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Integrated waters management – defining Beacon's role

Final

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About This Report

Title

Integrated waters management –defining Beacon’s role

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Abstract

Beacon’s research for Integrated Water Management (IWM) has been defined through a series of interviews and research into existing research in IWM and gaps in information.

Recommendations are made which take account of Beacon’s goals and transformation pathways and existing research commitments.

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1 Executive Summary

A study has been undertaken to consider how Beacon should best contribute to its integrated water management (IWM) target. IWM, sometimes known as Three Waters Management, refers to the integration of water supply, wastewater and stormwater management. Three main areas of investigation were undertaken being:

- What IWM related research has been carried out in New Zealand and what are the gaps?
- What information could Beacon supply that key stakeholders require to implement or assist the implementation of IWM?
- What aspirations do the representatives of Beacon's shareholders have for IWM research?

The findings, integrated with existing FRST commitments, have been used to define the IWM research for Beacon Pathway for the years 2008-2010. For maximum efficiency this has been combined in a RiB with ongoing water demand management research to avoid any over-lap which would otherwise have occurred.

A review of current research indicated that there were several research gaps. Much of the existing research had focused on trialing and monitoring technologies. Some life cycle analysis and health assessments had also been carried out. The main gaps that were identified through the consideration of current research and through discussions with stakeholders were:

- Organisational and policy impediments
- The value case for a range of shareholders, using full cost accounting methods, including an assessment of energy use, carbon emissions and, as best as practical, non-market valuations of social and environmental costs and benefits.
- An understanding of how IWM can best address the four well-beings
- Perceived barriers to uptake, in particular health related issues

Standard engineering technical issues especially related to stormwater management were thought to be well researched but there was no record of an attempt to design an IWM system based on a Life Cycle Analysis approach which took account of the range of sustainability (including cost) criteria such as carbon footprints, peak oil, climate change and the four well-beings.

Shareholders observations and suggestions were mainly in relation to the wider benefits that accrue from IWM with some reference to potential benefits for their individual organizations. The main points were:

- Beacon should continue to influence senior government officials and politicians and promote the value case for water use efficiency and IWM.

- We should develop the best economic formula to encourage uptake of water use efficiency at home and neighbourhood scales along with a better cost/benefit analysis methodologies for comparing water management approaches.
- There would be more interest in developing IWM related products if there was more certainty in the market; lack of certainty was put down to a lack of and inconsistency in regulations to encourage their use. There was a strong feeling that IWM approaches at the home and neighbourhood scale would require regulation to achieve significant uptake.
- LCA and full cost accounting methods for product analysis was also required
- Water management systems could be considered within the systems work and if not directly included then the systems design methodology could help inform an IWM system design.
- Myths needed to be challenged and barriers to uptake removed.

Given that the required technologies are well-known, even though their design could be improved upon, there was a general feeling of frustration that a greater sense of urgency from water managers and less complacency from consumers was required to get the integrated water management industry moving.

2 Introduction

This report documents findings which address one of two targets for Beacon's Water strategy "Reducing the Flow".

Target 2: All Homes and Neighbourhoods water resilience
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NZ homes and neighbourhoods have improved management of the three waters; water supply, wastewater and stormwater to decrease their negative impact on the residential and natural environment, thereby making a more resilient water system by 2020.

Before defining a research programme for integrated water management (IWM) it was apparent that some background investigation was required to ensure that Beacon focussed its efforts on the most strategic research areas and complemented, not replicated, research undertaken by other research providers.

IWM is being promoted in many countries and is at various stages of application across the world. Much of the focus is on stormwater management and how that can be a backdrop for improved urban design; working in tandem with nature. However IWM research being considered overseas, while providing useful background, is not entirely applicable to the New Zealand context which needs to take account of differing climates, regulations and policies and building typologies. The IWM research that has been carried out in New Zealand has in the main focused on one individual component of IWM at a time, primarily stormwater management. The pros and cons of rainwater tanks, in particular contaminant residue levels and methods to improve tank water quality have been well researched and there have been some economic approaches to value individual components of IWM. However, there still remain many gaps in research into the integration of the three main water services and their relationship to natural water cycles.

Given the need to be clear about what the IWM research gaps were, the opportunity was also taken to obtain a fuller understanding of stakeholder needs and what information would assist them to more widely apply IWM. Finally it is acknowledged that shareholders may be able to uncover commercial opportunities through well targeted research; opportunities which would also have wider benefits in assisting to gain further uptake of IWM.

3 Background

IWM is an approach to urban water management which potentially has multiple benefits for the residential built environment but to date in New Zealand, there has been slow and limited uptake. The benefits include:

- **Water supply reduction through the use of rain water** which in turn reduces stormwater quantities, both which reduce infrastructure maintenance costs and potentially major capital cost.
- **Less wastewater** with consequent reduction in infrastructure capital and maintenance costs
- **Less energy** use required in water supply and wastewater disposal.
- **More resilient homes and neighbourhoods**, better able to withstand floods and droughts through the use of on-site stormwater management devices, ponds, wetlands and less reliance on mains water supply.
- **An enhanced living environment** built around the local ecology instead of the car
- **Providing a focal point** for communities eg the Twin Streams Project in Waitakere, adding value to our “Neighbourhoods” approaches.

4 Method

The research objective was to define Beacon's research role in integrated management of water at homes and neighbourhoods scales, to ensure relevance to key stakeholders and shareholders.

