Water Management Program

1. Scope

The Water Management Program addresses all the water used, stored and/or produced by the University in the following ways:

- Potable water;
- Stormwater capture and reuse;
- Rainwater capture and reuse;
- Reclaimed water (treated effluent);
- Wastewater (sewage);
- Permanent and perennial water bodies and systems;
- Reverse osmosis water;
- Small wastewater treatment systems (i.e. septic tanks); and
- Underground water.

The following waters are **excluded** from this program:

- State waterways;
- Sewage treatment plants;
- Swimming pools;
- Aquaculture ponds; and
- Agricultural irrigation systems.

Many of these items include Environmentally Relevant Activities (ERA's) and waters covered by the Controlled Activities Program.

2. Objectives

- To ensure that the objectives of the Water Management Policy are achieved;
- To provide conservation strategies by following environmental quality procedures;
- To introduce water minimisation practices through identification of problem areas;
- To ensure that all relevant licences, permits and approvals are in place for water management activities;
- To set procedures in line with Quality Management in order to provide The University of Queensland's "Best Environmental Practices" for water management;
- To determine The University of Queensland's environmental performance when judged against current environmental legislation and applicable licence conditions; and
- Conduct auditing programs of water streams to ensure compliance with environmental legislation, standards and guidelines and applicable licence conditions.

3. Water Consumption & Supply

3.1 Potable Water Supply

Potable water is a valuable natural resource and it should be used only in situations for which there is no substitute or where a substitute is not technologically or economically feasible.

Potable water is generally not used for irrigation on any UQ sites. If potable water is to be used for irrigation, it should be done so in accordance with current water restriction guidelines and or permits. Refer to the relevant local council guidelines for further information. Where possible potable water used for stock watering will be replaced with rainwater.

3.2 Stormwater Capture and Reuse

Stormwater is captured and reused at UQ sites via lakes and/or dams. The quality of the lakes can be compromised by people putting nutrients, chemicals, silt and other rubbish into the stormwater drains.

3.3 Rainwater Capture and Reuse

The collection and use of rainwater for toilet flushing and irrigation is practiced at some UQ sites. New University building designs consider the collection and reuse of rainwater for irrigation as well as toilet flushing.

3.4 Wastewater (sewage)

Wastewater refers to sewage produced on University sites. Currently wastewater is only reused at the Gatton campus where a Sewerage Treatment Plant is installed. The plant is an Environmentally Relevant Activity and the reuse of the waste water is managed under a site specific management plan. . Audits of the wastewater stream at St Lucia do occur at regular intervals to ensure compliance with the University Trade Waste Agreement which is held with the Property and Facilities Division.

3.5 Reclaimed Water (from Fairfield STP)

Reclaimed water sourced from the Fairfield Sewage Treatment Plant is currently used at the St Lucia campus to irrigate the ovals. For specific information on using reclaimed water for irrigation water see the Irrigation Operating Procedure. An irrigation management plan is held by the Sustainability Office, Property & Facilities Division.

3.6 Permanent and perennial water bodies and systems;

There are a number of water bodies at University sites which are used to store water which is then reused for irrigation and other purposes. See the Lakes Management Operating Procedure for further information.

3.7 Reverse Osmosis Water

Reverse osmosis is a separation process that uses pressure to force a solvent (water) through a membrane that retains the solute (salt) on one side and allows the pure solvent to pass to the other side. This process is best known for its use in desalinsation (removing the salt from sea water to get fresh water), but has also purified naturally occurring freshwater for medical, industrial process and rinsing applications since the early 1970s. Typically sent to sewer, this water can and is being reused in some processes at the University. The water is typically high in Total Dissolved Salts (TDS) and careful consideration needs to be given to how and where it is reused.

3.8 Small wastewater treatment systems

These include septic systems and systems used for sewer mining. There are a number of UQ sites which rely on septic systems.

3.9 Underground Water

Gatton Campus grounds use underground water supplies for irrigation, taken from either the Artesian or Gilbert 1 (Moonie) bores. For more information on water supply at Gatton refer to the Gatton Water Efficiency Management Plan.

