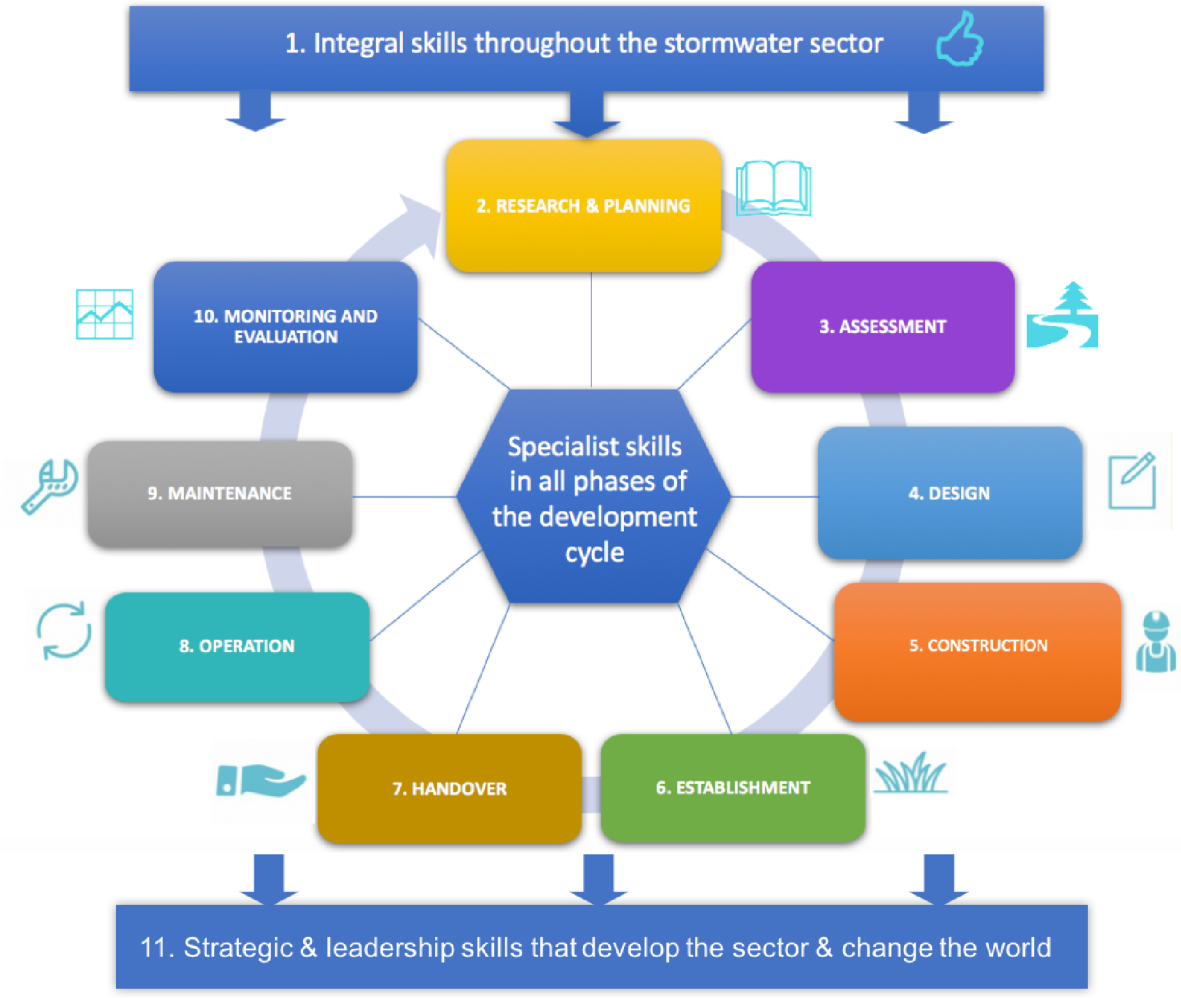
water NEW ZEALAND

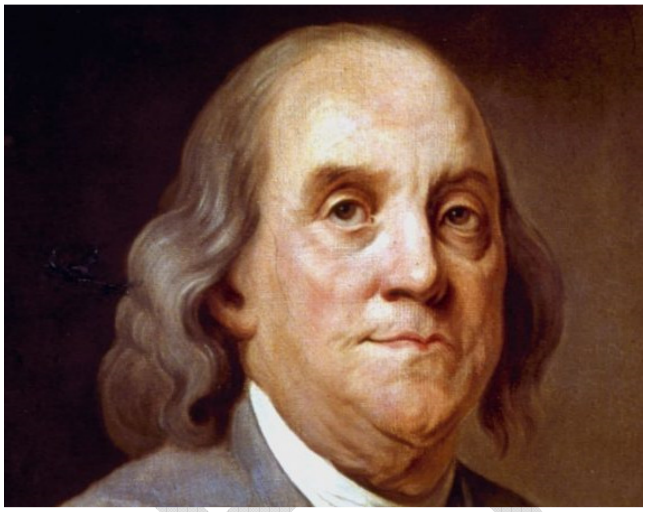
Stormwater Education, Training & Sector Development

SUMMARY OF THE PLAN



DRAFT for industry comment

24 April 2019



If you think education is expensive, try ignorance.

— Benjamin Franklin

Portrait image: OpenCulture.com

Environmental Communications Ltd

Environment & Sustainability Strategy &Training Institute

P O Box 147424, Ponsonby, AUCKLAND 1144

Phone: + 64 9 973 0880

Mobile: 021 631 843

E-mail: clare@clarefeeney.com

Web: www.clarefeeney.com

Citation

Water New Zealand (2019) *Stormwater Education, Training and Development: SUMMARY OF THE PLAN.* Prepared by Clare Feeney of Environmental Communications Ltd and the Education and Training Subgroup of Water New Zealand's Stormwater Special Interest Group. DRAFT of 24 April 2019 for industry comment.

Acknowledgement

The author gratefully acknowledges the prior work, expertise and generosity of Water New Zealand staff and the members of the Water New Zealand Stormwater Group Committee, as well as the excellent input from the wider industry during this three-year process before and during her involvement. Members of the Committee and Education and Training Subgroup are named in Appendix A.

How to use this Plan

This Plan is based on a lot of work carried out over several years. It proposes a lot more work for the sector – work the sector wants, much of which it is itself best placed to deliver.

To keep core information ready to hand for those who will step up to this work, the Plan is in three parts:

- The **Plan** itself
- a set of **Toolkits** with practical detail for working groups implementing the Plan
- a short set of **Appendices** for other information collected as part of this process.

A great deal of other work is going on, so working groups will be supported with several key documents referenced in the Plan, especially the 2018 and 2019 WSUD research team reports, ongoing work by the Ministry for the Environment and the Auditor-General's December 2018 report on Managing stormwater systems to reduce the risk of flooding.