The approaches utilised in the research included:

- Structured interviews/questionnaires of all stakeholders to determine research needs. The interviewees are listed in Appendix A. Stakeholders were sent an information pack prior to their interviews. Appendices B and C.
- Interviews with shareholders to understand their views on research needs and also consider commercial opportunities.
- Interviews with New Zealand IWM researchers and a review of reported IWM research, from websites and published articles.
- Analysis of the collated knowledge gaps against Beacon's established targets and FRST commitments.
- Definition and prioritisation of the research that will achieve Beacon's goals and add value to other Beacon programmes.

Beacon's research is at the home and neighbourhood scale so those scales remained the focus of the investigation. However some consideration of the larger catchment was required because of the accumulative effect of multiple dwellings and neighbourhoods at the catchment scale and the catchment being the natural unit for water management.

While a wide range of research issues were considered, the requirement of the recommended research was contained within the bounds of our commitments to FRST (Appendix D), i.e. best practice (the what) and value propositions (the why).

Interviewees were grouped as:

- Councils or water supply authorities
- Developers, Development Engineers and Consultants
- Researchers
- Shareholders

The list of interviewees by stakeholder grouping is given in Appendix A.

5 Research Results

5.1 Existing Research

Current research mainly falls into categories that relate to the three waters, water supply, wastewater and stormwater management. While each of those systems interacts with the others, that connection is not generally made in the research focus. Much of the research is understandably of a technical nature, the development of lower impact products or systems, often on-site treatment or supply.

University Engineering Departments are engaged in a limited amount of urban water research, however not mainly on IWM. New Zealand Water and Wastewater Association are active in promoting solutions for all aspects of water management, conventional as well as sustainable and other innovative solutions. They have commissioned research through NZWERF and hold several specialist conferences annually. They have various publications, including codes of practice and are an excellent resource for the water industry. It is fair to say that they focus mainly on the technical aspects of water management and meeting compliance. They also have educational booklets which are for general consumption.

Given the lack of fully integrated water management research in New Zealand it is valid to give a summary of the research by the three component categories, even though the ultimate goal of Beacon's research in IWM would be to link them in the most effective manner.

5.1.1 Rainwater Technologies

There is a "Roof Water Research Centre" in New Zealand, headed by Stan Abbott from Massey University. The aims of the Centre are broad and include social and political factors which influence the uptake of the use of rainwater for water supply. However the majority of the publications are focused on technical issues, in particular in relation to public health and improved rainwater tank design. Stan has a testing facility on site at the Wellington Massey Campus and is a strong advocate of the use of rainwater, even though the media has on occasions portrayed a more negative stance. Stan is an enthusiastic colleague keen to share knowledge and help drive the uptake of rainwater in domestic use.

Landcare Research has carried out some research on rainwater tanks, mainly considering the life cycle analysis of tanks of differing materials and comparing them with mains supply life cycle costs. The report notes that the LCA comparison only considers the supply benefits of rainwater tanks and doesn't include the potential for stormwater mitigation. Landcare Research have a considerable amount of information on rainwater tanks on their website¹ and have also convened a council workshop on the subject but don't have any current work where rainwater tank use is the main thrust.

■ ¹ www.landcareresearch.co.nz/publications/researchpubs/RaintankReferenceList.doc -

There has been very useful modelling carried out in relation to tank supply by Peter Coombs and Steve Lucas in Newcastle. The model PURRS which is used to simulate the performance of rainwater tanks under varying condition, was used extensively by Kapiti Coast District Council in applying for the proposed District Plan Change 75 under the RMA (1991).²

There has been some market evaluation carried out of the potential consumer uptake of rainwater tanks for supplementary supply and there is clearly a price barrier, especially for retrofitting rainwater tanks. However anecdotal evidence suggests that the advent of slimline urban raintanks along with summer water shortages is making them more attractive to the housing market. The value case however still has to be made for rainwater tanks and that needs to take account of all the potential costs and benefits.

5.1.2 Wastewater

Wastewater is generally dealt with at the municipal level, large pipes and increasingly improved forms of treatment to provide a relatively clean end product. Other by-products of larger systems include methane generation, soil conditioners and forest fertilisation. Large scale systems are undergoing incremental improvements which reduce their environmental impact. There are major costs involved and in most cases the products are still treated as waste. Community based systems are few and far between and generally considered to be less suitable for urban environments. On-site rural systems are common, indeed mandatory, but there are very few on-site urban wastewater systems which dispose of or recycle domestic waste.

There has been considerable research and development into greywater recycling systems over the years. Research has revolved around improving technologies and meeting health concerns, real or imagined. Greywater recycling systems generally take the water from the shower/bath and laundry and enable it to be recycled back into the house for toilet flushing and/or used externally for garden irrigation. There are commercial models which use an aeration device and a flow filter to separate the majority of soaps and lint from the water before it enters the holding tanks. Excess soaps are directed into a gully trap and solids are held in the filter until cleaned out. Such systems can save up to 30% of water use depending on the toilet model and usage rate.

