



**JOSH BYRNE
& ASSOCIATES**

Residential Greywater Ready Plumbing Guidelines



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Residential Greywater Ready Plumbing Guidelines

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Project

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1.	Introduction	1
1.1	Aim of These Guidelines	1
1.2	Structure of This Document	1
2.	Standards and Regulations	1
3.	Greywater-Ready Guidelines	2
1.3	Greywater-Ready	2
1.4	Greywater Diversion Device (GDD)	2
1.5	Greywater Sources	2
1.6	Greywater Volumes	3
1.7	Greywater-Ready Plumbing	3
1.8	Non-Greywater Plumbing	4
1.9	Location of Greywater Diverter Device Zone	4
1.10	Common Trenching	5
1.11	Greywater Irrigation Top Up	5
1.12	Greywater Irrigation	6
4.	Greywater-Ready Drawings	7
1.13	Greywater-Ready Typical Site Plan	7
1.14	Greywater-Ready Plumbing Detail	8
1.15	Greywater Diverter Device Zone Detail	9
1.16	Greywater-Ready Plumbing Schematic	10
5.	Industry Consultation	11
6.	References	11

1. Introduction

There is a compelling argument that greywater reuse via simple direct diversion (as compared to advanced treatment) at the residential level can make a significant contribution towards reducing mains water use in a cost-effective and energy efficient manner. It can also provide a restriction-free, fit-for-purpose alternative water source suitable for garden irrigation by recycling domestic greywater in a sanitary fashion. The uptake of these systems has, however, been quite low and a lack of technical detail as to the required plumbing and installation requirements has been identified as one of the reasons for this state of affairs. These guidelines are intended to address this specific issue. The characteristics of greywater, regulations and uses of greywater are not covered in this report as they are described extensively in other existing documents listed in both Sections 2 and 6 of these guidelines.

1.1 Aim of These Guidelines

These guidelines encompass the general plumbing details required to enable the efficient installation of residential greywater reuse systems for new homes i.e. **make them** 'greywater-ready'. The majority of new homes built in Western Australia, and the ground floor of roughly 90% of all homes in Australia (CCAA, 2011), are of a concrete slab-on-ground construction type. Sanitary drainage plumbing installed in slab-on-ground buildings is generally difficult and expensive to modify to suit the installation of a greywater system once the building has been constructed. These guidelines, in conjunction with the contained drawings, will allow builders and plumbers to install the sanitary drainage plumbing in accordance with best practice principles, so that any new dwelling can be greywater-ready. The guidelines will also provide useful information to those considering retrofitting existing homes irrespective of their construction type.

The guidelines consider direct diversion greywater reuse systems only, also known as Greywater Diversion Devices (GDD) in the [Code of Practice for the Reuse of Greywater in Western Australia 2010](#), hereafter referred to as *The Code*. Greywater Treatment Systems (GTS) which treat greywater to a higher level are not specifically considered, however, the concepts provided here for rendering a dwelling greywater-ready will still apply. It has been prepared with reference to the Standards and regulations listed in Section 2 and 6 of these guidelines.

In the preparation of these guidelines feedback was sought from the Water Corporation, WA Department of Health, WA Department of Water, WA Department of Housing, Irrigation Australia, Greywater Industry Group, Master Plumbers Association and the Standards Branch, Building Commission with the received feedback incorporated in this final issue.

1.2 Structure of This Document

This report is structured according to the following headings and should be read in conjunction with the complete drawing set as listed in Section 4.

- Section 1: Introduction
- Section 2: Standards and Regulations
- Section 3: Greywater-Ready Guidelines
- Section 4: Greywater-Ready Drawings
- Section 5: Industry Consultation
- Section 6: References

2. Standards and Regulations

These guidelines must be read in conjunction with the following Australian/New Zealand Standards, relevant Codes and publications;

- Standards Australia, AS/NZS 1547:2012 - On-Site Domestic Wastewater Management
- Standards Australia, AS 1345:1995 – Identification of the contents of pipes, conduits and ducts
- Standards Australia, AS/NZS 2700:2011 - Colour Standards for General Use
- Standards Australia, AS/NZS 3500:2003 – National Plumbing and Drainage Codes

- Standards Australia, ATS5200.006-2005 – Technical Specification for plumbing and drainage products – Reflux valves, sewerage
- **WA Department of Health (2012)** “[Approved Greywater Systems](#)”, WA Government, Perth, WA, Australia
- **WA Department of Health (2010)** “[Code of Practice for the Reuse of Greywater in Western Australia 2010](#)”, WA Government, Perth, WA, Australia

These guidelines were prepared to comply with the standards and regulations available as at May 2013. The plumber is to ensure all workmanship conforms to the most up to date and current version of the relevant Australian Standards and Regulations at the time of installation.

