

## 5. Monitoring and review

Strategy	Implementation	Lead organisations	Supporting partners	Timing
<b>How do we measure our success?</b>	<ul style="list-style-type: none"> <li>Stakeholder meeting/s to identify funding opportunities and organise investment projects</li> <li>Trust investment in priority project/s</li> <li>Annual reviews to assess progress will include lead organisations reporting on WQIP actions. This will contribute to an overall key performance indicator of the Healthy Rivers Action Plan that aims for a measured improvement in the percentage of WQIP actions being implemented each year</li> </ul>	Trust with CoC and CoM	SERCUL, DoW, Main Roads, Water Corporation, CRREPA, 'Friends of' groups, DETWA, DEC, DoP, industry partners, schools	2013  2013 End of 2014, then annually

Catchment water quality is monitored fortnightly by DoW on behalf of the Trust. Catchment report cards are updated annually to highlight trends on nutrient concentrations and loads during that year. This information can highlight slowing trends or reductions of nutrients being contributed from the catchment into the Canning River.

It should be acknowledged that not all WQIP management strategies and actions will impact directly on improving water quality but aim to enable other activities to be implemented with increased success. Research and monitoring activities are examples of these 'enabling' strategies and are integral components of the implementation of the WQIP. A focus on 'enabling' strategies in the first year or two of WQIP implementation and the delay between on-ground action and ecological response results in a lag effect in the improvement of water quality in the catchment occurring as direct result of WQIP activities.



Revegetation near Bateman Park



Brentwood Main Drain



Waterbirds near Shelley beach

## Coastal Catchments Initiative

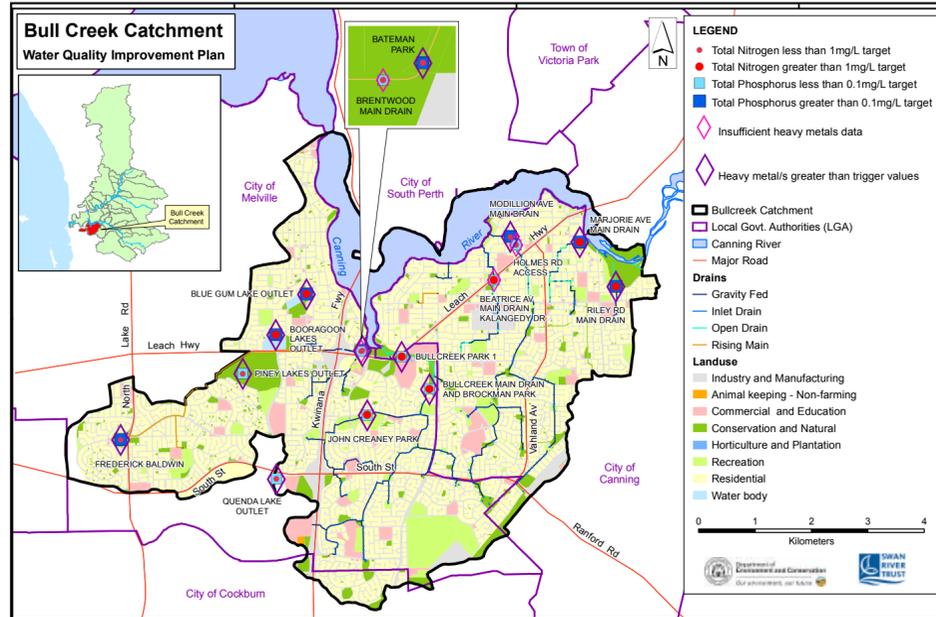
In June 2006 the Swan Canning river system was identified as a hotspot for water quality issues as part of the Australian Government's Coastal Catchments Initiative (CCI). The Swan River Trust was responsible for preparing the regional Water Quality Improvement Plan for the Swan Canning river system.

The regional WQIP provides a roadmap for reducing

nutrient levels in the river system using scientific models and decision support tools prepared under this new initiative.

Integrating science and management actions, an accredited WQIP will underpin a long-term investment strategy to improve water quality in known hotspots such as the Swan Canning river system.