This Plan can only be implemented by the kind of ongoing communication and collaboration that characterises the stormwater sector. An exciting time lies ahead.

Table of contents

Figures

Tables

Summary of the Plan

1. Context

Water New Zealand has been engaging with the stormwater sector over the last three years on the need for industry training. In late July 2018, Water New Zealand identified the need to develop a framework for a stormwater education and training programme and commissioned this Plan.

Drivers

Table A broadly indicates the very real costs to communities across New Zealand of inadequate education and training of stormwater professionals and low public awareness of stormwater-related issues. Most if not all of them are externalised: they are borne by public and private agencies in the infrastructure and development areas and in the end, by the people in every community across New Zealand. Documenting these builds the **business case** for industry training.

Brief

The brief is to deliver a **three-year executable Education and Training Plan** which provides:

- an adaptive framework adjustable to both the regional and national context, with a focus on training needs and delivery and how to fund the training
- tangible outcomes towards stormwater sector goals defined in industry feedback
- quantitative and qualitative methods to evaluate the effectiveness of the Plan.

This Plan is based on extensive engagement with the stormwater sector, which is made up of people who both want and can deliver identified training needs. It forms the basis for further engagement with the sector as a way of filling in the gaps in this first full draft and starting to implement its actions. It also will enable wider engagement with key players at a time of rapid change for the water sector.

Barriers

Work over the last 2-3 years shows the two biggest barriers to effective stormwater training are[1]:

- a lack of **structure** to the training
- lack of **funding** to develop and deliver training: volunteers can only do so much.

The Plan addresses these barriers. Refer to **Sections 1 and 2** of the full Plan.