Research has generally been carried out by the manufacturers such as EcoPlus to improve the design, substantiate performance and remove perceived and real barriers, especially relating to health and maintenance issues. Other research tends to be focused on large scale or rural systems, not directly applicable to urban environments. The local expert is Ian Gunn, ex University of Auckland, who is a mine of information on wastewater systems. A significant publication is “Sustainable Wastewater Management: A handbook for smaller communities and

² <http://www.kapiticoast.govt.nz/NR/rdonlyres/2A34BCFE-674A-4434-8CF4-08B1C17B0FF4/52757/MSP07572ProposedDistrictPlanChange75WaterDemandMan.pdf>

summary brochure”³. The options and benefits are well articulated in that document but it is not specifically focussed on urban environments.

Blackwater recycling is also possible through, for example, the use of composting toilets where composted toilet waste can be used as a fertiliser. While uncommon in modern western countries this type of use of waste was once common in agronomic communities.

Apart from a few members of the engineering fraternity most of the value proposition for on-site wastewater treatment systems, systems which are integrated with other water services and linkages with the natural water and nutrient cycles are published by the manufacturers.

Independent analysis of the systems, especially in conjunction with other water services would be worthwhile in promoting IWM.

5.1.3 Stormwater Management

Low impact urban design has, for many, become synonymous with stormwater management although there are clearly other design issues to be considered. The strong focus on stormwater management is not surprising given the large quantities of rainwater which hits impervious surfaces in the built environment and immediately becomes a waste product, stormwater, which needs to be disposed of. Reversing that approach through maintaining natural water systems, retaining urban streams, and using those features to enhance biodiversity could be mainstream for new Eco-neighbourhoods or neighbourhoods wishing to retrofit. However despite the considerable amount of research in low impact stormwater management its uptake in New Zealand is still slow and its integration with other water services not yet optimised.

Several organisations have carried out some research into stormwater management but Landcare Research is the main provider of research which is relevant to Beacon Pathway. Their research has focused on the design and performance monitoring of different stormwater interventions such as swales, roof gardens, stormwater detention and contaminant removal products. These have been considered at the site, sub-division and catchment scale along with some of the impacts on the local stream ecology and terrestrial biodiversity.

5.1.4 Putting it together; what is available now

There is a paucity of research which considers a systems approach to water management in the home or even at the sub-division scale. There have been some sub-divisions built which demonstrate attempts to integrate water management and some monitoring of their performance. There are clear gaps in the design and value propositions for convincing all stakeholders that there are economic as well as ecological and societal benefits to a more integrated approach. The time may have come for a clean sheet of paper approach to designing, promoting and evaluating a domestic water system, which is developed on sound systems thinking and sustainability criteria.

³ <http://www.mfe.govt.nz/publications/waste/wastewater-mgmt-jun03/index.html>

A summary of the main IWM research areas, current researchers and potential links is given in Table 1. Listed is the research with most relationship to Beacon's IWM goal rather than a comprehensive list of urban water research for each organisation

Table 1: Current IWM Research

Research focus	Researchers	Potential linkages with Beacon
Stormwater management and economic valuation	Landcare Research	Could provide resource economics input
Rainwater tanks, especially health related issues	Massey University	Strong proponent of supplementary supply. Could provide information and support.
Wastewater systems, both infrastructure and on-site supply	Ian Gunn	Could provide expert advice to Beacon and peer review
All aspects of water management, recently demonstrating increased interest in demand management.	New Zealand Water and Wastewater Association	Beacon needs to collaborate with NZWWA, potentially align some research and avoid replication
Demand Management	New Zealand Council for Infrastructure Development (NZCID)	Appear to be collaborating with NZWWA in commissioning research, hence need for collaboration as stated above.
Integrated Water Management	Hans Schreier	Hans Schreier oversees water research networks in Canada and has advised researchers, local and central government in NZ. Hans could both collaborate with and review research plans and outcomes
NIWA in particular is engaged in surface water research but has less direct involvement with the home and subdivision scale than Landcare Research.	Other CRIs and Universities	Links to be maintained as required. Keep watching brief via conferences and workshops. For example, Dr Elizabeth Fassman and Asaid Shamseldin's, University of Auckland Engineering School, research on stormwater.
Not generally at the cutting edge of research; users rather than providers	Engineering and Consulting Firms	Keep in contact with developments through conferences and workshops

5.2 Identified Research Needs- Summary of key knowledge gap areas

The comments from the interviewees on research needs, representatives from councils, water authorities, developers and consultants is summarised below under five main headings and then expanded upon in subsequent sections.

5.2.1 Governance, implementation barriers and funding

- We have a lot of technical knowledge; the main problem (barrier) is the implementation and funding to make the change
- Need to consider the effectiveness of different institutional frameworks versus the resource protection achieved for NZ as opposed to overseas models.
- Need for a ‘total package’ focus and knowledge base.
- Need to balance long term vision and immediate small simple steps.

5.2.2 The value case – Costs versus Benefits

- Greater clarification of costs and benefits for options is required utilising full cost accounting methods to include non-market valuation of social and environmental aspects.
- Clarification of issues which include carbon footprints, increasing oil costs/decreasing supply and climate change, and being aware of government programs in this area.

5.2.3 Health issues

- More consistency of recommendations required across regions, especially with respect to urban rainwater and reuse of stormwater/wastewater.
- Overcoming barriers, real or perceived, relating to rainwater supply or greywater recycling.

5.2.4 The four well-beings

- More work needed to clarify understanding, methodology and consistent use across regions.

