



Government of **Western Australia**
Department of **Health**
Public Health

Innovations in Water Recycling

Richard Theobald
Manager
Water Unit

Legislation (Sewage/Recycling)

- Health Act 1911
 - Requires sanitary facilities in houses
 - Provision for Sewerage Schemes (LGA or others)
 - Sewer connection requirements + rating
 - Products assessment and approval
 - Biosolid disposal/reuse
- Health Treatment of Sewage and Disposal of Effluent and Liquid Wastes) Regulations 1974
 - Design build and installation

Sewage

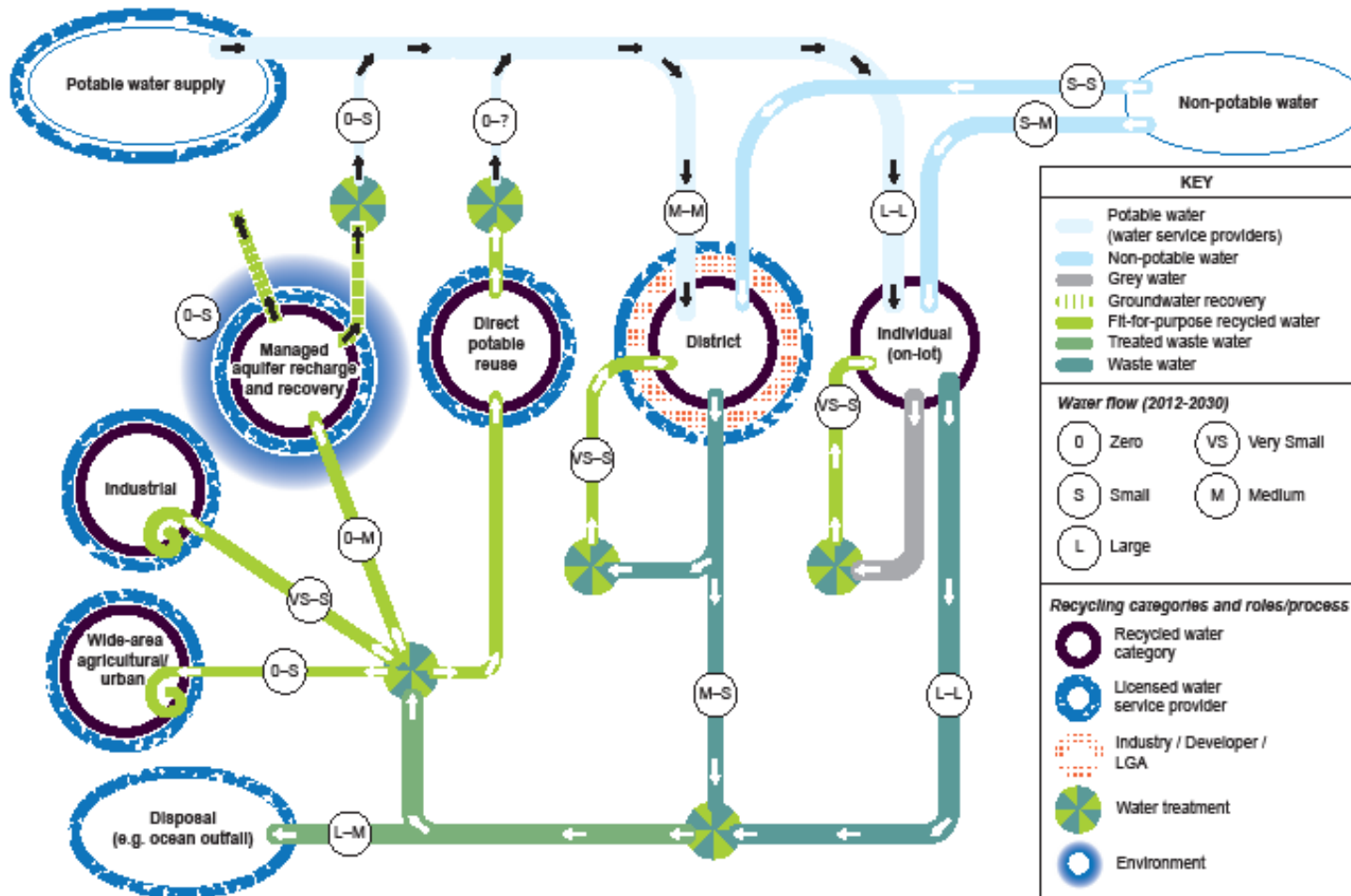
- Any thing or matter of sewage, nightsoil, faecal matter or urine, and any waste composed wholly or in part of liquid.

Recycled Water

- Any form of Ex-human use.
 - E.g.. Greywater, industrial wastewater, sewage, yellow & black water.
- Applies to single residential owner consumers.
- Includes design and build of distribution & treatment systems.
 - NH&MRC Phase 1 and /or 2 (Full risk application).

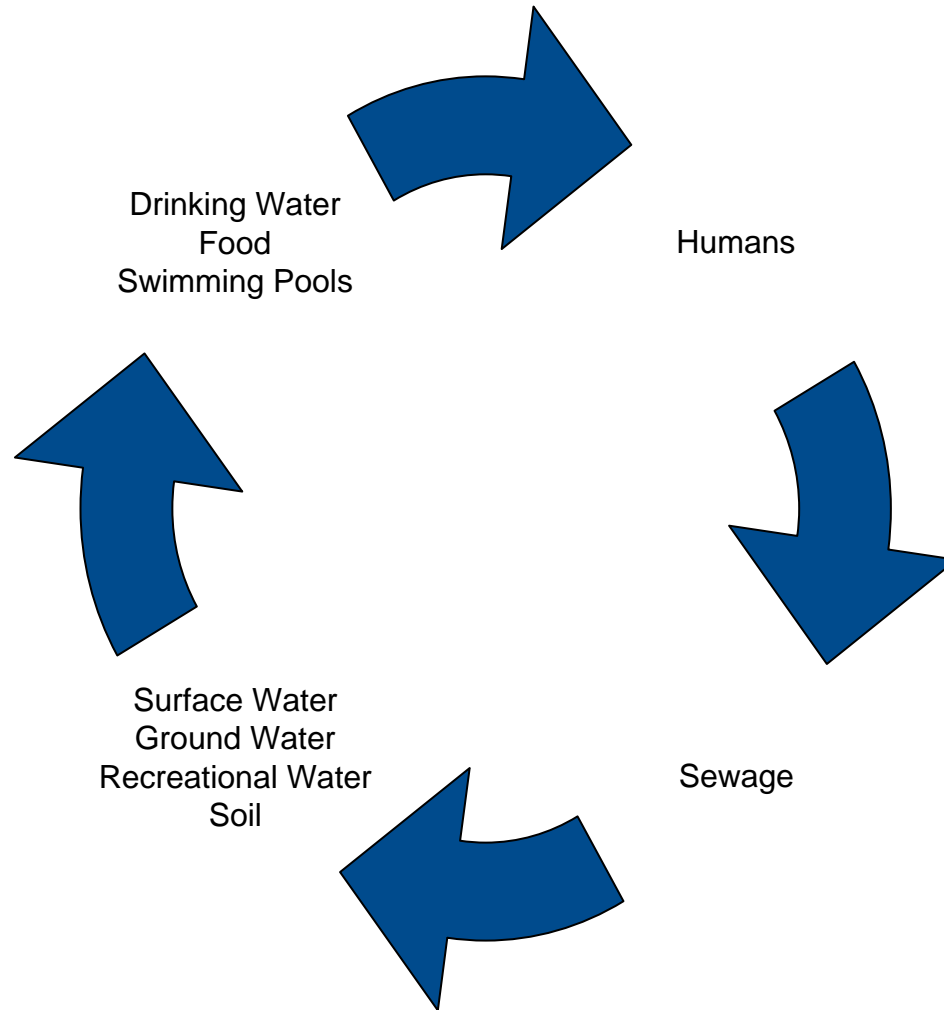
Water Recycling

(The water view)



Water Recycling

(The health view)



Major waterborne pathogens causing diarrhoeal disease since 1972

Year Identified	Pathogen	Comments on disease
1972	Small round structured virus (SRSVs, calciviruses)	Rapid onset acute diarrhoea often associated with vomiting in younger patients
1973	Rotavirus	Infantile diarrhoea often endemic in developing world
1976	Cryptosporidium parvum	Profuse water diarrhoea, important for water borne outbreaks due to chlorine resistance.
1977	Campylobacter spp.	Acute diarrhoea sometimes bloody
1983	Escherichia coli O157:H7	Acute often bloody diarrhoea, haemolytic uremic syndrome (HUS)
1992	Vibrio cholerae O139:H7	New strain of epidemic cholera

Cryptosporidium – Milwaukee, 1993

More than 4,000 people filed notices of injury with the city, 1,400 filed claims seeking damages of \$25 million. The city ultimately settled for \$100,000, General Chemical Corp., the water treatment chemical manufacturer, settled for \$1.5 million.

