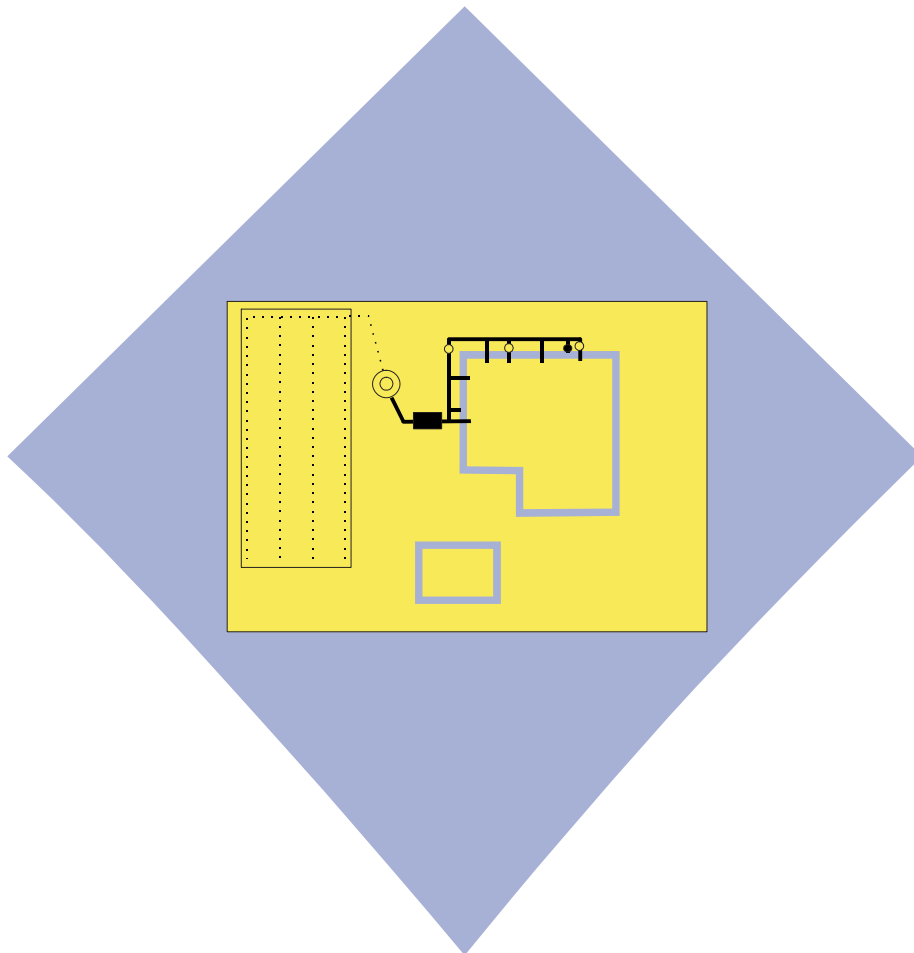


Waste Control Systems

STANDARD FOR THE
CONSTRUCTION, INSTALLATION AND OPERATION
OF SEPTIC TANK SYSTEMS IN SOUTH AUSTRALIA

SUPPLEMENT B

Aerobic Wastewater Treatment Systems



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*This Standard is to be read in conjunction with
the South Australian Health Commission Code,
"Waste Control Systems - Standard for the Construction, Installation
and Operation of Septic Tank Systems in South Australia"*



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FOREWORD

In July 1993 the Public and Environmental Health Act was amended to prescribe standards to be observed in installing and operating *Waste Control Systems*. The powers of the Act cover the setting of fees and regulation of construction, installation, operation, alteration and maintenance of such systems.

The Waste Control Regulations under the Public and Environmental Health Act have been framed to enable administration by Local Government of waste control systems covered by a prescribed code, with the SA Health Commission retaining the standard setting role, administration in districts outside of local government areas, and the approval of products and non standard systems.

Waste Control Regulation 4 prescribes codes to be read in conjunction with the regulations.

This Supplement details the technical aspects to be considered in the planning stages of a waste control system (aerobic wastewater treatment system) and sets out the requirements relating to applying for approval, and for the installation and operation of systems.

The information has been prepared to assist the relevant administering authorities in their respective roles as well as providing advice for consultants, for plumbers and drainers, for builders, and for owners and/or occupants of premises on the design, installation and operation of aerobic wastewater treatment systems.

The Supplement advises of the need to take into account the requirements of other agencies to ensure the installation and operation of the waste control system does not have an adverse environmental impact.

The information in this Supplement and the SA Health Commission Code *Waste Control Systems - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia* requires interpretation. It seeks overall to achieve an acceptable end result, that is, the design of a septic tank system to serve the specific requirements of the premises without creating nuisance or risk to health.

This Supplement needs to be read in conjunction with the SA Health Commission Code *Waste Control Systems - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia*, other prescribed codes and the Waste Control Regulations.

In accordance with Waste Control Regulation 4 this Supplement is a prescribed code. Non compliance with its provisions is deemed to be an offence under Regulations 23 and 26 and the relevant authority may institute legal proceedings.

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GLOSSARY OF TERMS

Absorption:	Uptake of treated effluent into the soil.
Aerobic bacteria:	Bacteria that grow in the presence of oxygen.
Aerobic wastewater treatment system:	A system that treats effluent by biological processes in the presence of oxygen.
Approve/approval/ approved:	Includes a written endorsement, authorisation or consent by the relevant authority and it may be subject to conditions and/or as otherwise indicated in the Public and Environmental Health (Waste Control) Regulations.
AS:	Australian Standard (latest version).
BOD₅:	The <i>biochemical oxygen demand</i> of sewage and other polluted waters is a measure of the organic content in terms of oxygen required for bacterial oxidation. The standard test measures oxygen used in 5 days at 20°C (BOD ₅).
Building:	A building as classified under the Development Act provisions; or building work requiring Development Act approval; or as defined by the Public and Environmental Health Act.
Chlorination:	The addition of chlorine releasing compounds to the treated effluent for the purpose of disinfection.
Combined chlorine:	Chlorine which is combined with ammonia and other organic compounds containing nitrogen to form chloramines thus reducing its effectiveness as a disinfectant.
Daily flow:	The volume of sewage and liquid wastes flowing into a septic tank during a 24 hour period.
Desludging:	Removal of the accumulated sludge and scum from the septic tank or aerobic wastewater treatment system compartment.
Disinfection:	A process which destroys, inactivates or removes pathogenic micro-organisms.
DN 100:	Is the nominal pipe diameter in millimetres
Domestic residential premises:	Includes single domestic dwellings, flats, units, townhouses, retirement villages (no communal food services) and like premises.
Effluent:	The treated liquid leaving the septic tank.

