compliance	Consistency with institutional arrangements (e.g. legislation, plans, strategies, etc)

Funding Criteria	Explanation
Effectiveness	Providing sufficient revenue to cater for growth and improve levels of service in acceptable timeframes Diversifying the rate burden Improving reliability and adequacy of the revenue stream Flexibility in use of funds (capital vs operation vs public vs private uses)
Equity	Fairness – user pays Recognising ability to pay
Acceptability	Easily understood - transparent and simple Consistent with public values and attitudes Perceived to be beneficial, equitable and fair
Economic Efficiency	Balancing costs and benefits, and includes an optimal mix of at source avoidance, treatment and mitigation of impacts: - Sets a fee where expenditure on effect reduction equals the community's benefit from that expenditure - Is flexible with respect to abatement, treatment and mitigation options
Incentives for Preferred Behaviour	Provides the right price signals for ratepayers (increasing stormwater charges with increasing contribution to flow or contamination) Provides opportunities for credits, reduced charges or subsidies
Ease/ Cost Effective	Relatively easy and inexpensive to implement, monitor and enforce Able to be reviewed and adjusted to meet funding needs

Funding Criteria	Explanation
Sustainability	Provides for funding in the long term in a stable and predictable manner

Based on the criteria in Table 4, PWC (2004), BCG (2004), NSCC (2005) and Landcare Research (2005) all determined that the following general approach should be further investigated:

- New development should continue to be funded through development and contributions;
- A targeted rate for stormwater funding is preferred; and
- Road user charges should be investigated since contamination from roads is a significant contributor to stormwater effects.

The key premise behind each of these funding solutions is that of "polluter-pays". The reports concur that a key funding principle should be that, whilst the whole community may benefit from stormwater infrastructure, the people who generate new development should contribute through development contributions. Furthermore, any new targeted rate should assist in creating behavioural change within the community and increase awareness of stormwater effects. Many of the other funding options, including general rates, do not meet either of these goals. A full copy of the funding assessment undertaken by Landcare Research is included in Appendix B.

Each of these preferred funding options is discussed in greater detail in Sections 4.2.4 – 4.2.6. It is noted that different financing options (such as borrowing, sink funds, asset investments, etc.) are not covered in this report, however, they would form an important part of any funding strategy.

4.2.4 Development and Financial Contributions

The use of development and financial contributions is an increasingly common practice in North America, Australia and New Zealand. It is based on charging a developer an 'impact fee' or contribution to cover the cost of new infrastructure and services on the wider stormwater network. The approach is based on the assumption that current residents have already paid for the infrastructure that serves them (usually either through taxes or fees), and they should not need to pay for upgrading services to meet the demand of new developments (Landcare Research, 2005).

Provisions under the s102 of the LGA (2002) and subsequent amendments provided the former Auckland TAs with flexibility to set a development contributions policy and assessment methodology. A development contribution can only be used for capital expenditure on network infrastructure identified in a LTCCP (s204). All of the former Auckland TAs had development contribution policies. On average,

the contribution amounted to 4% – 6.6% of the average cost to build a standard household lot (WCC, 2004).

One of the main advantages of a development contribution is that the policy, rationale, activities and assessment method only need to be written and publicly debated once before becoming operational and applying to all developments. The disadvantage, however is that the appropriate level of development contribution is difficult to set, especially where existing infrastructure is not sufficiently adequate to mitigate environmental effects and protect public health (Landcare Research 2005). In addition, it is less conducive to efficient outcomes as they are focussed primarily on implementation, and they provide little consideration of community choices between environmental quality and costs of stormwater treatment. Furthermore, development contributions cannot be used to fund maintenance, renewal or improvement works, they can only be used for capital expenditure (DLA Phillips Fox, 2008). However, they are a publically acceptable method of funding stormwater infrastructure related to growth since they conform to the "user-pays" principle (Landcare Research, 2005).

4.2.5 Targeted Rates

4.2.5.1 General Description[2]

The generic term targeted rate applies to a range of charges that target:

- a specific activity or group of activities being funded, e.g., stormwater management
- a specific factor being used as the basis for charging, e.g., impervious surface area
- characteristics of the property being charged, e.g., properties within a specified zone.

The principle of separating a funding stream from the general rate and directing it to a specific purpose is consistent with the beneficiary and exacerbator pays principles. Advantages of targeting are that it:

- improves certainty by creating a dedicated revenue stream with which to meet growing investment needs,
- provides information about the cost of the service and transparency in the allocation and use of funds.

However, targeting also has some disadvantages. Dedicated funding streams:

- reduce flexibility and ability to exercise discretion over expenditure, as the activities to be funded by a targeted rate must be specified in the TA's funding impact statement (s16(1) LGRA 2002),

1.0

[2] It is noted that substantial portions of this section are taken directly from the Landcare Research (2005) study as the report provides a useful summary of the use of targeted rates.

- potentially conflict with the ability to pay principle through the risk of "cost-based" rate adjustments.

The establishment of a targeted or dedicated funding stream can be independent of the factor being used as the basis for charging. For example, a stormwater charge can be nominated within a value-based rate or uniform annual general charge as a proportion or fixed sum within the total charge. This provides ratepayers with some information about the costs of the service and Council's investment, and is a useful stepping stone to a more targeted use-based charge.

A range of targeted rates reflecting use or contribution to demand for stormwater services are possible under the LGA (2002):

1 Targeted rate as a uniform annual charge

2 Targeted rate based on land area

3 Targeted rate based on land use

4 Targeted rate based on impermeable surface area

5 Targeted rate based on hydrological contribution (as a function of slope, soil type, land cover, land use, on-site storage, etc.).

Under sections 16-18 LGRA 2002, a local authority may set a targeted rate for one or more activities.

A targeted rate can be set on a uniform basis for all rateable land (uniform annual charge), or differentially for different categories of rateable land. The latter provision is extremely flexible and can be used to set a separate stormwater rate on a range of factors including the area of land within the rating unit that is sealed, paved, or built on, or the extent of provision of any service to the rating unit by the local authority, e.g., volumetric charging for water services. The latter was being used by some Auckland councils for the supply of potable water and wastewater services.

The Act maintains the provision for the setting of differential rates based on category of land (use, size, location, value). This approach was used in Rodney District to differentially rate rural and urban property owners for stormwater services. The Act does provide some limitations that need to be taken into account when considering a targeted rate:

- The sum of targeted rates set on a uniform basis (Uniform Annual Charge) and Uniform Annual General Charges cannot exceed 30% of total rates revenue [s21 LGRA (2002)]. Targeted rates set for water supply or sewage disposal are excluded from this calculation, but this exclusion does not apply to stormwater.
- There is no provision for credits or discounts for mitigation to be implemented through a reduced charge under a targeted rate. These would therefore need to be reimbursed under the rates remission provisions of the Act.

These limitations have been confirmed by legal opinions obtained from Bell Gully (2005) and Simpson Grierson (in NSCC, 2005). In addition, Bell Gully (2005) outlined that non-rateable land cannot be included within a targeted rate. This includes land that is vested in the Crown or local authority that is formed and used for a road, limited access road, access way, or service lane. Again, non-rateable land in the LGRA can be rateable for the purpose of setting a targeted rate if the rate is set solely for water supply, sewage disposal or refuse collection., but this provision does not apply to stormwater.