Unwell.

403,000

Doctor visits.

44,000

Hospitalised.

4,400

Deaths.

more than 100

Lost work or school days.

725,000

Lost wages & medical expenses.

\$96 million

New water purification system.

\$90 million

National Water Quality Management Strategy

NWQMS Policies & Principles (1994)

Groundwater Protection (1995)

Water Quality
Monitoring (2000)

Fresh and Marine
Water Quality (2000)

Drinking Water (2004)

Water Recycling – Phase 1 (2006)

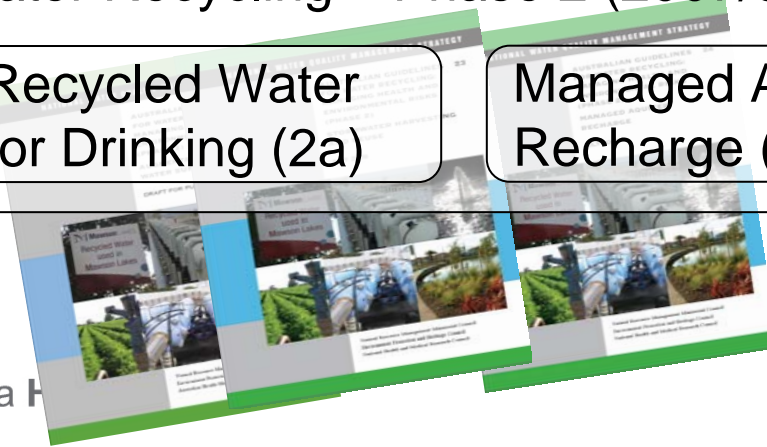
Water recycled from effluent, greywater

Water Recycling – Phase 2 (2007/8)

Recycled Water
for Drinking (2a)

Managed Aquifer
Recharge (2c)

Storm Water (2b)



12 Elements

Commitment to responsible use and management of recycled water

System Analysis & Management

2. Assessment of the recycled water system
3. Preventative Measures for recycled water management
4. Operational Procedures & Process Controls
5. Verification of recycled Water Quality
6. Incident & Emergency Management

Supporting Requirements

7. Employee awareness & training(7)
8. Community involvement & awareness (8)
9. Research & development (9)
10. Documentation & Reporting (10)

Review

11. Evaluation & audit
12. Review & continual improvement



Government of Western Australia
Department of Health

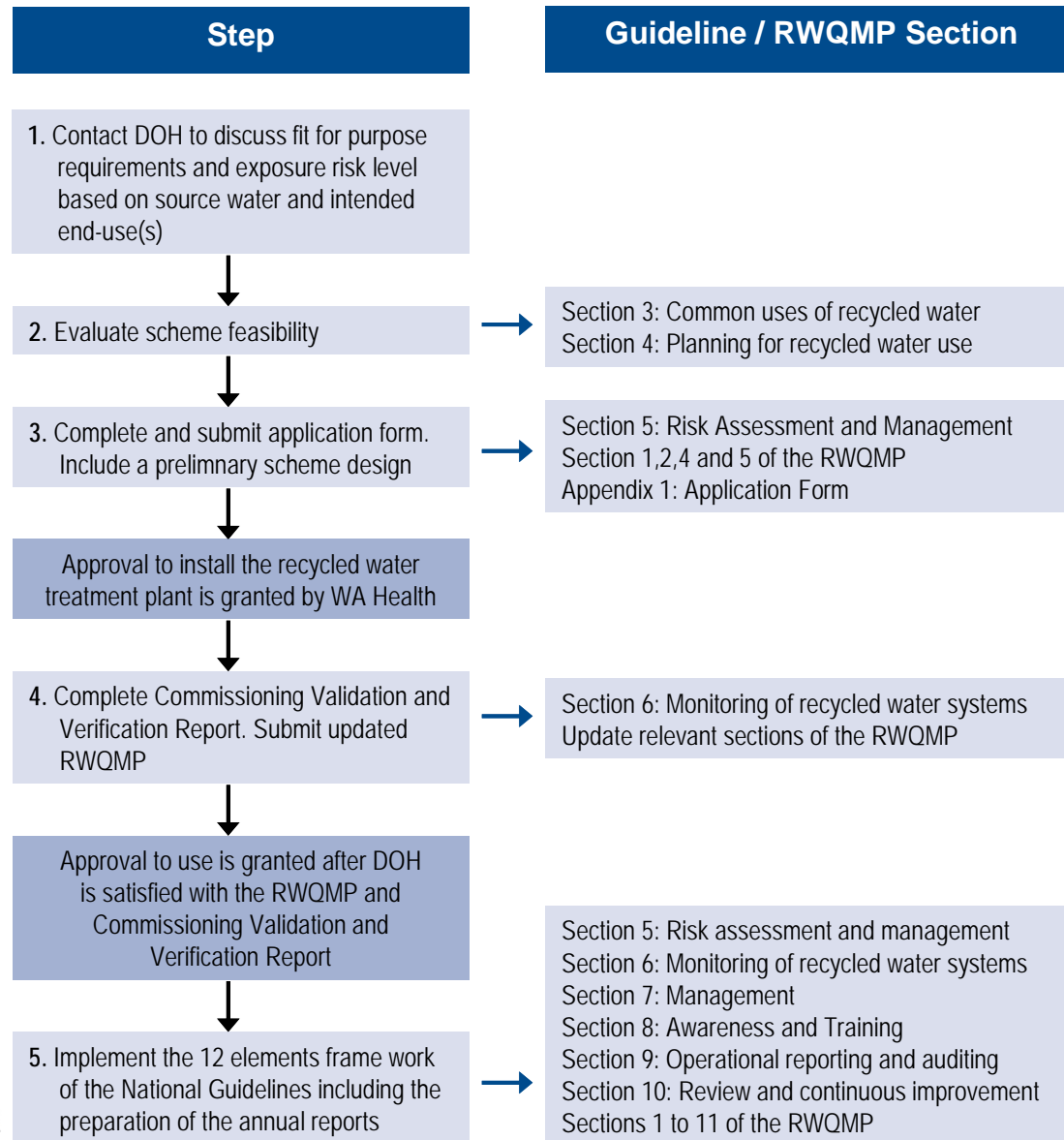
Guidelines for the Non-potable Uses of Recycled Water in Western Australia