2. Training framework

This Plan is fundamentally different from other environmental training plans because it:

- is based on a unique classification of training needs into the **water sensitive development cycle**. This allows a strategic overview of the entire stormwater and related sectors and their very different but interdependent skills, and provides a much-needed structure to help people search for the training they want. As new topics emerge, they can be readily fitted into the cycle
- draws on the skills in both the **stormwater** profession and the **professional training** sector
- integrates **evaluation** of the effectiveness of stormwater training into how catchment and asset managers monitor and evaluate the effectiveness of stormwater management generally, should they desire to do so.

Table A Indicative costs of inadequate stormwater education and training

Broad area	Examples of costs
Costs of rework and repair	Lack of training leads to the need for rework of inappropriate, poorly installed or maintained Water Sensitive Urban Design (WSUD) and other infrastructure. Lack of erosion and sediment control training leads to sedimentation of WSUD devices post-s224 sign-off.
Cost of delays	Consenting, tendering, funding, construction lead to avoidable price increases as a results of skills shortage and recruitment and retention issues.
Low productivity	Low productivity affects New Zealand's wider economy and the civil construction sector in particular, with lack of capacity and capability in the stormwater and wider horizontal construction sector an issue[2]. The skills shortage is now acute and is reflected in housing and infrastructure shortages and other issues.
Costs of poor outcomes of stormwater infrastructure	Without a core level of understanding at all stages of implementation, there are significant risks of poor outcomes in terms of environmental performance, CAPEX/OPEX costs, landscape amenity and public safety. Across New Zealand it is evident that a lack of information and technical capacity by decision makers, designers, contractors and operations staff is contributing to poor outcomes at all levels of WSUD implementation[3].
Cost of unintended consequences	More and more privately-owned and operated WSD systems will potentially fall back on the public sector to remedy. We need to think through the cost implications of directing (narrowing) policy to this end-future outcome without identifying possible consequences of far-future impacts.
Lack of investment in green assets	Poor outcomes with WSUD projects and practice ultimately leads to poor perception of the efficacy of such investment at both a political and public level. This in turn is resulting in inefficient investment of substantial public/private funds and a failure to realise the benefits associated with well executed WSUD[ibid]. Conversely, many studies show that where elected representatives and their communities understand the benefits they are willing to pay for them[4].
Costs of lack of national oversight and co-ordination	Gaps and duplication in information, effort and outcome monitoring with respect to stormwater management and training are avoidable costs to the country.
Unknown ROI of training	Across New Zealand it is evident that a lack of information and technical capacity by decision makers, designers, contractors and operations staff is contributing to poor outcomes at all levels of WSUD implementation[5]. Moreover, the costs and benefits of training in the sector are not tracked so we don't know how much of a problem the training is solving or the value of the solutions it delivers.
Cost of staff turnover	Staffing (subcontractor shortages / staff shortages / finding skilled staff / retaining staff / skill shortage / competition) was the top challenge/concern for respondents to a New Zealand survey of the construction sector[6]. Staff turnover is very expensive and is contributes to low productivity. Recruitment and retention is also an issue for Engineering New Zealand[7].
Costs of lack of alignment with wellbeing outcomes	There is an opportunity cost to the sector, especially to councils, in being unable to clearly align beneficial stormwater outcomes with the wellbeing indicators being developed by Treasury and Statistics New Zealand[8].
Lack of monitoring of wellbeing outcomes	Without robust assessment pf the costs and benefits of good (and bad) stormwater management it is difficult to measure attribution and contribution aspects of stormwater management to wider social, cultural, environmental and economic outcomes.
Risks of poor stormwater outcomes	Without a core level of understanding at all stages of implementation, there are significant risks of poor outcomes in terms of environmental performance, CAPEX/OPEX costs, landscape amenity and public safety[8]. Poor outcomes with WSUD projects and practice ultimately leads to poor perception of the efficacy of such investment at both a political and public level. This in turn is resulting in inefficient investment of substantial public/private funds and a failure to realise the benefits associated with well executed WSUD[8].

3. The water sensitive development cycle

Figure A depicts the water sensitive development cycle as a framework for categorising stormwater training needs across eleven areas of training on integral, specialist, sector and leadership skills.