## Map



Data from the Water Information (WIN) database between 2006 and 2012 was analysed to produce this map

## Further reading

Australian and New Zealand Guidelines for Freshwater and Marine Water Quality, Volume 1, The Guidelines (ANZECC, 2000) [http://www.mincos.gov.au/publications/australian\\_and\\_new\\_zealand\\_guidelines\\_for\\_fresh\\_and\\_marine\\_water\\_quality](http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality)

Healthy Rivers Action Plan (Swan River Trust, 2008) <http://www.swanrivertrust.wa.gov.au/science/program/Documents/healthy%20rivers%20action%20plan.pdf>

Swan Canning Water Quality Improvement Plan (Swan River Trust, 2009) [http://www.swanrivertrust.wa.gov.au/science/river/Documents/swan\\_canning\\_water\\_quality\\_improvement\\_plan\\_final\\_dec\\_2009.pdf](http://www.swanrivertrust.wa.gov.au/science/river/Documents/swan_canning_water_quality_improvement_plan_final_dec_2009.pdf)

## Partners

This WQIP was developed in consultation with the following stakeholders:



Caring for the Swan Canning Riverpark

November 2012

# Local Water Quality Improvement Plan Bull Creek Catchment



## Background

The Swan River Trust (Trust) and partners work to reduce nutrients and other contaminants entering the Swan and Canning rivers.

The Trust has developed and is investing in local **Water Quality Improvement Plans (WQIPs)**. These plans provide local government authorities and communities with a mechanism to prioritise recommendations and resources and seek funding to improve water quality in catchments contributing the greatest amount of nutrients. These plans should be reviewed annually and assessed after five years. Actions within WQIPs address nutrient and pollutant pathways through catchments from their source to the discharge point.

Analysis of recent data, modelling and other factors determined that Bull Creek Catchment is a priority catchment for WQIP development.

## Outcomes

The Water Quality Improvement Plan will:

- identify water quality issues and hot spots;
- identify environmental values of water bodies and water quality objectives required to protect the values; and
- identify and commit to a set of cost-effective management measures to achieve and maintain those values and objectives.

## Bull Creek Catchment Water Quality Improvement Plan

The Bull Creek Catchment is approximately 43.5 square kilometres and is located mostly within the cities of Canning and Melville. It is highly modified and converted to a largely piped drainage network with some intact natural wetlands and foreshore areas. The modified Bull Creek winds its way through a series of parks in the lower catchment before it discharges into the Canning River. The catchment has six other major outfalls discharging directly into the Canning River making water quality monitoring challenging. The drainage network receives water from stormwater runoff and groundwater, with Bull Creek at the lower end of the catchment flowing year round.

Most of the catchment has been cleared for urban residential, recreation, major roads with some business and light industry. There is remnant vegetation in the Bull Creek Reserve and key wetland sites such as Booragoon Lake, Blue Gum Lake and Piney Lakes. The foreshore length of over 10km provides a valuable asset and attracts many visitors to the Bull Creek Catchment.

One of the major issues in the catchment is nutrient inputs. Non-nutrient contaminants (e.g. hydrocarbons and heavy metals) in both the sediment and water within the catchment are also of concern. Specific issues include fertiliser use, lack of use of water sensitive urban design best practice, the impact from previous land uses including contaminated sites and farming, impact of light industry and septic tanks.



Steps to develop a local WQIP

## 1. Existing activities

What are we doing to improve water quality?

Local WQIPs link to existing projects and programs in the catchment. They draw together activities contributing to improved water quality and target future investments for optimal water quality outcomes. Projects are based on partnerships with local government, community and shared stakeholders.

Examples of key existing programs in the Bull Creek Catchment include:

### Community awareness and education

The Phosphorus Awareness Project funded by the Trust and delivered through South East Regional Centre for Urban Landcare (SERCUL) provides information on reducing nutrients. The cities of Melville and Canning have both been involved in the Annual Nutrient Survey for Local Government, attended Fertiliser Wise Fertiliser Training and supported Great Gardens workshops. A Clean Drains River Gains stencilling partnership resulted in nearly every drain in the City of Melville being stencilled.