August 2011

**Water Unit
Environmental Health Directorate**

Delivering a Healthy WA

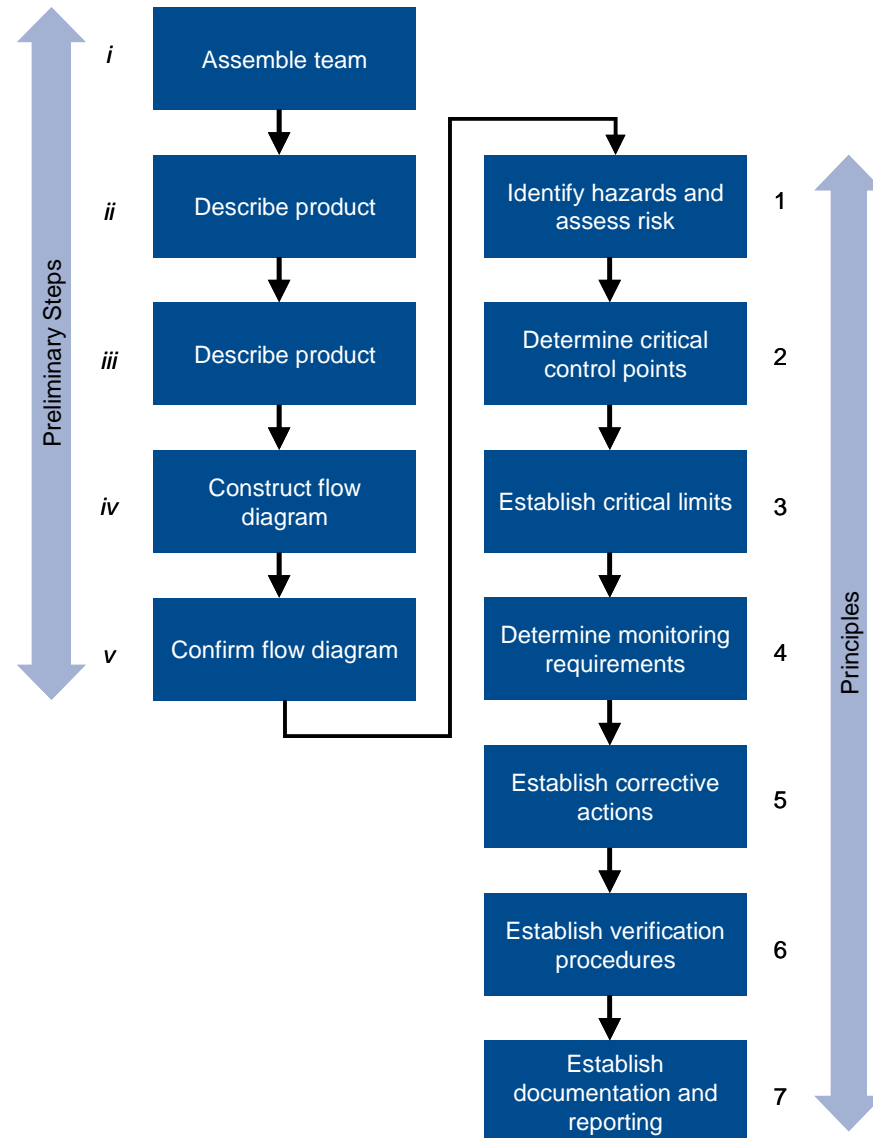
DOH Approval process

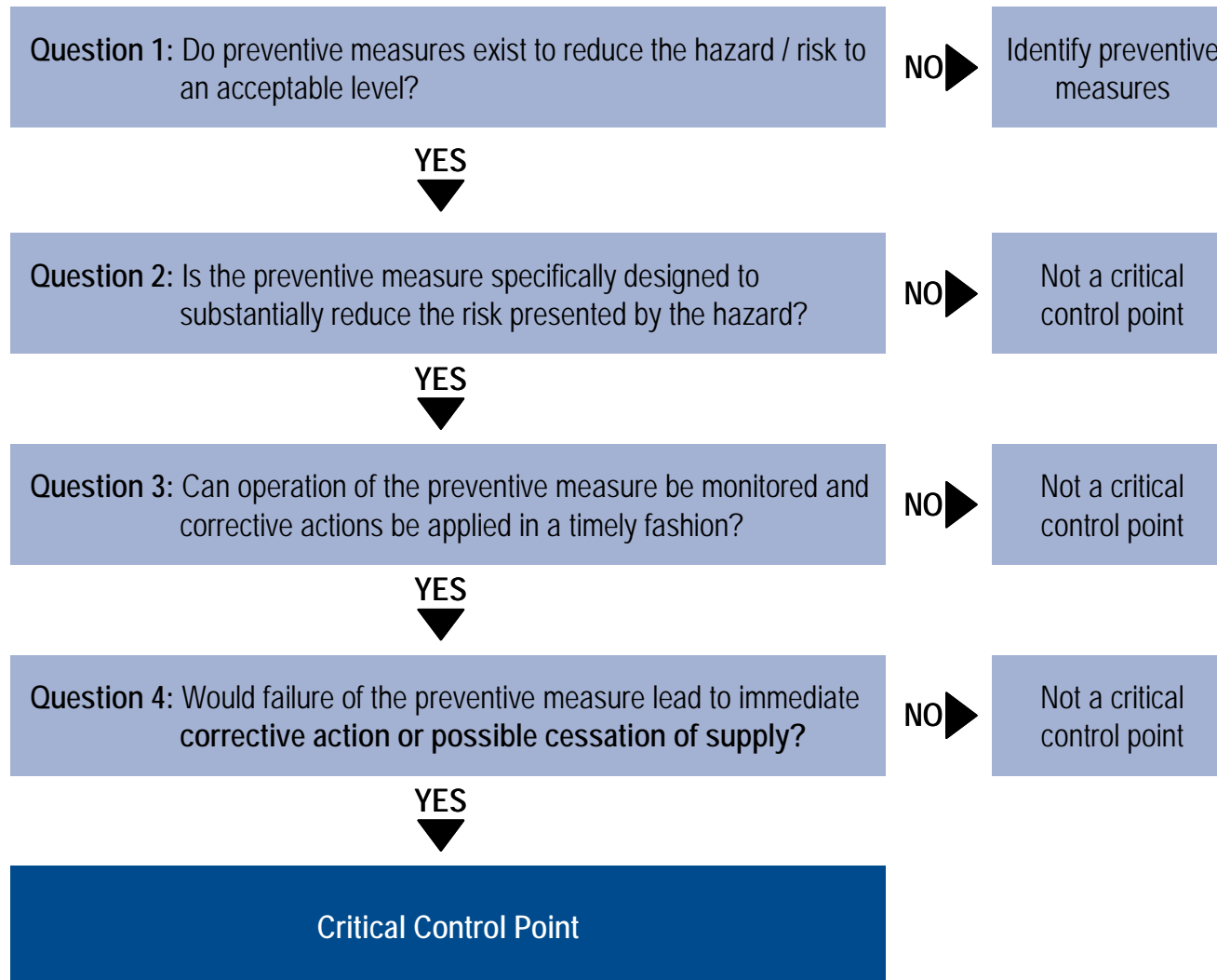


Standard Requirements

- Community Information packages (ongoing).
- Failsafe systems/backflow prevention devices.
- AS 3500 Compliance.
- Crossover responsibility/contracts.
- Distribution system maintenance.
- Plumber/Operator competency/training.
- Risk Identification (HACCP) & Catchment Management.
- Monitoring, management, maintenance and response systems.
- Alternate/Recycled Water Quality Management Plan.

HACCP Process





What is in a RWQMP ?

- Introduction – System Description
- Roles and responsibilities
- Water Quality Objectives
- System Assessment (Critical Control Points)
- Validation
- Operational Monitoring & Process Controls
- Verification (Assessable Monitoring)
- Supporting Programs
- Incident and Emergency Management
- Employee Awareness/training
- Document Control/Reporting
- Audit/Review/Improvement