The studies (Landcare Research, 2005; NSCC; 2005, ACC, 2004) show that an impervious area charge is the preferred means of applying a targeted rate. Table 5 provides a qualitative assessment of the main targeted rates options as undertaken by NSCC, 2005. Whilst a stormwater runoff charge was considered to be the most equitable approach to charging for stormwater services (Landcare Research, 2005), the impervious area charge is preferred on that basis that:

- Environmental and strategic benefits are likely to be very similar;
- Impervious area charges will cost less to implement; and
- The LGRA permits paved, sealed or built on areas to be used to assess liability for a targeted rate, but a runoff charge would require new legislation (NSCC, 2005).

Table 5 Summary of Evaluation of Annual Stormwater Funding Options (from NSCC, 2005)

Criterion	Status Quo	Imperv. Area	Hydrology	Uniform Fee	Total Area	Land-use
Achieves strategic goals	No	Yes	Yes	No	No	No
Economically Efficient	No	Yes	Yes	No	No	No
Changes behaviour	No	Probably Yes	Yes	No	No	No
Ease of implementation	Yes	Yes	No	Yes	Yes	Yes
Fair and equitable	No	Yes	Yes	No	No	No
Acceptable to ratepayers	Yes	Probably Yes	Probably Yes	Probably Yes	Probably Yes	Yes
Price signal	No	Yes	Yes	No	No	No
Financially viable to NSCC	Yes	Yes	No	Yes	Yes	Yes
Permitted by legislation	Yes	Yes	No	Yes	Yes	Yes
Overall No. Yes's	**4**	**7-9**	**5-6**	**3-4**	**3-4**	**3-4**
Overall No. No's	**5**	**0**	**3**	**5**	**5**	**5**

A uniform annual charge, although the simplest form of targeting, is not desirable given that it suffers from similar deficiencies to those associated with a general rate (see earlier discussion). Similarly, land area and land use rates are not desirable since they are both poor indicators of actual runoff or

contaminant contribution. Targeted rates based on these factors are therefore just as inefficient and inequitable as value-based rating (as undertaken through general rates), and add a layer of complexity with little additional benefit (Landcare Research, 2005).

4.2.5.2 Impervious Area Charge[3]

Impervious area charges (IACs) are the most common funding mechanism used for targeting stormwater charges internationally. They are now used in over 600 cities and districts in North America, and over 60% of cities in Germany (NSCC, 2005). In addition, as mentioned previously, the LGRA (2002) specifically allows for this type of rate as it references the "*area of land within the rate unit that is sealed, paved, or built on*" (Schedule 3, Clause 6). In addition, the Auckland Plan (2012) (Table 14.1 of the Plan) expressly allows for the use of targeted rates as a potential funding methodology. Both NSCC (2005) and ACC (2004) undertook studies to investigate the implementation of an IAC within their city boundaries. The reasons provided for doing so included:

- to provide a dedicated funding source to stormwater management;
- to allow for higher environmental outcomes within the city;
- to allow for a flexible and adaptable approach to rating and funding;
- to achieve greater equity; and
- to influence behavioural change and ensure that the 'polluter-pays' principle is met.

A summary table showing how other councils have considered or implemented a targeted rate is included in Appendix C.

Both studies (NSCC, 2005 and ACC, 2004) recommend that new development should be funded through development contributions, and that the purpose of the targeted IAC would be to fund existing improvements to the stormwater system and to ensure continued maintenance of the existing system. In addition, the studies concurred that the IAC should replace that portion of stormwater funding allowed for through the general rates, in order to minimise any rate increases at the outset. A number of issues for consideration with respect to implementation of the IAC were discussed, and these are summarised below:

1. Existing Costs: ACC (2004) stated that a key issue for implementation is firstly determining what costs can be covered by an IAC. As mentioned above, the IAC can cover operational costs and upgrades to the existing stormwater system. However, as highlighted in section 4.2.5.1, the rate cannot exceed more than 30% of the total rates revenue, and cannot be applied to non-

1.0

[3] It is noted that this section summarises and comments on work undertaken within the NSCC 2005 and ACC 2004 studies.

rateable land. This includes roads. As a result, ACC (2004) recommended that a uniform charge be applied to cover 'public' areas (this is discussed in more detail in point 2 below). An IAC therefore cannot be used as a stand-alone funding solution.

2. Public/ Private Split: It is vital to recognise that the ratepayer benefits from provision of stormwater services whether or not they are directly connected to the network (NSCC, 2005). In this regard, the method of charging needs to take account of the public and private split or distribution of benefits. In this case, public refers to public stormwater assets servicing public areas such as roads, opens spaces, non-rateable properties (such as schools and hospitals), etc. Private refers to stormwater costs that are directly influenced by private properties. NSCC (2005) proposed a 30% public: 70% private split. It is interesting to note that the proportion of public rating is relatively low, especially since more than 55% of contaminants associated with stormwater runoff emanate from public roads. It is for this reason that both reports state that alternative means of funding stormwater treatment from roads needs to be investigated.

3. Allocation Methodology: ACC (2004) and NSCC (2005) state that several options for allocating a targeted rate should be investigated. In addition to the options presented in section 4.2.5.1, ACC (2004) recommended that a 'on-site impervious area band' could be used. Rather than using the actual impervious area, a series of impervious area bands (e.g. 0 – 99m^2, 100 – 199 m^2, 200 – 299m^2, etc.) could be used. This would assist in reducing the level of accuracy needed to determine actual impervious areas on a site and potentially reduce discrepancies with ratepayers. ACC (2004) noted that within the Auckland Isthmus area, the majority of properties had <500m^2 impervious area, and that the most commonly impervious area ranged from 200m^2 to 350m^2.

4. Cost and Ease of Implementation: Both NSCC (2005) and ACC (2004) estimated initial set-up as well as on-going operational costs of an IAC. In both cases, high resolution aerial photography was available in order to determine impervious areas. However, accuracy of data needs to be checked, and a cross check between aerial photographs and the rates database undertaken. Allocation of shared impervious areas (such as cross lease driveways) would also need to be resolved. ACC estimated a figure of $85,000 (2004 NZ$ value) for initial data cleansing and $50,000 to resolve customer issues. NSCC (2005) estimated $250,000 +/- 30% for the detailed business case and consultation phase, with an addition $420,000 +/- 30% for initial implementation (2005 NZ$ value). A detailed breakdown of this estimate is included in Appendix D. In terms of on-going operational costs, ACC estimated $50,000 per year (2004 NZ$ value) whilst NSCC estimated $140,000 per year (2005 NZ$ value). The majority of the initial set-up costs relate to data cleansing, whilst on-going costs relate to monitoring and resolution of complaints.

