NATIONAL COMPETITION COUNCIL'S 2004 WATER REFORM ASSESSMENT

The following report details Northern Territory Government progress in implementing CoAG water reforms against the National Competition Council's 2004 assessment framework.

3.1 WATER AND WASTEWATER PRICING

Cost Recovery and Consumption Based Pricing

Government Owned Rural Irrigation and Bulk Water Schemes

There are currently no publicly funded rural irrigation or bulk water schemes operating in the Northern Territory. The provision of Government owned water and wastewater services is limited to remote, urban and metropolitan areas.

Water Licence Fees

The costs of administering water resource management programs are funded directly by Government. However, the provisions of the *Water Act* allow the Controller of Water Resources to require a licensee to provide any data or information deemed necessary as part of the licence conditions and hence a significant proportion of monitoring and reporting costs are borne by licensees.

3.2 WATER MANAGEMENT: WATER ENTITLEMENTS AND PROVISIONS TO THE ENVIRONMENT

Establishment of Water Entitlement Systems

Progress with Developing Water Management Plans

The Ti Tree Water Allocation Plan was declared in August 2002 and continues to be implemented. The Plan is scheduled for review by August 2007.

The Darwin Region Water Allocation Plan is in preparation, with review and upgrading of regional goundwater resource modelling being the major current focus of activity. Community consultation will commence in the near future and is scheduled to allow recommendations for declaration to be put to Government in 2005. In the interim, rural development is guided and regulated in accordance with the draft water allocation framework for the region, which seeks to retain a contingent provision for the environment of at least of 80% of regional surface water and groundwater flows.

The development of the Daly Region Water Allocation Plan is currently underway, with regional water balances having been defined, major environmental water requirements researched and detailed audits of water use established. Community consultation is being undertaken in conjunction with the proceedings of the Daly Region Community Reference Group, which is expected to submit a draft Water Allocation Plan and a draft Integrated Regional Land Use Plan to Government later in 2004. In the interim, irrigation development

is guided and regulated in accordance with the draft water allocation framework for the region.

The Alice Springs Region Water Allocation Plan is currently being prepared, with the completion of regional water balances for the major groundwater systems the major focus of activity. Community consultation will commence in the near future, with declaration by Government scheduled for 2005.

Progress With Converting Existing Water Allocations to New Entitlement Systems

Under the provisions of the *Water Act*, the ownership of water resources is vested in the Territory Government. All extractions of water resources, other than as exempted by ministerial declaration, must be licensed. Minor regulatory amendments in 1999, designed to facilitate possible trading of entitlements, brought the licensing entitlement system in the Northern Territory into full compliance with water reform requirements. As a consequence, implementation of CoAG water reforms has not necessitated the conversion of water allocations, as is the case in other jurisdictions.

Systems for Registering Water Entitlements

Current water licence registry systems are appropriate in the context of property rights and limited trading opportunities in the Territory.

Water entitlements are registered on databases within the Department of Infrastructure, Planning and Environment. Third party interests are not included, but could be readily incorporated. However, licence holders and financial institutions have not requested this information to be registered in the Territory to date.

Trading markets for water entitlements are yet to emerge in the Northern Territory, although there is no legislative or regulatory impediment preventing this. Consequently, the need for internet-based registry systems will continue to be monitored and may be implemented at an appropriate time in the future. At this stage, public access to water licence information is provided on request through the *Information Act.*

Additionally, policy decisions arising from the proposed National Water Initiative may also prompt the establishment of more sophisticated public registers for water entitlements in the future.

Consistency of Water Entitlement Arrangement with CoAG Obligations

The Territory's water property rights regime is established in the *Water Act*. The provisions of the Act have previously been assessed as being consistent with CoAG water reform principles.

Provision of Water to the Environment

Progress in Implementing Water Management Arrangements for River and Groundwater Sources

Current progress on the development of draft and final water management plans is detailed in Section 3.2 - *Establishment of Water Entitlements Systems.*

Ti-Tree Region

The only water allocation plan declared to date is for the Ti Tree Region. Consumptive surface water use is limited to no more than 5% of stream flow at any time. No groundwater dependent ecosystems were identified during the development of the water allocation plan, but 20% of groundwater was reserved from allocation to consumptive use as a contingency. Further investigations to establish whether or not groundwater dependent ecosystems exist will be reported at the first review of the plan, scheduled to be undertaken by 2007.

Indigenous cultural values for groundwater in the region are being researched by the Co-operative Research Centre for Desert Knowledge. The findings of this research will be considered as part of the review of the allocation plan.