INSERT LOGO IF AVAILABLE

**Recycled Water Quality
Management Plan
(RWQMP)
Name-F11
Recycling Scheme**

Version No: X

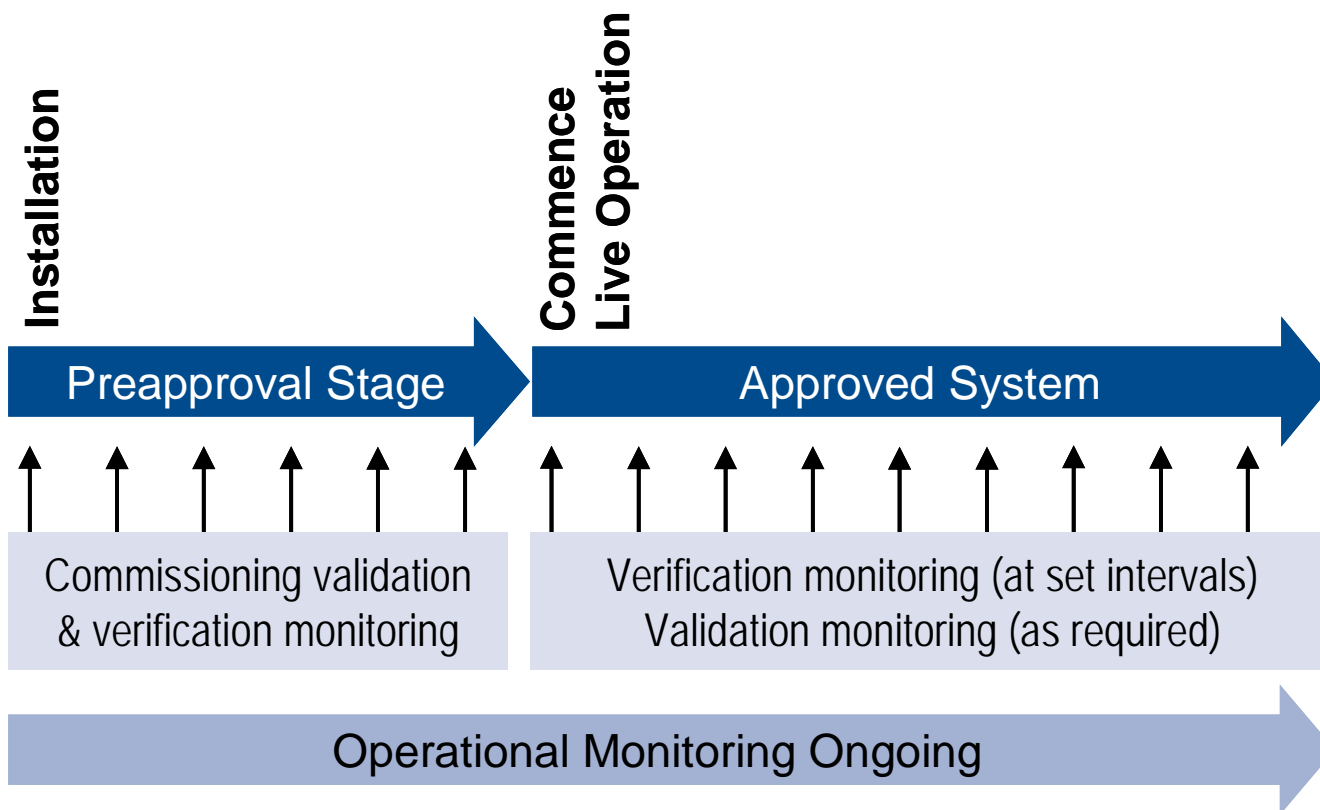
Date: day/month/year

- [http://www.public.health.wa.gov.au/cproot/4086/3/Draft_RWQMP_Template_WA_Health\(v1\).doc](http://www.public.health.wa.gov.au/cproot/4086/3/Draft_RWQMP_Template_WA_Health(v1).doc)

Monitoring

- Baseline – Information that underpins the risk assessment process
- Validation – Evidence to prove the recycled water quality management plan will work
- Operational – continual operational monitoring using surrogates
 - On line monitoring using surrogates
 - (e.g. turbidity, total organic carbon)
 - (e.g. disinfectant residuals, UV light transmission).
 - Critical limits - 24hr monitoring + alarms.
- Assessable monitoring to prove compliance.
- Verification – end product monitoring for individual health parameters based on system risk analysis.

Monitoring



Water Risk Rankings

Exposure Risk Level	Potential End Uses
High human contact level	<p>Residential dual reticulation (exposed to air), Multi-unit dwellings, Public toilets, internal use (toilets/dedicated laundry)</p> <p>Agricultural irrigation – unprocessed foods (e.g. salad crops)</p> <p>Urban irrigation with unrestricted access and application</p>
Medium	<p>Urban irrigation - some restricted access and application</p> <p>Fountains and water features</p> <p>Industrial use with potential human exposure</p>
Low	<p>Residential sub-surface irrigation</p> <p>Urban irrigation with enhanced restricted access and application</p> <p>Agricultural irrigation; processed foods</p>
Extra Low	<p>Woodlots, Subsurface reticulation (non-food crops)</p>

Recycled Water Compliance/Reporting

Exposure Risk Level	Compliance Indicators	Reporting Requirements
High	<ul style="list-style-type: none"> • E.coli (<1cfu/100ml) • Turbidity (<2 NTU) • pH (6.5-8.5) • Disinfection • Coliphage (<1pfu/100ml) • Clostridia (<1cfu/100ml) 	<ul style="list-style-type: none"> • Weekly • Continuous Online • Continuous Online • Continuous Online • Monthly • Monthly
Medium	<ul style="list-style-type: none"> • E.coli (<10cfu/100ml) • Turbidity • Disinfection • pH 	<ul style="list-style-type: none"> • Monthly • Continuous Online • Continuous Online • Continuous Online
Low	<ul style="list-style-type: none"> • E.coli (<1000cfu/100ml) • SS • Disinfection if used • pH 	<ul style="list-style-type: none"> • Monthly • Monthly • Continuous Online • Continuous Online
Extra Low	<ul style="list-style-type: none"> • E.coli (<10,000cfu/100ml) 	<ul style="list-style-type: none"> • 6 Monthly

Water Recycling Assessment Reports

Water Recycling Assessment Report Shire of

Scheme:	Shire
Location:	Western Australia
Wastewater Treatment Plant (WWTP):	
Contacts:	EHO Shire of
	eho@ wa.gov.au
Risk Exposure Level	Low
Assessment Date:	19 th April 2012

Key Findings from Assessment

References are to relevant sections of the *Guidelines for the Non-Potable Uses of Recycled Water in Western Australia, August 2011*. A table of these sections is included at the end of this report.

Key

	Compliant with Guidelines
	Not fully compliant - minor improvement required
	Non-Compliant - improvement required
	Not Applicable at time of Assessment

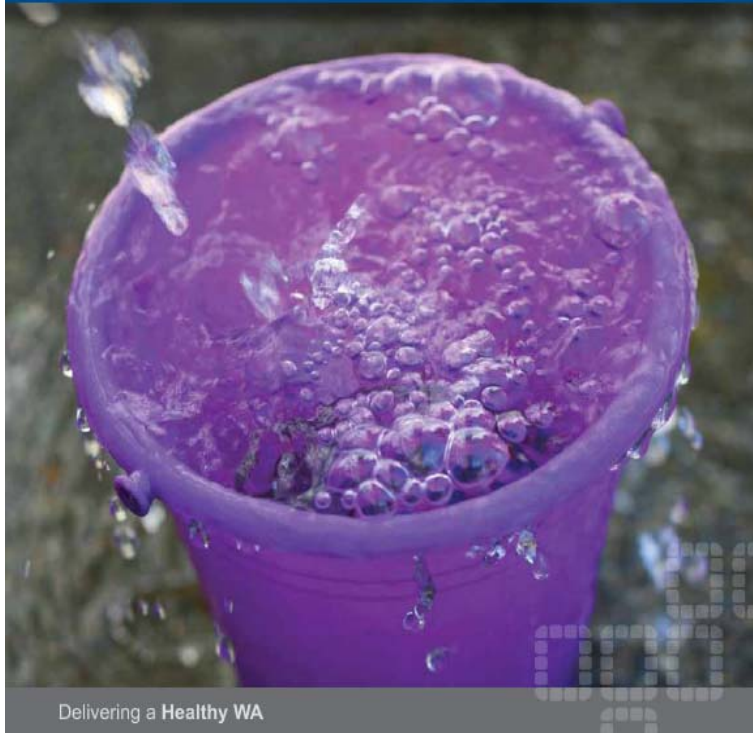
Assessed Item	Comment
WWTP performance	For the most part final effluent quality delivers within agreed parameters of water quality. E.coli concentrations well within limits of Low Risk category (i.e. average 280cfu/100mL). Average total phosphorus is high and average total nitrogen is falling low (based on signed agreement).
Supply Agreement (7.5)	Current agreement signed in 2007. AUQA doc number
Department of Health (DoH) approval (11)	**original document currently being sourced by at DoH.. Signed approval for extension of scheme to only is available
Disinfection WWTP	Chlorination compound is in good condition.