Effluent disposal system:	A constructed system utilising various methods and materials to effectively dispose of septic tank effluent.
Faecal coliforms:	Thermotolerant coliform organisms mainly indicating faecal pollution. <i>Escherichia coli</i> is generally the dominant species.
Free residual chlorine:	Chlorine that is not combined with ammonia and is available to destroy organic matter and ensure disinfection. (Also known as Free Available Chlorine.)
Friable soil:	Soil that is easily crumbled and consists predominantly of sand and loam.
Hydraulic loading:	Flow required to be handled by the treatment process.
Multiple occupancy residential premises:	More than one residential dwelling unit or flat constructed on one or more allotments and discharging into a common or multiple septic tank system/s and generally under one or more Titles.
Non domestic/residential premises:	Includes nursing homes, rest homes, retirement villages with communal food service areas, hotels, motels, lodging houses, camps, hospitals, institutional facilities and like premises.
Nutrients:	The foods for microbial and plant life; mainly compounds of nitrogen and phosphorus.
Pooling:	Water from any source that collects to form a pool or puddle which persists longer than the period between irrigation pump cycles.
Primary treatment:	Is the treatment of sewage that occurs in the septic tank compartment/s of a waste control system.
Relevant authority:	<ul style="list-style-type: none"> • is the local council where the installation of a septic tank system is in an area subject to local government control, • is the SA Health Commission where the installation of a septic tank system is in an area not subject to local government control; or the installation is for the local council; or the proposed system is of a kind not covered by a SA Health Commission Code/Standard, • is the SA Health Commission where approval is required for the manufacture, supply or installation of a waste control system, appliance, equipment, product or process within South Australia.
Reclaimed water:	Water that has been derived from wastewater and treated to a standard which is satisfactory for its intended use.

GLOSSARY (cont.)

Reticulated water:	Any water supply obtained from a reticulated system and includes any bore, river or dam water supply.
SAHC:	South Australian Health Commission
Sanitary fixtures:	The plumbing fixtures connected to the system including a bath, basin, clothes and dishwashing machines, food waste disposal unit, kitchen sink, laundry trough, spa bath, toilet and other sanitary fixtures as permitted by AS 3500-2.
Secondary treatment	The process of aeration followed by clarification and disinfection
Septic tank:	A tank receiving the discharge of sewage and sullage wastes from sanitary fixtures including a water closet, bath, basin, shower, laundry trough, washing machine, kitchen sink and similar plumbing fixtures.
Septic tank system:	Includes the sanitary plumbing, fixtures, traps, waste pipes, vents, inspection openings, drains, septic tank and/or other treatment units and method of effluent disposal.
Surface irrigation disposal area:	A dedicated area of land suitably landscaped for the disposal of reclaimed water by means of surface irrigation onto a suitable medium and plants capable of effecting a high rate of evapo-transpiration.
Subsurface soakage:	A trench, bed, well or pipe system from which effluent percolates into the soil.
Suspended solids:	Solid particles held in suspension including settleable and non-settleable matter.
Treated effluent:	Effluent which has undergone (wholly or partly) secondary treatment including aeration and/or clarification but has not been subject to disinfection.
Waste control system:	As defined by the Public and Environmental Health Act and includes any system providing for the collection, treatment or disposal of human, commercial or industrial wastes in solid or liquid form incorporating biological, chemical or artificial means and fixtures, fittings, appliances, plant, processes associated with such a system.
Wastewater:	Water which is collected and transported through waste pipes and sewers. Wastewater normally includes water from domestic, commercial and industrial sources.

1. INTRODUCTION

Domestic aerobic wastewater treatment systems are a modified version of an existing method of treatment that is used for community sewage and industrial wastes.

The demand for individual aerobic wastewater treatment systems has occurred through changes in wastewater technology; increased costs associated with the installation of deep drainage; residential development in areas where conventional subsurface effluent disposal methods are ineffective and the need to conserve water resources and protect the environment.

In South Australia a range of systems have been approved. Some units require a separate primary treatment tank (septic tank) and others consist of a larger tank incorporating primary treatment (septic tank), aeration, clarification, settling, disinfection and storage chambers. The resultant effluent is discharged by pumping to a dedicated surface irrigation disposal area. Larger systems may include two or more tanks configured to achieve the required level of treatment.

Whilst some units incorporate a trickling or rotating biological filter, the more commonly installed systems use a variation of the extended aeration process. An outline of the typical operation of this more common type follows.

AERATION CHAMBER

The design of the aeration chamber takes into consideration the uneven nature of waste flow, especially for domestic premises where shock loading is severe.

Air is usually supplied by a small blower or compressor and distributed throughout the chamber by air diffusers. In other systems air is supplied by means of a fan, venturi or mechanical agitation.

Media may be installed in the aeration chamber to facilitate contact aeration. The type of media may vary but should have a discrete flow pattern with a large contact surface area and a self cleansing action. Media provides a surface area that will entrap air, impede the flow of the effluent and allow air to be taken up into the effluent to promote microbial growth.

CLARIFICATION CHAMBER

After aeration the partly treated effluent flows into the clarifier which provides quiescent conditions for the settling of suspended solids. A sludge scum return system operating continuously or intermittently, returns the solids to either the septic tank compartments or the first aeration compartment.

DISINFECTION/PUMP CHAMBER

The clarified effluent then passes through a tablet chlorinator into the chlorination compartment with a retention time sufficient to ensure a free residual chlorine level of at least 0.5 mg/litre at a sampling valve located at the first discharge point in the surface irrigation disposal area. Depending on the type of chlorine compounds used, retention times may vary from 30 minutes to two hours at peak flow.

After disinfection, the reclaimed water is stored in a sump and then pumped to a dedicated, landscaped surface irrigation disposal area for final disposal by absorption and evapo-transpiration.

As the treatment systems described above rely on aeration and chlorination to treat the effluent, they are required to undergo regular maintenance to ensure that the reclaimed water satisfies the following criteria:

- BOD₅ - less than 20 mg/litre,
- Suspended solids - less than 30 mg/litre,
- Free residual chlorine - at least 0.5 mg/litre,
- Faecal coliforms - not more than 10 per 100 ml.

A typical aerobic wastewater treatment system sized to service a 6 person dwelling provided with standard plumbing fixtures requires at least 300m² of land (200m² for the irrigation area plus 100 m² for social and recreational purposes). Therefore, they are not considered appropriate for use on small allotments. This 300m² is additional to that required for the dwelling, sheds, carport, driveways, access paving, setback distances and the treatment unit.

Although the reclaimed water is of a standard suitable for irrigation, there must be at least 4 signs erected in the surface irrigation disposal area, warning that reclaimed water is being used and that it is not suitable for human contact/consumption.

It is very important that the surface irrigation disposal area be correctly maintained to maximise its evapo-transpiration and absorption capability.

2. SYSTEM SUITABILITY

The safe disposal of sewage and household wastewater is necessary to protect the health of the community and the environment.

Where connection to a reticulated sewerage system or a septic tank effluent drainage scheme is not possible and where the soil is suitable, the installation of a septic tank system using on-site disposal is the next best alternative.

In many parts of South Australia, development is occurring on sites where conventional methods of subsurface effluent disposal are not suitable, and alternative methods of effluent treatment and disposal are required.

Although aerobic wastewater treatment systems are more expensive to install and have higher operational and maintenance costs than conventional subsurface disposal systems, they are still less expensive than removing effluent by tankerage. Additional benefits accrue through the conservation of water.

A correctly operated and maintained aerobic wastewater treatment system is an acceptable alternative method for treating domestic sewage to a level that enables spray irrigation of non food plants. These systems also reduce the public health risks associated with other less effective treatment and disposal methods.