Daly Region

The recommendations that arose from specific research into environmental water requirements in the Daly River are being adopted in the preparation of the Daly Region Water Allocation Plan. The recommendations address the requirements for seasonal variability, frequency, magnitude and duration of river flows in particular. Additional scientific refinement of the findings is being undertaken by the Expert Reference Group to aid the Daly Region Community Reference Group in finalising the water allocation plan.

Community consultation processes for the Daly Region Water Allocation Plan is aided by the establishment of a public web-site to provide information and to facilitate community input to the development of the plan.
(http://www.ipe.nt.gov.au/whatwedo/dalyregion/refgroup/meetings/infokit.html).

Darwin Region

Available research into the environmental water requirements of wetlands and native woodlands in the Darwin Rural Area is being utilised to refine regional water balance models. It is anticipated that there will be negligible allocation of regional surface water for consumptive uses, in light of the historical low level of use of streams due to their small and highly seasonal flows. Ensuring the maintenance of groundwater dependent ecosystems remains the appropriate and necessary major focus of water allocation planning for the Darwin Region.

Progress on Scientific Research on Environmental Water Requirements

The Council was previously supplied with a copy of the Ti Tree Water Allocation Plan. It is not appropriate to provide copies of other regional plans at their current stages of development. As is already the case for the Daly Region, dedicated internet web-sites will be used for public information and consultation for the Darwin, and Alice Springs regional water allocation plans.

The need for additional research to better define environmental water requirements may be an outcome of regional planning work being undertaken for the National Heritage Trust and the National Action Plan for Salinity and Water Quality.

3.3 WATER TRADING

Current Trading Rules and Zones

Trading is currently only permitted in the Ti Tree Water Control District. There have never been any surface water licences granted in this district and none are ever anticipated due to the nature of stream flows in this arid region. The regional groundwater resource is managed in four distinct zones, with licences granted in only two of these.

Trading in water licences is only permitted in a Water Control District for which a Water Allocation Plan has been declared, and trading must be in accordance with that water allocation plan. Licensed entitlements may be traded in full or part, and the trade may be temporary or permanent. Other than the resource management rules that are specified in a water allocation plan, trading occurs freely as private transactions between buyers and sellers. Trade is concluded by amendment and/or grant of licence, following the supply of information on trade price, quantity of entitlement traded and duration of the trade.

Mechanisms to Avoid Adverse Environmental Impacts on River and Groundwater Health

Trading must be in accordance with a water allocation plan, which must include an allocation for the environment to avoid adverse impacts on river and groundwater health. The general rules applying to trading are as follow:

- inter-aquifer trading are prevented to avoid both resource sustainability and environmental impacts; and
- downstream trading in surface water licences permitted, however upstream trading will require approval on the basis that there is no risk of sustainability and environmental impacts.

Restrictions on Trade

Trade is restricted to water control districts, which are established where water use is at or near sustainable yields after allowing for environmental requirements. Trading markets are not viable outside water control districts, as relatively low levels of use in the Northern Territory mean that new licences can continue to be granted without adverse environmental impacts.

Trade within a water control district is restricted by the rules established in a water allocation plan. These rules inevitably encompass the physical, social and ecological constraints on trade that have been identified in consultation with the community.

Intrastate and Interstate Trade

No water licences have been traded in the Northern Territory to date.

Availability of Market Information and Trading Mechanisms

There are no mechanisms established to provide market information, reflecting the embryonic state of water markets in the Northern Territory. With increasing maturity, and declaration of additional water allocation plans, it is expected that such mechanisms will evolve.

3.7 PUBLIC EDUCATION AND CONSULTATION

Rural Cost Recovery and Pricing

As noted in section 3.1, there are currently no government funded rural irrigation or bulk water schemes in the Northern Territory.

Water Management Arrangements

The most significant change in water management in the Territory, arising from the CoAG strategic water reform framework, relates to the introduction of formal statutory processes for water allocation planning and trading in water entitlements. Public education in this regard is delivered through the community consultation processes that are fundamental to the preparation of water allocation plans and their subsequent implementation. This work continues with the Ti Tree Water Advisory Committee and the Daly Region Community Reference Group and will commence in the near future as public consultation processes are conducted as part of the development of the Darwin and Alice Springs regional water allocation plans.

The new curriculum guide was recently launched for Waterwise NT, which continues to operate as a primary water conservation educational and curriculum development program in Alice Springs. Schools participate in the program by meeting accreditation criteria, requiring increased water education content in the school curriculum, improved water management on school grounds and adoption of a school policy about better water management. A copy of the Waterwise NT Curriculum Guide is attached for information.

Waterwatch continues to operate as a community education program to facilitate involvement in wetland management and water quality issues.
http://www.lpe.nt.gov.au/care/waterwatch/home/default.html

Water Trading Arrangements

Trading arrangements only apply in control districts and are subject to the community consultation processes that are intrinsic to the development of water allocation plans.