5. Impact on Ratepayers: NSCC (2005) and ACC (2004) both identified that the distribution of impervious areas around their respective cities would have an effect on the ratepayer. Both

reports found that residential landuse comprises the highest landuse proportion (86% in Auckland City). As a result, residential properties also account for the highest proportion of impervious area. Given that property value and impervious area are not clearly related (ACC, 2004), residential property owners would be most likely to pay a higher IAC than business properties, in relation to the amount they currently pay within their general rates. In other words, smaller value residential sections will pay greater amounts towards stormwater than what they currently pay (an increase of between 1% – 9%), whilst businesses may pay less (a decrease of between 1% – 5%). This leads to significant distributional impacts and the potential lack of public acceptability of this option. NSCC (2005) investigated the impact of a number of different IAC scenarios with respect to the public vs private split, as well as including a business differential to offset the increase cost to residential ratepayers. Without the business differential, the rates burden shifts from high value to low value properties, and from business to residential, with a high value business property therefore paying the same rate as a low value residential property with the same impervious area. Despite the fact that removing the business differential would cause the IAC to be reduced by about 4 – 10%, NSCC (2005) did not recommend including it. In summary, the impact of an IAC on residential ratepayers could be potentially significant due to the rate burden shift from a value to area based system. What this means is that, in certain circumstances, those with the least capacity to pay for mitigation will incur a rate increase.

6. Credits: NSCC (2005) felt that a targeted rating system should also include the flexibility to provide "credits" for mitigation measures. The key purpose of this credit would be to assist in promoting behavioural change towards how stormwater is managed, such as has occurred in Germany. No further information on how such a credit system could work is provided, however, it is earmarked as an area for further investigation.

In summary, an IAC has been successfully used internationally as a means of funding stormwater management. It cannot, however, be used as a stand-alone funding tool here in New Zealand, and would need to be used as part of a toolbox of funding methods (such as development contributions, credits, road user charges). It appears as if former councils, and therefore the current Auckland Council have sufficient and detailed aerial photography to be able to quantify impervious areas within the region. However, a data cleansing exercise would be necessary not only to remove potential discrepancies, but to match the GIS data with information in the current rates database. Potentially the use of impervious area 'banding' will assist to reduce the level of effort required in this process. It is believed that cost, allocation methodology and implementation are unlikely to be barriers to implementing an IAC for Auckland. Rather, political and community acceptability of the shift in rates burden from business to residential landowners may prove to be a barrier. This is further highlighted by the fact that ACC and NSCC undertook detailed investigations into the use of the IAC, but neither council endorsed the new funding system. An additional complication is that up to 35% of impervious surfaces are located on non-rateable land, and as a result full recovery of stormwater costs by applying

an IAC to private properties is inequitable (Landcare Research, 2005). As a result, the public and private split needs to be carefully considered and applied. In order to potentially reduce the business/ residential shift, the application of a business differential could be reconsidered. Given that many commercial and industrial properties potentially have higher levels of contaminant discharges than residential properties, the differential could therefore be applied on a 'contaminant management/ risk' basis (e.g. an ARP:ALW schedule 3 industry would have a higher differential than a commercial business).

4.2.6 Road User Charges

According to WCC (2004), 60% of expenditure associated with pollution control is required because of pollution caused by motor vehicles. This suggests that 60% of the costs associated with mitigation of stormwater quality effects should be allocated to motor vehicle users. According to Landcare Research (2005), the Ministry of Transport study, "*Surface Transport Costs and Charges*" (Booz Allen Hamilton, 2005), concluded that the total cost of the road system and its use is $34 billion per annum (in 2005 NZ$ terms). As shown in Figure 6, only a small portion of this total cost relates to environmental externalities of road traffic, i.e. a total of $1.2 billion per annum. Of this portion, 85% relate to air quality, noise and water quantity (runoff) costs within urban areas.

Local air pollution externalities are paid for by the health department (estimated $442 million per annum), however, at present water quality and quantity costs associated with road runoff externalities are not fully paid for by anyone as, in general, stormwater management systems have historically only dealt with runoff quantity, not contaminant loading (Landcare Research, 2005).

Based on the Booz Allen Hamilton study (2005), costs of environmental impacts (specifically stormwater effects) from roads can be determined. The report serves as a useful benchmark for ongoing discussions surrounding how stormwater effects from roading activities should be funded. Given the high contribution of road users associated with pollution control, along with the fact that a targeted impervious surface tax would not be able to cover public road areas, WCC (2004), ARC (2004), ACC (2004) and NSCC (2005) all agree that local government would need to lobby central government to increase either road user charges or the petrol tax to assist with funding of stormwater effects from roads. Whilst these councils agreed that this would be an appropriate alternative funding source, there is no documentation of any lobbying to central government.