3. Greywater-Ready Guidelines

Key considerations and definitions used in the planning and design of sanitary plumbing in order to make a residential building greywater-ready are described within these guidelines. These guidelines are to be read in conjunction with the drawings in Section 4 of this document.

1.3 Greywater-Ready

The term greywater-ready refers to the installation of separate sanitary plumbing that collects greywater from sources suitable for greywater reuse, separate from all the other wastewater sources. Importantly, however, until such time as a greywater diversion device (GDD) is installed all greywater continues to flow into the non-greywater main drain i.e. sewer main drain.

No approvals are required for installing sanitary drainage plumbing that is greywater-ready. Approvals are required prior to installation of a greywater reuse system utilising the greywater-ready sanitary plumbing, and you should refer to The Code for this approvals process.

1.4 Greywater Diversion Device (GDD)

GDD's are to be installed by a licensed plumber, to the **manufacturer's** specifications and are to be a product approved from the Department of Health and carry a Watermark Certification. A list of approved **GDD's** can be found on the Department of Health website.

Approval to install a GDD is required from the Local Government prior to installation. Refer to The Code for more detail.

While there is a range of approved commercially available GDDs in WA, all units require the plumbing to collect and transfer greywater to a single point or GDD zone where the GDD unit and associated plumbing hardware will be located. A minimum zone is shown on the drawings to highlight installation on a site with limited space; a nominal size for the GDD zone is detailed in Section 3.7 Location of Greywater Diverter Device Zone.

GDD's are to be located, maintained and installed in accordance with the manufacturer's specifications. Ongoing periodic maintenance is important to ensuring the GDD operates effectively.

1.5 Greywater Sources

The definition of greywater is defined in The Code. It includes water sourced from shower, bath, floor waste gullies, washing machines, laundry troughs and vanity basin wastes. It specifically excludes all kitchen and toilet wastewater, including dishwashing machines.

It is imperative that owners of a greywater reuse system be aware of the need to use appropriate, environmentally friendly cleaning and personal care products (shampoos and soaps) and the potential negative impact on soil and plants if inappropriate products are used. Refer to The Code for more information.

It is recommended that air conditioner condensation discharge lines (where installed) be discharged into a tundish connected into the greywater plumbing at a waste trap / gully to capture this greywater source during the summer months and to provide top up for water trap seals. An air-gap must be maintained between the condensation line discharge point and water trap seal at all times to ensure no contamination or back flow occurs to comply with AS/NZS 3500:2003.

1.6 Greywater Volumes

There is merit in prioritising the collection of greywater from those sources that generate the most greywater particularly if the distribution of the various greywater sources as shown on the floor plan is complex in any way. This is typically the shower followed by the washing machine in terms of daily volumes produced. For example there may be little benefit in collecting greywater from a single hand basin if it is relatively remote to the principal greywater sanitary drainage.

Table 1 below provides the average volumes of greywater by source in a typical Perth home based on data from the [Perth Residential Water Use Study](#) 2008/2009 (WCorp, 2010).

1.6.1 Table 1 Perth average residential greywater volumes

WATER SOURCE	VOLUME (L/person/year)	% OF TOTAL GREYWATER
Shower and Bath	27,000	60%
Washing Machine	8,000	18%
Taps	6,000	13%
Evaporative A/C	4,000	9%
Total	45,000	100%

On average, the highest yields of greywater are from bathroom and ensuites, and it is recommended as a minimum to ensure the sanitary drainage plumbing servicing these water sources be greywater-ready. For reference The Code stipulates 60 Litres/person/day from the bathroom and 40 Litres/person/day from the laundry for design purposes.

1.7 Greywater-Ready Plumbing

All greywater sources, where feasible, are to be collected by a separate sanitary drainage plumbing network and include a DN 100mm gravity overflow back into the non-greywater main drain.

All greywater drains should be installed at the maximum achievable heights, ensuring compliance with AS/NZS 3500.2 and according to any GDD specifications. By maximising the outlet heights of the greywater plumbing services throughout, it will provide maximum flexibility in the arrangement and range of GDDs available to be installed.

Branch drains from greywater waste sources are generally to exit the building through the slab or footing with a minimum 25mm annular flexible liner installed where in contact with concrete.

