

ACT Healthy Waterways – A program to deliver citywide stormwater quality improvements

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This Increased pollutant loads generated by urban development, past land and water management regimes and poor community awareness around behaviours are placing the ACT's rivers and lakes under increasing pressure and affecting water quality. In turn, this is affecting the quality of water flowing out of the ACT and into the Murrumbidgee River.

A joint initiative of the Australian and ACT governments, ACT Healthy Waterways is investing \$93.5M in infrastructure, in-lake research, education and monitoring across the Canberra region. This Project represent an opportunity to reduce nutrient and sediment loads and improve water quality in the ACT's lakes, the Molonglo and Murrumbidgee rivers and the Murray-Darling system.

The Project posed a range of policy, technical and program challenges including a tight project timeframe, the appropriateness of infrastructure for inland conditions, the cost effectiveness of options and the need for broad community ownership.

The first phase of the Project involved comprehensive investigations and was completed in February 2016. To better understand the delivery challenges, the team implemented an event-based monitoring regime, evaluated the effectiveness of existing infrastructure, and undertook a community survey on social values and expectations around water. Project Advisory Groups - comprising technical experts, asset managers, academics and representatives from the community – were established, bringing a broad range of perspectives to the decision-making process. This approach resulted in:

- *refinement of treatment locations and the development of option concept designs for each site*
- *an improved water quality monitoring framework for the ACT*
- *a legacy package of works – infrastructure and broader management - that could, subject to normal government processes and budget priorities, be funded by the ACT Government in the longer term.*

Most importantly, Phase 1 adopted a catchment-wide approach. It looked beyond construction costs and considered wider environmental and social values, as well as the life-cycle financial implications of each infrastructure project. It enabled the team to apply appropriate weighted criteria to an initial list of over 500 potential sites and identify the best 19 projects to move forward into detailed design.

Designs were interrogated through a value-for-money process. A two-gateway approach was used - an initial assessment (VM1) to understand opportunities followed by a more detailed (VM2) workshop to resolve design changes. This approach reduces the scope of key risks such as earthworks, rock excavation and spoil disposal during construction and provide the design sub-consultants with direction for design development

The water quality infrastructure and behaviour change options will lead to long term improvements to environmental condition, urban landscapes, liveability, amenity and recreation. It has also created exemplar “best practice” templates for a range of catchment types - the solutions can be applied in similar catchments across the Murray- Darling Basin.

The second and final phase of the Project has commenced. Capital investment of over \$83 million will build 19 new infrastructure projects, as well as implementing programs to raise awareness about water quality issues and how residents, businesses and visitors can help look after and improve our waterways.

Construction has now commenced on 12 infrastructure projects, with seven more to be rolled out by the end of the year. The Project is expected to play an important role in reducing nutrient and sediment loads and improving water quality in the ACT's lakes, the Molonglo and Murrumbidgee rivers and the Murray-Darling system.

1. INTRODUCTION

Inland rivers and wetlands are under increasing pressure from urban expansion, development-focussed land and water management practices as well as a poor understanding of how every-day community activities affect stormwater quality.

ACT Healthy Waterways (ACTHW) is a joint initiative of the Australian and ACT governments to invest \$93.5M into monitoring, research, community education and catchment-scale water quality works across the ACT and region. The outcome will be improved water quality in local streams and lakes as well as downstream in the Murrumbidgee-Murray river system.

This nomination addresses the planning phase of the ACTHW project.

In planning the project, the ACTHW team faced policy, regulatory, process and technical challenges. From the outset, the team took a holistic approach; working with urban designers, engineers, ecologists and the community to select sites that could deliver both water quality and social outcomes.

To better understand the challenges, an event-based monitoring regime was implemented, the effectiveness of existing infrastructure was assessed, and the community was surveyed on social values of water. Project Advisory Groups (PAGs -technical experts, academics, asset managers and community representatives) were established to bring a broad range of perspectives to decision-making.

A catchment-wide approach to selecting sites and treatment options looked beyond construction costs to also consider environmental and social values as well as whole of life-cycle implications. Planning regulators and the anticipated asset owners were engaged to develop new approval processes and technical guidelines for large stormwater quality works.