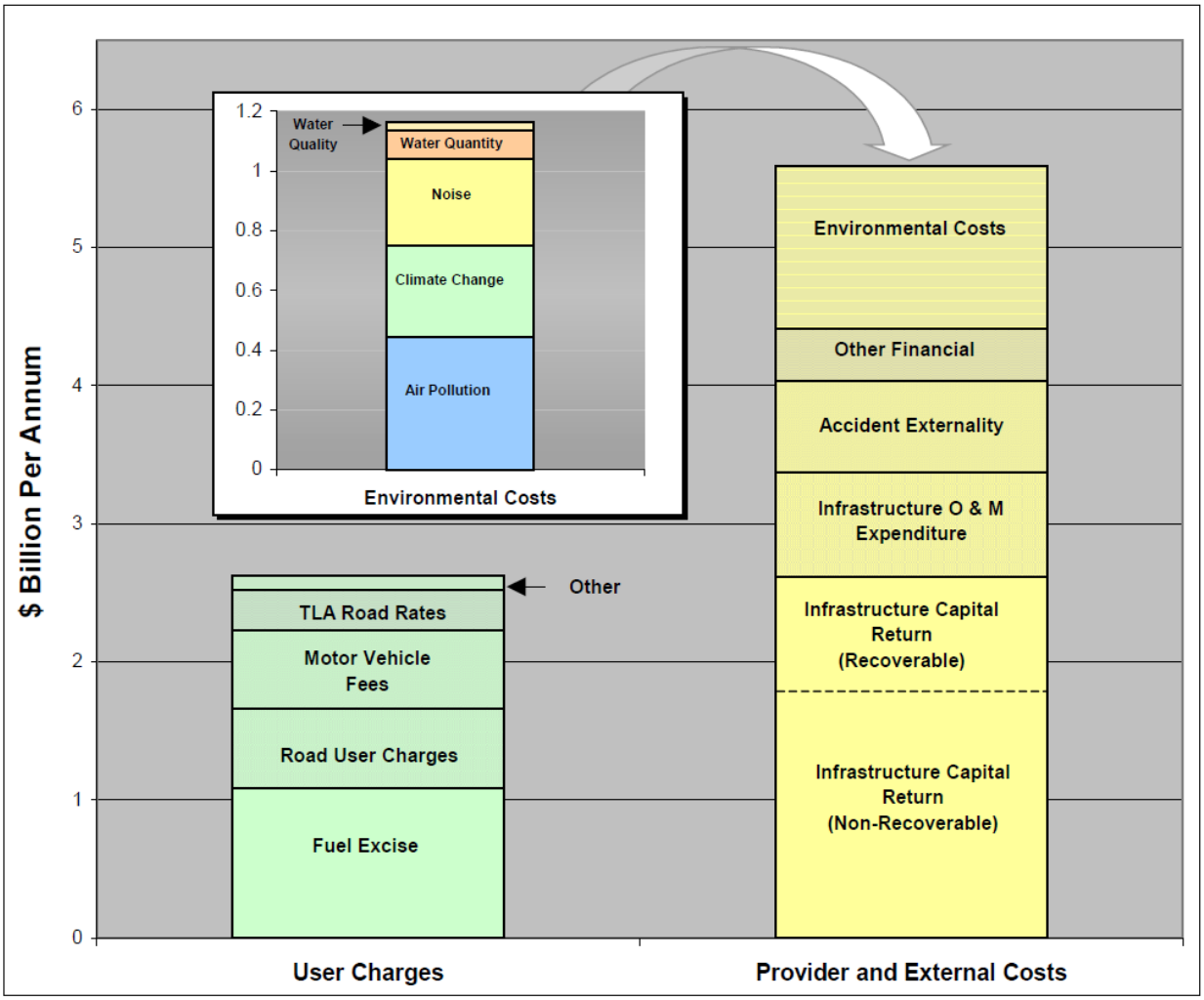

Figure 6 Total road system costs – user charges, provider and external costs

4.2.7 Other Options

A number of other funding options such as voluntary offset credit and incentive schemes, negotiated agreements and cap and trade schemes (such as is used in carbon trading) are also available to councils as alternative financial tools (rather than funding options) for managing stormwater innovatively and under tight budgetary constraints. These options are described and discussed in Appendix B, however information pertaining to each of them is very briefly summarised (taken from Landcare Research, 2005) and discussed below:

- Voluntary offset credit and incentive systems: Many stormwater utilities in the US and Germany offer credits or fee reductions for landowners who implement best management practices to reduce runoff. Credits range from 10% to 100% of the stormwater utility fee. Fee reductions through credit provisions are usually, however, limited to non-residential properties, and the

economic inducement of the credit is rarely sufficient to cause a property owner to retrofit controls or perform activities simply to obtain the reduced fee. In New Zealand the issue of subsidising or funding on-site stormwater management infrastructure of this type is the subject of some debate. Subsidising the construction of on-site infrastructure is viewed as risky and expensive because subsidies would be financed as operating rather than capital expenditure and therefore need to be funded from the recurrent budget, i.e. rates. The issue of fee reduction or credit systems, incentive payments, and direct funding for on-site stormwater management systems in New Zealand needs further research.

- Negotiated agreements: Recent research into mechanisms for encouraging reduction of non-point source water pollution has highlighted the potential of negotiated voluntary agreements. Negotiated agreements are contracts between regulatory authorities and regulated entities, most commonly between levels of government, and have been widely used in Western Europe. Historically, the potential to use negotiated agreements with the TAs to target outcomes in specific catchments or receiving environments beyond those directed in the Air Land and Water Plan or determined as the Best Practicable Option in Integrated Catchment Management Plans deserved further consideration by the ARC. It is unclear, however, how this could be implemented now that all councils have been amalgamated into one organisation. Potentially the use of network discharge consents could form the basis of a negotiated agreement based on catchments at the Combined Receiving Environment level.
- Market based quantity instruments: A "cap and trade market" is a quantity-based instrument that restricts total allowable level of emission, allocates this level among individuals as allowances, and permits the transfer of these allowances through free trade. The particular advantages of cap-and-trade marketing are that it does not require the market regulator to have any prior knowledge of the efficient abatement cost, and that it sets an enforceable limit on total emissions irrespective of current land use or future development. Its major weakness is that it requires accurate monitoring and enforcement of performance, which is difficult with diffuse source pollutants like stormwater. The application of the cap-and-trade approach to water pollution problems can also face legal and public acceptance obstacles around issues of property rights. The USEPA concluded that the legal issues associated with the implied property rights changes were a major constraint to its implementation.

5.0 Conclusions and Recommendations

5.1 Conclusions

The review provided in this report highlights that significant expenditure will be required (in the order of $5.5 billion) in order to ensure that existing stormwater infrastructure operates at the desired levels of service (Auckland Council, 2011). In order to maintain or enhance the quality of the receiving environment, this expenditure could increase to $9.2 billion as a result of retrofitting stormwater treatment. At present, the draft Auckland Council Stormwater AMP (2012) recommends a capital and operating budget of $4.9 billion over 20 years. Alternative funding sources will need to be used in order to meet the funding shortfall, and potentially reduce the timeframe for implementation.

The review suggests a three-pronged funding strategy (Landcare Research, 2005):

- Capital investments financed by debt and development contributions;
- Treatment and operational costs funded by targeted rates and contributions from road users; and
- Planning, administration and servicing costs funded by grants, uniform annual general charges or general rates, contributions from road users and/ or penalties and fees.

The review has highlighted that there are no legislative impediments to the implementation of these solutions. The LGA (2002) and LGRA (2002) and associated amendments clearly allow for and facilitate the use of targeted rates and development contributions. However, to date, only development contribution policies have been implemented by councils within Auckland.

Developing an appropriate funding strategy requires balancing a number of key principles to ensure a mix of public and private benefits is provided. Any funding strategy therefore needs to be equitable, economically efficient, sustainable, accepted by the community and easy to implement. No one solution is able to meet all of these funding criteria, and as such a toolbox approach to funding stormwater management will be required. This proposed approach is summarised in Table 6.

There are pros and cons associated with each type of funding option presented in Table 6, for example, road user charges would be an equitable means of recouping costs for water quality effects from roads, however, it is likely to be difficult to implement. Conversely, there are no practical barriers to implementing an impervious area charge, however, public acceptability and ability to pay may well preclude its use. Each of these options requires further investigation (see Section 5.2), but perhaps a first step towards highlighting stormwater as a key service which Council provides could include ring-fencing the general rates proportion which relates to stormwater management. This would assist in raising the profile of stormwater within the community and set the scene for any future changes which may occur as a result of a funding methodology review.

Table 6 Summary of funding options to be included in the "Alternative Funding Toolbox"

Funding Option	Status	Comment
General Rates	In use	Decision on whether or not general rates should be reduced by the current annual cost of providing stormwater services in order to reduce potential rates increases if alternative funding sources are utilised.
Development and Financial Contributions	In use	Preferred option as concurs with "polluter-pays" principle. Further exploration around the issue of 'gold-plating'.
Impervious Area Charge	To be investigated	Preferred option as concurs with "polluter-pays" principle. Need to determine an efficient charging level, public: private split, business differential, cost and social implications of implementation.
Uniform Annual General Charge	To be investigated	Could be a way of funding the 'public' portion of the IAC.
Stormwater Road User Charges	To be investigated	Preferred option as concurs with "polluter-pays" principle. Difficult to implement, but could assist in covering the cost of effects of stormwater discharges from roads (non-rateable land).
Credit and Offset Schemes	To be investigated	Assists in promoting behavioural change.
Negotiated Agreements and Cap & Trade Schemes	To be investigated	Potentially a useful method to improve the efficiency of investment in abatement efforts on a region-wide rather than catchment basis.

5.2 Recommendations

A number of the reports reviewed recommended further investigations into understanding and quantifying the funding shortfall and toolbox. The most pertinent ones are provided below.