There are many volunteer organisations that work with key stakeholders to implement on-ground actions. The local governments and SERCUL assist with planning, training and providing technical expertise. Both city councils have established environmental education centres, Piney Lakes Environmental Education Centre and the Canning River Eco Education Centre, which aim to increase understanding of the environment in the local area.

**Partners:** Cities of Canning and Melville, SERCUL, Canning River Residents Environment Protection Association (CRREPA), Friends of (Fo) Bull Creek Catchment, Booragoon and Blue Gum Lakes, Canning River Regional Park Volunteers (CRRP), Trust, schools

**Expected outcomes:** Medium improvement in water quality

### Water prioritisation and research

The City of Melville has recently achieved Corporate Milestone 5 of the International Council for Local Environmental Initiatives (ICLEI) Water Campaign. This campaign focuses on local government policies and practices to reduce consumption and avoid or decrease water pollution. The city is also a Waterwise Council.

The cities of Canning and Melville and the Trust are participants in the Cooperative Research Centre for Water Sensitive Cities program which aims to

harness storm water to overcome water shortages, reduce urban temperatures, and improve waterway health.

**Partners:** Cities of Canning and Melville, Trust

**Expected outcomes:** Medium improvement in water quality

### Rehabilitation programs

The foreshore has been a focus for restoration effort for many years, much of which has been funded through the Trust's Riverbank Program in partnership with the cities of Canning and Melville. This focus has been on erosion control, improving habitat and providing water quality treatment of drainage waters entering the Canning River. CRREPA has played a substantial role helping to implement Riverbank projects in the catchment. Outside Riverbank program funding, the cities have also invested significant resources into maintaining and rehabilitating the wetlands and foreshore areas.

There are several volunteer organisations that work with key stakeholders to coordinate and implement on-ground actions to improve wetland and catchment health. These groups also provide a vital educational role within the community. The Trust's River Guardians program involves the general community in river-based restoration activities.

**Partners:** Cities of Canning and Melville, SERCUL, CRREPA, FoBull Creek Catchment, FoBooragoon Lake and FoBlue Gum Lake, Canning River Regional Park Volunteers (CRRP), Trust

**Expected outcomes:** Medium improvement in water quality and high improvement in biodiversity

### Water quality monitoring

The City of Melville has sampled lakes and drains biannually in the catchment since 1996. Since 2007, an annual report has been produced to highlight concerns, trends and management recommendations. The Department of Water (DoW) has monitored water quality on behalf of the Trust since 2010. This sampling estimates concentrations and loads of total nitrogen (TN) and total phosphorus (TP) entering the Canning River from the Bull Creek Catchment.

**Partners:** City of Melville, SERCUL, DoW, Trust

**Expected outcomes:** Low improvement in water quality

## 2. Condition

What are the water quality issues in the Bull Creek Catchment?

### High levels of nitrogen, phosphorus and non-nutrient contaminants

In March 2010 a new catchment sampling project was implemented to address gaps in existing catchment monitoring, and to provide data for predictive modelling of the Swan Canning Catchment. This consisted of fortnightly sampling of 17 sites, including one in the Bull Creek Catchment at Holmes Road. A review of the location of monitoring sites across the catchments has recently taken place. This review concluded that the Holmes Road site will continue to be monitored because it represents the largest area of Bull Creek Catchment and has the longest data set. A second site (Beatrice Avenue Main Drain, Kalagedy Drive) has also been selected as it represents the median site for the catchment for nitrogen and phosphorus concentration. Most data for the City of Canning's area of the catchment is sourced from the 2006 Non-Nutrient Contaminant Program and the 2011 Swan Canning WQIP (SCWQIP) sampling program, so the addition of another regularly monitored site will provide more rigour to the current catchment monitoring regime.