3. APPROVAL TO MANUFACTURE

The Public & Environmental Health (Waste Control) Regulations require all manufacturers of aerobic wastewater treatment systems to obtain specific approval for each model, prior to their release onto the South Australian market.

Approval for the sale of aerobic wastewater treatment systems in South Australia is issued on condition that construction is to engineering standards and the requirements of the SA Health Commission, and the system is subject to regular maintenance. The quality of the reclaimed water must comply with the minimum discharge criteria at all times.

A copy of each maintenance report, as carried out by the supplier's or other service personnel, must be provided to the authority approving the site installation as soon as practicable after each service.

Work should not commence on the installation until approval has been issued by the approving authority. Details to be provided are shown in Section 8 the *Applications and Approvals* of this Supplement.

The SA Health Commission, as a condition of its approval, requires the manufacturer to supply the owner/occupier of the premises with a comprehensive manual, setting out the care, operation and

maintenance requirements of the system, including procedures to follow in the event of a system malfunction.

Appendix I, *Guidelines for the design and manufacture of aerobic wastewater treatment system*, details the general requirements to be addressed in an application to the SA Health Commission for approval to manufacture an aerobic wastewater treatment system for sale in South Australia.

The Public and Environmental Health Act (Waste Control) Regulations enables the SA Health Commission to require the provision of additional technical, scientific and engineering data to support the claims made in the application. The regulations also enable the SA Health Commission to require a treatment unit to undergo trials and tests prior to granting formal approval.

4. SYSTEM DESCRIPTION

SIZING OF THE PRIMARY TREATMENT COMPARTMENTS

The capacity of the primary treatment (septic tank) compartments are determined in accordance with the criteria detailed in Chapter 5 of the SA Health Commission Code *Waste Control Systems – Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia* or as specifically approved by the SA Health Commission.

For a normal dwelling of up to 6 persons and having standard plumbing fixtures (no food waste disposal unit or spa bath), the minimum capacity of the primary treatment (all waste septic tank) compartments is 3000 litres.

SIZING OF THE SECONDARY, CLARIFICATION & CHLORINATION TREATMENT COMPARTMENTS

Generally the capacity of the aeration, clarification, chlorination, effluent storage and pump chamber are determined according to recognised engineering standards. The sizing takes into account factors relating to hydraulic, organic, surge and peak loadings, detention times, treatment process and process residues, volumetric requirements for diffusers, media, pipework, pumps and other components.

An aerobic wastewater treatment system receiving the all wastes discharge from a residential dwelling for up to 6 persons would be designed to handle:

- a hydraulic load of 150 litres per person per day,
- an organic load of 50 grams BOD₅ per person per day ex the primary treatment compartments (septic tank).

Based on the above, the system would have a 900 litre per day hydraulic load and 300 grams per day BOD₅ organic load.

This calculation assumes standard sanitary fixtures - i.e. no spa bath in excess of 120 litres and no food waste disposal unit.

NON STANDARD FIXTURES

Non standard fixtures are permitted with the following modifications to the secondary treatment compartments of the aerobic wastewater treatment system:

Spa baths

Sizing of the secondary treatment capacity and the irrigation area is dependent on the capacity of the spa bath;

<i>Capacity of spa bath</i>	<i>Treatment capacity</i>	<i>Irrigation area</i>
less than 120 litres	no change	no change
121 - 370 litres	increase hydraulic loading by 250 litres	increase irrigation area by 55m ²
371 - 680 litres	increase hydraulic loading by 500 litres	increase irrigation area by 110m ²

No alteration to BOD₅ loading.

EXAMPLE

A system designed for a residential premises of up to six persons (all waste) with a spa bath of 300 litres capacity requires an aerobic wastewater treatment system designed for a hydraulic loading of 1150 litres per day ((6x150) + 250) and provision of an irrigation area of 255m² (1150 ÷ 4.5 litres/m²).

Food waste disposal units

The installation of a food waste disposal unit requires the installation of a system having a larger primary and secondary treatment capacity and may require a larger disposal system depending on use conditions. Additional requirements are necessary to deal with increased organic and hydraulic loadings.

Details of the primary treatment capacities are detailed in Chapter 5.7 *Non Standard Fixtures of the SA Health Commission Code Waste Control Systems - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia*.

The increased loadings are as follows:

- hydraulic loading increase by 10% (see note)
- organic loading increase by
 - domestic residential premises 33%
 - non domestic/residential premises 33%
 - restaurants/dining/meals areas 50%

NOTE: *No increase required for the hydraulic flow where the food waste disposal unit is installed in domestic residential premises.*

EXAMPLE

A residential premises for up to 6 persons (all waste) including a food waste disposal unit discharging into an aerobic wastewater treatment system would require a capacity as follows:

- 900 litres hydraulic (6 x 150)
- organic loading of 400 grams ((6 x 50) + 33%)
- 200m² irrigation area
- 4 000 litre primary (3 000 + 50% sludge scum)

EXAMPLE

A restaurant (no liquor licence) catering for a maximum of 100 meals per day requires an aerobic wastewater treatment system designed for the hydraulic and organic load including a food waste disposal unit (FWDU) as follows:

Loading requirements

- organic
 - 10 grams BOD₅ per meal (assume 1 meal = 1 person)
 - 20 grams BOD₅ per employee
- sludge scum
 - 35 litres/person
- hydraulic
 - 15 litres/person

System requirements

- *primary treatment (septic tank)*
 - 100 persons + 4 staff = 104 persons
- *sludge scum (SC)*
 - 104 x (35 + 17.5) = 5 460 litres (includes 50% SC for FWDU)
 - As greater than 5 000 litres for 1 year, desludging frequency can be 2 yearly
 - 5 460 x 2 = 10 920 litres (SC)
- *hydraulic (H)*
 - 104 x (15 + 1.5) = 1 716 litres includes 10% H for FWDU
 - total capacity = 12 636 litres
- hydraulic H (secondary treatment unit)
 - 100 persons + 4 staff = 104 persons
 - 104 x (15 litres + 1.5) = 1 716 litres includes 10% H for FWDU
- *organic (O) (secondary treatment unit)*
 - 100 persons x (10 + 5) = 1 500 grams includes 50% O for FWDU
 - 4 staff x 20 = 80 grams
 - total organic = 1 580 grams
- *irrigation area*
 - 1 716 litres ÷ 4.5 litres/m² = 381m²

For *multiple occupancy residential premises* such as units, townhouses and flats the sizing of the *secondary treatment* requirements for the aerobic wastewater treatment unit is based on the total number of bedrooms plus one bedroom, with 2 persons per bedroom.