1.1. The need

ACTHW addresses a need for water quality improvement across the ACT. Stormwater treatment projects are being retro-fitted to the existing urban areas of Canberra at multiple, decentralised sites to treat diffuse pollution. The process needed to meet the expectations of the funding entities and the aspirations of the adjoining communities and provide high benefits for cost. It also adapted coastal solutions to meet the technical needs of established inland urban areas. All this in a regulatory environment not structured to assess and approve works of this nature.

1.2. Challenges, actions and outcomes

- Develop a working list of projects that would best achieve the environmental, financial and social expectations of the stakeholders, this consisted of:
 - **Identifying available land.** Through a desk-top analysis of land property data, a raw list of over 500 potential sites across the ACT was developed.
 - **Eliminating constrained sites.** Coarse filter workshops removed sites with significant constraints (contaminated soils, major infrastructure, ecological significance, cultural heritage and land ownership) leaving approximately 190 viable sites.
 - **Developing a transparent site selection process.** A project-specific site selection process was developed, addressing a range of parameters including potential water quality performance capacity, acceptability to the local community, environmental

- impact, along with Capital expenditure and ongoing operations and maintenance costings. A short list of 49 projects was developed.
- **Prioritising projects.** A multi-criteria analysis, subsequent benefit-cost analysis and further community workshops were undertaken. Construction costs as well as ongoing operation and maintenance costings were also taken into consideration and a priority list of 27 projects advanced to detailed design.
 - Retrofit existing urban catchments. The works at each site needed to be planned and configured to not only achieve water quality goals but also minimise costs associated with existing site constraints. Constraints encountered across the project included:
 - Adjoining property holders' amenity and safety;
 - 15,000 KPa gas pipeline serving the entire southern portion of Canberra;
 - 132 KV above ground and underground electricity cables;
 - Public and secure government fibre optic communication cables;
 - High pressure trunk water mains;
 - Trunk sewers;
 - Contaminated soils;
 - Threatened and endangered native species;
 - Archaeologically and geologically significant soils;
 - Culturally significant sites (one was carbon-dated to 9,600 YBP); and
 - Limited knowledge of large inland water quality improvement works. Existing ACT codes and standards did not reflect current knowledge and practices in stormwater quality.
 - Planning approval processes not designed for the function, nature and scale of the works.
 - Public land sites in existing developed areas.
 - While part of a coordinated program, the sites are spread across the city with little or no direct relationship to each other.
 - The works are an order of magnitude larger than previous stormwater quality works undertaken in Canberra.
 - The current planning approval process was examined, gaps identified and a concise, WSUD-specific approvals pathway documented.
 - A fixed budget and relatively short and constrained timeframe for project delivery.
 - Uncertainty regarding ongoing operations and maintenance (O&M) funding. Very little data and information relating to the operation of comparable water quality infrastructure available. In response to the impending hand-over of assets, ACTHW project management and TCCS operational staff-built forecasts of long-term operation, maintenance and replacements costs, enabling the preparation of budget submissions to ACT Treasury.

1.3. How project selection was innovative

Beyond the coarse filter workshops, the process of selecting projects that could be advanced to Development Approval and detailed design required an innovative combination of investigation, visualisation, consultation and agreement, particularly given a regulatory environment with limited exposure to large stormwater quality infrastructure.

The key steps included:

- **Asset Assessment and Monitoring Framework.** To better understand how water quality assets, perform in the ACT and identify design, construction and operation deficiencies, an audit of 49 existing assets was undertaken and a comprehensive, long-term monitoring framework is being developed.
- **MUSIC modelling of the catchments** to establish and understand the current conditions and characteristics.
- **MUSIC modelling of each site.** To ensure they returned comparable outcomes, the catchment and performance parameters for MUSIC was standardised for Canberra conditions and expert-reviewed prior to adoption.
- **Project data sheets** were developed for comparative assessments. They addressed core criteria areas, quantified as follows:
 - Absolute reduction in annual loads of nutrients (TN, TP), sediment (TSS), gross pollutants and heavy metals by MUSIC modelling
 - Effect on the ecosystem and the habitat of (threatened) species by the area of land impacted, as well its environmental value
 - Groundwater recharge by the potential annual volume of recharge per annum