Figure A The water sensitive development cycle as a stormwater sector development tool

Table B lists the training topics under each of the eleven headings. The numbering convention allows courses to be listed in a logical order at the beginning while enabling other courses to be added while maintaining the integrity of the development cycle approach. The use of icons and numbers also allows clear navigation of any future website and where a given workshop fits within the development cycle.

There is more information in **Section 3** of the full Plan.

Table B Integral and specialist stormwater training needs across the water sensitive development cycle

1. Integral skills	
See Toolkit 2 Tables 1.1-1.7	
1.1	Te Ao Māori and iwi engagement
1.2	Principles of sustainability and water sensitive design across the four wellbeings
1.3	Wellbeings Part 1: Introduction to cost sensitivity/life cycle costings, cost & benefit analysis of sustainability/WSD across the four wellbeings, including multidisciplinary engagement
1.4	Community engagement methods including positive communication & conflict resolution
1.5	Creativity and innovation
1.6	Train the Trainer training for environmental experts delivering non-NGICP training
1.7	Responsible procurement: how to prepare, respond to and deliver on tenders requiring outcomes across the four wellbeings/six capitals

Specialist skills	
2. Research, planning and governance (Toolkit 2 Tables 2.1-2.5)	
2.1	Research, planning and governance: from research & policy to consenting &compliance; statutory & other methods, catchment governance – beyond the three waters
2.2	Monitoring and evaluation Part 1: how to define desired outcomes and indicators across the four wellbeings
2.3	WSD Part 1: Water sensitive/green/low impact design overview and principles
2.4	Risk and resilience, including climate change effects, mitigation and adaptation
2.5	Wellbeings Part 2: Costs and benefits of WSD and its alternatives
3. Catchment assessment and planning (Toolkit 2 Tables 3.1-3.5)	
3.1	Catchment management planning
3.2	Ecology Part 1: ecological, cultural, archaeological and social analyses
3.3	Asset planning and management, including mixed green and grey infrastructure
3.4	Hydrology including flooding, and hydrological modelling
3.5	Hydraulics and hydraulic modelling
4. Design (Toolkit 2 Tables 4.1-4.2)	
4.1	WSUD Part 2: detailed design, from site characterisation to device design and sizing
4.2	Wellbeings Part 3: BPO/MCA: best practicable option/multi-criteria analysis of all wellbeings
5. Construction (Toolkit 2 Tables 5.1-5.3)	
5.1	WSUD Part 3: How WSUD infrastructure and devices operate; fit-for-purpose construction; inspection (checklists, what to look for)
5.2	Ecology Part 2: Protection, capture and/or relocation of sensitive terrestrial and aquatic species
5.3	Sensitive construction methodologies including subdivision-scale erosion and sediment control and small site erosion and sediment control + pollution prevention
6. Establishment: ecological and amenity aspects (Toolkit 2 Tables 6.1-6.2)	
6.1	Establishment and care of stormwater and other plantings, including weeding and replacement
6.2	Ecological re-establishment, including introduction/reintroduction of terrestrial & aquatic fauna
7. Handover (Toolkit 2 Tables 7.1-7.3)	
7.1	Legal aspects Part 1: subdivision-scale decommissioning of temporary environmental controls
7.2	Legal aspects Part 2: handover hold points, verification and rectification of asset condition
7.3	Legal aspects Part 3: small site-scale – environmental controls
8. Green and grey asset operation (Toolkit 2 Tables 8.1-8.3	
8.1	Green and grey asset operation with respect to desired levels of service
8.2	Ongoing point source contaminant control from industrial and other source premises
8.3	Ongoing diffuse source contaminant identification and control
9. Maintenance (Toolkit 2 Tables 9.1-9.3)	
9.1	Inspection: the art and science of inspecting green and grey assets on public and private land
9.2	Proactive maintenance: planning, budgeting, implementing, documenting, learning
9.3	Reactive maintenance: budgeting, implementing, documenting, learning
10. Monitoring and evaluation (Toolkit 2 Tables 10.10.5)	
10.1	How to measure and monetise the effectiveness of environmental training
10.2	The art and science of compliance monitoring
10.3	Wellbeings Part 4: How to measure the effectiveness of catchment and asset management plans across the four wellbeings as per the statutory analysis in 2.1 and 2.2
10.4	Wellbeings Part 5: how to capture costs and benefits at all stages of the development cycle to contribute to cost/benefit assessments & case studies
10.5	The learning organisation, evaluation and learning for adaptive and creative management