EXAMPLE

Four by two bedroom units (no spa baths or food waste disposal units)

- 4 units x 2 bedroom = 8 bedrooms
- 8 bedroom plus 1 bedroom = 9 bedrooms
- 9 bedroom x 2 person/bedroom = 18 persons
- system capacity
 - : 18 x 150 litres *and* 18 x 50 grams
 - : 2 700 litres *and* 900 grams

However, if the same units each had a 370 litre spa bath and a food waste disposal unit (FWDU) the system including primary capacity would be sized as follows:

- *primary capacity* (based on 4 year desludging frequency)
 - *sludge/scum*

18 person x (80 + 40 (50% for FWDU)) x 4 years	= 8 640 litres
--	----------------
 - *hydraulic*

18 person x 150 litres	= 2 700 litres
4 spa baths x 250 litres	= <u>1 000</u> litres
Total primary tank capacity	= 12 340 litres
- *secondary hydraulic capacity*

18 person x 150 litres/person/day	= 2 700 litres
4 spa baths x 250 litres	= <u>1 000</u> litres
Total secondary hydraulic load	= 3 700 litres
- *secondary organic capacity*

18 person x [50 grams + 16.5 (33% for FWDU)]	= 1 200 grams (rounded)
--	-------------------------
- *irrigation area requirement*

3 700 litres/day ÷ 4.5 litres/m ² /day	= 822m ²
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Therefore system capacity would be:

- primary (sludge scum & hydraulic) 12 340 litres
- secondary hydraulic 3 700 litres
- secondary organic 1 200 grams
- irrigation area 822m²

For non-domestic commercial applications, the size of the aerobic wastewater treatment system is dependent on the:

- hydraulic loading,
- organic loading,
- flow balance or surge control.

For details of the various hydraulic flow requirements by use or activity refer to Chapter 11 - Table 1, of the SA Health Commission Code *Waste Control Systems - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia* and for details on the organic loading requirements refer to Appendix II of this Supplement.

It may be necessary to add the various amounts to arrive at the total hydraulic and organic loading. Where Table 1 of the Code or Appendix II of Supplement A, referred to above, do not list the specific type of premises or activity, it may be necessary to select a *similar* use/activity and use that figure or adjust accordingly. The relevant authority reserves the right to request additional data to substantiate the nominated loadings and/or vary such loadings.

FLOW BALANCING OR SURGE CONTROL

For systems not incorporating flow balancing or where the hydraulic system loading is highly variable, larger capacity aerobic wastewater treatment systems may be required.

All aerobic wastewater treatment systems approved for use in South Australia are rated on a maximum hydraulic and organic loading.

UNIT INSTALLATION REQUIREMENTS

The aerobic wastewater treatment system must be installed so that the cover and access openings are at least 100-150mm above the finished ground level. The junction between the wall and cover must be rebated and sealed water-tight.

A shaft/riser/ring used to raise the cover and access openings to the surface must be constructed of the same material, diameter, and thickness as the walls of the tank.

All junctions between the wall of the tank, shaft/riser/ring and cover must be rebated and must be sealed water-tight. The first junction must be at least 300mm above the usual working liquid level of the tank.

Electrical controls, blowers, compressors and non-submersible pumps must be located above ground in non-traffic areas, and be firmly secured using anti-vibration mountings in a well ventilated weatherproof housing.

All wiring must be installed by an appropriately licensed electrical worker and all electrical connections shall comply with the requirements of the supply authority service rules and AS 3000, *SAA Wiring Rules*.

Where separate primary and secondary treatment tanks are used, they must be installed on a level compacted/solid base. They must be spaced so that ground movement will not result in structural damage or loss of integrity of the base support of the shallower tank (angle of repose factor).

No part of either tank must be closer than 2 metres to the other except where both tanks are installed on undisturbed bedrock or a reinforced concrete base.

The backfill around the deeper tank must be sufficiently compacted to prevent movement or collapse of the ground below or around the shallower tank.

Connecting pipes between the two tanks must be laid in accordance with the National Plumbing Code AS 3500, Part 2, *Sanitary Plumbing and Sanitary Drainage*.

Landscaping of the finished ground surface must be graded down and away from the cover of the aerobic wastewater treatment unit to prevent the ingress of surface water through the access openings.

ALARM SYSTEMS

All aerobic wastewater treatment systems must be provided with an alarm to indicate an electrical or mechanical malfunction. The alarm must comprise audible and visible (indicator light) components, with muting facilities for the audible component. For domestic systems the alarm indicators must be positioned inside the building, preferably in the kitchen or laundry.

For multiple occupancy residential premises, an indicator light and audible alarm, with muting facilities for the audible component, must be provided in the kitchen or laundry of each residence, with an external flashing visible alarm in a suitable location to indicate a system malfunction.

For commercial and industrial premises, an indicator light and audible alarm, with muting facilities for the audible component, must be provided in a prominent location inside the building with an external flashing visible alarm provided in a suitable location to indicate a system malfunction.

SURFACE IRRIGATION DISPOSAL AREA

The surface irrigation disposal area must be dedicated to the sole use of receiving reclaimed effluent. The area must be landscaped, preferably with shrubs and trees and should be designed to discourage pedestrian and vehicle access.

Sizing of the disposal area

The disposal area for a residential dwelling for up to 6 persons is calculated using a maximum hydraulic loading of 4.5 litres per square metre over a 24 hour period. For a daily flow of 150 litres per person, and a minimum of 6 persons, the area of the surface irrigation disposal system is:

$$\frac{6 \times 150}{4.5} = 200 \text{ m}^2$$

For multiple occupancy residential premises such as flats, units and townhouses the area of the irrigation site is calculated on the basis of the number of bedrooms plus one and a daily flow of 300 litres per bedroom, eg.

- 4 units x 2 bedrooms = 8 bedrooms
- 8 bedrooms + 1 bedroom = 9 bedrooms
- 9 bedrooms x 300 litres = 2 700 litres
- 2 700 litres ÷ 4.5 litres/m² = 600m²
- Irrigation area = 600m²

This assumes standard plumbing fixtures installed. All additional fixtures; for example, food waste disposal unit and spa bath, will require an increase in the treatment and disposal capacities.

To determine the total load for sizing of the irrigation area it may be necessary to add a range of use conditions, including loadings where applicable.

In certain circumstances, the surface irrigation disposal area for specialist care hostel type accommodation may be sized at a figure less than 300 litres/bedroom where it can be demonstrated by legal documentation that the occupancy rate for each unit does not exceed one person at any time, (eg 150 litres/person). The hydraulic load will be determined on receipt of all information required with the application. The relevant authority reserves the right to incorporate an allowance for visitors and or other use.

- NOTE:**
- (1) *Where the only source of water is rainwater or carted water the minimum area required will be based on a hydraulic flow of 125 litres/person/day. This will equate to a minimum surface irrigation area of 166m² for a typical residential dwelling for up to 6 persons.*
 - (2) *Where the land gradient is greater than 10% (1:10) and it is practicable, the surface irrigation disposal area may need to be modified by benching or bunding etc. and/or increased in size to enable satisfactory disposal of the reclaimed effluent (See Figure 4).*
 - (3) *If the land gradient is greater than 20% (1:5) the application will be individually assessed, with drip or subsurface irrigation being mandatory **where approved**.*
 - (4) *Specific provisions of the Development Plan under the Development Act, namely, the Mount Lofty Ranges Comprehensive No. 2 and amendments preclude the siting of an effluent disposal system on land:*
 - *having a slope greater than 20% (1 in 5),*
 - *having less than 1.2m depth from the surface to bedrock, seasonal or permanent watertable,*
 - *situated in an area likely to be inundated by a 10 year return period flood event.*
 - (5) *Specific provisions of the Environment Protection Act and Regulations are applicable for aerobic wastewater treatment systems installed in a "Water Protection Area" and having a capacity greater than 100 persons.*
 - (6) *On some sites it may be necessary to require tertiary treatment of the effluent and specific subsurface irrigation system with microprocessor control to regulate discharge cycles and quantity of effluent. It may also incorporate backflushing devices to maintain the subsurface disposal system.*

LANDSCAPING

Most sites are initially unsuitable for evapo-transpiration of reclaimed effluent. Where this is the case and there is surface rock or water; near surface ground water or rock; or heavy soils, the site must be modified.