New Rural Water Infrastructure

As noted in section 3.1, there are currently no government funded rural irrigation or bulk water schemes in the Northern Territory.

Waterwise NT Curriculum Guide

Water issues in the Alice Springs region can effectively provide the context and learning pathway for achieving a broad range of NT Curriculum Framework outcomes in a variety of learning areas. The Waterwise NT curriculum guide links outcomes in the NTCF to information, ideas, case studies and resouces found in the *Waterwise NT School Program and Resource Guide*.

How to use this guide

The Curriculum Guide is presented in tables for each relevant learning area (SOSE, Sci, T&D, Eng, Arts, Maths). Each learning area is divided into the relevant strands and/or elements. The guide provides a number of example *water focused topics* closely corresponding to NTCF indicators, that can be used as the pathway for achieving NTCF outcomes for a particular element or strand. The guide includes page references that link to relevant sections of the *Waterwise NT School Program and Resource Guide.*

Additional resources

The example water focused topics are designed to stimulate further ideas about using water as a context for learning. Although the Waterwise publication will provide a range of useful resources, many others can be readily sourced elsewhere. The *resource guide* chapter in the publication presents a broad range of additional resouces that can be found on the Internet, in education kits, books, videos or from other people and programs in the Alice Springs community.

Excursion Guide

Suggestions for excursion opportunities are presented for each relevant example water focused topic, indicated by the abbreviation in italics (see below). The excursion guide chapter in the Waterwise NT publication contains further details for a selection of excursion sites*.

CP – Ilparpa Claypans*

IS – Ilparpa Swamp*

WP – Wastewater Treatment Plant*

GW – Gap Waterhole

RC – Roe Creek Borefield

DP – Alice Springs Desert Park

WW – Wigley's Waterhole*

TS – Alice Springs Telegraph Station

EG – Emily Gap

CS – Coolabah Swamp

EC – Ellery Creek Big Hole

OP – Olive Pink Botanic gardens

Social Systems & Structures

SOSE

Element	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Time, Continuity & Change	- Examine the change in water use in Alice Springs from traditional indigenous uses to current uses. *TS,CP* **[Soc2.1,3.1]**	28-50	-	-	117	-	-
	- Investigate use of groundwater resources and how this has shaped development in Alice Springs (relate to development across Australia) *RC* **[Soc2.1,3.1]**	30-50	-	-	75-78	-	-
Indigenous Studies	- Reconstruct traditional indigenous ways of life in the arid environment, how did they find and manage water? *DP,CP,EC* **[Soc 2.2]**	28,29	-	-	-	-	-
	- Devise questions to ask a traditional indigenous guest speaker on their life. [**Soc 2.2]**	28,29	-	-	-	-	-
Civics, Governance & Social Justice	- Investigate the role of the NT Government water-related legislation and its impact on society (eg. The Water Act). **[Soc 1.3,4.3]**	31	53	-	-	144-148	161
	- Explore the influences on Government policies about water or wetlands. (Eg. The influence of Non-Government organisations in Alice Springs). **[Soc4.3]**	-	-	-	-	149-154	159-161
	- Appraise the issues of increasing the price of water or introducing water restrictions in Alice Springs. Examine different points of view, conduct a survey or stage a mock parliamentary debate. **[Soc 1.3,2.3,3.3,4.3]**	-	-	-	-	152,153	160
	- Demonstrate active citizenship by getting involved in water or wetland management.	-	-	-	-	-	155-191
Values, Beliefs & Cultural Diversity	- Examine group and individual values and beliefs and how these influence the way Central Australians use water. **[Soc 3.4]**	25-38	-	-	-	142-154	-
	- Explore the various ways different people and cultures use and value wetlands. **[Soc 4.4]**	-	-	-	101-118	-	-
	- Identify a moral / legal issue of significance to the community (eg. the price of water), gather information from a variety of vested interest groups and recommend a course of action. **[Soc 5.4,5+.4]**	43-47	-	-	-	152,153	160
Enterprise	- Examine the differences between people's *needs* and *wants* in relation to water. (eg. Tally or audit your water usage). **[Soc KGP3.5,1.5,2.5]**	22-38	-	-	-	-	163-170
	- Investigate the relationship between the price of water to consumers and the cost of water production to the Government. **[Soc 3.5]**	43-47	-	-	-	152,153	160