- Climate change by percentage change in water quality load under changed climate conditions when compared to normal rainfall scenario
- Effect on recreational opportunity (quality of open space) by the proportional change to area available for relevant activities
- Impact on open space by the total area impacted
- Effect on amenity value by a assessment of the change in quality of existing amenity
- Impact on flood risk by the capacity of the asset to mitigate existing flood risk
- Potential water availability for stormwater harvesting by the volume treated and diverted to temporary storage
- Perceived community attitudes/support by survey
- Cultural heritage values by number of sites potentially impacted
- Effect on trees by number of trees impacted
- Construction Cost by CAPEX and staging opportunities
- O&M cost by \$ per annum over the asset lifetime
- Decommissioning/renewal cost by CAPEX for renewal and expected working life in years
- **A project-specific multi-criteria analysis (MCA)** tool was developed to guide the prioritisation of the projects. The site criteria were workshopped to agree on a weighting system to be applied to the MCA.
- **Initial concepts** were developed for each site and documented with basic information on the type of asset, works extent, appearance, potential performance and key metrics.
- **Community engagement.** Concepts were presented to the community in a series of workshops that included technical experts who provided explanations on the nature and operation of the works. The consultation material was also presented to key stakeholder and community groups. Feedback and preferences were collated and used to quantify support; or otherwise.
- **Initial costings** were developed to ensure comparable outcomes the line items and unit rates were standardised prior to adoption. This process highlighted a short-coming in the available data for O&M costs for ACT waterways infrastructure.
- **O&M Costs.** In the absence of comprehensive historical data, desk-top literature searches for O&M cost data in other jurisdictions along with 'first principles' estimations undertaken by the Transport Canberra and City Services Directorate (TCCS) were used to develop appropriate O&M costs for input to the detailed MCA
- **Benefit-Cost Analysis.** MCA outcomes considered through a Benefit Cost Analysis.
- **Short-list.** A cumulative CAPEX was developed for projects. In this way potentially 500 sites were reduced to 49 sites. This short-list was submitted to the Commonwealth Government for funding approval as part of a supplementary business case for the project.
- **Advanced concepts** for the short list were prepared and categorised as either Priority or Reserve. These were submitted to a second and more comprehensive round of community consultation was undertaken.
- **Priority List.** The final outcome was a priority list of 27 Priority plus 9 Reserve projects to take forward to detailed design.

1.4. How community engagement was innovative

Input from the community has played a vital role in ACTHW since the project commenced and has been innovative in a number of ways.

Project Advisory Groups (PAGs) were established early on to represent the water industry, the community, the scientific community, and various government agencies. They were consulted on a regular basis throughout phase 1 and were instrumental in site evaluation and selection, select representatives of the PAGs were invited onto the MCA panel that prioritised from an initial list of 500 potential sites according to cost and feasibility as well as the potential for improved water quality and increased amenity.

As a result, the list of 500 was reduced to 188 (178 infrastructure and 10 in-lake projects) and the design team developed concept plans for each site ahead of the first of two in-catchment community consultations in July 2015.

Comments were received from experts, community groups and people who attended catchment-based drop-in sessions. The feedback helped shape the development of preliminary plans for 24 priority projects, 12 reserve project and in-lake research.

At the second series of drop-in sessions during September 2016, visitors viewed the preliminary plans, talked directly with members of the design team and provided feedback. For those unable to attend, the Your Say website made it easy to view the plans and submit comments online.

The project team used a range of communication tools and mediums to promote the September drop-in sessions and encourage comment on the Your Say website:

- Residents who live near each of the projects were notified via a letterbox drop
- Posters and brochures were displayed in all ACT public libraries
- Stakeholders received regular email updates
- Updates were shared on the Environment and Planning Directorate social media pages
- Information about ACTHW was included in the Canberra Connect newsletter, and internal ACT Government staff email
- Canberra Connect public screens featured information about the project and dates for drop-in sessions
- Advertisements and articles were published in a range of publications and on associated websites, eg. ACT Landcare, Youth Coalition of the ACT, various catchment groups.

Over 3000 people either visited the website or attended a drop-in session.