Comprehensive surface water data is available for the City of Melville portion of the catchment since a monitoring program was established in 1996. In 2007 a partnership between the City of Melville, SERCUL and DoW standardised monitoring practices. This partnership led to a rigorous annual survey of 10 sites for a suite of parameters including physicals, nutrients and heavy metals. An annual report is produced to highlight concerns, show trends and provide recommendations for management.

The Bull Creek Catchment WQIP map provides a summary of TN, TP and heavy metal results from monitored sites within the Bull Creek Catchment. These sites range in sampling effort from 4 to 82 sampling events. The map highlights where median results for nutrient concentrations were above or below Healthy Rivers Action Plan (HRAP) targets. TN and TP were consistently high in some key wetland sites and drains. TN concentrations are a more widespread problem than TP with sites monitored along the Bull Creek Main Drain recording median TP values lower than the HRAP target of 0.1mg/L. This is compared to all other drainage lines recording high TP values. The map shows that all monitored sites recorded some heavy metals above *Australian and New Zealand Guidelines for Freshwater and Marine Water Quality* (ANZECC, 2000) or lacked sufficient data for analysis. Particular hot spots for poor water quality include the far eastern main drains (Riley Road and Marjorie Avenue), Brentwood Main Drain outfall and Booragoon and Blue Gum Lakes. Catchment-wide issues include low dissolved oxygen (DO) and high aluminium and iron concentrations. More isolated issues but still of concern include other non-nutrient contaminants such as zinc, mercury, lead and selenium, sediments collected near Bull Creek Main Drain and Brentwood Main Drain that are toxic to copepods and mussels. Other concerns are turtle deaths in lakes, and previous landuse impacts including from contaminated sites.



### Water quality issues and pollution indicators in the Bull Creek Catchment

Contaminants	Biotic/environmental
<ul style="list-style-type: none"> <li>Nitrogen and phosphorus concentrations and loads exceeding HRAP targets</li> <li>Non-nutrient contaminants concentrations exceeding ANZECC guidelines - catchment wide aluminium (Al) and iron (Fe), isolated copper, zinc and lead issues</li> <li>Metals in sediment – zinc, mercury, lead, selenium.</li> <li>Acid-sulphate soils need to be considered</li> <li>Potentially:                             <ul style="list-style-type: none"> <li>anionic surfactants</li> <li>polycyclic aromatic hydrocarbons (PAHs)</li> <li>petroleum hydrocarbons</li> </ul> </li> <li>Contaminated sites potentially impacting ground and surface water quality</li> <li>Previous land uses potentially impacting on water quality</li> <li>Pollution and spill events and the impact of gross pollutants</li> </ul>	<ul style="list-style-type: none"> <li>Serious environmental health issues for some significant lakes in the catchment</li> <li>Potential impacts from aluminium and iron toxicity</li> <li>Nuisance weeds and algae growth</li> <li>Soil and water discolouration including orange, muddy water (may be due to presence of iron bacteria or pollution events)</li> <li>Death/stress of desirable aquatic fauna for example turtles and mussels</li> <li>Low DO levels in key wetland sites</li> <li>Excess bird faeces</li> <li>Noxious odours</li> <li>Death/stress of native vegetation</li> </ul>

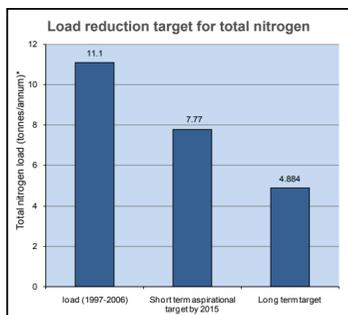
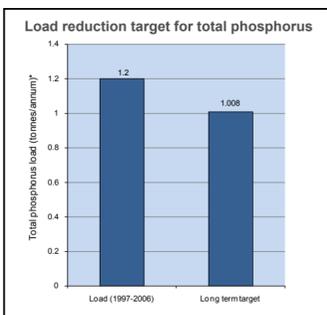
## 3. Values, objectives and targets

What water quality improvements would we like to achieve in the Bull Creek Catchment?