5.2.5 National Water Organisation

- Generally the industry is satisfied with the NZWWA (New Zealand Water and Waste Association) to represent their needs.
- Need to look at possible institutional rearrangements linked to ‘Governance and implementation barriers’ in the first point above.
- Varied views from being wary of more bureaucracy to the need for a national regulatory body such as the American EPA (Environmental Protection Agency) or water equivalent of EECA (Energy Efficiency and Conservation Authority). Some considered that regulation is the only driver, along with cost, that will make people change.

5.3 Governance, Implementation Barriers and Funding

There was general agreement that:

5.3.1 *We have the technical knowledge; the main problem (barrier) is the implementation and funding implementation*

- In addition, organisations like NIWA and Landcare Research are doing a lot of technical research, measuring and monitoring so Beacon should not focus on that technical area.
- While there is some funding for the capital cost of, for example, the upgrading or new small community wastewater treatment facilities, the small councils then struggle with the ongoing operational, maintenance and depreciation costs.
- Consensus that the ‘only’ way people change what they are already doing is because of regulation and financial incentives. Therefore, need to send the right price signals. For example, user pays, while raising social issues around ability to pay for the lower income bracket, has been proven to ‘work’ in terms of reducing demand and making people more aware of the ‘true costs’ of the different water services. Another example is stormwater that currently has no user pays options, but if there was, for example, an impervious ‘tax’, this would send the right signal about reducing stormwater flows and those that generate more stormwater need to pay more.
- The biggest improvement can be made in simplifying the ownership and funding issues and separating the management of these long life assets from the short term views of politically based organisations.
- How do we integrate the enforcement/regulatory role of the regional councils and the ‘business’ management of the assets owned and operated by the local authorities?

5.3.2 *Major impediments rest at the Institutional level.*

- Successful implementation rests on the blending of Regional Council environmental responsibility through the Resource Management Act (RMA) and the land use responsibilities of the territorial authorities (District and City Councils). While this is generally recognized as an issue, there is inadequate funding and little effective blending of regional plans, district plans and codes of practice.
- Lack of relevant national policy statements/standards, issues raised in Regional Policy Statements, Local District Plans/bylaws across the country.
- Role of regional government versus a bulk supplier in regional infrastructure planning.
- One proposition was to prepare a scoping document on institutional issues. This would also need to work in closely with the PUCM (Planning Under Co-operative Mandates)⁴ research currently underway through Waikato University. The analysis would need to look beyond NZ borders and look at overseas ‘champions’ working within other institutional and resource protection frameworks. This could be done through an expert’s forum in NZ over a two or three day workshop or charrette. The success of such workshops is very dependant

⁴ <http://www.waikato.ac.nz/igci/pucm/>

on getting the right people involved with the willingness and ability/authority to make changes.

5.3.3 Major barrier is lack of a ‘total package’ focus and knowledge base.

- Often the new innovative technologies/systems cross many trades (plumbers, builders, electricians and engineers) and the knowledge base needs to be developed to make it ‘easier’ and ‘more affordable’ for land owners and developers to opt for the ‘non-standard’ option. People go for the ‘easy’ option.
- Some feedback indicated that, for instance, new home owners were less likely to include the more sustainable (often non-standard, unknown and more costly) options as they are often more focused on getting the larger house for the least cost, compared to renovations etc where owners tend to be doing things differently and hence are more likely to look at alternative options.

5.3.4 The need to balance long term ‘vision’ and immediate small simple steps.

People were wary of too much high level vision work, without also incorporating the simple practical day to day steps one can take now. One such phrase, especially relevant to the smaller authorities was; ‘too many of us are buried in the urgent to the detriment of the important.’

5.4 The Value Case – Costs versus Benefits

5.4.1 The main point of agreement was the need for greater clarification of costs and benefits.

The following points were raised:

- Some work on stormwater technology costs but not a lot on wastewater, water supply and integrated costs when considered as a whole ‘system’.
- The use of full cost accounting methods to include non-market valuations, particularly of social and environmental impacts.
- A need to involve the financial sector, especially with depreciation and life cycle costings as up front capital costs are becoming a reduced portion of the whole of life costs.
- Several questioned the ‘real value’ of a lot of the new technologies.
- Territorial authorities are becoming more like a ‘business’, with regional authorities setting the ‘rules’. As such territorial authorities are becoming more ‘business focused’ rather than only a ‘public service’.
- The constant need to balance the increasing awareness of the public, both in terms of requiring higher environmental standards and at the same time wanting ‘lower’ rates.
- The need to clearly articulate a range of scenarios, including total systems including all waters of stormwater, wastewater and water supply options, where people can more clearly see and balance the costs and benefits. The skill to portray this often very complicated number crunching in a way so the general public can understand and make informed choices.

5.4.2 *The need to clarify the issue of your ‘carbon footprint’, increasing oil costs/decreasing supply and climate change.*

There was a varied response ranging from agreeing with climate change to considering it a ‘fuzzy science’.

Some of the issues raised were:

- While most were starting to include sea level rise and increasing storm frequency resulting from climate change impacts, very few were taking the generation of greenhouse gases into their options analysis.
- Hence, people were focused at the bottom of the cliff. That is, designing for the change but not addressing how to prevent, or at least minimise the change from happening in the first place.
- Although, while most said technical knowledge was not a barrier, very few were taking into account the future impacts of ‘peak oil’ and a declining energy supply. None were seriously analyzing their ‘carbon footprint’ in options analysis of infrastructure with a life of 50 to 100 years. How can we plan for a society in 50 years? What will society be like in 50 years?
- The need to co-ordinate any work with that being done at the national level. Examples were the two large government research proposals to look at global climate models and assess their implications and assess impacts.