Landform modification prior to commissioning of the aerobic wastewater treatment system includes soil cultivation, with at least 150mm depth of friable soil and or other suitable material such as pinebark, woodchips, scoria etc. to the specified depth over the entire surface irrigation disposal area; for example, 100mm layer of friable soil and a 50mm layer of pinebark. Hay, straw or mulch may be used, but more frequent replacement will be necessary. The area also needs to be planted with appropriate flora to ensure loss of the reclaimed water from the irrigated area by transpiration as well as normal evaporation.

Where the surface irrigation disposal area is constructed over rock, or where there is a danger of reclaimed water escaping to adjacent areas, impervious materials must be used to contain the reclaimed water totally within the dedicated area.

If the existing vegetation is not suitable or adequate for evapo-transpiration, extra trees and shrubs must be planted, and additional landscaping may be necessary.

Plants in the surface irrigation disposal area must be suitable for the transpiration of reclaimed water and be salt and nutrient tolerant. (See Appendix III.)

The surface irrigation disposal area must not be located on land prone to waterlogging or subject to flood or surface water inundation.

Landscaping must be designed so that the reclaimed water does not pool within, or run-off from, the surface irrigation disposal area.

As a public health precaution where spray irrigation is used, vegetables or food plants, including fruit and nut trees, must not be grown in the surface irrigation disposal area. However, if drip irrigation is used, fruit and nut trees may be allowed. In some cases it may be appropriate to dispose of the reclaimed water by subsurface irrigation.

As a precautionary measure, pedestrian traffic, except for maintenance purposes, should be excluded from the surface irrigation disposal area.

All roof waters must be diverted away from the surface irrigation disposal area. Where practicable, roof waters should be diverted to the street water table or to a point beyond the surface irrigation disposal area.

It is important to ensure the spray irrigation system is installed, operated and maintained to prevent contamination of rain water catchment areas and rain water tanks.

Within the surface irrigation disposal area there must be at least four warning signs, one on each side, clearly positioned to inform the occupants of the premises that reclaimed water is used for irrigation. These signs must be on a white background with *RED* lettering of at least 20mm in height and worded as follows:

**WARNING - RECLAIMED WATER
NOT SUITABLE FOR HUMAN CONTACT/CONSUMPTION**

All landscaping and flora plantings *should* be completed and the surface irrigation disposal system *must* be in operation prior to occupation/use.

IRRIGATION SYSTEM

The reclaimed water must be distributed evenly over the entire surface irrigation disposal area without spray drift, pooling and/or run-off from the area.

The spray heads must be suitable for use with reclaimed water. The spray plume must not exceed 600mm above the finished level of the surface irrigation disposal area.

Spray drift into adjacent areas is not permitted and some sites may require *drip irrigation* due to adverse conditions (eg. exposed sites subject to strong prevailing winds, no fencing provided, excessive land slope etc.).

Care must be taken in the selection of the type and placement of the spray heads to ensure the plume is contained totally within the surface disposal area. This may require the installation of 90° and or 180° sprays around the perimeter of the surface irrigation disposal area.

A dripper system can be used as an alternative to spray irrigation, provided there is no pooling or run-off of the reclaimed water within or from the surface irrigation disposal area. The number of outlets required is dependent on the type and capacity of the drippers, the aerobic wastewater treatment unit, pump and landscaping. A detailed plan is to be submitted with the application showing the discharge quantity and the area to be served by each dripper, including details of trees, shrubs or plants to confirm uptake of the applied reclaimed water. Approval will be granted on an individual basis.

The irrigation system including the pump, pressure lines and distribution points must be of sufficient capacity to ensure that the rate of discharge is at least 50% greater than the maximum volume delivered at any one time into the aerobic wastewater treatment system to satisfy imposed pressures such as friction or static head.

The minimum standard of all pipework to and within the surface irrigation disposal area must be polyethylene complying with AS 2698. Pipework must also be suitable for use with reclaimed water and buried at least 150mm underground. uPVC potable water pipes are not permitted under any circumstances for use in the irrigation system.

For residential premises, the disposal system must be a fixed system.

For commercial and/or industrial premises, a moveable system may be allowed, subject to individual approval. Any moveable system must be installed so as to confine the discharge of reclaimed water solely within the surface irrigation disposal area and comply with increased setback distances.

Timer switches are not permitted for the operation of the surface irrigation disposal system unless they are electrically operated in conjunction with the irrigation pump.

5. ALLOTMENT REQUIREMENTS

RECREATIONAL, SOCIAL & DOMESTIC USE AREAS

Sufficient space must be provided on the site for domestic, social and recreational use *in addition to* the area required for:

- building and perimeter paving,
- foot and vehicle access,
- vehicle parking, carports, garages and storage sheds,
- septic tank and aerobic wastewater treatment system,
- surface irrigation disposal area.

For single occupancy residential premises, the area provided for domestic, social and recreational use must be at least 50% of the area required for the dedicated surface irrigation disposal area. For multiple occupancy residential premises, this must be at least 25% of the area required for the dedicated irrigation disposal area and be evenly distributed amongst the residences. This includes:

- lawns,
- patios,
- outdoor entertainment,
- children's play areas,
- clothes drying,
- garden area.

NOTE: (1) *The narrow areas created by minimum set-back distance of 1.5 metres or less are not to be used for the determination of the requirements of the domestic, social and recreational use area.*

(2) *Commercial and/or Industrial premises may be exempted from recreational, social and domestic use requirements subject to adequate land being available for disposal of the irrigated effluent.*

SETBACK DISTANCES

To protect buildings, structures and adjoining properties a range of minimum setback distances are necessary (See Figures 1 to 4):

Surface irrigation disposal area

On a flat or gently sloping site, gradient less than 1.0% (1:100)

- 0.5 metres from boundaries,
- 1.5 metres from buildings, including those erected on adjoining allotments.

On a sloping site, gradient greater than 1.0% (1:100)

- 0.5 metres from upslope boundary,
- 1.5 metres upslope from lower boundaries,
- 1.5 metres downslope from buildings,
- 3.0 metres upslope from a lower cut face/bench,
- 3.0 metres upslope from buildings, including those erected on adjoining allotments.

From swimming pools including surrounding paved areas

- 3.0 metres on flat ground,
- 3.0 metres downslope,
- 6.0 metres upslope.

From any well, bore, dam used or likely to be used for human or domestic use

- 50 metres.

From any watercourse identified on a current series 1:50 000 Department of Environment and Natural Resources topographic map and used or likely to be used for human or domestic use

- 50 metres. (Refer also to Note 2).