Water Storage 1 – Disinfection Shire Assets	Maintenance of Dam and its disinfection unit are of high concern. Capacity to operate the chlorination unit safely has been compromised and therefore chlorination of the dam over the 2011/2012 summer months was not possible. Dam at high risk of algal blooms in absence of adequate chlorination and nutrient load. Target chlorine residual is hard to achieve as (a) Chlorination dosing is compromised (b) High algal growth from mixing with high-nutrient water from nearby turkey nest dam. This dam received water from the from washing down trucks. The high nutrient load is likely to lead to high algal growth; and (c) Outlet and inlet appear to be in the same location which suggests inadequate mixing time for chlorine. Dense vegetation and erosion on dam banks. Potable water markings on recycled water pipes Question about the overflow system into the environment via the southern bank.
Water Storage 2 – Playground	Condition of tank and fencing is good condition. No signage present. No evidence of sampling regime implemented by the Shire and validation of water quality at final use site at present is not available.
Irrigation Site 1 – Playground	Concerns about evident ponding of recycled water on play equipment, picnic tables, BBQ's and drinking fountain. No adequate buffers in place. More signage required at access points. Run off of water enters a water course flowing through the site. Overflow of this water body then discharges onto the Watering times are from 9pm – 4am, not allowing enough time for 4hr drying/withholding period.
Water Storage 3 – Primary School	Uncertainty whether chlorine tablet dosing occurs at storage tanks. No signage present. No evidence of sampling regime implemented by the Shire and validation of water quality at final use site at present is not available. No sample tap apparent at tank site. Concern as to whether chlorine tablets are used extensively in tanks for disinfection and not relying on a centralised disinfection system. Minor fence repairs required. Condition of tank and fencing is good condition.
Irrigation Site 2 – Primary School Oval	Oval itself appears to have adequate buffers and signage. Irrigation times not verified hence cannot be confident whether people are exposed to recycled water. More information required.
Water Storage 4 – Tanks	Tanks themselves are not fully fenced however assets such as sample points and pumps are fenced. Working assets are in good condition. No signage onsite. No evidence of sampling regime implemented by the Shire and validation of water quality at final use site at present is not available.
Irrigation Site 3 –	Lack of restrictions of access to site in combination with level of treatment and disposal method shall need to be addressed (e.g. installing non-continuous access barriers). Irrigation times not verified hence cannot be confident whether people are exposed to recycled water. Signage is present however more may be needed. To be determined in consultation with Department of Health.



Government of Western Australia
Department of Health

Code of Practice for the Reuse of Greywater in Western Australia 2010



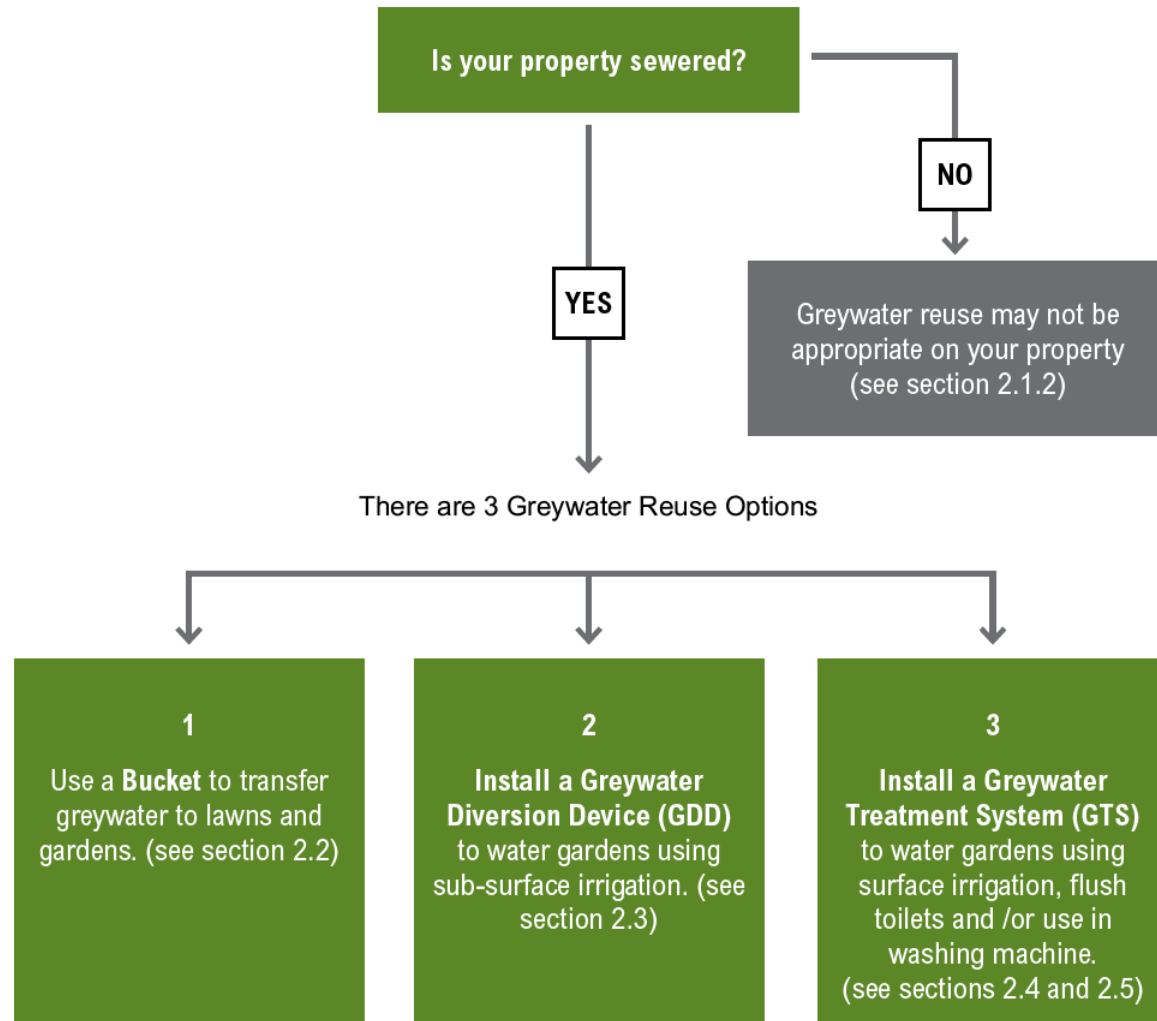
Delivering a Healthy WA

Greywater Reuse Options

- Bucket
- Greywater Diversion Device (GDD)
- Greywater Treatment System (GTS)



Greywater Reuse Options



Guidance for Garden Irrigation



Government of Western Australia
Department of Health
Public Health

Guidance note for garden irrigation using greywater diversion devices

Introduction

This fact sheet provides information and guidance on how to safely use greywater diversion devices (GDD) in your home for watering the garden via sub-surface irrigation.

What is a Greywater Diversion Device (GDD)?

- GDD's filter greywater from showers, washing machines, baths, wash basins, spa baths and/or laundry tubs and divert it to the garden.
- All GDD include a hand activated valve, switch or tap that can either divert the greywater to the garden in summer or to the sewer in winter.

What types of GDD exist?

There are two types of GDD

- Gravity GDD: Greywater moves from the home to the irrigation area by gravity.
- Pump GDD: An electrical pump moves greywater from a non-storage surge tank to the irrigation area.

What is sub-surface irrigation?

- An irrigation system buried at least 10 cm below the surface of soil or mulch.

Note: GDD do not treat greywater, therefore, the irrigation system is buried to minimise exposure to contaminants and microorganisms that may cause diseases.

How can I safely use a GDD?

Greywater reuse using a GDD is considered a low risk activity providing the GDD;

- Does not store greywater in any way.
- Is installed by a licensed plumber.
- Has a WaterMark licence.
- Is connected to a sub-soil irrigation area that is correctly sized, designed and installed (See set back distances in Tables 1 and 2).
- Only garden-friendly detergents are used.
- Is regularly maintained and the filters are cleaned each week
- Sub soil irrigation area is well maintained; and
- Greywater is diverted when the garden needs watering. (Do not overwater or water during rain periods).