5.2.1 The Funding Gap

The Auckland Council (2011) report on the Stormwater Management Improvements and Cost Estimation Model (SWECM) made a number of recommendations relating to model improvements. These include:

- Further refinement of the SWCEM in relation to growth;
- Inclusion of low impact design in the model (authors note: this should include potential future works for retrofitting stormwater treatment so that the model is not just about maintaining existing standards, but understanding the costs of enhanced environmental outcomes. In this regard the NIWA Spatial Decision Support System may be useful to model future growth and treatment scenarios);
- Inclusion of transport contaminant related costs in the model;
- Refinement of flood alleviation and overland flow path works;
- Inclusion of maintenance costings so that a life cycle cost approach to understanding stormwater costs is taken - it is noted that the SWCEM only includes capital investment costs;
- Improvement and refinement of the model to investigate costs of treatment devices other than ponds;
- Refinement of network costings; and
- Refinement of GIS data.

Potentially a way forward for Council would be to utilise other costing and growth models (such as the NIWA Spatial Decision Support System) to obtain an understanding of the life cycle costs (LCC) of stormwater treatment. This may be a more cost efficient means of obtaining the LCC data rather than refining the current SWCEM.

5.2.2 Alternative Funding Options

Landcare Research (2005) provides a number of recommendations for future research into the three most promising funding options. Relevant recommendations, as well as those resulting from this review and that recommended by NSCC (2005), are included below:

- Development Contributions: monitoring and stocktake of the implementation of financial and development contributions in New Zealand in order to determine whether or not there is an over specification or 'gold plating' of infrastructure related to growth. International experience suggests significant risks associated with up-front payments and a focus on construction rather than long term maintenance of stormwater infrastructure.
- Targeted Rates – Impervious Area Charge:
    - Determination of efficient charging levels for an IAC. Very little work in New Zealand or overseas has been undertaken on the price elasticity of demand for stormwater management and treatment, yet this is a critical factor in determining an appropriate level of service provision and charging. This is a high priority for further exploration.
    - Barriers to adoption, this especially relates to the issues raised in Section 4.2.5.2, and should include a component to investigate not only physical barriers to implementation (such as cost and ease of implementation), but also social barriers (such as political and community acceptability and willingness to pay), and should include the following key issues:
        - refinement of set-up and operational costs under the new council structure;
        - ease of measurement of impervious areas, including combined areas and potential use of 'impervious bands';
        - how aspects such as non-rateable land, the public/ private split, the business differential affect the viability of the option in terms of revenue collection;
        - distribution of costs and ability to pay;
        - distribution of benefits;
        - implications of reducing general rates by the current annual cost of providing stormwater services in order to reduce potential rates increases.
    - Cost effective collection of impervious data. Landcare Research (2005) reports that remotely sensed satellite imagery offers a potential low cost, automated alternative to aerial photography.
    - Credit and off-set incentive schemes for source control or at source prevention or mitigation. This would require an investigation into the means of structuring investment and ownership that allow for financing, legal and operational agreements that facilitate maintenance and compliance monitoring.
    - The development of an implementation programme for roll-out of the IAC as part of a funding toolbox for stormwater management (if applicable). This could include aspects

such as internal resources, programming, public consultation, changeover troubleshooting, etc.

- Roading and Polluter Charges: The value and likely effectiveness of a detailed business case for contributions to stormwater management from road user charges should be further explored. In this regard, it would be useful to have a better understanding of the contribution of roads to environmental effects as a result of stormwater discharges. Similarly, quantification of the contribution of specific consumer products (such as roofing materials), could assist in either setting polluter charges or feed into a credit/ off-set incentive scheme.
- The potential use of negotiated agreements or a cap and trade approach to improve the efficiency of investment in abatement efforts across the region should be further explored.
- The design of "pay-as-you-go" sinking funds could be further investigated as long-lived dedicated funding systems for capital-intensive assets can lead to significant capital reserves being built up prior to major upgrades in infrastructure.

These recommendations will assist in further understanding the implications of each option and their ability to be implemented under the current governance framework. Nonetheless, the proposed investigations would only provide an understanding of each option in isolation of the others. In order to achieve a sustainable, equitable and economically efficient strategy of funding, a toolbox approach is required, and therefore the implementation of and interaction between the options needs to be considered more holistically. It is therefore recommended that an investigation be undertaken to further understand the cost, resourcing, programming, and governance implications of implementing more than one solution. The risks of implementing one solution, in isolation of the others, and without the safety net of revenue collected from general rates, should also be explored. Finally, the practicality and implementability of the toolbox approach needs to be further investigated.

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Appendix A Funding Options

Appendix A provides a description of the different types of funding options. Information has been taken directly from the Landcare Research (2005) report. In some areas the text has been amended to reflect the current governance situation.

General Rate

Revenue collection through a general rate based on land or property value is predicated on the ability to pay principle. Charging for stormwater services through a general rate based on property or land value is the most common system used in the Auckland region by both the regional and territorial local authorities. Its advantages are its widespread acceptance, administrative simplicity, and flexibility in that adjustments in expenditure can be made relatively simply in response to planning or political cycles. Its disadvantages, however, are that growth in revenue is limited by public acceptability, which may not be closely related to factors influencing expenditure, that its inherent flexibility can lead to manipulation of expenditure priorities that might be inefficient, and that there is no direct relationship between use and payment so there is no incentive for individual ratepayers to modify their behaviour in response to costs. Properties generating similar levels of runoff but of different value make quite different contributions toward stormwater management costs, i.e. there is vertical equity. On the other hand, low value commercial uses with high impervious surface area, e.g., car parks, contribute relatively little compared with high value commercial uses that may have lower impervious surface area, e.g., well-landscaped, multi-level apartment or office developments. Under a general rating system businesses, which generally have higher property values per unit area, contribute proportionately more to stormwater management costs than residential property owners.

Uniform Annual General Charge

In contrast to a property value-based rate, a Uniform Annual General Charge (UAGC, also known as a flat tax) is intended to distribute the cost of service provision equitably among beneficiaries or users.

Such charges are a common feature of rating systems in North America and New Zealand and are widely accepted for collecting revenue for a set of services delivered uniformly to each rating unit.

Because property size and type influences the generation of stormwater runoff, however, including payment for stormwater services as part of a UAGC is just as inefficient and inequitable as' charging for stormwater services through a general rate. It still bears no relation to the actual use of or contribution to the need for the service by the individual ratepayer. In general, charging for stormwater services

through a UAGC disproportionately burdens small-footprint buildings, e.g., suburban residential properties, relative to large properties with high levels of impermeability.

A further limitation is that the amount collected under a UAGC and uniformly charged targeted rates is constrained to a maximum of30% of total rates revenue under s21 LGRA (2002).

Targeted Rate

The generic term targeted rate applies to a range of charges that target:

- a specific activity or group of activities being funded, e.g., stormwater management
- a specific factor being used as the basis for charging, e.g., impervious surface area
- characteristics of the property being charged, e.g., properties within a specified zone.

The principle of separating a funding stream from the general rate and directing it to a specific purpose is consistent with the beneficiary and exacerbator pays principles.