From the pool level for the River Murray and Lakes

- 100 metres and above the 1956 flood level.

From a water source used for agricultural, aquacultural or stock purposes

- 50 metres.

NOTE: (1) *Specific provisions of the Development Plan under the Development Act may preclude siting of effluent disposal systems in certain areas and include:*

(a) *"the Mt. Lofty Ranges Comprehensive No. 2 and amendments"*
-no effluent disposal system within 50m of a watercourse identified on a current series 1:50 000 Department of Environmental and Natural Resources topographic map.

(b) *the "Regional Coastal Areas Policies" requires that effluent disposal systems*

should not be located less than 100m from the mean highwater mark along coastal foreshore areas.

- (2) *Whilst a watercourse is defined as a blue line on a 1:50 000 topographic map there are situations where a watercourse exists and is poorly defined on the 1:50 000 map or is excluded by other detail. Therefore it is important to ensure that the 50m setback is maintained to prevent contamination of the State's water resources.*
- (3) *Specific provisions of the Environment Protection Act and Regulations are applicable for aerobic wastewater treatment systems installed in a "Water Protection Area" and having a capacity greater than 100 persons.*
- (4) *Disposal of septic tank effluent, treated effluent or reclaimed water is not permitted within the 1956 River Murray & Lakes Flood Zone.*
- (5) *Where possible setbacks greater than the above are recommended.*

A combined septic tank/aerobic wastewater treatment unit or aerobic wastewater treatment unit must be;

- at least 1.5 metres from the surface irrigation disposal area,
- at least 3.0 metres from any boundaries or buildings,
- as far as practicable and in all cases at least 10 metres from any well, bore, dam or any watercourse used or likely to be used for human or domestic purposes.

- NOTE:**
- (1) *Where it is intended to locate the surface irrigation disposal area upslope of a building, the footing design engineer should be consulted to determine the likely impact on the building footing and the need for any additional requirements such as diversion trenches. Confirmation of the footing design engineer's requirements should be provided with the application.*
 - (2) *Special provisions of the Development Plan under the Development Act, namely the Mt. Lofty Ranges Comprehensive No. 2 and amendments apply with regard to the siting of effluent treatment systems.*
 - (3) *Specific provisions of the Environment Protection Act and Regulations are applicable for aerobic wastewater treatment systems installed in a "Water Protection Area" and having a capacity greater than 100 persons.*
 - (4) *The primary and secondary treatment unit must be sited on land above a 10 year return period flood event. In cases where it is not possible to achieve this requirement, it will be necessary to have the access cover and inspection opening shafted so as to terminate 150mm above the 10 year period flood event level, except where precluded by the provision in (2) above.*

6. SYSTEM OPERATION

Aerobic wastewater treatment systems, as presently approved, are not generally suited for intermittent use and consequently, approval will only be granted for a system designed to be operated in accordance with the manufacturer's recommendations. All applicants are required to negotiate this aspect with the manufacturer.

To ensure that the operation of the septic tank and aerobic wastewater treatment system is efficient and trouble-free, the use and discharge of strong alkalis, oils, acids, bleaches, disinfectants, chemical detergents, pesticides and herbicides to the primary and secondary treatment

compartments should be avoided. Where bio-degradable cleansers are used, the manufacturer's recommendations should be followed.

The maximum daily flow should not be exceeded nor the system subjected to shock loads; eg. by using the shower or bath and washing machine at the same time. Wherever possible, large loads of washing should be divided into smaller loads and the washing done at more frequent intervals. Should surge loading become a problem, it may be necessary for a balancing compartment to be added to the aerobic wastewater treatment system.

If the biological activity of the system is affected by surge loading and/or chemicals, then there will be a reduction in the quality of reclaimed water, requiring the system to be re-balanced by the manufacturer's service agent.

7. SYSTEM MAINTENANCE

FREE RESIDUAL CHLORINE

The reclaimed water must have at least *0.5 mg/litre of free residual chlorine* at the first point of discharge on the surface irrigation disposal area; that is, the sampling valve located at the first spray head or dripper in the disposal area.

In certain circumstances, usually for commercial applications, higher levels of free residual chlorine may be required as a condition of approval.

As an alternative, reclaimed water can be pumped from the aerobic wastewater treatment unit to a holding/storage tank before distribution to the surface irrigation disposal area or other disposal as approved. Sufficient chlorine must be added to the reclaimed effluent to ensure at least 0.5 mg/litre free residual chlorine in the holding/storage tank, and at discharge from the sampling valve located at the first spray head or dripper in the surface irrigation disposal area.

The approving authority reserves the right to inspect individual systems and to conduct any tests to confirm compliance with regulatory and/or approval requirements.

UNIT MAINTENANCE

The aerobic wastewater treatment system must be maintained at all times to ensure that the following requirements are satisfied;

- the reclaimed water from the system complies with the discharge criteria,
- the irrigated reclaimed water is chlorinated to the minimum *residual free chlorine* standard as measured at the first point of discharge within the irrigation area,
- the irrigation system is maintained to a standard that prevents it from creating an environmental nuisance and or risk to health. Such maintenance is to prevent the occurrence of spray drift, misting, pooling and run-off from the surface irrigation disposal area.
Heavy penalties apply for the illegal or unauthorised discharge of effluent, treated effluent or reclaimed water.

Septic tanks, or the septic tank compartments of the aerobic wastewater treatment systems, must be desludged in accordance with the approved conditions and/or the manufacturer's operating instructions. This is usually every four years for a dwelling serving up to 6 persons. Some manufacturers of aerobic wastewater treatment systems recommend desludging more frequently.

An existing septic tank connected to an aerobic wastewater treatment system must be desludged prior to the commissioning of the system.

In the event where the septic tank, aerobic wastewater treatment system and irrigation system is not operated in accordance with the above conditions, or the system is operated in a manner prejudicial to public health, the approving authority may;

- require modification of the system,

- impose sampling of the effluent, reclaimed effluent or reclaimed water with the user (owner or occupier) bearing all sampling costs,
- require replacement of the aerobic wastewater treatment system,
- require the removal of the effluent from the site by tankage for final disposal in an approved manner and location,
- institute legal proceedings under the Public and Environmental Health Act and or the Public and Environmental Health (Waste Control) Regulations or other legislation.

The installer/supplier of the aerobic wastewater treatment system is required to supply the owner/occupier with an *operating and maintenance manual*. The manual must clearly detail the operation and maintenance procedures to be followed, to ensure that the reclaimed water conforms with the discharge criteria. The manual must detail the procedures to be followed in the event of system malfunction.

MAINTAINING THE SURFACE IRRIGATION DISPOSAL AREA

To ensure that the surface irrigation disposal area operates at its maximum efficiency, the required medium, such as friable soil, pine bark, wood chips, scoria etc. and suitable plants capable of effecting a high evapo-transpiration rate, must be maintained at all times.