Values	Objectives
<b>Stream flow (SF)</b> Flows from the Bull Creek drainage network contribute to the freshwater flow of Bull Creek and the Canning River. Flows from the drainage network are also valued for the irrigation of active parks and recreation reserves.	<ul style="list-style-type: none"> <li>Improve water flow management to improve environmental values</li> <li>Maintain water flow to enable efficient irrigation of priority recreation sites</li> </ul>
<b>Cultural and spiritual (CS)</b> The catchment is culturally and spiritually significant to the whole community. This is demonstrated through a high level of community involvement and use of the catchment and foreshore. There are a number of Aboriginal significant sites listed on the Department of Indigenous Affairs Register of Aboriginal Sites and most of the waterways and wetlands hold specific value and stories for local Noongar people.	<ul style="list-style-type: none"> <li>Protect cultural and spiritual values of the catchment and adjacent foreshore and river</li> </ul>
<b>Aquatic ecosystem health (AH)</b> The Bull Creek Catchment is a highly urbanised catchment with local water bodies, reserves and the foreshore still providing valuable refuges for fauna. Bull Creek Reserve provides an opportunity to restore part of the catchment to a relatively natural state. The water quantity and quality of Bull Creek affects the Canning River ecosystem through delivery of stormwater with elevated nutrients and non-nutrient contaminants year round. Improved ecological health relies on urban-based education programs, increased use of best practice in water sensitive urban design, rehabilitation, improved industry practices and monitoring of point sources.	<ul style="list-style-type: none"> <li>Continue to reduce nutrient and non-nutrient input entering the catchment's drainage network via source control and discharge from Bull Creek and the smaller outfalls from the Bull Creek Catchment into the Canning River</li> <li>Enhance and protect aquatic ecosystem health values</li> </ul>
<b>Recreation and aesthetics (RA)</b> Reserves, lakes and the foreshore areas provide opportunities for active and passive recreation in the catchment. The foreshore and river also supports organised and commercial recreational pursuits. The river and wetland landscape and vistas attract many people to live in and visit the catchment.	<ul style="list-style-type: none"> <li>Educate users of the area about catchment-based issues</li> <li>Improve water quality to maintain and protect recreation and aesthetic values</li> <li>Maintain community expectations in the catchment</li> </ul>

Nutrient or non-nutrient contaminant		Target
Total nitrogen (TN)	Concentration target throughout the catchment at monitored sites	1.0mg/L (HRAP)
	Short term load reduction target - end of catchment	30% reduction by 2015 (HRAP)
	Long term load reduction target - end of catchment	56% reduction (SCWQIP)
Total phosphorus (TP)	Concentration target throughout the catchment at monitored sites	0.1mg/L (HRAP)
	Short/long term load reduction target - end of catchment	16% reduction by 2015 (SCWQIP)
Non-nutrient contaminants	Concentration throughout the catchment at monitored sites	Meet ANZECC trigger values (various) – 95% protection level*

\*The 95% protection level is reflective of the receiving body (the Canning River) being a slightly disturbed system.



The HRAP short-term target is to reduce TN and TP loads into the Canning River by 30% by 2015. As predictive modelling from the SCWQIP demonstrates, in the longer term a 56% reduction in annual load of TN and 16% reduction of TP is required to meet ecosystem health requirements. As a 30% reduction for TP is greater than the long term target (16%), only a long term target for TP load is required.

## 4. Implementation

How do we achieve the water quality targets?