Strategic and leadership skills	
(To be added to the table in Toolkit 2 when fully assessed)	
11.1	Career pathing
11.2	Leadership training
11.3	Sustainability leadership training
11.4	MBAs (Masters of Business Administration)
11.5	Masters of Public Policy
11.6	Director training

4. Training priorities

Section 6 of the Plan suggests targeting high priority capability and capacity needs by:

- synergising with a **pilot training** programme funded by Auckland Council that targets design, construction, inspection and maintenance of water sensitive stormwater infrastructure, which address some of the top training needs listed by the industry
- proposing a method to **prioritise other training** to meet other urgent and expensive needs, as shown in **Figure B**
- providing a **self-help model** that enables the sector to deliver on its own training needs.

Figure B Training priority matrix

Availability of stormwater education or training			
LOW	Little or no education and/or training available at the time of writing		
MEDIUM	Some education and/or training available at the time of writing, or existing materials need to be adapted for the purpose		
HIGH	Good availability and suitability (with some updates) of education and/or training at the time of writing		
Urgency of stormwater education or training need			
LOW	Low identified need for training in the short-medium term		
MEDIUM	Training is needed in the short-medium term		
HIGH	There is a high priority for training in the short and medium term		
Priority of stormwater education or training STOP OR WAIT | SLOW | GO			
Availability of training	**Need for training**		
	LOW	**MEDIUM**	**HIGH**
HIGH	**SLOW**	**GO**	**GO**
MEDIUM	**WAIT**	**SLOW**	**GO**
LOW or N/A	**STOP**	**WAIT**	**SLOW**

A **pilot** training initiative is under way via an agreement between Water New Zealand, Auckland Council Healthy Waters department and the WSP Opus Environmental Training Centre to introduce the US-based Water Environment Federation's National Green Infrastructure Certification Program (NGICP). As set out in **Section 11** of the full Plan, the program delivers **certificate-level training** for people who construct, inspect and maintain green infrastructure (Steps 5 to 9 in **Figure A**). If the pilot results are favourable, this training could be rolled out to other parts of the country. The Council is also considering introducing its own training for the design of water sensitive infrastructure.

Many of the urgent training needs identified by the industry relate to highly specialised post-graduate training that is best met through **continuing professional development** (CPD), such as water sensitive design; policy, planning, standards, consenting, compliance, monitoring; GIS analysis, hydraulic modelling and software training; water quality, stormwater treatment, habitat and amenity; costs and benefits; and principles/overview/basics/case studies (see **Section 3** of the full Plan). Experts from within the industry itself, including research institutes and tertiary providers, are best placed to meet those needs. A structured approach to **CPD training** is thus the focus of this plan in the short to medium term.

5. Approach to the training

A self-help model

Section 10 of the Plan proposes a "self-help" model to developing and delivering stormwater training, with stormwater subject matter experts invited to prepare and deliver training with the support of professional trainers. This will ensure the training meets the outcomes demanded by best practice adult vocational training as well as identified performance gaps in best practice stormwater management.

A supportive model

Section 9 of the full Plan explains how several supporting elements need to be in place to sustain the program for the long term, as shown in **Figure C**. Training is seldom the only solution to a problem, and sometimes it is not the right solution at all. This plan highlights the needs for such other success elements to sustain the program.

Figure C Elements of successful environmental training programs (After Clare Feeney, 2013[9])

An aspirational model

Industry engagement has revealed an ardent and aspirational streak amongst stormwater professionals. Over half of the 2018 survey respondents agreed that there is 'no strategic pathway for our professional development in stormwater'.

As set out in **Section 12** of the full Plan, this finding points to the potential for stormwater professionals to make a difference within and beyond the stormwater sector by developing:

- **integral** skills that pervade the stormwater sector
- **expert** skills in the specialist phases of the water sensitive development cycle
- **strategic** skills that develop the stormwater and related sectors
- **leadership** skills that transform the rest of the world.

Business commentators are increasingly concerned about the lack of diversity at the highest professional levels, including boards of private and public sector bodies. Opportunities for stormwater professionals to bring their environmental expertise to the top tables need to be highlighted as a way of bringing sustainability into core business and government activities, for example by encouraging stormwater professionals to become CSOs (corporate sustainability officers), CEOs and directors in the public, private and nonprofit sectors.