Environments

SOSE

Element	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Place Landforms & Features	- Illustrate the features of a wetland, waterway or built drainage system. Why are they important? Where are they located? IS,CP,WW [**Env KGP 3.1,1.1,2.1]**	-	52-56	-	94-116	-	-
	- Research and report on how land is used in the local region. How has it changed over time? How do the land uses effect water quality in wetlands? (eg, impacts caused by urban and agricultural environments). *GW, WW, TS, IS* **[Env 2.1,3.1,4.1,5.1]**	-	-	-	97-108 135-140	-	189-190
	- Examine the characteristics of catchments and wetlands in the landscape using maps and satellite images. *WW, TS, GW, EG, EC, CP* **[Env 2.1,4.1,5.1]**	-	-	-	94-116	-	-
	- Analyse and create a presentation based on the changing face of an environment (eg Ilparpa swamp or claypans). *IS,CP,* **[Env 4.1]**	-	52-69	-	109-140	-	189-190
Environmental Awareness & care	- Participate in activities to care for the local area (eg. save water or remove rubbish). **[Env KGP3.2,1.2]**	-	-	-	-	-	163-191
	- Research a local urban issue and formulate and implement/advocate solutions (eg, the sustainability of Alice Springs water supply, urban salinity in Alice Springs, or impacts of wastewater disposal at Ilparpa swamp). *RC,CS,IS,WP,CP* **[Env 1.2,2.2,3.2,4.2,5.2,5+.2]**	30-50	52-69	-	-	-	156-191
	- Report on or evaluate how the Arid Lands Environment Centre, the Alice Springs Desert Park or other organisation promotes environmental care. *DP* **[Env 2.2,3.2,4.2,5+.2]**	-	-	-	-	149-151	181, 183 189-190
	- Identify the perspective of stakeholders who want to use a resource for different purposes (eg, use of water resources, use of a wetland). **[Env 3.2,4.2,5.2]**	30-38	-	-	94-118	148-153	-
	- Examine the economic, political and technical responses to the issue of water consumption and availability in Alice Springs. *RC, Contact DIPE for info on wastewater reuse.* **[Env 5.2]**	30-50	57-67	-	-	144-154	156-161
	- Produce examples of how our values and customs may affect the choices that we make about the uses of natural resources. Eg, lifestyle choices on water consumption (How suitable are 'English' style gardens in Central Australia?). *DP,OP* **[Env 3.2,4.2]**	32-47	-	79-87	101-108 117-118	142,143	-

Natural Systems	- Explain the different stages that wetland insects go through in their development (eg. compare water beetles with dragonflies). *DP* **[Env 2.3]**	-	-	-	123-134	-	189-190
	- Identify and classify wetland organisms, construct simple food chains or describe interactions. *IS, WW,TS,CP,DP* **[Env KGP2,KGP3,1.3]**	-	-	-	123-140	-	189-190
	- Identify the function of adaptations of animals and plants to a wetland environment. *IS, WW,TS,CP,DP.* **[Env 3.3]**	-	-	-	123-140	-	189-190
	- Describe a habitat or natural system, create a model or investigate energy flows (eg, river, waterhole, claypan) *IS,CP,WW,TS,EC,DP* **[Env KGP3,1.3,2.3,3.3]**	-	-	72-88	94-140	-	189-190
	- Describe the nature and variation of the Central Australian climate and how this effects the lives of people and natural systems. **[Env 2.3]**	28-38	-	79-91	109-140	-	189-190
	- Explore the responses of people plants and animals to changes in a natural system, such as the changes to Ilparpa swamp caused by a 'human system' (sewage treatment) or cycles of wetting & drying. *IS, WP, CP,DP* **[Env 3.3,4.3]**	35-37	52-67	72-87	119-140	-	189-190
	- Discuss and investigate the water cycle. (How do people and wildlife interact with it?) *All excursion sites* [**Env 2.3,4.3,5.3]**	30-50	52-69	71-91	94-140	-	-

Enterprise

SOSE

Element	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Life Roles	- Investigate the types of careers and skills required in the natural resource management and water industry (eg. hydro-geologist, landcare facilitator, wastewater plant operator, driller, environmental scientist, flood forecaster, ranger). *WP,RC,DP,TS* **[Ent 4.2,5.2]**	30,45, 47,49,	-	-	114	-	-
Consumerism	- Examine the patterns of consumerism and consumption with regard to water in Alice Springs, how will current and historic use effect future sustainability? **[Ent 5.5,5+.3]**	30-50	-	-	-	-	159-161