4. Water Minimisation Strategies

Water minimisation strategies incorporate a hierarchical approach to water management. The strategy utilises the following four principles:

- **Source Reduction** is the most preferred strategy as it reduces the amount of water consumed. Reducing the use of potable water is also important for retaining good quality drinking water for consumption and other sensitive uses.
- **Recycling** involves the re-use of the water for other University purposes and may include once used potable water, reclaimed water, waste water and reverse osmosis water.
- **Treatment** of water refers to processing the water or wastewater so that the contaminant load is minimised. This includes the treatment of sewage by the localised sewage treatment plants and within the sewer mining treatment plants. Water can then be reused for other purposes or discharged to waterways by the Department of Environment and Resource Management (DERM) approval.
- **Disposal** (or discharge) of water into natural receiving waters is the least preferred option and is used when it is not feasible to use any of the above strategies due to environmental, economic and technological constraints.

Table 1 outlines the current water minimisation strategies that the University uses and the current application of these strategies. This list is not exhaustive and new ways of increasing the effectiveness of the strategies are being investigated and implemented.

Table 1. Water Minimisation Practices at The University of Queensland

Strategy	Process	Means	Results
Source Reduction (potable water)	Water reclamation & reuse	Stormwater is used for irrigation. Rain water is collected from roof tops for use in buildings for toilet flushing. Potable water used for cooling is reused for irrigation.	Reduction in amount of town water required for use.
	Control irrigation outputs	Computer controlled irrigation system.	Doesn't oversupply water for irrigation therefore reduces water consumption.
	Use of water reduction technology	Fit all toilets, urinals taps & showers in all buildings with water saving devices.	Reduction in amount of water consumed.
Recycling	Water reclamation	Treated wastewater normally discharged to river reclaimed for irrigation.	Improve resource utilisation (water not lost directly to natural system).
Treatment	Wastewater treatment	Sewage treatment plants handle all sewered effluent using best practice standards. Sewer mining is a new technique for recovering and treating effluent. Its application is currently being investigated.	Reuse for irrigation (refer above)
	Septic Systems	Treats effluent. Solids cleared and treated liquor to ground water.	Cleaner, less noxious discharge to natural systems.
	Effluent ponds for animal wastes	Wastewater treatment system and ponds and artificial wetlands are used.	Reduces BOD (COD), solids and some other parameters before discharge or reuse.
Disposal	Direct Discharge	Stormwater that cannot be contained on site is discharged to natural systems.	N/A

5. Water Efficiency Management Plans

Where they have been developed, individual campuses and sites operate under Water Efficiency Management Plans. These plans outline management strategies and actions specific to each site, not excepting the strategies outlined in this program, for water conservation on the campus/site to which it pertains.

Water Management Plans for UQ campuses and a number of other sites are available through the Sustainability Office, Property and Facilities Division.

6. Water Pollution/Contamination Controls

6.1 Grease Traps and Oil Arresters

All kitchen sinks at food outlets shall be discharged through grease traps in accordance with local authority by-laws. Other areas where there is oil content in wastes, such as garages and workshops, should be plumbed similarly.

6.2 Bunding and Freeboard

A bund is a wall used to contain or exclude liquid and liquid borne solids. Bunding and/or Freeboards shall be used at the following locations:

- Chemical stores;
- Effluent ponds;
- Feedlots
- Construction sites.

The bunded area and volumes will depend upon the design requirements. The Workplace Health and Safety Act (1995) specifies that bunding should be sufficient to contain 100% of the contents of the largest tank in a compound plus the volume displaced by tanks in the compound. For packages, capacity greater than the volume of the largest package and up to 25% of the aggregate quantity (depending on the class).

Freeboard is the excess capacity of a pond or lake that can be used to store excess water in the case of an emergency or an extremely high wet weather event. An approximate guide for freeboard capacity is 18 days storage of the input liquid (includes any continuos and/or regular discharges **plus** 90 percentile rainfall).

6.3 Stormwater Containment

Stormwater containment includes diverting, excluding and containing stormwater in structures such as artificial dams, lakes and tanks. It is important that stormwater is diverted and excluded from contaminated areas or areas where contamination is possible. Uncontaminated stormwater can then be directed to catchment areas where it can be used for other purposes such as irrigation and reduce the demand on towns water.

Table 2 Stormwater Containment at The University of Queensland.