Locate the nominal DN 100mm greywater main drain as high as possible in the common service trench ensuring minimum depth of cover and falls are achieved. Ensure that the greywater main drain is located 100mm above the sewer main drain at the point of overflow.

Plumbers are to locate rodding and inspection openings as required to allow for the clearing of blockages in the greywater sanitary drainage plumbing.

For the location of the Greywater Diverter Device Zone refer to Section 3.7 and 4.

1.7.1 Greywater Venting

Greywater sanitary plumbing is to include an upstream vent to comply with AS/NZS 3500.2:2003, and where appropriate greywater sanitary drainage plumbing can share the vent utilised by non-greywater sanitary drainage plumbing waste drains.

The plumber is to install secondary air admittance valves where required due to branch drain lengths as required by AS/NZS 3500.2:2003.

1.7.2 Greywater Waste Trap/Gully

The greywater sanitary drainage plumbing must include an overflow relief gully, disconnector gully or other suitable waste trap/gully as required to comply with AS/NZS 3500.2:2003.

It is important that all greywater waste trap / gullies be raised above the surrounding finished surface level to stop the ingress of stormwater as required by AS/NZS 3500.2:2003, with the top of the waste riser to be protected, generally by means of a concrete surround.

It is possible for the overflow relief gully to be utilised for greywater top up during periods of building vacancy. Refer to Section 3.9 Greywater Irrigation Top Up for more details.

1.7.3 Greywater Pipe Labelling

All greywater-ready sanitary plumbing pipework greater than DN 80mm must be clearly marked **'GREYWATER'** at **maximum 1000mm intervals in accordance with AS 1345:1995**, as per Amendment 3 (Dec 2010) to AS/NZS 3500.2:2003 Section 6A Greywater Plumbing and Drainage Systems.

1.8 Non-Greywater Plumbing

Toilet waste, kitchen sink and dishwashing waste water branch drains must be connected to the non-greywater main drain, and therefore separate from all bathrooms and laundry branch lines connected to the GDD.

The separation of greywater and non-greywater sanitary drainage plumbing will reduce the flow in the non-greywater ready plumbing. To maximise line flushing of these plumbing lines, It is recommended that other non-greywater wastes (e.g. kitchen) be located upstream of toilet wastes.

Where a branch drain exits the footing it is to return down and discharge into the non-greywater main drain. The main drain is recommended to be located 100mm from the building edge where setbacks and site constraints limit the available space for the installation of greywater sanitary drainage plumbing and the Greywater Diverter Device Zone (refer to Section 3.7).

The greywater main drain is generally to be located above the non-greywater main drain in a common trench. In close proximity to the Greywater Diverter Device Zone (refer to Section 3.7) the greywater main drain is to be located a minimum of 100mm above (vertically) and 400mm to the side (horizontally) of the non-greywater main drain.

The location of the non-greywater main drain shall be to suit the required setbacks of drains and trenching from all adjacent footings. Refer to common trenching in Section 3.8.

1.9 Location of Greywater Diverter Device Zone

A zone should be selected to enable the installation of the broadest possible selection of Greywater Diverter Devices (GDD). This GDD zone is to be a minimum of 2000mm long, along a continuous section of greywater main drain (DN100) and located downstream of all greywater branch lines, and before the bend of overflow to non-greywater main drain.

The selected location will depend on the site and building arrangement and should allow for a nominal GDD zone of 1000mm wide, 2000mm long and 1200mm deep to accommodate the future installation of the majority of GDDs including, an approved reflux valve and additional GDD manufacturers equipment (e.g. secondary disc filters) as may be required.

Where setbacks and site constraints limit the available space for the GDD zone, it is recommended that a minimum GDD zone of 500mm wide, 2000mm long and 600mm deep be allowed to accommodate the installation of a more limited range of compact GDDs and associated GDD equipment.

This area should remain clear of all non-greywater service lines including stormwater, sewer, telephone, power and gas services.

GDDs are to be located **and installed in accordance with the manufacturer's specifications**.

1.9.1 Greywater Diverter Device Power Supply

GDDs will require either a control box to be hardwired to the mains power in accordance with the **manufacturer's specifications or alternatively** connected to a waterproof general power outlet (GPO). The

GPO should be mounted external to the building in close proximity (<2m) to the proposed GDD location and nominally 500mm above finished surface level to allow for the future power connection of the greywater device controller/pump hardware. The power outlet should ideally be installed on a separate power circuit with a labelled Residual Current Device in the electrical switchboard to minimise the possibility of nuisance tripping affecting the GDD's operation.