A range of targeted rates reflecting use or contribution to demand for stormwater services are possible under the LGA (2002):

1 Targeted rate as a uniform annual charge

2 Targeted rate based on land area

3 Targeted rate based on land use

4 Targeted rate based on impermeable surface area

5 Targeted rate based on hydrological contribution (as a function of slope, soil type, land cover, land use, on-site storage, etc.).

Under sections 16-18 LGRA 2002, a local authority may set a targeted rate for one or more activities.

A targeted rate can be set on a uniform basis for all rateable land (uniform annual charge), or differentially for different categories of rateable land. This provision is extremely flexible and can be used to set a separate stormwater rate on a range of factors including the area of land within the rating unit that is sealed, paved, or built on, or the extent of provision of any service to the rating unit by the local authority, e.g., volumetric charging for water services. The latter was being used by some Auckland councils for the supply of potable water and wastewater services.

The Act maintains the provision for the setting of differential rates based on category of land (use, size, location, value). This approach was to be used in Rodney District to differentially rate rural and urban

property owners for stormwater services. The Act does provide some limitations that need to be taken into account by TAs considering a targeted rate:

- The sum of targeted rates set on a uniform basis (Uniform Annual Charge) and Uniform Annual General Charges cannot exceed 30% of total rates revenue [s21 LGRA (2002)]. However, targeted rates set for water supply or sewage disposal are excluded from this calculation.
- There is no provision for credits or discounts for mitigation to be implemented through a reduced charge under a targeted rate. These would therefore need to be reimbursed under the rates remission provisions of the Act.

Road User Charges

Vehicle use accounts for up to 60% of non-point stormwater contamination (Waitakere City Council 2004; Auckland City Council 2004). However, the only mechanism currently available for levying motor vehicle users would be through increasing the petrol tax or road user charges collected by central Government. Ongoing work on surface transport costs and charges following the passing of the Land Transport Management Act (2003) provides an avenue for continued lobbying for central funding of roading externalities.

Borrowing

Infrastructure assets have long life spans and require large amounts of capital investment, in particular amounts and time periods. They are therefore best financed through some form of debt programme with regular, sustainable funding mechanisms servicing the capital and debt repayment in addition to operating and maintenance costs. This also allows for equity between generations by spreading the costs of developing infrastructure over current and future users.

In New Zealand, financing is generally by NZ registered banks, although specialised lending services are provided by the Local Authority Bond Trust and Local Authority Finance Corporation. This is in contrast to North America, where financing through bond issues, i.e. capital raised from the public rather than financial institutions, is common. Bonds that are guaranteed by local government may require a lower interest rate than those issued by commercial organisations (IA 2004, p. 57). In Australia private sector funding is limited. A survey of local authorities and private sector investors identified two major constraints:

- Lack of critical mass in investment opportunities given the limited geographical boundaries of local authorities

- The difficulty in packaging infrastructure projects in such a way as to facilitate private sector engagement and form workable agreements and contracts. This was reported as primarily an issue of local government capacity.

Debt financing is still one of the most widely used and accepted mechanisms to fund replacement or upgrading of stormwater infrastructure in New Zealand. However, the Infrastructure Auckland report suggests there is increasing nervousness among TAs about further increasing gearing and having to increase rates to service increased borrowing. This is consistent with trends in Australia, where there is growing debt aversion among local authorities and State Governments. The combination of debt aversion and lack of dedicated recurrent charging mechanisms for stormwater system development is a major barrier.

Development Contributions

The practice of charging developers "impact fees" or "development contributions" to cover the costs of new infrastructure and services on the wider stormwater system is increasingly common in North America, Australia and New Zealand, and is generally consistent with the criteria listed above. The approach is based on the assumption that current residents have already paid for the infrastructure that serves them (i.e. either through taxes or fees) and they should not have to pay for upgrading services to meet demands created by new developments. The appropriate level of developer contribution is difficult to set, and the contribution amount will vary depending on the nature of the development, its location and the sensitivity of the receiving environment to existing effects. They are often the subject of considerable controversy, and the ability to levy for a wide range of community facilities has led to the contributions being perceived as a "loaded up-front" charge. Unfortunately the downfall of this type of levy system is that development contributions cannot be used to fund maintenance, renewal or improvement works for existing infrastructure, nor long-term maintenance works for 'new' infrastructure to which the contribution applies.

Financial Contributions

Financial contributions differ from development contributions in that they can only be imposed as a condition of consent granted under the Resource Management Act (2001). They can be used in tandem with development contributions, and can even apply to the same activity, so long as the purpose of the development contribution is different from that of the corresponding purpose of the financial contribution. As a result, many councils have retained financial contribution regimes under their district plans (DLA Philips Fox, 2008 p. 3 & 4).

Allocations or Grants

Allocations from a grant issued through a national or Government agency or a dedicated infrastructure improvement fund set aside from general tax revenue are significant contributors to specific infrastructure projects in some jurisdictions. In New Zealand this mechanism has traditionally been used to provide support for development and maintenance of the local roading infrastructure and has been funded from roading charges. As discussed in section 2.2.3 above, there is a reasonable case for national road users to contribute to the costs of local stormwater management. The appropriate size of any payment should be related to the contribution of road usage to stormwater and contaminant runoff. However, any payment would not be fully economically efficient unless it was also related to the most cost efficient form of abatement which may involve mitigation elsewhere in the catchment.

Alternative sources of revenue from national sources such as sales taxes on "polluting" products such as vehicle technology, roofing products and/or materials have also been raised as possibilities.

Regional Sales Tax

In a similar manner to allocations and grants from national revenue collection mechanisms, there is a potential to set regional sales taxes to contribute to major local infrastructure investment needs. While these have been used in North America, e.g., Las Vegas funds much of its public services from local sales tax revenue, there is little support for this approach in New Zealand, e.g., Kerr (2005). In New Zealand, increases in petrol sales tax in 2002 and 2004 were both justified by the need to invest additional funds in roading projects in specific regions, but the tax has been applied uniformly across the country. In principle, regional sales taxes suffer the same inherent strength - levying contributors to the problem, and weakness - being difficult to assess, as allocations and grants from nationally collected charges.

Fees and Penalties

In New Zealand, these generally cover the cost of providing the service being charged for, i.e. reviewing the plan, conducting the inspection, measuring the indicator, enforcing the condition, etc. In other jurisdictions, hook-up or installation fees can be charged as recoupment payments for buying into surplus capacity in existing infrastructure. In New Zealand the developer contribution performs this function. Similarly, penalties generally do not generate significant funds for development; levels of fines are generally set by the Courts and are rarely punitive. Effectively, maximum penalties tend to be set at a level consistent with the recovery of costs involved in dealing with the effects of the breach.