SCIENCE

Working Scientifically

Sci

Element	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Planning	- List questions that will guide an investigation of water consumption rates or a wetland community. Predict outcomes of the investigation. *IS,WW,TS,DP,CP,GW* **[WS 1.1,2.1,3.1]**	30-47	-	-	119-140	-	189-191
	- Plan a study to test a hypothesis about the effects of pollution in a waterway. (What is the impact of pollution on water quality and diversity of water animals?) Ilparpa swamp is an excellent study site & the claypans can be used as a 'control.' *IS, CP,GW,* **[WS 3.1,4.1,5.1]**	-	63-67	-	119 -140	-	189-191
	- Design methods of measuring water consumption in various appliances at school (eg, irrigation system, shower, or evaporative air-conditioner). **[WS 3.1,4.1,5.1]**	30-47	-	-	-	-	162-185
Investigating	- Investigate and record observations of a waterway effected by pollution. Collect and present data on water quality, flora, fauna & human disturbances. *IS, GW* **[WS 1.2 – 5+.2]**	-	63-67	-	119-140	-	189-191
	- Investigate water consumption at school by conducting a water audit, or calculating rates of consumption. (eg, how much water does an evaporative air conditioner use?) Draw conclusions from results. **[WS 3.2 – 5+.2]**	30-47	-	-	-	-	162-185
Evaluating	- Reflect on the results of experiments about water consumption or pollution. Identify difficulties in data collection or accuracy. Make conclusions or suggest further experiments IS,GW, **[WS 1.3 – 4.3]**	30-47	63-67	-	119 -140	-	162-191
	- Compare results and conclusions from water consumption or pollution experiments to those reported in other studies or in scientific texts. **[WS 4.3,5.3]**	30-47	63-67	-	119 -140	-	162-191
Acting responsibly	- Based on scientific investigation and understanding: **[WS 2.4,3.4,4.4]**						
	▪ Take action to reduce water consumption at the school	30 –47	-	-	-	-	162-185
	▪ Design an improved stormwater system at the school that will reduce pollution	-	-	-	-	-	186-187
	▪ Create a communication campaign that educates other students about a water quality or water consumption issue	-	-	-	-	149-151	186
	▪ Develop a school policy about efficient water management	*14,15	-	-	-	-	14, 179
	▪ Share results of scientific investigations (eg. with the community, media, school newsletter, other schools, or environmental agencies).	-	-	-	-	149-151	186
	- Consider the ethical issues related with the finding that water prices could be increased to achieve sustainability of Alice Springs' water supply. *RC* **[WS 5.4]**	25-47	-	-	-	152,153	160
Science in Society	- Explore the way scientific understanding of Alice Springs water resources effects community and NT Government use and management of water. **[WS 3.5, 5.5]**	39-50	63-67	-	-	142-154	155-161
	- Examine & debate issues linked to protecting wetlands on pastoral leases, reducing impacts of sewage effluent, or reducing water consumption in Alice Springs. *WW* **[WS 4.5,5.5]**	39-50	63-67	-	119-140	142-154	-

Concepts and Contexts

Sci

Discipline	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Natural & Processed Materials	- Investigate observable features of water and its structure and properties (relate to its importance and uses). **[CC KGP2.1, KGP3.1,1.1,2.1,3.1]**	27-38	-	72-87	135-140	-	189-191
	- Examine the structure & properties of rocks in Central Australia. How can geology be used to predict water availability or quality in aquifers? *RC, EC, CS* **[CC KGP2.1, KGP3.1,1.1,2.1,3.1]**	39-50	-	88-91	-	-	-
Life & Living	- Investigate the adaptations of aquatic animals and plants that allow them to survive in a wet environment. (Compare adaptations with human technology). *IS, CP, WW, TS, EC, DP* **[CC 1.2 - 5.2]**	-	-	-	119-140	-	189-190
	- Explain the various stages that a wetland insect or a local frog species goes through in their development and lifecycle (eg. water beetle or water holding frog). **[CC 2.2]**	-	-	-	123-127 ,132	-	189-190
	- Report on a unique feature of Australia's biodiversity (eg. a wetland) through a study of a local area. *Excursions as above.* **[CC 2.2]**	-	-	-	109-140	-	189-190
	- Classify the diversity of organisms that are found in a Central Australian wetland (eg. use a taxonomic key). *Excursions as above.* **[CC 2.2]**	-	-	-	119-134	-	189-190
	- Collect or survey and compare plants found in the local environment (eg. wetlands) **[CC 2.2]**	-	-	-	119-122	-	189-190
	- Describe how the behaviour of living things respond to changing environmental conditions (eg. the behaviours of various organisms in response to a wetland drying out). **[CC 2.2,3.2]**	-	-	79-89	131-134	-	
	- Examine the relationships between organisms that inhabit wetlands (eg. predators & prey, mutualism, parasitism, herbivory). Construct a food chain or web. *Excursions as above.* **[CC 2.2,3.2,4.2]**	-	-	-	128-134	-	189-190
	- Investigate photosynthesis in a wetland – how to vascular plants and algae contribute to the food chain? What happens if extra nutrients are added? *IS,GW* **[CC 3.2,4.2]**	-	61-67	-	119,129, 130,137	-	-
	- Investigate the interactions between organisms in a wetland and the physical environment such as water quality. (Eg, how does dissolved oxygen effect fish and macro-invertebrates?) *Excursions as above.* **[CC 2.2,3.2,4.2,5.2]**	-	61-67	79-89	131-140	-	189-190
	- Examine and debate issues associated with biodiversity conservation (eg, impact of introduced mosquito fish *Gambusia*, human disturbance of Ilparpa swamp or cattle grazing on wetlands). *IS* **[CC 4.2]**	-	61-67	-	100-140	149-154	186-191