1.5. How the approval process was innovative

Planning

Project delivery was challenged by an approval process developed for new work, typically in green-field areas or large in-fill sites, commonly on private land and typically a single site, rather than a suite of sites. ACTHW did not align well with this approach:

- The sites are public lands in existing developed areas.
- While part of a coordinated program, the sites are spread across the city with little or no direct relationship to each other.
- The works will assist to reduce the environmental impact of past developments.
- The works are larger than previous stormwater quality works undertaken in Canberra.

A WSUD projects approvals pathway was developed and is available for future projects. The pathway is shown below.



Figure 2: Asset approvals pathway with WSUD phases

Engineering

The ACT development approval process includes reference to key stakeholders for acceptance in principle of any proposed infrastructure. However, the limited working knowledge of large inland water quality improvement works relates largely to coastal locations and large jurisdictions. Additionally, the ACT codes and standards did not reflect current knowledge and practices in stormwater quality.

Proactive input to update ACT codes, standards and guidelines was required. In collaboration with TCCS, the Environment Planning & Sustainable Development Directorate (EPSDD) rationalised the ACT WSUD Code (*within the Territory Plan*) and developed new complementary WSUD design guidelines (*outside of the Territory Plan enabling flexible adaptation*).

EPSDD also assisted TCCS to develop new technical standards that take into account geographic and climatic conditions. The result is a new Municipal Infrastructure Standard for Stormwater with an addendum for bioretention systems.

ACTHW undertook:

- **Comprehensive survey of existing assets** accompanied by an assessment of the performance of each and an explanation of under-performance where possible.
- **Investigation into current practice** in WSUD infrastructure. Particular emphasis on Melbourne, Sydney and SE Queensland supplemented by international desk-top research into practices in low-rainfall continental regions.
- **Technical workshops** with leaders in the stormwater quality field to identify solutions for inland conditions. These included workshops with ecologists, botanists and horticulturalists to develop plant lists for waterways infrastructure.

ACTHW employed a waterway engineer to assist in the technical review of the proposed assets.

How the process has been documented to enable others to achieve similar outcomes

A project website was established to support the community consultation undertaken during the project, and printed material has also been prepared to support letter box drops and community drop

in sessions. As the delivery phase is still in progress, final documentation of the process is not yet complete. The intention of ACTHW is to establish a knowledge centre.

'On-ground' outcomes

Apart from a suite of stormwater quality improvement assets across the city, ACTHW will provide a lasting legacy of planning, engineering and scientific outcomes, including:

- An approval process as it relates to large WSUD assets;
- New Municipal Infrastructure Standards that better address large WSUD assets with specific attention to bioretention systems in inland locations;
- ACT WSUD design guidelines;
- Better O&M budget planning basis and process;
- An on-going stormwater quality monitoring program;
- A H2OK community education program
- New plant list for waterways infrastructure

This same process can be applied to catchment-scale delivery of stormwater treatment options in urban areas across the Murray-Darling Basin.

Collaboration with other entities

ACTHW is collaboration between the ACT (EPSSD) and a number of other entities including:

- ACT Government agencies
- Commonwealth Department of Agriculture and Water
- Community Councils
- Queanbeyan Palerang Regional Council
- Utility services
- Woodland and Wetlands Trust (Jerrabomberra Wetlands)
- Canberra Airport
- PAGs

As well as our team of consultants:

- Alluvium
- Aecom
- GHD
- eWater
- Aither
- Calibre
- Prentice Ecosystems
- Cardno
- Avisure
- BSD Landscape
- ACT Geotechnical
- Navin Officer Heritage Consultants

1.6. Summary

In terms of infrastructure planning, the ACTHW project has driven innovation in the ACT, has met planning and technical challenges and will deliver improved water quality in Canberra's streams and lakes. It will make a contribution to the health of the Murrumbidgee-Murray system and it will leave a legacy of knowledge on the planning and delivery of large stormwater quality assets for inland communities.

2. ACKNOWLEDGMENTS

ACT Healthy Waterways is a joint initiative of the ACT and Australian governments to improve the quality of water entering our lakes and waterways and flowing downstream into the Murrumbidgee River system. The project includes the construction of infrastructure – like wetlands, ponds and rain gardens – as well as research trials, a community education campaign and improvements to water monitoring practices.