An evidence-based model

In order to evaluate the effectiveness of this training plan, two models are recommended as set out in **Section 5** of the full Plan:

- five levels of evaluation of the effectiveness of training that are used by professional trainers all around the world. As shown in **Figure C**, the five levels range from trainees finding the training relevant and comprehensive, through their supervisors tracking observable workplace changes in practice, up to senior managers measuring the full financial return on investment in training
- a logic model adopted by the United Nations Environment Programme, which helps environmental managers assess the impact of their interventions on complex natural ecosystems, should they desire to do so as a result of this training initiative.

Figure C How professional trainers evaluate the effectiveness of their training: a globally accepted model Kirkpatrick and Phillips[10]

6. Delivering on the Plan

A lead agency

Water New Zealand is best placed to lead the stormwater training process, including quality assurance of the training and tracking its delivery and outcomes (**Section 11** of the full Plan). As the wider three-waters context starts to emerge, things will change, but Water New Zealand has the capability to build strategic partnerships to support the survival of industry education and training into this fast-approaching future.

Key partners

Predominantly engineering-based but increasingly less so, the multi-disciplinary stormwater sector has connections into many professional associations, from aquatic ecology and landscape architecture to planning and surveying. As set out in **Section 11** of the full Plan, professional associations and government agencies have much to offer as training partners and some of these relationships are already well-established.

Some potential partners are already well-equipped with systems and skills for the development and delivery of training, such as Engineering New Zealand, the Environmental Institute of Australia and New Zealand, Local Government New Zealand, the New Zealand Planning Institute and the Society of Local Government Managers, as well as some of their international equivalents. Other partners are at a strategic and policy level, such as Ministry for the Environment and any new urban water and infrastructure bodies.

Water New Zealand need to start engaging with these partners and other key stakeholders and decision-makers from July 2019 to support for the training plan and help fund it.

A funding model

The sector has endorsed a comprehensive need for stormwater education and training and can back this up with a powerful business case, as shown in **Table A**. Realistically, however, at least in the next 2-3 years (**Sections 10 and 13** of the full Plan), funding will need to come from:

- Water New Zealand itself
- members who have the most to gain from good training – mostly the larger councils
- members who can donate their time to help develop high priority training
- a commercial model of training where development costs are progressively recovered over time from training fees (some support for smaller councils and firms may be needed).

Table C summarises the funding options suggested by the industry.

Table C Summary of options for funding stormwater education and training

Source: 2018 Water New Zealand Stormwater Education and Training Water New Zealand survey

First priority (60 responses incl. comments)	No.	2nd priority (37 responses incl. comments)	No.	Third priority (16 responses incl. comments)	No.
1. Industry sponsors	10	1. Industry/other (unspecified) sponsors	8	1. Sponsors – unspecified	4
2. Certification thru existing professional bodies	9	2. Support through national professional bodies	6	2. Certification thru existing professional bodies	2
3. User pays	6	3. Certification thru existing professional bodies	5	3. Support through national professional bodies	2
4. Support through national professional bodies	5	4. User pays	4	4. User pays	1
5. Industry employers pay	3	4. Support through educational institutes	2	5. Other approaches	1
6. Council sponsorship	2	6. Industry employers pay	1	6. Support through educational institutes	1
7. Support through educational institutes	2	7. Collaborative approaches	1	7. Partnering with tertiary organisations including user-pays training	1

Other funding suggestions[11] include:

- central government could be urged to provide funding to support the many changes it proposes for the water sector, though this would not be available for some time
- regional and territorial councils could provide financial support with some cost recovery from trainees
- free education, presumably referring to tertiary (polytech and university education), as was done in Invercargill to encourage students to move there and more recently to encourage people to enrol in university education
- working with training providers to identify funding streams for short courses (see Table 9.2 in **Toolkit 11**).

7. Short and medium term actions

Given the current rapid developments in water sector governance, this plan recommends the future preparation of a **funding plan** backed up by a robust **business case** for **future professional development** needs to help the sector meet future challenges and opportunities.

2019-2020 budget

The current phase of industry engagement on stormwater education and training is ongoing and this phase of consultation will be concluded after the 2019 Stormwater Conference when an updated plan will be released.