Campus	Structure
St Lucia	Lakes and rainwater tanks
Gatton	Lakes, ponds, dams and rainwater tanks
Mt.Cotton Farm	Lakes and ponds
Pinjarra Hills Farm	Dams and ponds

Care must be taken that stormwater is not diverted from natural systems that require it.

6.4 Septic Tanks

Design specification and installation of septic tanks shall be in accordance with Section 10 of the Sewerage and Water Supply Act (1949)

6.5 Rainwater Tanks

Design specification and installation of rainwater tanks shall be in accordance with Queensland building and development codes and local council by-laws. As a minimum rainwater tanks must have:

- suitable measures to prevent contaminants from entering the rainwater tank having regard to the nature and level of contaminants within the locality;
- Suitable measures to prevent mosquitoes breeding in the tank and vermin entering the tank;
- Suitable measures to ensure that internal fixtures supplied from a rainwater tank have a continuous supply of water; and
- Suitable measures to prevent overflow from ponding under building floors or flood around foundations of buildings.

Water from a rainwater tank must not contaminate the potable water within a reticulated town water supply system.

6.6 Water Quality Standards

The Brisbane City Council has adopted for its potable water quality standards the Australian Drinking Water Guidelines 6, 2004 endorsed by the National Health and Medical Research Council. Refer to Part 3 "*Monitoring"* Section10.8 "*A Summary of Guideline Values"*

The Brisbane City Council is bound by the conditions of the licence for its sewage treatment plant at Fairfield to discharge treated effluent to the standard detailed in table A1.2. Treated effluent is pumped directly from the final treatment ponds at Fairfield to the effluent ponds at the St. Lucia campus. Treated effluent discharged by Fairfield STP should adhere to the quality described in Appendix 1, table A1.2. The University of Queensland conducts water quality audits on the main effluent lake used for irrigation at least monthly.

The *Queensland Water Recycling Guidelines December 2005* guides the use of recycled water from sewerage treatment plants in Australia. For further information see the Irrigation Operating Procedure.

7. Water Management

7.1 Water Volumes

Table 3 shows the typical volumes of reclaimed, reused or recycled water used throughout the year. It is anticipated that these will be maintained and increased if sustainable.

Table 3 Volumes of reclaimed and reused water used annually at The University of Queensland.

Campus	Water	Process	Quantity
St Lucia	Stormwater	Irrigation	35 megalitres per year
St Lucia	Reclaimed	Irrigation	12 megalitres per year
St Lucia	Rainwater	Irrigation, toilet flushing and cooling	0.5 megalitres storage capacity
Gatton	Reclaimed	Irrigation	120 megalitres per year
Pinjarra Hills	Stormwater runoff	Irrigation	180 megalitres per year

7.2 Water Monitoring & Audits

Monitoring will be undertaken when required and/ or as outlined in the operating procedures. Monitoring times may change depending on the water quality results.

It is the responsibility of the Manager Sustainability of the Property and Facilities Division to set up a water monitoring program when required.

Table 4. Water quality audits at The University of Queensland.

Campus	Situation	Description
St Lucia	Waste Water	Parameters as set out in Appendix 1
St Lucia; Gatton	Irrigation	Refer Operating Procedure for Irrigation.
St Lucia; Gatton; Pinjarra Hills Farm	Lakes	Refer Operating Procedure for Lakes Management
All sites	Rainwater tanks	Testing of Legionella and E-Coli as required.

7.3 Research into Water Usage and Practices

Part of promoting the best management of the community's resources is assistance and support, where feasible, of research into issues related to water usage, treatment and management practices. Property and Facilities works with the University Community and encourages students to conduct research which might be applicable to the operation and maintenance of University water supplies.

8. Training & Awareness

8.1 Training

It is the responsibility of the Heads of Schools and Centres, Managers of Farms and Research Stations and other Senior Officers to ensure that their personnel are adequately trained in environmental management issues. Refer to the training program for further information.

8.2 Awareness

The Sustainability Office, Property and Facilities Division promotes water management on campus and implements awareness programs to ensure that the University community is aware of their responsibility to conserve water and report water leaks. For more information on water awareness programs see www.uq.edu.au/sustainability

9. Reporting

All monitoring results are reported to the Manager Sustainability on an annual basis and the Sustainability Office is responsible for the investigation of any anomalies.