Voluntary offset credit and incentive systems

Many US stormwater utilities offer credits or fee reductions for landowners who implement best management practices to reduce runoff. Credits range from 10% to 100% of the stormwater utility fee (Doll & Lindsey 1999). Factors for which credits are generated include:

- Detention volume
- Peak discharge detention
- Retention volume
- Total runoff abatement
- Water quality controls
- Reduction in pollutant loading
- Maintenance of onsite devices
- Development intensity

Fee reductions through credit provisions are usually, however, limited to non-residential properties, and the economic inducement of the credit is rarely sufficient to cause a property owner to retrofit controls or perform activities simply to obtain the reduced fee (Cyre 2005a; Parikh et al. 2005). North American cities have had far greater success with public education and regulatory requirements than with pricing incentives attained through the user fee rate design (Parikh et al. 2005). Despite this, more than half the stormwater utilities in the United States adopt rate methodologies that incorporate user fee "credits" or positive behaviours and practices. One reason is that the general public and, especially, the business community have been more accepting of user fee structures that include such credits than of those that do not (Parikh et al. 2005). An additional incentive for local governments to provide credits is that the courts in the United States recognize a credit mechanism as a characteristic of a user fee and not of a tax. Since laws in many states limit the types of "taxes" that cities, counties, and special-purpose districts may adopt, but are more lenient in the local adoption of user fees, the adoption of user fee credits is more widespread than pure economics might justify (Parikh et al. 2005).

In contrast, credit systems in Germany appear to have been very successful. By 1996, 29 cities provided capped subsidies for reducing impervious area that range from NZ$900 to NZ$19,000 (NZ$9-NZ$110 per square metre) (Maunsell 2005). The two most commonly subsidised activities were construction of green roofs and rainwater tanks.

In New Zealand the issue of subsidising or funding on-site stormwater management infrastructure of this type is the subject of some debate. Subsidising the construction of on-site infrastructure is viewed as:

- risky because it becomes a private asset and the TA has limited control over its use and maintenance;
- expensive because subsidies would be financed as operating rather than capital expenditure and therefore need to be funded from the recurrent budget, i.e. rates.

Direct funding of on-site infrastructure would mean costs could be considered as capital investment, but ownership of assets on private land would potentially generate additional liability for maintenance, access, and consideration for the use of land. The issue of fee reduction or credit systems, incentive payments, and direct funding for on-site stormwater management systems in New Zealand needs further research.

Negotiated agreement programmes

Recent research into mechanisms for encouraging reduction of non-point source water pollution has highlighted the potential of negotiated voluntary agreements (Parikh et al. 2005; Randall 2003). Negotiated agreements are contracts between regulatory authorities and regulated entities, most commonly between levels of government, and have been widely used in Western Europe since the early 1980s (Bruyninckx 2001 in Randall 2003). In 1997, the European Environmental Agency reported 312 active agreements in 15 countries, covering climate change, water pollution, air pollution, waste management, soil quality, and ozone depletion. Recent research at Ohio State University (Randall 2003) explores the effectiveness of performance contracts between regulators and groups of individual landowners in reducing non-point source nitrogen and phosphorous emissions.

Historically, the potential to use negotiated agreements with TAs to target outcomes in specific catchments or receiving environments beyond those directed in the Air Land and Water Plan or determined as the Best Practicable Option in Integrated Catchment Management Plans deserved further consideration by the ARC. It is unclear, however, how this could be implemented now that all councils have been amalgamated into one organisation.

Market-based quantity instruments

A "cap and trade market" is a quantity-based instrument that restricts total allowable level of emission, allocates this level among individuals as allowances, and permits the transfer of these allowances through free trade. Emitters that keep their emissions below their allotted level may sell their surplus

allowances to others. The subsequent reallocation of allowances results in the equalizing of marginal abatement costs and the lowest cost allocation of the abatement burden. The approach has been very successful in air pollution abatement, e.g., $S0_2$, and is actively being explored for water quality trading and carbon trading.

The particular advantages of cap-and-trade marketing are that it does not require the market regulator to have any prior knowledge of the efficient abatement cost, and that it sets an enforceable limit on total emissions irrespective of current land use or future development.

Its major weakness is that it requires accurate monitoring and enforcement of performance, which is difficult with diffuse source pollutants like stormwater. The most common approach in the US is to establish a monitoring exchange that calculates tradable allowances from the successful adoption and implementation of individual best management practices. Trading ratios are used in the calculations to allow for uncertainty in the relationship between the estimated and actual reductions from individual BMPs, and for location effects caused by the spatial impacts of emissions.

The application of the cap-and-trade approach to water pollution problems can also face legal and public acceptance obstacles around issues of property rights. In the urban environment where there have historically been few controls on stormwater delivery from existing properties, it is likely that the right to deliver an unlimited amount of stormwater to a publicly managed stormwater system, constrained only by site coverage limits, is considered an existing property right. Constraining a perceived right will generate opposition unless there is a very clear and accepted reason for the constraint. The potential for the use of the cap-and-trade approach to limit emissions by individual land owners has been considered by a research team within the USEPA. They concluded that the legal issues associated with the implied property rights changes were a major constraint to its implementation (Parikh 2005). This may also be the case in New Zealand. However, an alternative application of the approach could be considered by the ARC, i.e. the development of a cap-and-trade system between catchments for the delivery of TSS and other contaminants of concern to major receiving environments (Tamaki estuary, Manukau Harbour, Upper Waitemata harbour, etc.). This could be implemented through the catchment management plan or network discharge consent process at the consolidated catchment environment level.

For major receiving environments these requirements provide only limited control over the total delivery of contaminants. The situation is complicated by multiple catchments, variable landforms and soil characteristics, and the spatial distribution of major contaminant sources. The use of proportional reduction limits and methods-based controls is likely to lead to inefficient abatement effort. For example, it may be possible to reduce TSS delivery at no additional cost by reducing emissions by 90% from a catchment contributing a high proportion of the total sediment load and achieving only 50% reduction in a neighbouring catchment with a lower sediment delivery ratio. The adoption of a cap on total delivery of contaminants and allocation of tradable allowances by catchment has the potential to promote the most efficient investment in abatement effort across catchments.

Appendix B Evaluation of Funding Options

Appendix B contains a summary table (Table 4, page 28) from the Landcare Research report (2005) which assesses numerous funding options in accordance with the criteria specified in Section 4.2 of this report.

Table 4 Summary evaluation of financing and funding options

Criterion		Borrowing	Sinking funds	Vested assets	Development contributions	Grants	Road User Contributions	Regional sales tax
Appropriateness	Consistency with legislation	++	Uncertain	++	++	+	-	Uncertain
Effectiveness	Provides sufficient funding	+	-	-	+	-	-	-
	Taps sources of funds other than ratepayers	0	-	+	+	++	++	+
	Improves reliability of funding stream	0	+	+	+	0	+	+
	Flexible in expenditure	-	+	--	0	Uncertain	Uncertain	Uncertain
Fairness and equity	Beneficiary or exacerbator pays principle	0	0	++	++	-	+	-
	Ability to pay principle	0	0	0	0	0	0	0
Acceptability	Easily understood	++	-	+	+	+	+	+
	Consistent with public values	+	-	+	+	0	+	0
	Perceived to be beneficial	+	-	++	++	+	+	-
	Perceived to be fair and equitable	+	-	+	+	0	+	Uncertain
Efficiency	Cost effective to implement and enforce	++	0	-	+	0	0	Uncertain
	Motivates preferred behaviour	+	+	0	0	0	+	0
	Leads toward optimal mix of avoidance, treatment and mitigation.	++	-	-	-	-	++	-

-- / - / 0 / + / ++ strongly negative / negative / unaffected or mixed / positive / strongly positive

Table 4 cont.