5.5 Health Issues

Several expressed opinions on the lack of consistency over health issues, especially with rainwater collection and the reuse of stormwater/wastewater. There are health issues that need to be addressed and ensure that the technology sufficiently addresses them. There are also health related perceptions which may not be based on fact or a proper interpretation of facts and require myth busting. There may also be the need for a national, or at least a regional, approach for consistencies across different regions.

5.6 The Four Well-Beings

There was considerable discussion on the four well-beings – ranging from saying they fully understood, to partially understood to it was all too ‘fuzzy’ to be of any real use.

This is an area where more work is needed. Some of the points raised were:

- Need for a consistent methodology, definition of cultural (all cultures), sustainable economics, thresholds, no offsetting ‘bads’ with ‘goods’.
- Variation in Section 32 analysis. Arguing ‘best practice’ again and again through courts wasting time and money. – does this need to have a regional or national approach?
- How to overcome legislative barriers, especially conflicting requirements between Acts which impact on the built environment.
- Assessment of same issues done by many different people leads to inconsistencies.
- Some thought ‘fuzzy science’, needs clarification.

- Because RMA is law and definitions are often governed by case law, it is only the lawyers that know what it really means – the need to get out to the actual users.
- The need for a national core set of indicators was raised by some while others were wary of more layers of bureaucracy.

5.7 A National Water Organisation

In general people were satisfied with the existing NZWWA (New Zealand Water and Wastes Association), its special interest groups and water services managers group.⁵

Again the views varied from those wary of any more bureaucracy to those who felt an organisation such as the American ‘EPA’ (Environmental Protection Agency) authority which had more regulatory power is the way to increase implementation and uptake. Alternatively a water equivalent to the New Zealand EECA (Energy Efficiency and Conservation Authority) was proposed. Regulation and money were the two main drivers to better uptake that everyone agreed on. This links to current institutional arrangements being the primary barrier compared to a lack of technical knowledge.

Some of the points raised were:

- Benefits of one central technical agency. People mentioned this was the intention of NZWERF, but that it hadn’t delivered as planned.
- References were made to where organisations could include water issues. For example, the Auditor General and their role to ‘audit’ (Do we need an audit of the Section 32 analysis councils are required to go through to assess different options. It was generally agreed that there is a wide variation in the degree to which the section 32 analysis is done varying from a ‘white-wash’ to a voluminous technical document). An example of an organisation which produces well respected (both nationally and internationally) manuals and/or guidelines is the New Zealand Ingenium National Asset Managers Steering (NAMS) Group.
- Need a body with power like the American ‘EPA’ (Environmental Protection Agency).
- Assess effectiveness of EECA (Energy Efficiency and Conservation Authority) before adopting as a model for water or a combined site for an energy, water and materials conservation organisation.
- Work on national issues such as peak oil, carbon footprint, regional issues crossing political boundaries, all industries issues such as farming impacting water quality, risk frameworks.

5.8 Differences between stakeholders

The differences of opinion expressed by Regional Councils, Territorial Local Authorities, water authorities, developers and consultants are summarised below.

Regional Councils as regulators of the RMA (and those operating at the regional level) raised more issues around governance and the need for national standards and policies while

■ ⁵ <http://www.nzwwa.org.nz/>

Territorial Local Authorities raised more questions around the costs/benefits and value case of new water services options.

Territorial Local Authorities often saw themselves as a business compared to a regulatory/enforcement role of the Regional Councils. Therefore the issues raised by different local authorities were a function of where they saw their primary role fitting into the continuum between pure regulation/enforcement/public good to acting solely in a financial business environment. In an ideal integrated water management program, these would be integrated for the maximum benefit for all. This is one area of contention raised above in terms of the barriers to the implementation of a total integrated water management system.

Developers and consultants raised more issues around consistent approaches and standards across regions and the need for national standards. Developers and consultants are often working across regions and the conflicting 'local standards' make for confusing messages around what is regarded as 'best practice'.

5.9 Synopsis of Shareholder responses

Wayne Sharman

Strongly urged the need to provide the value case for integrated water management. The NZBCSD is considering water allocation issues and suggested that I talk to Heather Stonyer about our respective research which I have subsequently done. NSBCSD have developed a model through Aqualink which assists with water allocation. Their idea is that regional councils would be required to show that there is a demand management plan in place. Presumably they would then require that of their (Territorial Authorities).

Wayne emphasised the role of government and promoting water efficiency at senior levels, potentially through political channels and asked if we know central government's view on water use efficiency?

Recommended that Eric Palmer, Chief Executive of the Gasfitters Association is a good contact.

Overall Wayne's concern is in keeping with the role of Building Research/BRANZ

Peter Joyce

Keen to have the value case at the homeowner and TA level and find the key to enthusing developers. We need the best economic formula to encourage uptake of water use efficiency at home and neighbourhood scales.

Tony Miguel

Stated that water services are always driven by hydraulics and operated in silos. We need water services management coordination. No clear cost/benefit methodology accepted. Keep catchment hydrology normal and consider low flows. Not over-impressed with the model MUSIC. Suggested that Beacon contact Asaid Shamseldin, a senior lecturer at Auckland

University who has set up a stormwater monitoring framework. Maybe target businesses and property owners that back onto streams. Need enforcement plus education. Need to be clear about required environmental flows. Don't know much about groundwater flows and how they impact on streams. Need value cases.