Sci

Discipline	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Energy & Change	- Investigate the forces and energy flows involved in the water cycle. **[CC 3.3]**	-	-	71-91	94-100	-	-
	- Examine the flow of energy and nutrients in a wetland food chain. Extend the ideas to the issue of 'bio-accumulation,' (eg. DDT). *IS, CP, WW, TS, EC, DP* **[CC 3.3]**	-	61-67	-	119-130	-	186-191
Earth & Beyond	- Use simple instruments to collect information on the weather, discuss patterns. **[CC 1.4,2.4]**	-	-	79-87	-	-	-
	- Describe changes that occur in the local environment (eg. to a habitat or landscape after rain). **[CC 1.4]**			79-87	110 –116	-	-
	- Investigate the effects of a dry and unpredictable climate on the availability of water for living things. **[CC 1.4, 3.4]**	-	-	79-87	110 –116 131-134	-	-
	- Collect information on the local landscape over a period (eg. features of a local wetland). **[CC 2.4]**	39-50	-	79-87	110-116 131-134	-	-
	- Describe the consequences on the environment of various land uses (eg. erosion & pollution in wetlands from pastoralism or urban development). **[CC 2.4]**	-	61-67	-	100-108	-	-
	- Explore the changes that have occurred to the Central Australian climate and geomorphology over geologic time. (How has this effected the flora and fauna of the centre?). *DP* **[CC 3.4,4.4]**	-	-	79-87	115,116	-	-
	- Examine the properties of aquifers in Central Australia. *RC, CS* **[CC 3.4]**	39-50	-	72-78 88-91	-	-	-

T & D

Strand	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Designing Producing & Critiquing	- Investigate a water efficient product (eg. shower rose), report on why the water efficient product is preferred over another and describe its benefits. **[DPC 1.3]**	32-37	-	-	-	-	172-188
	- Research the best options for design possibilities (eg. select a variety of drought tolerant plants for a water efficient garden). **[DPC2.2]**	32-37	-	79-87	-	-	172-188
	- Improve or change systems and reflect on the consequences (eg. system of oval & landscape watering). **[DPC 2.3]**	32-37	-	79-87	97-108	-	172-188
	- Conduct research in order to construct a design brief (eg. water efficient garden incorporating water-harvesting techniques). Use a collaborative approach. **[DPC 3.2]**	32-37	-	79-87	-	-	162-191
Designing	- Investigate the implications of alternative options for designing a proposal for one of the following: **[De 4.1,5.1]**						
	- water efficient garden	32-37	-	79-87	-	-	180-183
	- stormwater filtration system to prevent pollution / rubbish leaving the school.	-	52	-	97-108	-	186-187
	- water efficient shower rose or tap	32-37	63-67	-	-	-	174-176
	- greywater treatment and/or reuse system (eg, for evaporative air conditioning).	32-37	-	79-87	-	-	156,173 178(↑)
	- Develop alternative ideas in order to modify & improve designs (above). **[De 5.1,5.2, 5+.1]**						
Producing	- Produce one of the following by using a design brief & appropriate materials: **[Pr 4.1,4.2,4.3,5.1,5.2]**						
	- water efficient garden	32-37	-	79-87	-	-	180-183
	- stormwater filtration system to prevent rubbish leaving your school.	-	52	-	97-108	-	186-187
	- water efficient shower or tap	32-37	63-67	-	-	-	174-176
	- greywater treatment and/or reuse system (eg, for evaporative air conditioning).	32-37	-	79-87	-	-	156,173 178(↑)
	- Collect data on the performance on one of the designs (above) and use the results to make modifications and improvements. **[Pr 5.3,5+.3]**						