1.9.2 Reflux Valve

A reflux valve is a backflow prevention device to protect the GDD unit from any potential backflow of non-greywater waste into the GDD unit. Where required reflux valves are generally installed and approved at the same time as the installation of the GDD unit.

Reflux Valves are to be installed to comply with AS/NZS 3500.2:2003 Section 4.5 and be Watermark approved complying with ATS5200.006-2005 '**Technical Specification for plumbing and drainage products – Reflux valves, sewerage**', refer to [Australian Building Codes Board](http://www.abcd.org.au) (ABCD) website to search available products. Reflux valves need to be accessible with a capped riser shaft at ground level for servicing.

Reflux Valves are required on all sewer mains connected sanitary drainage plumbing with an in-ground GDD unit. The reflux valve is to be installed downstream of the GDD and before the bend of overflow to the non-greywater main drain.

Note that non-sewer connected buildings (i.e. septic / leach drains) or buildings which have an above ground GDD unit do not require a reflux valve.

1.10 Common Trenching

Common trenching is a cost-effective and efficient means often utilised for locating the main service supply lines for new homes. Where greywater sanitary drainage plumbing and **GDD's are located in common** trenching with other services, adequate space must be allowed for installation. Greywater plumbing drains are to be located above other sanitary drainage plumbing drains and other site service supply lines, with adequate height to allow for the installation of a GDD and maintain required separation of services. The non-greywater main drain is to be offset a minimum of 400mm horizontally from the greywater drain in the proposed GDD zone.

1.11 Greywater Irrigation Top Up

To ensure that greywater irrigated areas have an adequate water supply during times when the building may be unoccupied (e.g. summer holiday periods in particular), it is important to consider the requirement for water top up to the system.

1.11.1 Top Up Water Source

The preferred water supply for greywater top up is from a dedicated irrigation line controlled by an irrigation controller with an adjustable valve (to regulate the in-flow) located before the pipe discharge into the connection to the sanitary plumbing drainage.

Alternatively an external garden tap or separate pipe with adjustable gate valve should be installed for future connection of a battery operated irrigation timer, plumbed to discharge water above the connection to the greywater sanitary plumbing drainage.

Greywater top up can also be achieved through direct top up via a Reduced Pressure Zone Device (RPZD) into the GDD, refer to AS/NZS 3500.1:2003 for more detail.

1.11.2 Connection to the Greywater Sanitary Drainage Plumbing

Water top up may be connected to the greywater sanitary drainage plumbing via a number of methods including a trapped tundish (preferred), overflow relief gully or other suitable waste trap / gullies.

Where mains water is used as the top up water source a pipe discharging into the waste trap / gully shall meet the following requirements to ensure no contamination of the water source via backflow occurs. Refer to AS/NZS 3500.2:2003 for further details;

- Connection shall be above the level of the water seal

- The top of the tundish or waste pipe riser will be above the flood level rim of the fixture
- Have an air gap of a size twice the internal diameter of the discharging pipe
- Be located in an accessible location for maintenance

Pipework discharging into this connection is to have a nominal 55mm air gap, refer to AS/NZS 3500.1:2003 - Table 4.3 for minimum air gap requirements.

1.12 Greywater Irrigation

Untreated greywater in WA may only be used via sub-surface/strata irrigation below a minimum of 100mm of soil or mulch (refer to Section 2.3 of The Code for details). Drip irrigation specifically designed for greywater application is readily available for this purpose.

It is highly recommended that consideration be given to the likely route and proposed surface treatments over the top of the greywater distribution main line from the GDD to the intended greywater irrigation area(s) for future connection.

The installation of a dormant greywater irrigation main line below paving and structures will minimise site disturbance during future installation of a greywater reuse system. For a typical residential application the irrigation main line will nominally be of a 25mm internal diameter and installed 75mm below the base of paving.

Pipe work is to either be 'purple' greywater irrigation piping complying with AS2700, or PVC piping with purple identification tape installed over to comply with AS/NZS 3500.2:2003, Clause 9.5.4.1. When running irrigation pipe under trafficked areas the pipework should be protected as per AS/NZS3500.1:2003 Plumbing and Drainage Part 1: Water Services.