Examples of approved GDD's



Nylex GDD



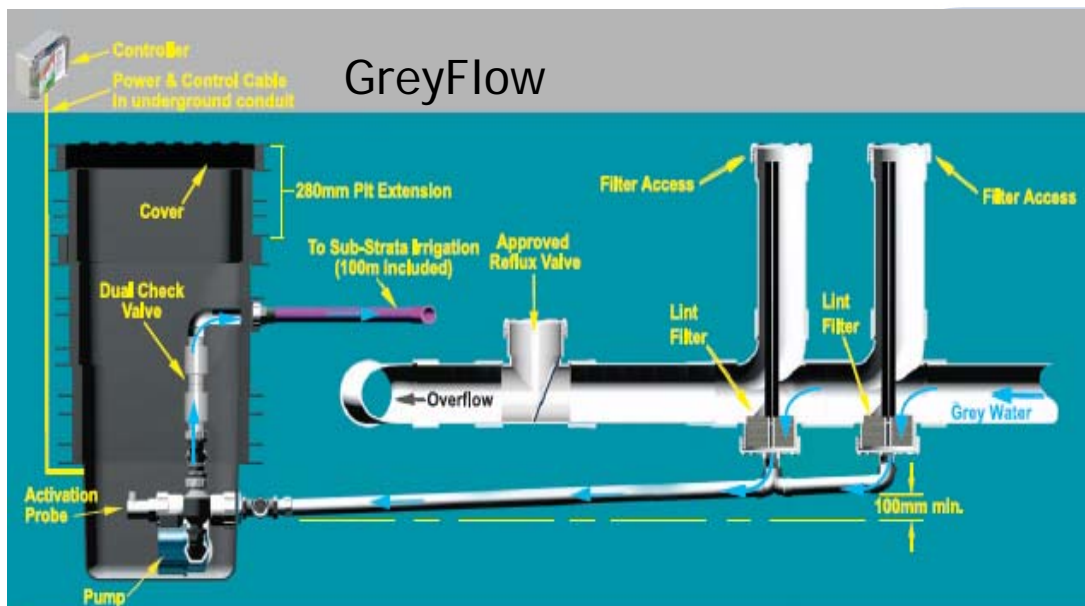
G-Nova



Matala Gator



Greymate



GreyFlow

Sub-surface irrigation for GDD



Examples of approved GTS's



Novagrey



Oasis GT600



Product certification

- Standards Australia:
 - AS 1319 Safety signs for the occupational environment
 - AS 1345 Identification of the contents of pipes, conduits and ducts
 - AS 2700 Colour Standards for general purposes
 - AS 1546.1 Onsite Domestic Wastewater Management – Septic tanks
 - AS/NZS 1547 Onsite Domestic wastewater management
 - AS/NZS 3500 Plumbing and drainage – Water Services
 - ATS 5200 Technical Specifications for plumbing and drainage products – Procedures for certification of plumbing and drainage products
 - ATS 5200:460 Technical Specification for plumbing and drainage products – Greywater Diversion Device (GWDD)
 - HB 326 – 2008 Urban Greywater Installation Handbook for Single Households

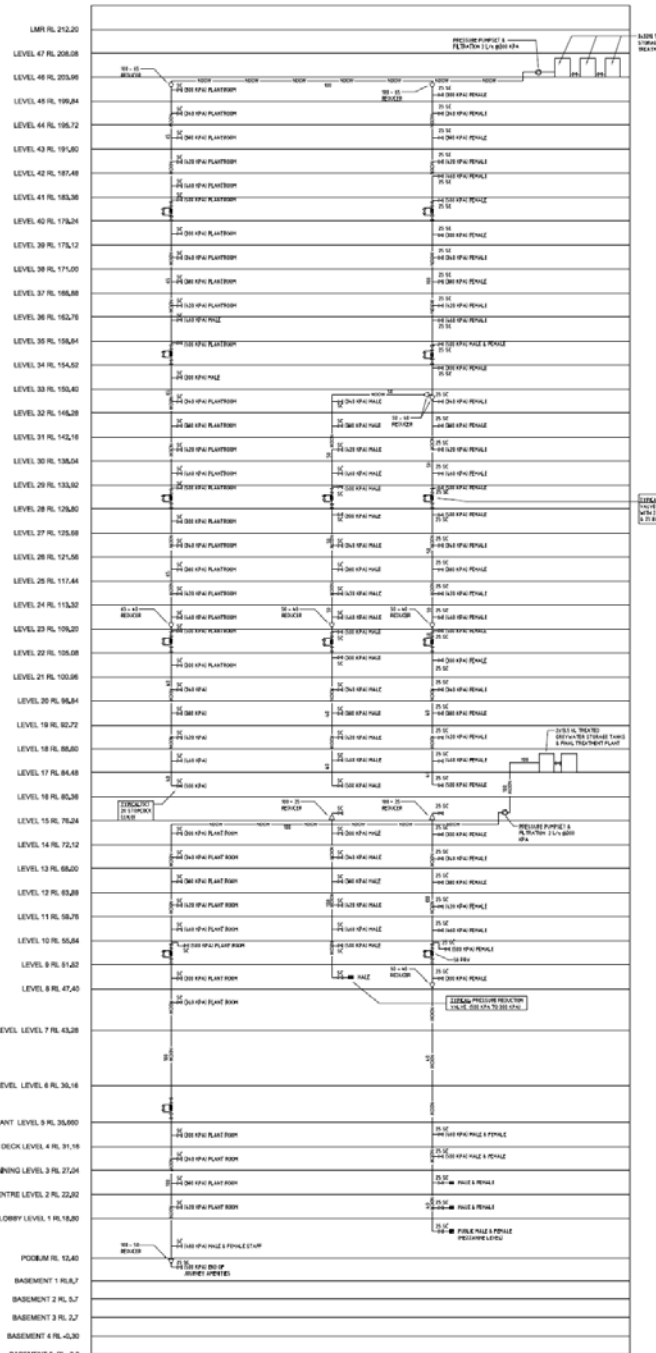
Recycle Schemes & Systems

- Established schemes
 - Local Government – 92
 - In the last 3 years
 - Applications – 103
 - Approved to install – 26
 - Approved to use – 56
 - Not approved - 21