Treatment train approach	Management strategies	Implementation	Lead organisations	Supporting partners	Timing	
<b>1 Prevention</b> Land use and planning ↓	<b>1.1 Review urban and infrastructure planning to incorporate Water Sensitive Urban Design (WSUD) best practice*</b>	1.1.1 Develop a checklist to ensure WSUD as identified in the <i>Stormwater Management Manual for Western Australia</i> is incorporated into strategic planning and retrofitting processes (AH)	CoC, CoM	Department of Planning, DoW, Trust	Starting 2013	
		1.1.2 Investigate in-house, locally-focused training opportunities in WSUD (AH)	CoC, CoM, Trust, DoW	SERCUL	Starting 2013	
		1.1.3 Identify and prioritise locations where disconnection of the drainage system, in accordance with current WSUD principles (retention/detention/treatment), could be incorporated into existing locations (AH)	CoC, CoM, Trust	DoW, SERCUL	Starting 2013	
		1.1.4 Devise a mechanism to ensure that any drainage system modifications where discharge to wetlands occurs are considered by the environment team and that they have the time and opportunity to suggest WSUD alternatives (AH)	CoC, CoM	DoW	Starting 2013-14	
		1.1.5 Develop a process to identify and incorporate WSUD opportunities into public open space strategy (AH, RA)	CoC, CoM, Trust	SERCUL	Starting 2013-14	
		1.1.6 Develop a policy to prioritise use of local native plants in landscaping of public and private (developers) landscaping (AH, RA, CS)	CoC, CoM		Starting 2013-14	
		1.1.7 **Explore options to improve the brownfield and infill of industrial premises in Willetton Light Industrial Area to use best practice WSUD design standards, including basin modification (AH)	CoC, CoM	SERCUL	Starting 2013-14	
	<b>1.2 Prioritise water quality in decision support systems</b>	1.2.1 Implement actions prioritised through International Council for Local Environmental Initiatives (ICLEI) (SF, AH, RA)	CoM		Ongoing	
		1.2.2 **Develop a work instruction to formalise the practice for fertiliser use specifying tissue and leaf testing requirements (AH, RA)	CoC, CoM		2013/2014	
		1.2.3 Support Cooperative Research Centre for Water Sensitive Cities program through ongoing investment; delegating internal organisational responsibility of the program to ensure research outcomes inform local initiatives; and participate in workshops (SF, AH)	CoC, CoM, Trust	Other industry partners	Ongoing	
		1.2.4 Review and update management plans for key wetlands in the catchment including Bull Creek Reserve, Quenda Wetland, Piney Lakes, Yagan Wetland Reserve and Shelley Foreshore Reserve (CS, AH, RA)	CoC, CoM		Starting 2013-14	
	<b>1.3 Continue and expand water quality monitoring</b>	1.3.1 Continue to fund water quality monitoring and analysis in the Bull Creek Catchment and seek funding to expand the program to the entire catchment and incorporate sediment and groundwater, where appropriate (AH)	CoC, CoM	SERCUL, Trust, DoW	Ongoing	
		1.3.2 **Review historical and current land use data, in particular contaminated sites, to identify potential sources of non-nutrient contaminants, prioritise areas requiring further investigation and identify management options (AH)	DEC, Trust	SERCUL, DoW, CoC, CoM	Starting 2013	
	<b>2 Minimisation</b> Ecoefficiency ↓	<b>2.1 Reduce council nutrients and non-nutrients output</b>	2.1.1 Maintain high attendance rates of local government officers at Fertiliser Care or similar training course (AH, RA)	CoC, CoM, SERCUL	Trust	Ongoing
			2.1.2 Extend best management practices such as soil and leaf testing, soil amendments and minimal water use to 100% of active public open space (AH, RA)	CoC, CoM		Ongoing
			2.1.3 Manage aquatic weeds in drains and compensation basins to prevent spread to wetlands and waterbodies (SF, CS, AH, RA)	Water Corporation (WC), CoC, CoM	SERCUL, Main Roads (MR), Department of Agriculture and Food	Ongoing
		<b>2.2 Reduce nutrient and non-nutrient outputs from business and community</b>	2.2.1 Expand and target residential education in efficient fertiliser management to reduce nutrient inputs (AH)	CoC, CoM, SERCUL, Trust	CRREPA	Ongoing
2.2.2 **Support education and projects in other larger high priority areas that are not managed by local government, for example golf courses, aged care facilities, shopping centres, school ovals (AH)			Department of Education and Training	Trust, SERCUL, CoC, CoM	Starting 2013	