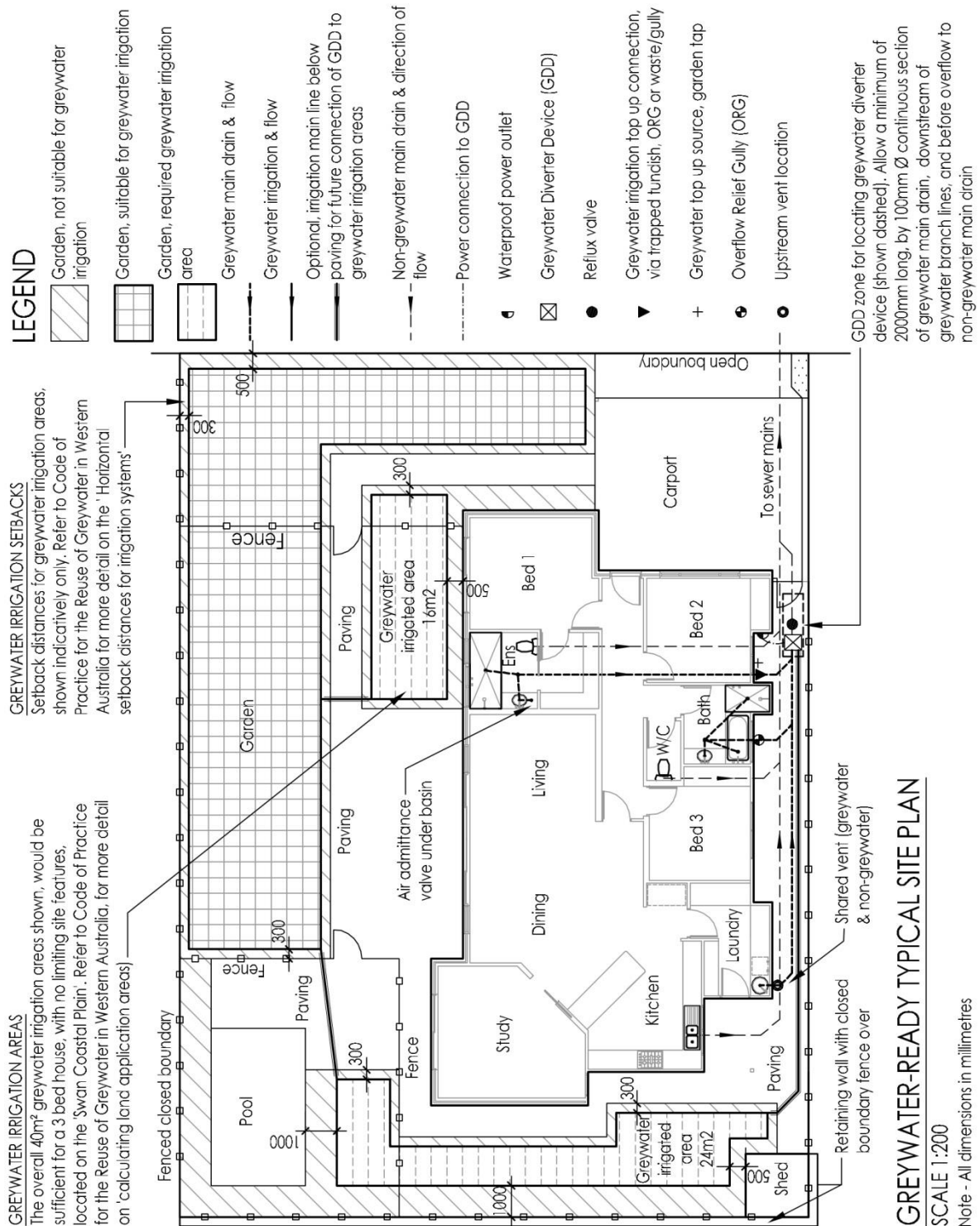
Main line should be laid from the potential GDD location to 200mm past the edge of paving or structures en-route to any potential greywater irrigation areas with all ends capped and locations noted/identified.

For more detail on the requirements for installing greywater sub-surface/strata irrigation, including calculating irrigation areas, required setbacks, soil and site assessment criteria refer to The Code. Installation of irrigation serviced by a greywater diversion device is to comply with the GDD manufacturer's specifications.