T & D

Strand	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Critiquing	- Consider the similarities and differences between water efficient and 'regular' appliances and evaluate according to criteria or by measuring performance. **[Cr 4.1,5.1,5+.1]**	-	-	-	-	-	172-185
	- Assess the environmental impacts of a real product or system (eg. toilet, shower or air conditioner), modify designs following assessments of performance. **[Cr 4.2,5.2,5+.2]**	43-47	63-67	79-87	-	-	163-185
	- Explore the social, financial and environmental influences on the development of 'water efficient' products (eg. shower rose, toilet, washing machine) **[Cr 4.2,5.2]**	25-48	63-67	79-87	-	-	172-185
	- Examine the relative importance of technology in reducing water consumption (eg. water efficient shower rose) versus the savings that can be achieved by behavioural change (eg. taking shorter showers). **[Cr 4.2,5.2].**	32-38	-	79-87	-	-	172-185
	- Prepare a multimedia report or presentation on the viability, suitability, costing and environmental effects of plant species selected for a landscaped garden. **[Cr 5+.3]**	43-47	-	79-87	-	-	180-183

Eng

Strand	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Listening & Speaking	- Speak to the class or a community group about a water issue (eg. how or why water is wasted, how to save water, looking after a wetland etc.). **[L/S 2.1,3.1,4.1,5.1]** - Make a video documentary about a water issue (eg. interview a variety of people). **[L/S 2.1,3.1,4.1,5.1]** - Produce a video 'advertisement' promoting water conservation (identify the audience, main messages, information and communication style). **[L/S 2.1,3.1,4.1,5.1]** - Debate an Alice Springs water issue. (Eg. wasted water; water restrictions; the price of water, appropriate school landscaping, enforcement of water regulations, is Alice Springs running out of water? **[L/S 4.1,5.1,5+.1]** - Invite guest speakers to talk about a local water issue. Ask questions, discuss and analyse the ideas, opinions and information. Take notes and critically summarise the main ideas or arguments. **[L/S 1.3,2.3,3.3,4.3]** - Analyse and discuss a water issue from the NT Government 'Hansard' (written record of spoken parliamentary debate). *See p. 154* **[L/S 5.3,5+.3]**	**All chapters** of the *Waterwise NT school Program and Resource Guide* provide relevant background information about water issues. Potential guest speakers are identified in the 'Helpful People & Programs' table in the *Resource Guide* chapter.					
Reading & Viewing	- Read and discuss the children's book 'Whizzy & Zacks Fabulous Adventures,' about the water cycle. **[R/V 1.1,2.1]** - Analyse a range of promotional material about 'saving water' discuss the intended audience and purpose. (eg, Websites, fact sheets , videos, brochures, posters). **[R/V 2.1,3.1,3.2,4.2]** - Read and evaluate the content, purpose and styles used within a range of written material about water issues. (eg. from the '*Waterwise NT School Program & Resource Guide*' newspapers, or Web-sites. **[R/V 3.1,3.2,4.1,4.2,5.1,5.2]**	**All sections** of the *Waterwise NT school Program and Resource Guide* provide relevant background information and writings about water issues. Numerous written and multimedia resources are identified in the 'water on the web' & 'Education Resources' tables in the *Resource Guide* chapter.					

Eng

Strand	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Writing	- Make a trip to a wetland habitat and then write a simple or more detailed written text about the experience. **[W 1.1,2.1]** - Write a story, poem or drama script about a water drop and its journeys through the water cycle, (eg, in a river, drain, ground water, clouds, ocean, lakes). **[W 2.1,3.1,4.1]** - Write a story, poem or drama script about the exiting world of a tadpole or other wetland creature (how does it have fun? What are the dangers?) **[W 2.1,3.1,4.1]** - Design and write a flier for a particular purpose (eg. informing the community about our water supply, or promoting water conservation ethics). **[W 2.1,3.1,4.1,5.1]** - Write an argument about an Alice Springs water issue. Use an essay or 'letter to the editor' style. (See numerous example topics in 'Listening & Speaking' debates above). **[W 4.1,5.1,5+.1]** - Write a guide with instructions about how to save water in the home, school or garden. **[W 2.1,3.1,4.1,5.1]**	**All sections** of the *Waterwise NT school Program and Resource Guide* provide relevant background information about water issues.					