Criterion		General rate	Stormwater UAGC	Targeted rate (value based)	Targeted rate (land area)	Targeted rate (land use)	Targeted rate (IAC)	Stormwater charge
Appropriateness	Consistency with legislation	++	++	++	++	++	++	Would require CCO
Effectiveness	Provides sufficient funding	--	+	+	+	+	+	+
	Taps sources of funds other than ratepayers	--	--	--	--	--	--	+
	Improves reliability of funding stream	--	+	+	+	+	++	++
	Flexible in expenditure	++	++	+	+	+	+	+
Fairness and equity	Beneficiary or exacerbator pays principle	--	--	--	--	-	+	++
	Ability to pay principle	++	-	+	+	+	0	0
Acceptability	Easily understood	++	++	+	+	+	+	+
	Consistent with public values	+	+	0	0	0	+	0
	Perceived to be beneficial	0	0	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain
	Perceived to be fair and equitable	+	+	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain
Efficiency	Cost effective to implement and enforce	++	++	++	++	++	+	--
	Motivates preferred behaviour	--	-	-	-	0	+	++
	Leads toward optimal mix of avoidance, treatment and mitigation.	--	--	--	--	-	+	+

-- / - / 0 / + / ++ strongly negative / negative / unaffected or mixed / positive / strongly positive

Table 4 cont.

Criterion		Fees and Penalties	Credits and incentives	Negotiated agreements	Cap and trade
Appropriateness	Consistency with legislation	+	+	Uncertain	Uncertain
Effectiveness	Provides sufficient funding	-	0	0	0
	Taps sources of funds other than ratepayers	+	0	0	0
	Improves reliability of funding stream	-	-	0	0
	Flexible in expenditure	+	0		
Fairness and equity	Beneficiary or exacerbator pays principle	++	+	0	+
	Ability to pay principle	0	0	0	0
Acceptability	Easily understood	++	+	++	+
	Consistent with public values	+	Probably	Probably	Probably
	Perceived to be beneficial	Probably	Probably	Probably	Probably
	Perceived to be fair and equitable	Probably	Probably	Probably	Probably
Efficiency	Cost effective to implement and enforce	Probably	Uncertain	Probably	Uncertain
	Motivates preferred behaviour	+	+	+	+
	Leads toward optimal mix of avoidance, treatment and mitigation.	+	+	+	++

-- / - / 0 / + / ++ strongly negative / negative / unaffected or mixed / positive / strongly positive

Appendix C Targeted Rate Council Initiatives in New Zealand

This appendix contains a summary of what councils in the Auckland region were doing in 2004 with respect to stormwater targeted rates, and other councils that have either implemented a stormwater targeted rate for 2004/05, or are considering one. Source: ACC, 2004.

Table C1.1 Summary of councils applying or considering a stormwater targeted rate

Council	Implemented or considering a SWTR	SWTR rating factor used (allocated on the following basis)	Differentiation	Comments
Manukau City Council	Not considering at this stage	N/A	N/A	Are not currently considering a SWTR
North Shore City Council	Considering	N/A	N/A	Are considering introducing a SWTR, possibly based on impervious area.
Waitakere City Council	Not considering at this stage	N/A	N/A	Are not currently considering a SWTR
Rodney District Council	Implemented	Land value	Is set differentially, but have not stated on what basis.	
Franklin District Council	Implemented	Capital value	On urban stormwater defined areas (no differentiation by ratepayer group)	
Christchurch City Council	Implemented	Capital value	On land drainage area (no differentiation by ratepayer group)	Are considering abandoning the SWTR and incorporating funding back into the general rate. This is mainly due to the difficulty in defining direct benefit and indirect benefits of the stormwater service.
Matamata-Piako District Council	Implemented	On a fixed rate per rating unit	(no differentiation by ratepayer group)	Bulk of the stormwater funding is achieved via the targeted rate, a small "public" portion of stormwater costs are funded from the general

Council	Implemented or considering a SWTR	SWTR rating factor used (allocated on the following basis)	Differentiation	Comments
				rate.
Wellington City Council	Implemented	Capital value	Differentiated by the 2 ratepayer groups (Residential and Commercial)	The SWTR is only assessed if the property is connected to the network.
Upper Hutt City Council	Implemented	Capital value	Is set differentially, but have not stated on what basis.	
Kapiti Coast District Council	Implemented	On a fixed rate per rating unit	Differentiated by the 4 urban stormwater areas (no differentiation by ratepayer group).	Costs are different for each of the urban stormwater areas.
Thames-Coromandel District Council	Implemented	On a fixed rate per rating unit	Differentiated by the areas defined by their Community boards (no differentiation by ratepayer group).	
Manawatu District Council	Implemented	On a fixed rate per rating unit	Differentiated by the 5 townships, (no differentiation by ratepayer groups).	Costs vary for each of the townships.
Nelson City Council	Implemented	Land value	No differentiation by ratepayer group.	
Tasman District Council	Implemented	Capital value	Differentiated by urban and non-urban areas (no differentiation by ratepayer group).	
Banks Peninsula District Council	Implemented	Capital value	Differentiated by urban stormwater areas (no differentiation by ratepayer group).	

Council	Implemented or considering a SWTR	SWTR rating factor used (allocated on the following basis)	Differentiation	Comments
Waimakariri District Council	Implemented	Land value	Differentiated by urban stormwater areas (no differentiation by ratepayer group).	
Far North District Council	Considering	Fixed rate per rating unit	Differentiated by ratepayer group.	Commercial properties will be 2 times the Residential rate as Commercial properties are allowed 100% site coverage compared to Residential's 50% site coverage.

Appendix D NSCC Cost Estimate for Implementing an Impervious Area Charge

7.4.2 North Shore City Implementation Cost Estimate

This is a simplified analysis and provides an order of cost estimate associated with the development, implementation and ongoing operational costs associated with the introduction of an impervious area charge.

(i) Detailed Business Case and Consultation Phase

Budget estimate	$250,000 +/- 30%

This will need to include:

- Policy review and changes , as required
- Legal review and amendments as required
- Detailed business case analysis
- Development of an implementation programme
- Consultation

(ii) Initial Implementation

Budget Estimate	$420,000 +/- 30%

This includes:

- Aerial survey — $100,000
  (assumes a 1/3 share of total cost to council)
- Accounts — $50,000
  Assumes modifications to councils financial management
  Information systems and ratepayers systems
- GIS and Property — $100,000
  assumes integration of GIS and aerial survey data
  for impervious area mapping, monitoring and charging
- Professional fees — $70,000
  Assumes project management, consultation,
- Pilot Trial — $100,000
  We recommend a pilot trial be established over a
  limited area to ensure systems established are

operational, reliable and
accurate.

(iii) Ongoing Operational Costs

Budget Estimate	$140,000 +/- 30%

(Assumes operating cost estimates from US and German experience and includes account management, measurement, enforcement and subsidies (at 1% of revenue billed), triennial fly-over

These costs need considerable refinement and should be read as order of cost estimates only.

Source: NSCC, 2005.