Chris Thorpe

Stormwater management devices and building their presence in re-use products. Regulatory incentives to uptake of these products are limited and little consistency across the country. Have Hume Septor and Hume Guard, products for gross pollutants. Currently low impact devices are mainly driven through regulation (eg the Auckland Regional Councils TP10 stormwater treatment guidelines in Auckland) but there is a maintenance cost which acts as a deterrent to uptake. So their focus for low impact devices is where they have regulations. Chris noted that Wellington has very little regulation. Propriety products can go through endorsement for TP 10 and are driven through resource consent conditions.

At the moment their stormwater retention/detention tanks are made in concrete or aluminium. Chris would be interested in water reuse products if more demand.

We discussed the leakage issues and Hume Pipes is interested in sleeving, putting a polymer membrane inside aging pipes. Eg soft HDPE forced through pipe, hardened by hot water

Research requirements are for product life cycle costs and demonstration of cost/benefits over time. Should plan for water management on a catchment basis. A key issue for Humes is whether there will be legislation which drives increase demand. It needs to be made easy for homeowners to do.

Barbara Nebel and Bob Schula

Main opportunity is water options for systems work. Systems research could come up with design criteria for HSS (Beacon's High Standard of Sustainability criteria) and could be applied to water systems. Use Quality function deployment to know what the constraints are.

They suggested that Beacon should contact Gudja Magison fo Scion for information on wastewater research.

Alistair Fleming

New Zealand Steel or Bluescope Steel NZ stopped producing rainwater tanks many years ago. Currently Bluescope Water (in Australia) sends the raw steel product into New Zealand so there is some interest in increasing the market for the raw steel product but none at present for the end product. BJ Moss in Gisborne manufacturing Bluescope Steel laminate.

The key research issue was to challenge some of the assumptions relating to wastewater recycling and water re-use.

6 Discussion and Recommendations

Of the long list of potential research issues raised, Beacon has to choose what research can best contribute to both its understanding of integrated water management and its overall goal for sustainable homes. The next two years research needs to be reasonably tightly focussed to ensure sufficient progress is made. Other issues can still be addressed but through other channels, such as submissions on policies and plans and supporting other organisations who have similar goals. For example the governance and legislative issues that direct water management in New Zealand may not be areas where we would focus our research but Beacon can still influence then where it believes a change is required.

A number of issues do stand out as having good research potential. In general they have already been flagged in our FRST contract with this scoping study identifying that we were on the right track and giving more substance and detail to key research gaps.

Definition of Value Cases for IWM has been requested from all sectors but it is likely that those value cases will require differing considerations for the main stakeholder groups being consumers, government (both local and central), developers and industry. There is a need to make the value case on more than just the cost benefit analysis; to take environmental, social and possibly cultural values into account and as yet there is no common understanding of how to value across those four well-beings. Future global forces such as oil prices and climate change will have a significant impact on IWM but are currently barely register on the radar of decision makers in water management. Energy is a key input of water management. We need to understand that relationship between energy and water better and how that might be intensified with peak oil. Those issues should all be considered in defining value cases, strengthening the case for more efficient and resilient IWM.

There are real and perceived barriers that need to be investigated and communicated. There are too many half truths and myths which are delaying the uptake of more efficient IWM. These are especially found in the health sector where recommendations from old publications with minimal updating are regurgitated and applied out of context, for example a much quoted Ministry of health document.⁶ The lack of consistency in approaches across the country is an indication of the need for more rigorous research in this area.

Finally there are the technologies to provide for on-site and community scale IWM. As interviewees noted other researchers are monitoring existing technologies which generally relate to only one of the three waters. However nobody is looking at how to design the optimal system for IWM. Beacon has an opportunity to define the design criteria which would produce best practice systems for the site and community scale. Ideally Beacon could then partner with a

⁶ *Ministry of Health (updated 2006). "Household Water supplies - The selection, Operation and Maintenance of Individual Household Water Supplies",*

product manufacturer to systems trial these designs through the Now100 or Rennovate1K programmes.

In summary it is recommended that Beacon pursue the following IWM research strands and that they form the basis for the next RiB:

- Determine the value cases for IWM from the perspective of a range of stakeholders, using full cost accounting methods including non-market valuations of social and environmental costs and benefits, and considering key global issues such as rising energy prices and shortages and climate change.
- Remove barriers and challenge existing assumptions, especially around health issues, which inhibit the uptake of IWM.
- Develop the design criteria for optimised household and neighbourhood IWM systems; develop prototypes and trial them through Beacon's other programmes.