Arts

Elements within strands	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Dance	- Explore the various states of water (solid, liquid & gas) through music and dance. Solid is virtually no movement, water involves a flowing dance with participants holding hands – gas goes totally wild! **[CrA KGP2.1 KGP3.1]**	**All sections** of the *Waterwise NT school Program and Resource Guide* provide background information about water issues that can be used as a context for exploring the Arts.					
Drama	- Interpret the movement of water creatures through drama or mime. **[CrA KGP2.1 KGP3.1]** - Role-play the different personalities and actions of people with conflicting views on how to manage a wetland (ranger, pastoralist, tourist etc). **[CrA 3.1, Dr 4.1]** - Devise a drama performance including costumes to interpret the high dramas of life for plants, animals and people in and around a temporary wetland. **[CrA 3.1, Dr 4.1]** - Explore and/or perform the environmental play 'Spencer the voice of water,' with costumes, lighting, sound music, dance and audience participation. *Contact Waterwise coordinator for details.* **[Dr 4.1,5.1,5+.1]** - Analyse the play script for 'Spencer the voice of water' to explore the messages and characters. *Contact Waterwise coordinator for details.* **[Dr 4.3,5.3,5+.3]**						
Media	- Create artworks for *National Water Week* or other event to promote messages about conserving water or wetlands (Eg, a poster or multimedia display). **[SkP 3.1, Me 4.1,4.2,5.2]** - Explore and compose sounds and images to create an artistic PowerPoint presentation to evoke feelings about pollution (or other issue) in wetlands. **[Me 4.1,4.2,5.2]** - Create a scripted video presentation or advertisement incorporating music, graphs, text or other art form in order to get a message across about saving water or looking after a wetland. **[Me 4.1,4.2,5.2]**						
Music	- Play and experiment with musical instruments to represent a wetland environment (eg, buzzing insects, frogs croaking, rustling reeds, running water, clapping thunder and rain splashing on the waters surface). **[CrA KGP3.1, SkP KGP3.1]**						

Arts

Elements within strands	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Visual Arts	- Design and make artworks that explore social issues by using painting, drawing, cut-out media pictures and text for display in the school (eg. 'save water' or 'stop litter pollution' messages) **[CrA 3.1]** - Combine images of water with images of its uses (eg, agricultural produce), or the issues associated with it (eg. photo of a dry well or pollution) **[CrA 2.1,3.1]** - Design and produce a collaborative mural or public artwork that reflects a socio-cultural issue or idea (eg, saving water, protecting wetlands from urban pollution). **[Va 4.1]** - Explore personal beliefs or opinions about a social issue to develop subject matter for artworks that convey meaning & values (eg, weeds strangling a wetland, saving water) **[Va 5.1]** - Explore the links between traditional Aboriginal art and dreaming. Explore the importance of water and its relationship with people and spiritual beliefs. **[Va 5.3]**						

Maths

Strand	Example water focused topics	Use & Supply	Wastewater Story	The Water Cycle	Wetlands & Ecology	Water Rules!	Action!
Spatial Sense / Space & Measurement	- Draw an aerial view / map of a local catchment area showing waterways and land uses (eg. residential, industrial & national park). Link places through drainage channels. **[SS 3.3]**	-	-	-	94-102	-	
	- Create an optimal design of a lawn sprinkler system by calculating the area watered by each pop up sprinkler. Determine the number and location of sprinklers. **[SM 4.4]**	32-37	-	-	-	-	180-183
	- Research the significance of a leaky tap by collecting data on the rate that water leaks and calculating the volume of water that will be wasted over a given time period. **[SM 4.3,5.3]**	32-37	-	-	-	-	175-176
Measurement & Data Sense / Chance & Data	- Calculate the volume of water in various storage facilities (eg. bucket, rainwater tank, sewage treatment ponds, potable water storage tanks). **[MDS 2.1]**	42	57-60	-	-	-	-
	- Compare and interpret data & graphs showing water consumption across sectors or uses in Alice Springs and in various other cities and towns for a comparison. **[MDS 1.5,2.5,3.5]**	32-38	-	-	-	-	-
	- Undertake the *school water audit* in order to graph and interpret results. Make recommendations based on findings. **[MDS 1.5,2.5,3.5]**	32-47	-	-	-	-	164-170
	- Collect data to establish the difference in flow rates of water in various appliances (eg, regular and water efficient shower rose). Graph results. **[MDS 1.5,2.5,3.5]**	32-37	-	-	-	-	164-178
	- Explain and apply part or all of the statistical investigation process (posing questions, collecting, presenting & interpreting data). Eg. Compare results of home water audits, or survey opinions about introducing water restrictions. **[MDS 2.5,3.5 CD 4.1,4.3,4.4]**	32-47	-	-	-	-	159-161 164-178
Number Sense / Algebra	- Use division to estimate how much water is consumed by each person in Alice Springs by dividing total consumption by population. Make comparisons with consumption in other regions to rate Alice Springs' water efficiency. **[NS 3.3]**	34,38	-	-	-	-	-
	- Interpret the ratios of water consumption per sector or use in Alice Springs. Use results to discuss the focus of water conservation efforts. **[N 5.1]**	32-38	-	-	-	-	171-185