To ensure this initiative maintains momentum, seed funding is sought the Stormwater Group for the purposes of industry education and training. As set out in **Section 13** of the full Plan, the funding will be used as shown in **Table D**.

Table D Key actions, funding and timeframes

No.	For action by the Stormwater Committee	Funding	Timeframe
1.	Give inkind support for the Auckland Council Healthy Waters pilot of the WEF NGICP (National Green Infrastructure Certification Program) and other non-NGICP training (water sensitive design)	Auckland Council	To December 2019
2.	Report to the Water New Zealand Board seeking endorsement of the Stormwater Education, Training and Development Plan and seed funding for actions for the 2019-2020 financial year	N/A	June 2019 meeting
3.	Request the Water New Zealand Board to fund sufficient travel and other expenses to enable members of the Stormwater Committee to work with Water New Zealand on enlisting support from councils and other key influencers and decision makers in order to obtain funding for stormwater training for the 2020/21 financial year and beyond	Water New Zealand	1 July 2019 to 30 June 2020

As much as possible in the 2019/2020 and 2020/21 financial years, we also aim, with industry support, to:

- provide subject matter experts on prioritise topics with support to develop, deliver and evaluate CPD training in line with best adult vocational training principles and practice
- seek funding and other support from other interested parties as part of a longer term funding plan.

It is also important to encourage and track in-kind contributions that reduce the costs of training. In-kind contributions could include donation or sponsorship of things like training venues, printing, catering, transport to and from construction and other sites or hosting of live and pre-recorded webinars and other virtual training.

Longer term actions

Longer term actions are set out in the three-year Action Plan in **Table E**. There is more detail in **Section 13** of the full Plan. These actions are dependent on the availability of funding and new arrangements in the water sector.

The numbering of the steps refers to the United Nations Environment Program's integrated water management cycle. Water New Zealand has already completed steps 1-4 for this Plan, and required this Plan to deliver on Steps 5, 6 and 7 as follows:

1. Establish status: identify issues
2. Build commitment to reform
3. Analyse gaps
4. Prepare strategy and action plan
5. Build commitment to actions
6. Implement plan
7. Monitor and evaluate progress.

Some actions can be done concurrently and in the short term, much of Step 6 will be done before Step 5.

Table E Longer term actions to progress stormwater sector training

Actions in summary
Step 5: Build commitment to actions 5.1 Endorsement of this Stormwater Education, Training and Sector Development Plan 5.2 Funding plan 5.3 Governance and management plan 5.4 Partnership plan 5.5 Engagement and communication plan 5.6 Evaluation plan
Step 6: Implement plan 6.1 Engage with influencers and partners 6.2 Identify training priorities and engage with potential trainers 6.3 Engage with funders 6.4 Engage with existing tertiary and other providers as per priorities in updated plan 6.5 Develop training not currently available and adapt existing training as needed as per priorities 6.6 Deliver adapted and new training 6.7 Track plan implementation 6.8 Track external synergistic or confounding factors 6.9 Assess and adapt the Plan
Step 7: Monitor and evaluate progress 7.1 Track implementation outcomes 7.2 Adaptive management: update and recommit to Plan

8. Contents of the full plan, toolkits and appendices

The Plan

Toolkits: information to support working groups

Toolkit 1 Industry suggestions for stormwater-related training needs

Toolkit 2 Summary and gap analysis of stormwater training needs and providers

- Table 1 Needs assessment for integral skills that pervade the stormwater world
- Table 2 Needs assessment for specialist planning skills
- Table 3 Needs assessment for specialist catchment management skills
- Table 4 Needs assessment for specialist design skills
- Table 5 Needs assessment for specialist construction skills
- Table 6 Needs assessment for specialist establishment skills
- Table 7 Needs assessment for specialist handover skills
- Table 8 Needs assessment for specialist green and grey asset operation skills
- Table 9 Needs assessment for specialist maintenance skills
- Table 10 Needs assessment for specialist monitoring and evaluation skills

Toolkit 3 The ADDIE and SAM models for developing training

Toolkit 4 Types of training needs assessment

Toolkit 5 Capturing both formal and informal levels of stormwater education and training

Toolkit 6 A matrix to help build a gap analysis of stormwater courses from professional bodies