7 Appendix A: Interviewees

Table 2: Interviewees

Organisation	Name	Position Title
Councils and Water Authorities		
Auckland Regional Authority (ARC)	Matthew Davis	Manager Stormwater Action Team
ARC	Mark Bishop	Stormwater team
ARC	Grant Barnes	Manager Monitoring & Research
ARC	Alastair Smail	Environmental Policy, Planning
Watercare	Jim Hodges	Chief Engineer
Watercare	Myles Lind	Programme Manager, Three Waters
Metrowater	Brian Sharman	Innovation Manager
Rodney District Council	Peter Reid	Water Manager
North Shore City Council	Jan Heijs	Water Services Manager
North Shore City Council	Chris Stumbles	Strategic Planning Engineer
Auckland City Council	Mike McQuillan	Group Manager, Environmental and Utility Management
Environment Waikato	David Spiers,	Program Manager, Policy & Planning
Environment Waikato	Urlwyn Trebilco,	National process, standards, sustainable development
Hastings District Council	Brett Chapman	Engineer
Napier City Council	Johan Ehlers	Development Manager
Wairoa District Council	Neil Cook	Engineering Manager
Environment Canterbury	Rick Jones	Acting Portfolio Manager (Water)

Developers, Development Engineers and Consultants		
Landco	Paul Armstrong	Development Engineer
HLC	Katja Lietz	Sustainability Manager
Neils Construction	Grant Brebner	General Manager
Wood & Partners	Mark Williams	Director
Tse Group	Yasenko Krpo	Principal, Manager of Land and Civil Division
Private Consultant	Earl Shaver	Consultant in stormwater
Environment and Business Group	Clare Feeney	Director, Environmental Communications
Sovereign homes	Phillip Powney	Project Manager
Hynds Environmental	Peter Carroll	General Manager
Researchers or research managers		
Landcare Research	Mike Krausse	Manager: Urban Environments
Private Consultant	Ian Gunn	Consultant and researcher in wastewater systems
Massey University	Stan Abbott	Director of the Roof Water research Centre
Auckland University Faculty Engineering	Elizabeth Fassman	Senior lecturer in the Civil and Environmental Engineering Department.
NZWWA	Peter Whitehouse	Manager, Advocacy and Learning
UBC	Hans Schreier	Water researcher
NZCID	Stephen Selwood	CEO
EcoPlus	Craig Brown	Markets and researchers barriers to uptake of greywater recycling
Shareholders		
Building Research	Wayne Sharman	Manager Industry Development
WCC	Peter Joyce	Manager-Urban Design, Strategy & Development
WCC	Tony Miguel	Group Manager Asset Management
WCC	Martin Glover	EcoWater Services Delivery Manager
Hume Pipes	Chris Thorpe	Environmental Products Engineer
Scion	Barbara Nebel	Group Leader Sustainability Frameworks
Scion	Bob Shula	General Manager
New Zealand Steel	Alistair Fleming	Market Information Manager

8 Appendix B: Beacon Briefing Document

Integrated Water Management; a briefing document for stakeholders

Background

Beacon Pathway's research portfolio includes best practice of water management in the residential built environment, at the home and neighbourhood scales. Beacon recognizes that there is existing research through other providers in water management and wants to ensure that it complements rather than replicates that research and that its investment in that work results in the return for shareholders and stakeholders. To this end it is seeking input from interested parties to help structure its research programme to maximize its benefits.

Context

Integrated water management (IWM) in the urban context, sometimes known as three waters management, entails a holistic approach to the provision of potable and non-potable water, the removal of wastewater and treatment of stormwater. The rationale for treating those individual water services as an integrated system would be to optimise their efficiency and limit costs while minimizing environmental damage.

While traditionally dealt with independently, there are benefits in managing the three water services collectively. For example demand management to limit potable water can mean a reduction of wastewater; rainwater saved for household use will mean a reduction of stormwater coming off the roof. Recycled wastewater can also supplement water supply within the home and reduce overall wastewater volume.

Wastewater can also be collected at the neighbourhood scale and substitute for valuable potable water used for landscaping; stormwater can be captured on site or at the neighbourhood scale to help maintain the water balance of the catchment, filter contaminants from the flow and recharge environmental flows in streams and groundwater.

Various organisations, communities and individuals are stakeholders to integrated water management to the point where IWM or integrated catchment management (ICM) is sometimes described from an organizational viewpoint, with the integration referring to the decision making and operational processes across organizations; primarily social and economic interactions. It's indicative of the complexity of IWM, as separate organizations may be responsible for differing water services, possibly one reason why IWM has not yet found a strong following in New Zealand, despite its obvious benefits.

The research focus for IWM in New Zealand has had a strong emphasis on consideration of the technologies that can be applied, in particular those described as low impact urban design. These have been trialled and tested and through this process some traction has been made but progress has also been slow. Some of the technologies, especially those concerned with

stormwater management are considered “soft engineering” approaches and tend to result in the reduced use of piped infrastructure.

IWM has the potential to provide benefits for ratepayers, water managers and their organizations as it will help optimize efficiencies in water services. IWM is for water management organizations which seek to optimize social, environmental and economic efficiencies rather than maximizing revenue. Where local government manages water, seeking to optimize those efficiencies is required under the Local Government Act.

IWM can also spawn new industries, low impact and on-site solutions to water provision and dealing with waste or stormwater. Those industries are still under-developed in New Zealand as the demand has to date been low. The potential is however there and one outcome of Beacon’s focus on IWM would be an increase in the activity within this industry.

Research areas

What are the information needs and the barriers to be removed to obtain better integration of water management in New Zealand? Beacon’s research is generally applied and outcomes are achieved through interactions with other organizations which are able to help define their needs, and utilize Beacon’s time and expertise to achieve common goals. Potential research areas could relate to policy and regulatory initiatives, technologies and developing industries and organizational structures and could include but are not restricted to:

- Identifying the value proposition for the further uptake of IWM, how to make the proposition more attractive?
- Clarifying roles and responsibilities for providing water infrastructure, from national to local; and identifying best practice service delivery models.
- Integrating the Four Well-Beings (Cultural, Social, Economic and Environmental) into the decision making process, defining an options analysis framework.
- Taking climate change and peak oil into account, what will they mean for the future of water services?
- At source and on-site management options: reuse, reduce, retention, recycling.