NOTE: *The approving authority may impose additional requirements with regard to the installation and operation of the aerobic wastewater treatment system, depending on site specific conditions.*

8. APPLICATIONS & APPROVALS

NOTE: *This Supplement only provides details on the requirements for aerobic wastewater treatment systems. Therefore to obtain other relevant information required with an application for approval to install an aerobic wastewater treatment system it will also be necessary to refer to the SA Health Commission "Waste Control System - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia".*

PUBLIC & ENVIRONMENTAL HEALTH (WASTE CONTROL) REGULATIONS

The Public and Environmental Health (Waste Control) Regulations detail the legislative requirements to be satisfied with regard to the manufacture, installation and operation of waste control systems.

REGULATION 6 defines the relevant authority and their respective areas of authority.

REGULATION 7 provides that;

A person must not install or alter a waste control system except as approved by the relevant authority.

REGULATION 9 provides that;

A person must not manufacture or construct a waste control system or a component, part or product for a waste control system except as approved by the relevant authority.

REGULATION 10 provides that;

A person must not sell, or expose for sale, or have in his or her possession for the purpose of sale a waste control system unless it has been manufactured or constructed under an approval from the relevant authority.

REGULATION 11 provides that;

A person must not use a waste control system except as approved by the relevant authority.

REGULATION 12 provides that;

(1) The application:

- be on a form determined by the SA Health Commission,
- contain the required information as detailed on the form and as set out in the relevant code and be accompanied by the required plans,
- include such other data as required by the relevant authority,
- be accompanied by the required fee.

(2) Penalties apply for false or misleading information.

REGULATION 13 (3) provides that;

The applicant, owner or the occupier of the premises are obliged to ensure the waste control system complies with the approval conditions at all times.

Penalties apply for non compliance with the relevant regulations.

APPLICATION TO INSTALL A SEPTIC TANK & AN AEROBIC WASTEWATER TREATMENT SYSTEM

Prior to installing a septic tank and an aerobic wastewater treatment system it is necessary to submit an application to and receive an approval from the relevant authority.

The relevant authority is:

The local council for the area where the system is to be installed, *or*

The South Australian Health Commission for areas of the State not under local government control.

Application for approval to install a septic tank and an aerobic wastewater treatment system must be made on the required application form and provide the necessary information. The application form can be obtained from the relevant authority.

INFORMATION TO BE PROVIDED WITH THE APPLICATION

Application form

The application form requires completion of the appropriate sections relating to the:

- location of the installation,
- owner/applicant,
- premises and system,
- non standard fixtures,
- septic tank,
- land capability assessment,
- aerobic wastewater treatment unit details including;
 - manufacturer's name,
 - model number,
 - hydraulic loading in litres per day,
 - BOD₅ loading in grams per day,
 - hydraulic loading in litres,

- surface irrigation disposal area,
- alarm system,
- declaration and signatures.

To assist with the identification of the site the application details should include the following information:

- *where situated with a defined suburb or township:*
provide street number, and/or allotment number, street name, suburb or township,
- *where situated within a rural area:*
provide hundred, section, allotment number, name of road, name of township or district,
- *where the location of the installation is not within a defined township:*
provide clear directions and a location plan,
- *in addition the site must be identified:*
provide a sign positioned at the front of the allotment, showing the owner's name and the allotment number.

NOTE: (1) *Applications not signed by the OWNER will be returned for the appropriate endorsement.*

(2) *Before proceeding with the preparation of an application to install a septic tank and an aerobic wastewater treatment system, preliminary assessment of the site is necessary. Refer to Section 7.2 "Site Assessment Criteria" of the SA Health Commission Code "Waste Control Systems - Standard for the Construction, Installation, and Operation of Septic Tank Systems in South Australia".*

(3) *Failure to satisfy the requirements in Section 7.2 "Site Assessment Criteria" of the SA Health Commission Code "Waste Control Systems - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia" may necessitate:*

- *increased disposal system requirements,*
- *consideration of alternative treatment and or disposal methods.*

The applicant is responsible for ensuring that the installation of the septic tank and aerobic wastewater system is installed in accordance with the approved plan and approval conditions. For this reason the owner should when possible be the applicant. Refer to the comment on Regulation 13 (3) in this Section.

NOTE: *Work on the installation of a septic tank and aerobic wastewater treatment system should not commence until copies of the "approved plan and approval conditions" have been received by the applicant. Installation of the system without approval may result in action by the relevant authority.*

Site layout plan

(see Figures 1 to 3)

A detailed site layout plan must be provided (in duplicate) drawn to a scale of 1 in 500 showing:

- block dimensions,
- contours indicating natural ground fall,
- proposed location of the building and all other structures including sheds, swimming pools and paving etc,
- position of the proposed septic tank, the aerobic wastewater treatment unit and surface disposal irrigation area including setback distances from boundaries, buildings, the aerobic wastewater treatment unit, the irrigation system, swimming pools etc,
- location of any building on the boundary alignment,

- details of any site modifications eg. benching, cutting and filling,
- details and location of any diversion trenches to collect surface or migrating subsurface water,
- details and location of storm, surface and roof water disposal,
- details of any well, bore or dam used or likely to be used for human and or domestic use,
- details of any water source used for agricultural, aquacultural or stock purposes,
- details of any water course, identified on a current 1:50 000 Department of Environment and Natural Resources topographic map, used or likely to be used for human and or domestic purposes,
- type of proposed septic tank - eg. precast or constructed in situ,
- capacity of the proposed septic tank and/or pump sump,
- type of aerobic wastewater treatment unit to be installed,
- details, type and position of audible and visible alarm,
- details of the aerobic wastewater treatment system including:
 - location of the warning signs,
 - position of irrigation lines,
 - information as to the location of irrigation discharge points,
 - method of construction of surface irrigation disposal area bed, including the materials to be used,
 - an indication of salt and nutrient tolerant flora to be provided to achieve evapo-transpiration effect (types of plants and general locations),
 - where a split irrigation system is used; details of mechanisms to ensure even discharge to each area and to prevent overloading of individual areas.

Building layout plan

(See Figure 5)

A detailed building layout plan must be provided (in duplicate), and drawn to a scale of 1:100, providing the information as outlined in Section 3.3 of the SA Health Commission Code *Waste Control Systems - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia*,

Application fee

Payment of an application fee must accompany each application. Refer to the relevant authority for details as the fee varies according to system capacity and other factors.