10. Budget

It is the responsibility of the Manager Sustainability of the Property and Facilities Division to allocate the appropriate resources to the water management program for the university on an annual basis.

11. Records

All documents issued with respect to water management are to be held by the Property and Facilities Division (St Lucia and Gatton) and/or farm and research stations as appropriate. The term documents, for the purpose of the water management program, refers to:

- Operational Procedures;
- Plans;
- Checklists;
- Reports;
- Notes/ Memoranda;
- Letters; and
- Invoices.

12. Water Process Responsibilities

The following table lists the responsibility of those at different levels in the University in regard to water management.

Table 6. Responsibilities

Responsible Person	Duties
Users and Employees	• Not to dispose of chemical wastes down laboratory sinks (unless accepted - refer to Chemical Waste procedure or trade waste guidelines at http://www.brisbane.qld.gov.au/bccwr/building_and_development/documents/permits_trade_waste_guidelines.pdf • Be aware of the water management procedures applicable to their workplace; and • Attend environmental management training seminars.
Heads of Schools and Centres, and Executive Officers	• Ensure that staff are aware of the water management procedures; • Arrange adequate environmental management training; • Ensure that water management is carried out according to The University of Queensland Environmental Management System and Water Efficiency Management Plans; and • Review water management as necessary.
Property and Facilities Division	• Provide technical and engineering advice regarding water management to The University of Queensland schools and centres; • Liaise with Heads of Schools and Centres, and Executive Officers to ensure that water management is effectively carried out at the University Campuses; • Minimise the use of potable water across all sites by implementing water efficient technologies and substituting potable water for alternative sources where it is technologically and economically feasible to do so; • Conduct water auditing and/or monitoring to trend consumption; • Ensure that bunding is built and maintained in relevant areas; • Develop and implement environmental management training; and • Develop and implement water efficiency management plans.

13. Contacts

The first point of contact in regards to any water management issue is the Environmental Engineer who is based at the St. Lucia campus with Property and Facilities Division: Phone: 3365 1587. Otherwise refer to contacts in each of the operating procedures.

14. Definitions

14.1 Waters

Under Section 4 of the *Environmental Protection Act, 1994*, **waters** means "Queensland waters".

14.2 Waste Water

Under the Guidelines for Sewerage Systems - Acceptance of Trade Waste, 1994, **domestic wastewater** is defined as "the water borne waste derived from human origin comprising faecal matter, urine and liquid household waste from closet pans, sinks, baths, basins and similar fixtures designed for use in private dwellings".

14.3 Trade Waste and Sewage

Under Schedule I b.2 of the *Sewerage and Water Supply Act 1949-1982*, the following definitions are given:

- **Trade waste** is defined as "The wastes from any industry, business, trade or manufacturing premises, other than domestic sewage."; and
- **Sewage** is defined as "The used water supply of the community: the term includes faecal matter, urine, household slops, and polluted waters."

14.4 Background Levels

The **background level** of a parameter of interest is defined as the concentration of that parameter would be observed if no activity which caused contamination (to any extent) had occurred. For example, the background level of COD of wastewater is equal to the concentration of COD in the tap water supplied by the council.

14.5 Non-point Source

A **non-point source** is a source of waste that is not directly regulated, is not mandated, and no permit can be held for its release. Examples of non-point sources of waste include:

- Urban runoff from unsewered urban areas;
- Unconfined pastures of animals;
- Runoff from range land; and
- Wet and dry atmospheric fallout over a water surface.

14.6 Irrigation

Irrigation is a means of supplying water to an area of land by utilising channels, pipes or sprinklers.

14.7 Secondary Treated Effluent

Secondary treated effluent is effluent which has undergone primary treatment (i.e. solids are removed from effluent via sedimentation or equivalent physical means) and is then further treated by means of biological flocculation, pond stabilisation or some other equivalent process that will remove organic matter. In most cases, the effluent will then undergo chlorination to eliminate any harmful bacteria and pathogens. This is termed "disinfected secondary treated effluent".

14.8 Rainwater Tank

Rainwater tank mans a covered tank or combination of covered tanks used to collect rainwater from a building roof.