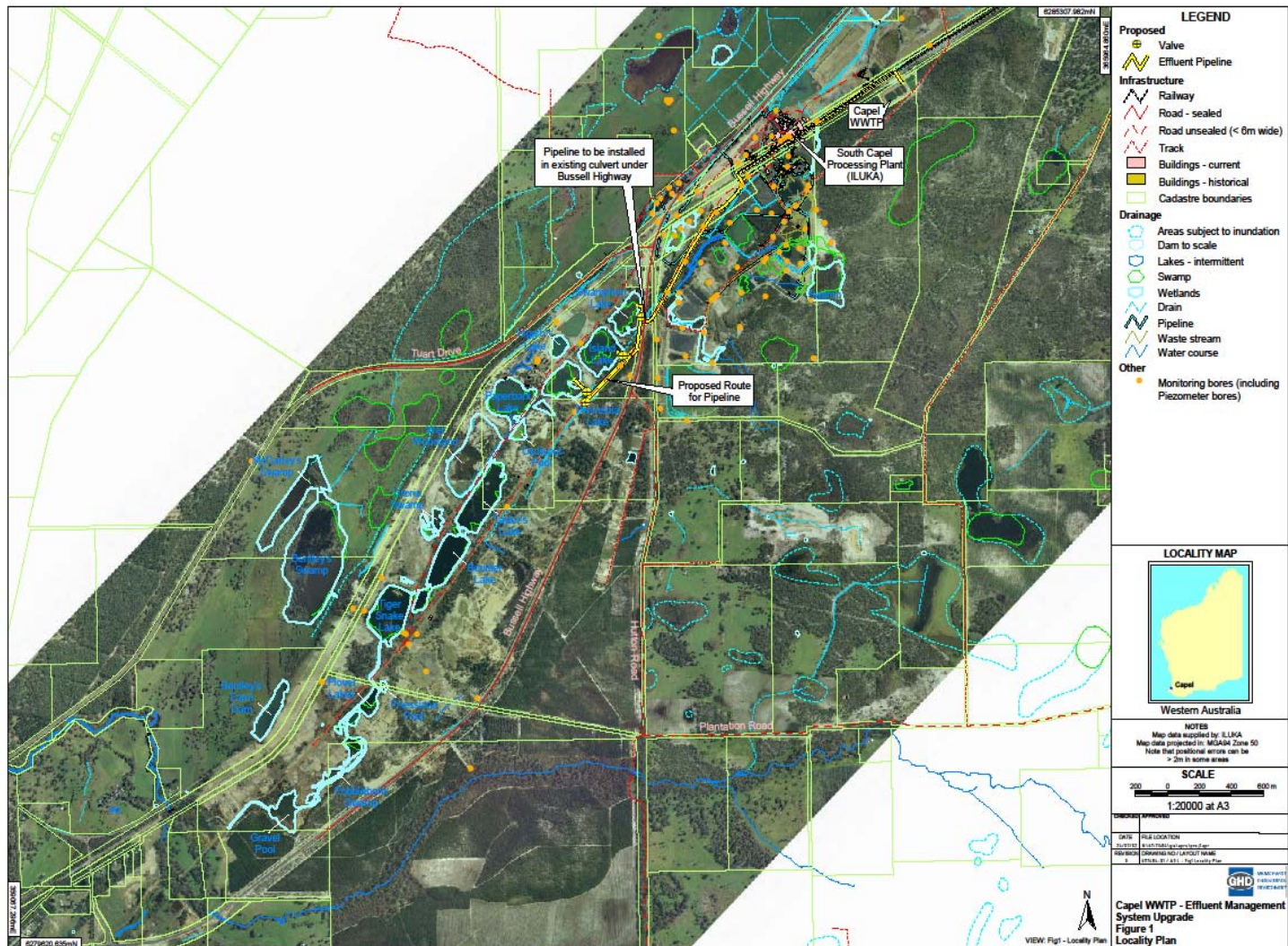


Location	Type	Approved		Location	Type	Approved
140 William	GW/ Int	Yes		City Square	GREY	Yes
Albany	TWS/ Irr	Yes		Coolgardie Shire	TWS/POS	Yes
Alcoa Kwinana	TWS/ Proc	Yes		Corrigin Shire	TWS/POS	Yes
Alcoa Pinjarra	TWS/ Proc	Yes		Devil Creek	TWS/Proc	InP
Alcoa Wagerup	TWS/ Proc	Yes		Dongara Golf	TWS/POS	Yes
Alkimos	TWS/ 3rd	No		Donnybrook Scheme	TWS/POS	Yes
Atlas Iron Pardoo	TWS/ proc	Yes		East Pilbara	TWS/POS	Yes
Atlas Iron Wodgina	TWS	InP		Esperance Shire	TWS/POS	Yes
Barrow Island	TWS / Proc	Yes		Exmouth Shire	TWS/POS	No
Bellevue Truck Wash	WW/ Proc	Yes		Finucane Island	TWS/Int	No
Beverley Shire	TWS/ POS	InP		Fleetwood Karratha		
Black Cat Mine	TWS/Proc	InP		FMG Rail	TWS/POS	InP
Boart Longyear	Proc	Yes		Gap Ridge Karratha	TWS/POS	
Boddington	TWS/ POS			Mandurah Scheme		
Bridgetown Shire	TWS/ POS	Yes		Halls Head	TWS/POS	Yes
Broome North	TWS/ dust	No		Jabiru Metals	TWS/POS	No
Busselton Golf	TWS/ POS	Yes		Kalgoorlie Boulder	TWS	Yes
Caddadup Scheme				Karnet Prison	TWS/Irr	
Canning Leisure	WW/Irr			Katanning Shire	TWS/POS	
Cape Lambert Port B	TWS/Proc	Yes		Kingfisher Stayover	TWS/POS	InP
Capel Wetlands	TWS/POS	Yes		Kulin Shire		
Carina Mine	TWS/POS	No		Kwinana Industry	TWS/Proc	Yes
Caversham Winery	TWS/POS	No		Lanfranchi Nickel	TWS/Proc	InP
Christmas Creek	TWS/POS	Yes		Magellan Mine	TWS/Proc	InP

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Capel Wetlands



Alcoa

- Alcoa
 - Gordon road to Kwinana residue area cooling pond
 - Caustic $>2.5\text{g/L}$ pH >10



Bellevue Industrial Area Truck Wash

- 5KI/day, Benzene, toluene, Ethylbenzene, xylene, oils and grease
 - <http://www.public.health.wa.gov.au/cproot/4263/2/Guidance%20note%20for%20wash%20down%20facilities%20using%20recycled%20water.pdf>



Dongara Golf Course



Finucane Island



BHP Billiton Iron Ore

Finucane Island Facility, Port Hedland

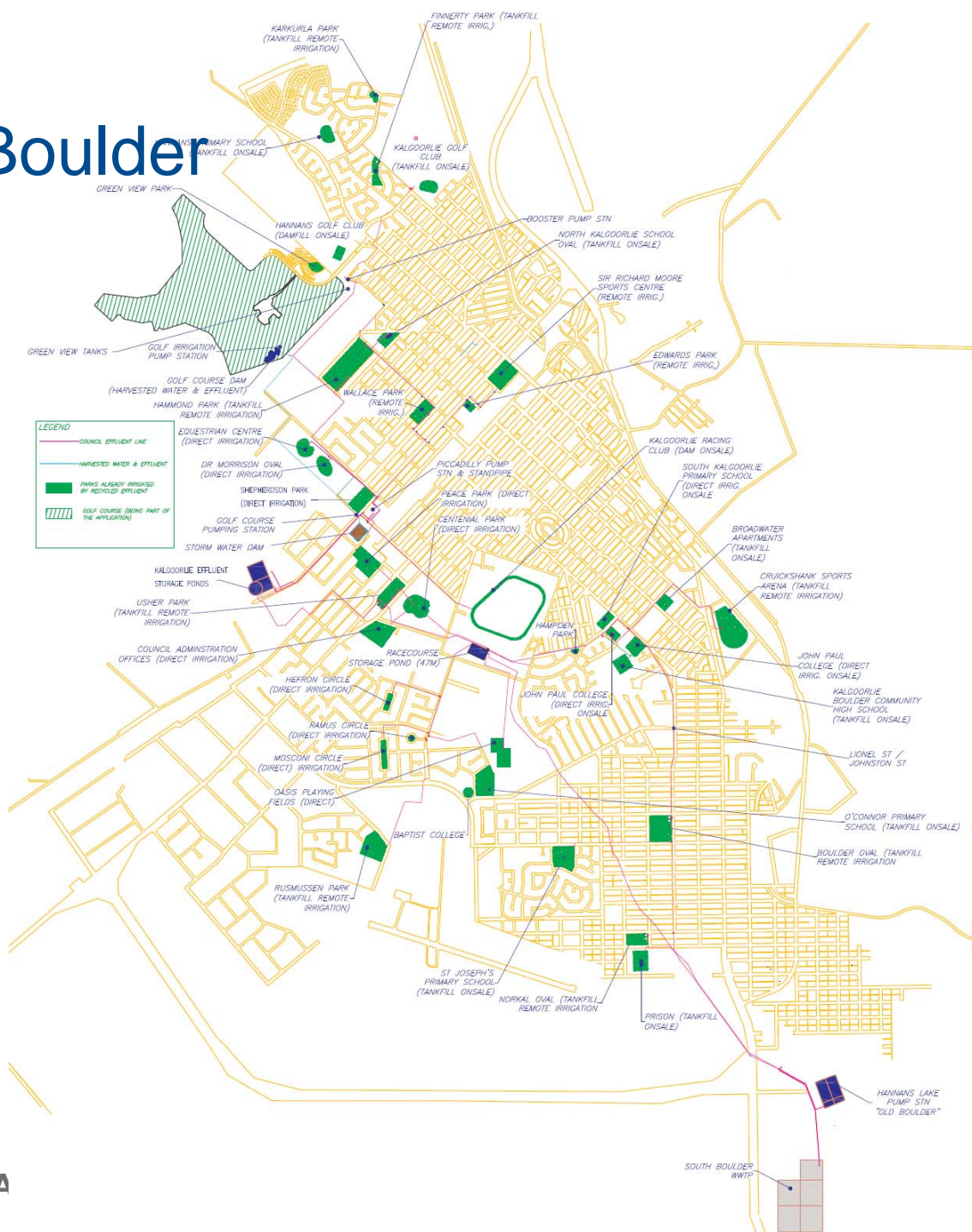
Waste Water Treatment Plant (WWTP) and Reuse Scheme
Application for Approval of a Recycled Water Reuse Project