9 Appendix C: Brief Summary of Executive Summary

Beyond Ageing Pipes, PCE April 2001

(How have we performed since 2001?)

In 2001 the four major areas of challenge identified were:

- Fragmented nature of water systems management and lack of clear central government home for policy and legislation.
- Lack of stakeholder awareness and understanding of urban water systems and involvement in their management. One of the biggest challenges will be reaching consensus between the various stakeholders on the environmental, social, (cultural) and economic goals of urban water systems....More research is required on technologies, including those that can be adopted from overseas, as well as social and economic research into urban water systems and approaches. Possible expanded EECA to include water.
- Tensions surrounding who owns, who manages and how water is valued and priced. Support for flow-based user charges. Equitable access to water and privatization.
- Lack of appreciation of the need to manage waters in an integrated way according to ecosystem principles. Water is not an unlimited resource.

2001 Recommendations

To the Minister of Commerce (as the Minister chairing the group of ministers with responsibilities for urban water system management):

- Establish and resources a Task Force to assess new options and models for the delivery of water services that meet the identified principles and criteria for sustainable urban water systems. (Kettle comment – need to first agree on what the principles and criteria are? Maybe Beacon could facilitate a series of workshops throughout the country to agree on the principles and criteria and what is the best way to implement them on a daily basis?)
- Direct Task Force to develop a process for increasing stakeholder input. Free exchange of knowledge and experience between community, tangata whenua, agency and business interests.
- Direct Task Force to examine water valuing, pricing and charging options (Kettle comment – there have already been a number of these studies done. Maybe Beacon assembles these past studies and produces a summary of findings to see if more work is required and are these existing studies relevant for all areas throughout NZ?).

To all territorial authorities and water services providers:

Prepare an overarching water services strategic plan as a framework for the sustainable and integrated management of urban water systems. (Beacon question– has your water authority prepared such a document and if so, what does it say?) The strategic plan needs full participation of all stakeholders and includes indicators for the ecological, social and economic (and cultural) sustainability of the whole system. (Beacon Question – does your water authority have agreed indicators and weightings?)

10 Appendix D: FRST commitments

Table 3: FRST commitments related to IWM

Milestone 4.4	Integrated water management best practice
Description	<ul style="list-style-type: none"> Research related to the second of Beacon's two water research targets: improving the management of supply, waste and storm water in homes and neighbourhoods. Identify current best practice in terms of technology and policy instruments which align the management of water delivery, wastewater and stormwater for maximum cost and ecological benefit identify current barriers and design improved pathways to uptake. This starts research for target 2: resilient water services Identify and investigate opportunities for new and innovative products or services This sits at the interface of Local Government Act, Resource Management Act and Building Code: review and clarify conflicts amongst the three pieces of legislation.
Start date	01/06/08
Finish date	30/06/09
Achievement Measure	By mid 2009, Beacon has identified the best approaches to integrated water management and how to remove current barriers and resistance to its uptake. Results have been presented to the Beacon shareholders and through a stakeholder workshop (e.g. councils and water utilities) and the way forward accepted as indicated in Board and workshop minutes.
Milestone dependent on	
Milestone Contributes to	

Milestone 4.5	Integrated water management value propositions
Description	<ul style="list-style-type: none"> Identify the value of integrated water management in terms of the four well-beings (Local Government Act) and indicate how the value propositions contribute to each of the key stakeholders Convene a forum to consider how to include the value propositions in relevant decision making and policy implementation Continue to make submissions to councils, key stakeholders to influence and direct development of plans and policies.
Start date	01/03/09
Finish date	01/02/10
Achievement Measure	By 2010, at least WSAs are using the value propositions to inform decision making and policies, as indicated in formal documentation (e.g. policy statements, district plans, council minutes). And, a workshop has been held with key stakeholders (developers, councils, utilities) and they have adopted the value propositions as documented in workshop minutes.
Milestone dependent on	M4.4, M2.4
Milestone Contributes to	M4.6

Milestone 4.6	Mechanisms to stimulate water uptake pathways
Description	<ul style="list-style-type: none"> ▪ Broaden the network of research partners and bring together the value cases and best practice packages (from both water targets). Test the uptake of this learning in new situations, e.g. councils which politically can't instigate water metering. ▪ Ensure learning from this process is captured and informs development of future policies, packages etc.
Start date	01/03/09
Finish date	30/06/10
Achievement Measure	<p>By 2010 at least six key Councils have implemented water demand management strategies with water supply reduction targets of 50% through (a) development and implementation of value propositions and the case for change with key stakeholders and, (b) adoption of best practice for water efficiencies.</p> <p>By 2010, a portfolio of ten public and peer reviewed publications or conference presentations have been accepted and public submissions are available on the website. IP has been classified as public or commercial and mechanisms for general publication or commercial protection are in place.</p> <p>In addition, four councils have adopted Beacon's value propositions for improved integrated water management in homes and neighbourhood, these end-users have validated the approach and have incorporated Beacon's recommendations into relevant policies and practices.</p>