2.2.3 **Encourage local governments to adopt an auditing process and implement education and awareness programs for small to medium enterprises to ensure compliance with the Environmental Protection Unauthorised Discharges Regulations 2004 and reducing stormwater contamination (AH)			CoC, Department of Conservation and Environment	SERCUL, Trust, CoM	Ongoing	
<b>2.3 Reduce nutrient and non-nutrient output from industry</b>	2.3.2 Explore opportunities to use findings from Small Factory Environmental Management Support Program (AH)	CoC, SERCUL	CoM	Starting 2013		
	<b>3 Reduction</b> Source control ↓	<b>3.1 Reduce outputs from community by education and involvement</b>	3.1.1 Raise community awareness of water quality and the connection of the urban drainage system to the Canning River through involvement in revegetation and education activities (CS, AH, RA)	CoC, CoM, SERCUL, Trust	CRREPA, Fo Bull Creek Catchment, Blue Gum and Booragoon Lakes	Ongoing
<b>3.2 Apply nutrient best management practices*</b>		3.2.1 Implement sediment and erosion reduction program utilising outcomes from the Trust's trial Southern River sediment and erosion project (SF, CS, AH, RA)	CoC, CoM, Trust, SERCUL	DEC, DoW, MR	Starting 2013	
<b>4 Amelioration</b> Conveyance and transmission ↓	<b>4.1 Improve urban drainage design and support structural nutrient intervention</b>	4.1.1 Support Friends groups to prioritise, develop and source funding for projects focused on water quality outcomes (CS, AH)	CoC, CoM, SERCUL	Trust, CRREPA, Friends of groups	Ongoing	
		4.1.2 **Increase biofiltration treatment and retention time in identified high priority sites (AH)	CoC, CoM	DoW, Trust, WC	Starting 2013-14	
		4.1.3 **Maximise localisation of road runoff treatment (AH)	CoC, CoM		Starting 2013-14	
		4.1.4 Where practical create vegetated buffer zone/verges and implement WSUD principles between waterways and turf in council reserves to help prevent herbicides, fertiliser and grass clippings entering waterways (AH)	CoC, CoM	DoW, Trust, SERCUL	Starting 2013-14	
<b>5 Treatment, reuse and disposal</b>	<b>5.1 Promote structural and non-structural intervention and controls</b>	5.1.1 Identify and investigate the benefits of the installation of pollutant trapping/treatment devices along roads in high risk areas, high traffic volume roads and/or immediately adjacent to high value wetlands or the river (AH)	MR, CoC, CoM	DoW, Trust, SERCUL	Ongoing	
		5.1.2 **Work with Main Roads to ensure work within drainage basins does not negatively impact on the water quality of the catchment and to discuss potential opportunities to include nutrient and non-nutrient stripping design options (AH)	MR, CoC, CoM	SERCUL, Trust	Starting 2013	
		5.1.3 **Seek opportunities for operating and capital projects to increase potential contaminant removal (AH)	WC, Trust, CoC, CoM	SERCUL	Starting 2013	
		5.1.4 **Improve practices to reduce the impact of spills in the environment, in particular provide annual pollution response training to key local partners; and ensure local Emergency Management Plans incorporate effective pollution response strategies. (AH)	CoC, CoM, SERCUL	DEC, Trust	Starting 2013	
	<b>5.2 Reduce nutrient input from sewage</b>	5.2.1 Full connection of existing and proposed industrial and residential areas where a sewerage scheme is available (AH)	CoC, CoM	Trust, WC, DoW	Ongoing	
		5.2.2 Manage wastewater scheme to reduce spills to the environment (AH)	WC		Ongoing	

\*new management strategy \*\*new management actions (SF) = streamflow, (CS) = cultural and spiritual, (AH) = aquatic ecosystem health, (RA) = recreation and aesthetics. Links to catchment values in Section 3.

The Bull Creek Catchment WQIP aims to reduce nutrient loads entering the Canning River through nutrient intervention and changed management practices. By using a treatment train approach, a combined set of management actions are applied along nutrient pathways to minimise nutrient and non nutrient contaminant losses to waterways.

The lead organisations and supporting partners will implement this WQIP in the constraints of existing budgets and resource levels. They are committed to working together to actively seek new resource opportunities.