Toolkit 7 How professional trainers evaluate the effectiveness of their training

Toolkit 8 How catchment managers can evaluate the effectiveness of their plans: more about the orders of outcomes framework

Toolkit 9 How to develop good training that can be evaluated

- 9.1 Steps to developing training whose effectiveness can be evaluated
- 9.2 Developing “good” training
- 9.3 A team effort by the industry
- 9.4 Coping with multiple guidelines
- 9.5 Building in certification to a comprehensive training framework

Toolkit 10 Trial run of a priority-setting assessment

Toolkit 11 Detailed industry and other suggestions for training delivery

Toolkit 12 Criteria to assess and compare cost-effective methods of delivering training

Toolkit 13 New Zealand providers of stormwater education and training

- 13.1 Survey suggestions of training providers
- 13.2 Other training providers
    - Industry Training Organisations that confer formal recognition of stormwater-related learning and competence
    - Recognition of training and competence: available pathways through Connexis
    - Connexis apprenticeships in civil infrastructure trades
    - WSP Opus
    - Engineering New Zealand
    - NZ Planning Institute
    - NZIS
    - New Zealand Asset Management Support (NAMS)
    - New Zealand Institute of Highway Technology (NZIHT).
    - Personal and professional development opportunities for stormwater professionals

Toolkit 14 Overseas examples of stormwater education and training

Toolkit 15 Growing a pool of stormwater SMEs who can train

Toolkit 16 Train the Trainer Training for stormwater subject matter experts

Toolkit 17 The flipped classroom model

Toolkit 18 Other things that support effective training programs

Toolkit 19 Detailed industry suggestions for funding our training

Toolkit 20 About Learning Management Systems

Appendices

9. References

[1] Pers Comm, James Reddish 11 March 2019

[2] NZ Institute of Economic Research, NZIER (2013) Construction productivity: an evidence base for research and policy issues. NZIER report to the Building & Construction Sector Productivity Partnership, 5 July 2013.

[3] Ministry for the Environment (2018) The Opportunity for a National WSUD Capacity Building Program. A Thinkpiece prepared for a 25 July 2018 teleconference of the Outreach and Capability Building Subgroup about the Ministry for the Environment's Urban Water Principles Project.

[4] See for example Batstone, C. and Sinner, J. (2010) Techniques for evaluating community preferences for managing coastal ecosystems. Auckland region stormwater case study, discrete choice model estimation. Prepared by Cawthron Institute for Auckland Regional Council. Auckland Regional Council Technical Report 2010/012. Also, see Kerr, Geoffrey N. and Basil M.H. Sharp (2003) Community Mitigation Preferences: A Choice Modelling Study of Auckland Streams. Lincoln University, Research Report No. 256, May 2003 and many more recent reports.

[5] Ministry for the Environment (2018) The Opportunity for a National WSUD Capacity Building Program. A Thinkpiece prepared for a 25 July 2018 teleconference of the Outreach and Capability Building Water New Zealand about the Ministry for the Environment's Urban Water Principles Project.

[6] BDO (2018) The Construction Survey Report. A survey of New Zealand construction industry businesses conducted in April 2018.

[7] Interview with the Susan Freeman-Greene, CEO of Engineering New Zealand with Jesse Mulligan, 1–4pm, 14 September 2018. Listen duration 13′ :24″. Listen and download from https://www.radionz.co.nz/national/programmes/afternoons/audio/2018662565/engineering-in-new-zealand

[8] See https://treasury.govt.nz/publications/dp/wellbeing-frameworks-treasury-dp-18-01 and https://treasury.govt.nz/information-and-services/nz-economy/living-standards

[9] Clare Feeney (2013) How to Change the World – a practical guide to successful environmental training programs Global Professional Publishing, UK. See also http://www.clarefeeney.com/successful-training-programs-workshop/

[10] Kirkpatrick, D. (1998) *Evaluating Training Programs: the Four Levels.* Berrett-Koehler Publishers Inc. San Francisco. Find out more at https://www.kirkpatrickpartners.com/Our-Philosophy/The-Kirkpatrick-Model and (2) Philips, Dr J. J. (1997) Return on Investment in Training and Performance Improvement Programs. Butterworth Heinemann. Find out more at https://roiinstitute.net/.

[11] Pers comm from Allan Leahy to the Stormwater Subgroup