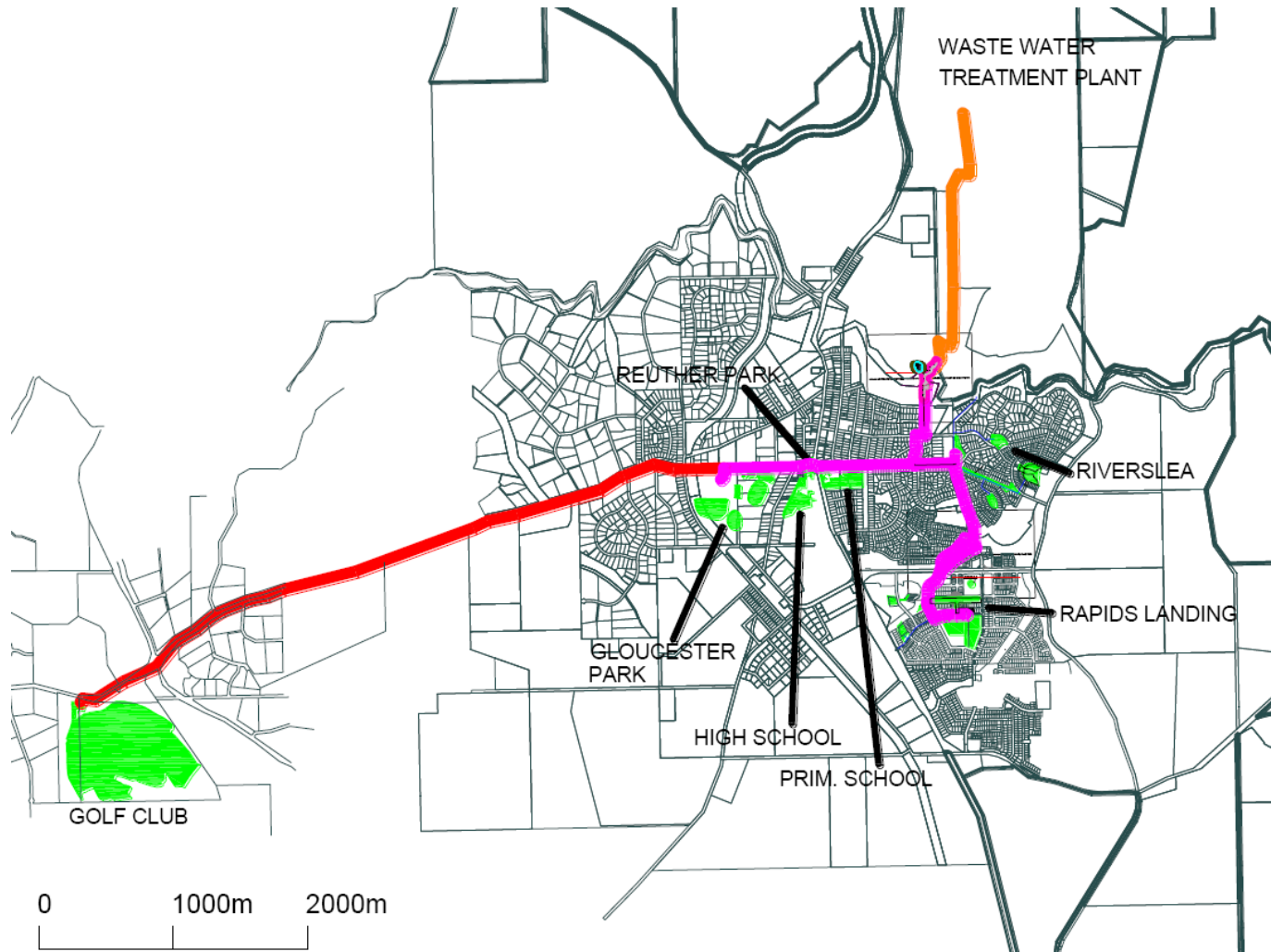
Yongah Hill Detention Centre



Kalgoorlie Boulder



Margaret River Scheme



Subiaco Standpipe

- Landscape irrigation and construction
- Recycled water supply agreement with users



Rio ROC Perth Airport

- Greywater reuse system for toilet flushing



So Where Are We Now

- Opportunistic abstraction of ground water – Done/2nd review
- Single residential rainwater augmentation – Done
- Communal residential rainwater – Done
- Recycled (waste) water ex house and restricted use – Done
- Recycled (waste) water in house – Done
- Stormwater – On hold
- Aquifer storage and recovery – On hold
- Managed Aquifer Recharge for Human consumption - Beenyup

What is still to be done

- Legacy issues and compliance with the new Guidelines.
- Legislation
- Other indicator organisms for non membrane systems.
 - E.g. Coliphage, Clostridia, Giardia and Cryptosporidium.
- Acceptance of indicators and surrogates
 - E.g. rhodamine for coliphage
- Establishment of monitoring and reporting systems to adequately cater for multiple small systems.
- National accreditation, validation and approval system
- Training competency requirements
 - (e.g. plumbers, irrigators, installers, operators)
- Chemistry & Microbiology capacity/accuracy/timeliness



Topic Areas

A-Z topics and diseases

Data and statistics

Disaster management

Environmental health, food,
water and hazardsBody art and personal
appearances

Disaster management

Emerging community
issues

Food

Health hazards

Insects and pests

Pesticides and chemicals

Public buildings and mass
gatherings

Radiation

Water

· Alternate water use

· Aquatic facilities

· Drinking water

· Environmental Waters

· Recycled water

· Wastewater management

Genomics

Healthy lifestyles

Healthy planning and
developmentInfectious diseases, sexual
health and immunisationLicensing, notifications and
legislation

Medicines and poisons

Information for...

Enforcement agency

Health providers

Government

Public health staff

[Home](#) > [Environmental health, food, water and hazards](#) > Water

Water

Click on the icons below for further information on water quality issues.

Drinking
waterGroundwater
ReplenishmentWastewater
managementRecycled
waterEnvironmental
watersAquatic
facilitiesAlternate
watersBiosolids &
compostersEmergency
adviceFor further information contact the Water Unit at the Environmental Health Directorate on +61 8 9388 4999 or email ehinfo@health.wa.gov.au



Topic Areas

[A-Z topics and diseases](#)
[Data and statistics](#)
[Disaster management](#)
[Environmental health, food, water and hazards](#)
[Genomics](#)
[Healthy lifestyles](#)
[Healthy planning and development](#)
[Infectious diseases, sexual health and immunisation](#)
[Licensing, notifications and legislation](#)
[Medicines and poisons](#)

Information for...

[Enforcement agency](#)
[Health providers](#)
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[Home](#) > [Water](#) > Recycled water

Print

Recycled water



Recycled Water in WA



Application Process



Guidelines & Publications



Groundwater Replenishment



Greywater Reuse



Monitoring & Testing



Weblinks

Web Links:

- Department of Health WA
 - <http://www.public.health.wa.gov.au>
- Australian Guidelines for Water Recycling
 - <http://www.ephc.gov.au/taxonomy/term/39>
- Guidelines for the Non-Potable Uses of Recycled Water in Western Australia
 - [http://www.public.health.wa.gov.au/cproot/2280/2/Guidelines%20for%20the%20Non-potable%20Uses%](http://www.public.health.wa.gov.au/cproot/2280/2/Guidelines%20for%20the%20Non-potable%20Uses%20)
- Recycled Water Sampling Techniques
 - <http://www.public.health.wa.gov.au/cproot/2988/2/Recycled%20Water%20Sampling%20Technique.pdf>
- DOHWA Recycling schemes application form
 - <http://www.public.health.wa.gov.au/cproot/4084/3/Application%20Form%20for%20Recycled%20Water%20Schemes.doc>
- Code of Practice for the Reuse of Greywater in Western Australia
 - <http://www.public.health.wa.gov.au/cproot/1340/2/COP%20Gretwater.pdf>

Questions