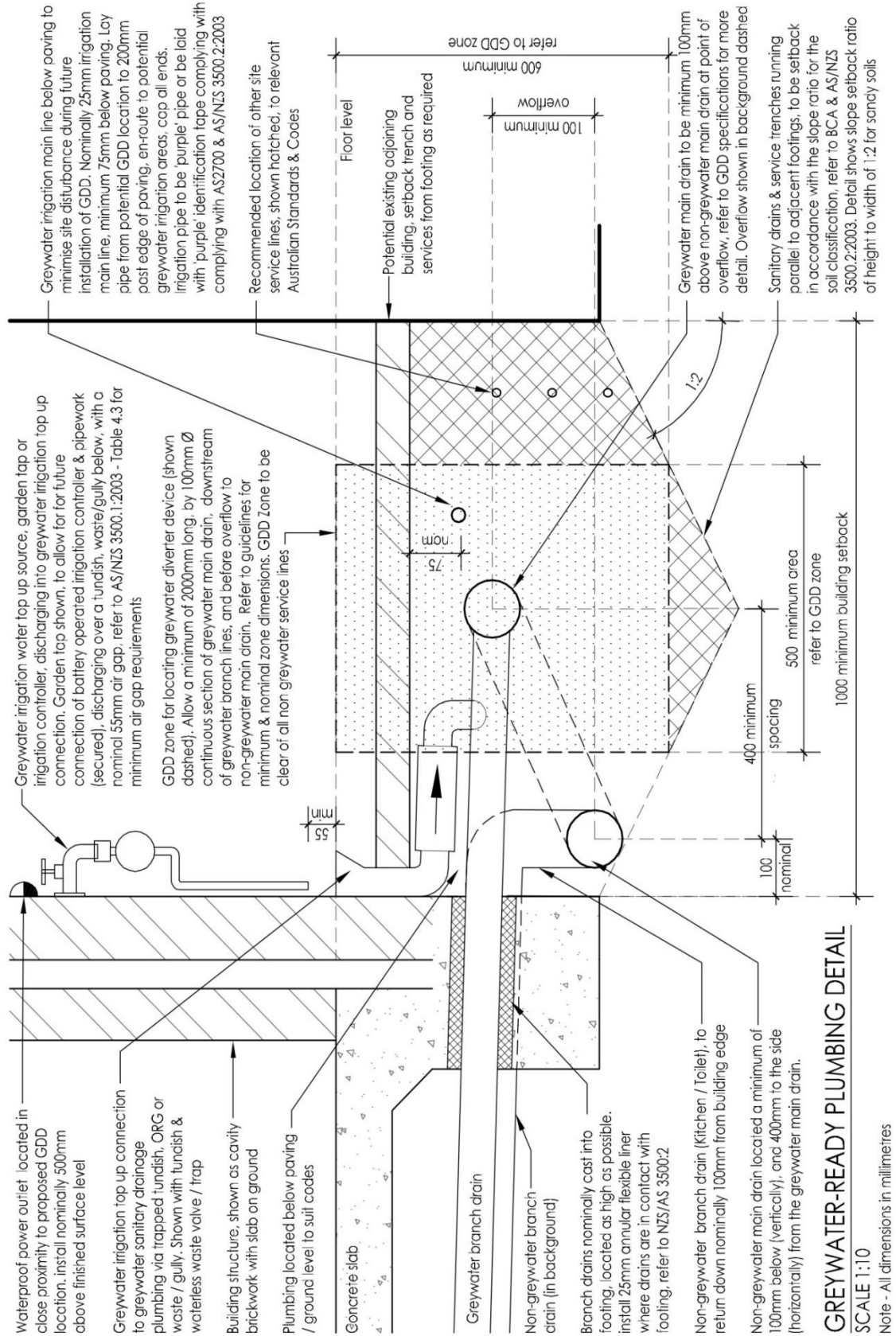
4. Greywater-Ready Drawings

The drawings provide detail in relation to the installation of greywater-ready sanitary drainage plumbing.