14.9 Reticulated town water supply system

The reticulated town water supply system means a pipe network managed by a water service provider registered under the Water Act 2000 for delivering drinking water directly to premises.

15. References

- BCC - The Trade Waste Guide, 1995
- BCC - Industrial Liquid Waste Sewer Acceptance Criteria, 1996
- EPA - Environmental Authority (No. 5080000194) for Fairfield Sewage Treatment Plant
- The State of Queensland EPA- Queensland Water Recycling Guidelines, 2005
- NHMRC & ARMCANZ - Australian Drinking Water Guidelines 6, 2004
- Water Act 2000
- Workplace Health and Safety Act 1995
- Plumbing and Drainage Act 2002
- Environmental Protection Act 1994
- Environmental Protection (Water) Policy 1997

Appendix 1

Since there is no way of monitoring the source of sewage that enters treatment plants table A1.1 lists guidelines that the City Council encourages industry to adopt.

Table A1.1: Acceptance Guidelines for Municipal Sewage Treatment Plants.

PARAMETER	GUIDELINE VALUE	UNIT
BOD_5	Determined by Council	mg/L
Temperature	<38	°C
pH	6-10	
Grease and Oil (total)	200	mg/L
Ammonia as N (plus ammoniacal ion)	100	mg/L
Kjeldahl Nitrogen	150	mg/L
Total Phosphorus as P	50	mg/L
Sulphate as SO_4	2000	mg/L
Sulphite as SO_2	100	mg/L
Chlorine as Cl_2	10	mg/L
Aluminium	100	mg/L
Iron	100	mg/L
Manganese	100	mg/L
SPECIFIC ACCEPTANCE GUIDELINES FOR METALS		
Arsenic	5	mg/L
Cadmium	2	mg/L
Chromium (total)	20	mg/L
Cobalt	10	mg/L
Copper	10	mg/L
Lead	10	mg/L
Mercury	0.05	mg/L
Nickel	10	mg/L
Selenium	5	mg/L
Silver	5	mg/L
Tin	10	mg/L
Zinc	10	mg/L
Boron (as B)	100	mg/L
Bromine (as Br_2)	10	mg/L
Fluoride (as F)	30	mg/L
Cyanide (as CN)	5	mg/L
Sulphide - total (as S^2)	5	mg/L

Table A1.2 Environmental Licence Release Limits Fairfield STP

Release limit							
Quality characteristics	Minimum	Long Term 50th Percentile	Short Term 50th Percentile	Long Term 80th Percentile	Short Term 80th Percentile	Maximum	**Monitoring frequency**
BOD5				20 mg L^{-1}	30 mg L^{-1}	60 mg L^{-1}	Weekly
Suspended Solids				30 mg L^{-1}	45 mg L^{-1}	90 mg L^{-1}	Weekly
Total Nitrogen (until 31 December 2007)						120 mg L^{-1}	Weekly
Total Nitrogen (from 1 January 2008)						36 mg L^{-1}	Weekly
Total Phosphorus		10 mg L^{-1}	15 mg L^{-1}			30 mg L^{-1}	Weekly
pH	6.5					8.5	Weekly
Dissolved Oxygen	2.0 mg L^{-1}						Weekly
Faecal Coliforms		1 000 organisms 100 mL^{-1}	1 500 organisms 100 mL^{-1}	4 000 organisms 100 mL^{-1}	6 000 organisms 100 mL^{-1}		Weekly
Free Residual Chlorine						0.7 mg L^{-1}	Weekly
Methylene Blue Active Substances (MBAS)						2.0 mg L^{-1}	NIL
Phenolic Compounds						0.5 mg L^{-1}	NIL
Total Arsenic						0.1 mg L^{-1}	NIL
Total Cadmium						0.01 mg L^{-1}	NIL
Total Chromium						0.5 mg L^{-1}	NIL
Hexavalent Chromium						0.05 mg L^{-1}	NIL
Total Copper						0.1 mg L^{-1}	NIL
Total Lead						0.1 mg L^{-1}	NIL
Total Mercury						0.005 mg L^{-1}	NIL
Total Nickel						0.5 mg L^{-1}	NIL
Total Zinc						0.5 mg L^{-1}	NIL