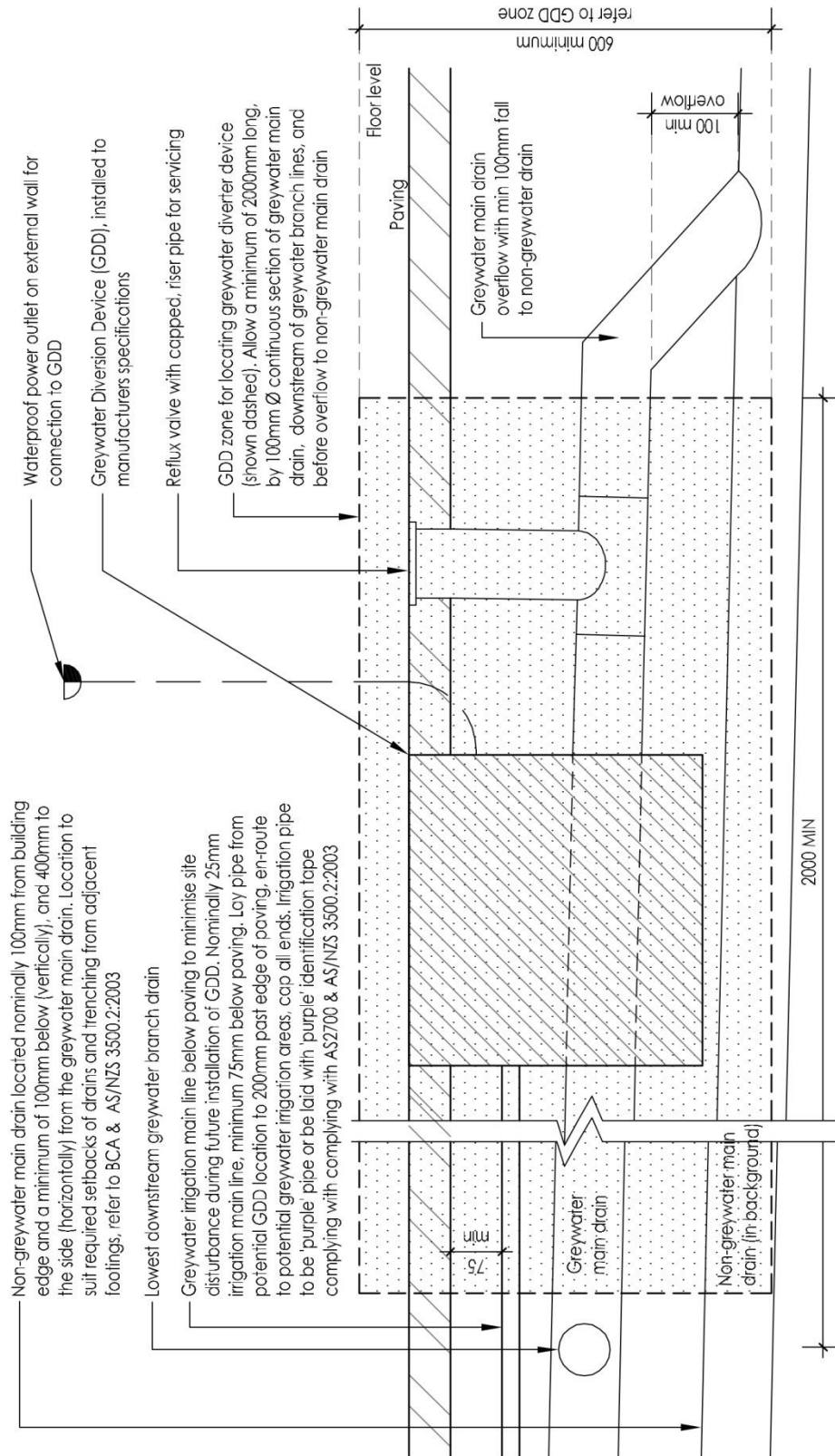
1.13 Greywater-Ready Typical Site Plan



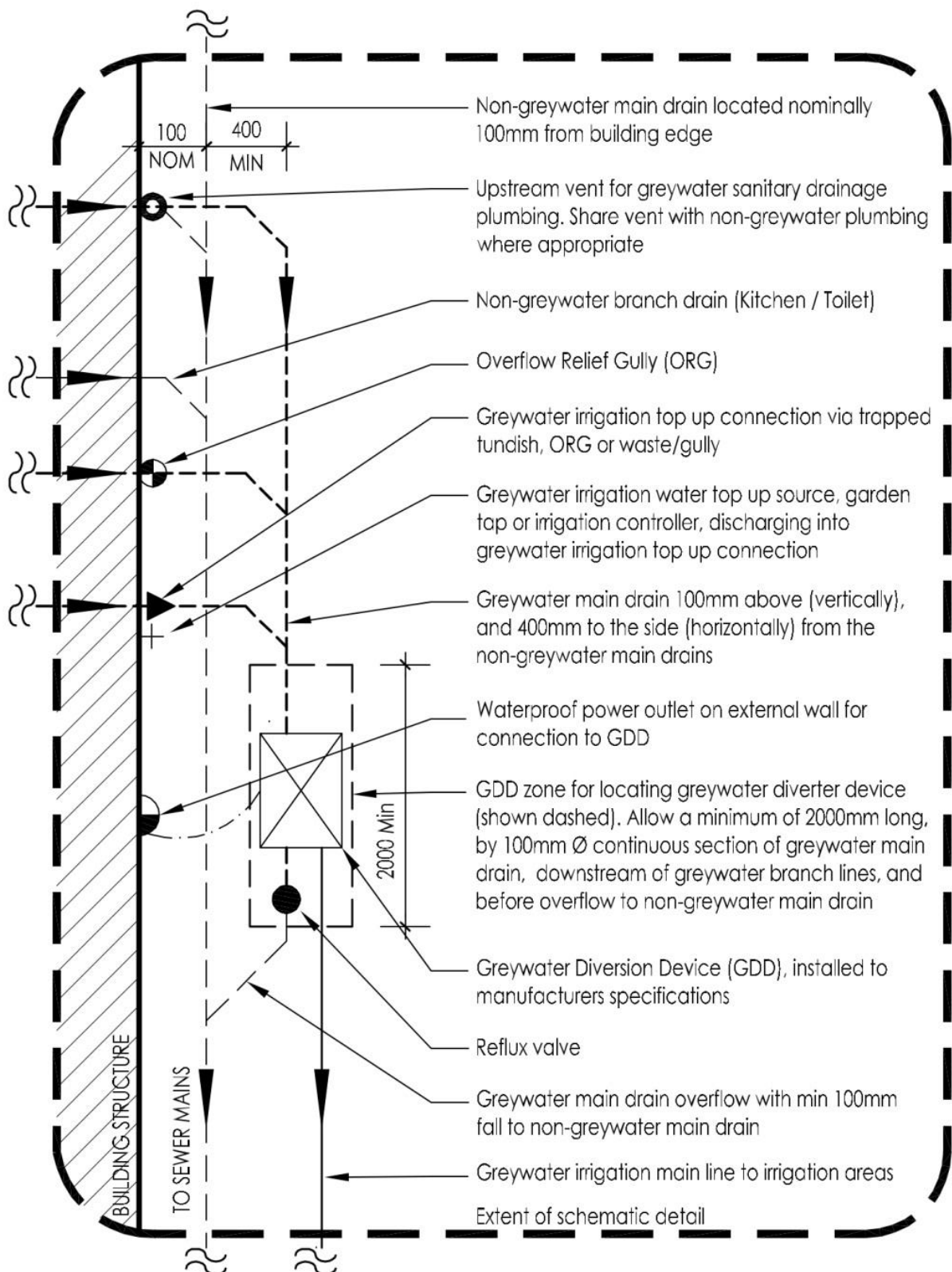
1.14 Greywater-Ready Plumbing Detail



1.15 Greywater Diverter Device Zone Detail



1.16 Greywater-Ready Plumbing Schematic



GREYWATER-READY PLUMBING SCHEMATIC

NOT TO SCALE

5. Industry Consultation

Liaison with the relevant industry stakeholders was undertaken to obtain their input into this document. These parties were:

- a. Department of Health
- b. Department of Housing
- c. Department of Water
- d. Greywater Industry Group
- e. Irrigation Australia
- f. Master Plumbers Association
- g. Standards Branch, Building Commission Water Corporation

6. References

The specifications and drawings contained within this document have drawn on the following Australian/New Zealand Standards, Codes and publications;

- [Cement Concrete & Aggregates Australia](#) (2011), “Concrete Slab-on-ground and Energy Efficiency - Briefing paper 17”
- National Water Commission (2008), “The National Water Commission Waterlines Publication – Requirements for installation of rainwater and greywater systems in Australia”, National Water Commission, Australia
- National Water Commission (2008), “[Urban Greywater Design and Installation Handbook](#)”, Australian Government – National Water Commission, Master Plumbers and Mechanical Services Association of Australia, RMIT University, Australia
- Standards Australia, AS/NZS 1547:2012 - On-Site Domestic Wastewater Management
- Standards Australia, AS 1345:1995 – Identification of the contents of pipes, conduits and ducts
- Standards Australia, AS/NZS 2700:2011 - Colour Standards for General Use
- Standards Australia, AS/NZS 3500:2003 – National Plumbing and Drainage Codes
- Standards Australia, ATS5200.006-2005 – Technical Specification for plumbing and drainage products – Reflux valves, sewerage
- WA Department of Health (2012) “[Approved Greywater Systems](#)”, WA Government, Perth, WA, Australia
- WA Department of Health (2010) “[Code of Practice for the Reuse of Greywater in Western Australia 2010](#)”, WA Government, Perth, WA, Australia
- Water Corporation (2010), [Perth Residential Water Use Study](#), Water Corporation, Perth, WA