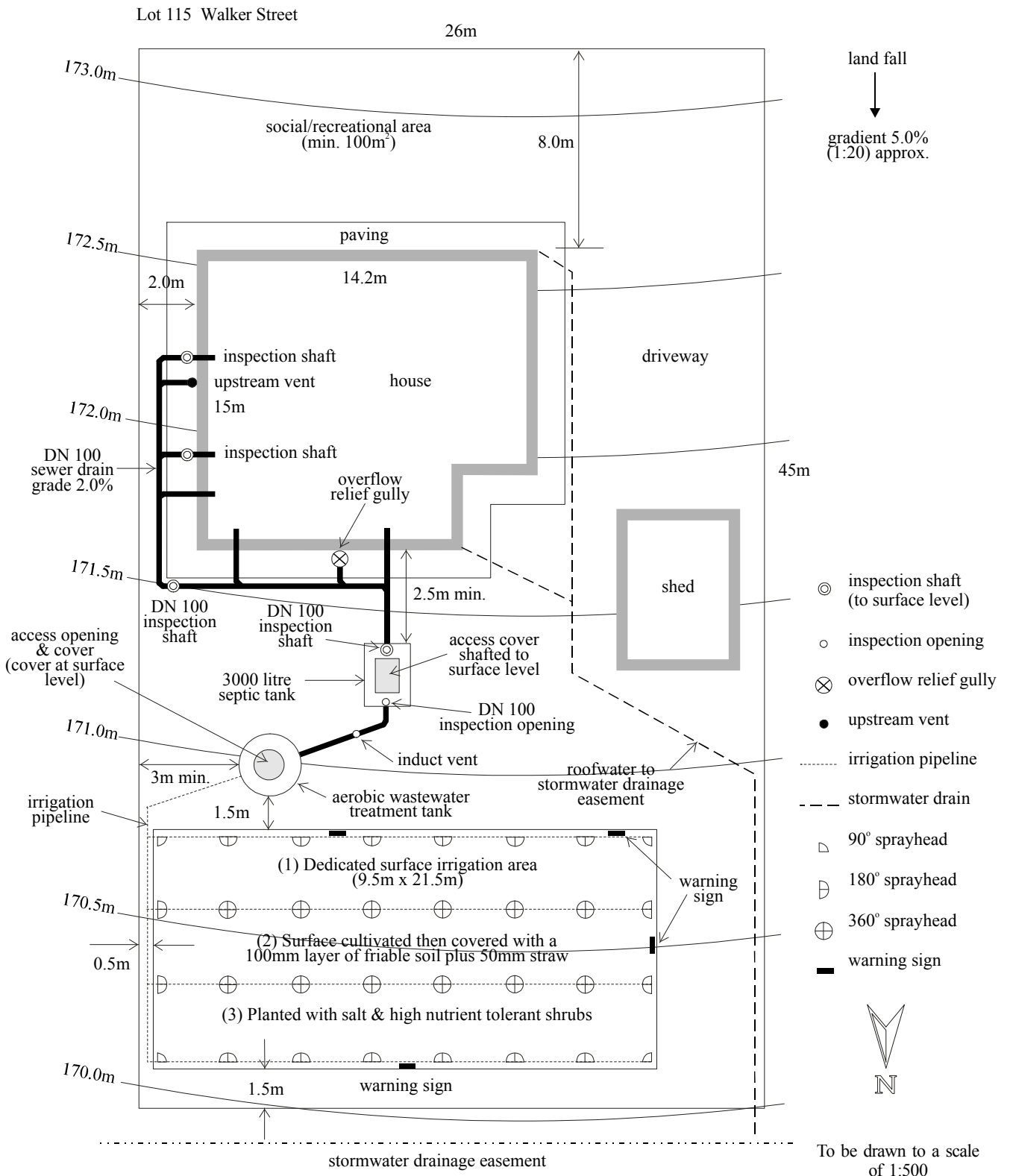
NOTE: (1) *Failure to provide the relevant information may delay approval.*

(2) *The applicant/owner is required to provide geotechnical evidence demonstrating that the nominated disposal area satisfies the requirements contained in Chapter 7 of the SA Health Commission Code "Waste Control Systems - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia".*

ENQUIRIES

Enquiries regarding aerobic wastewater treatment systems can be made to:

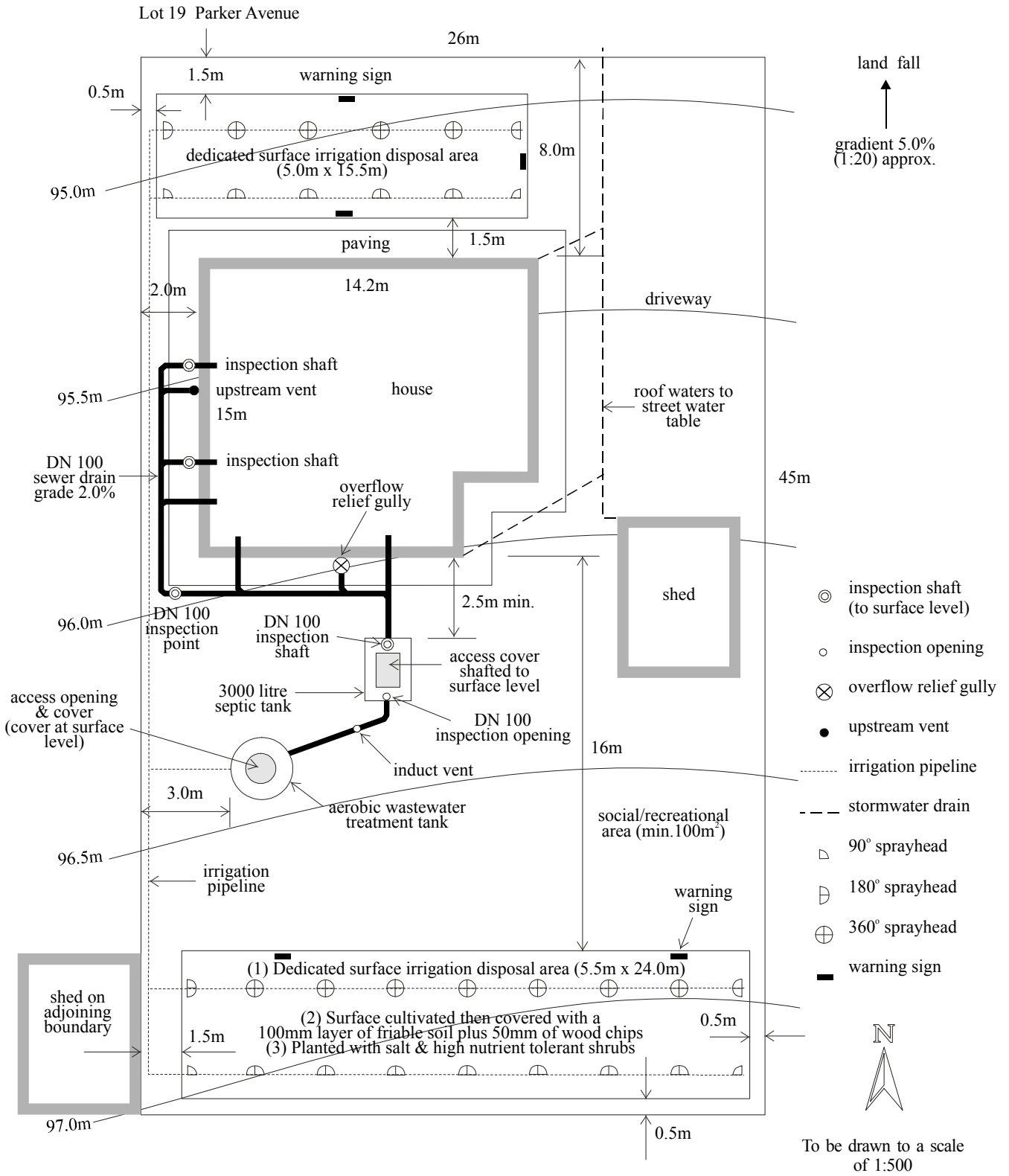
- (1) The local council office for the area in which the system is to be installed.
- (2) The South Australian Health Commission if the system is to be installed in an area not under local government control.



(Schematic & reduced for printing)

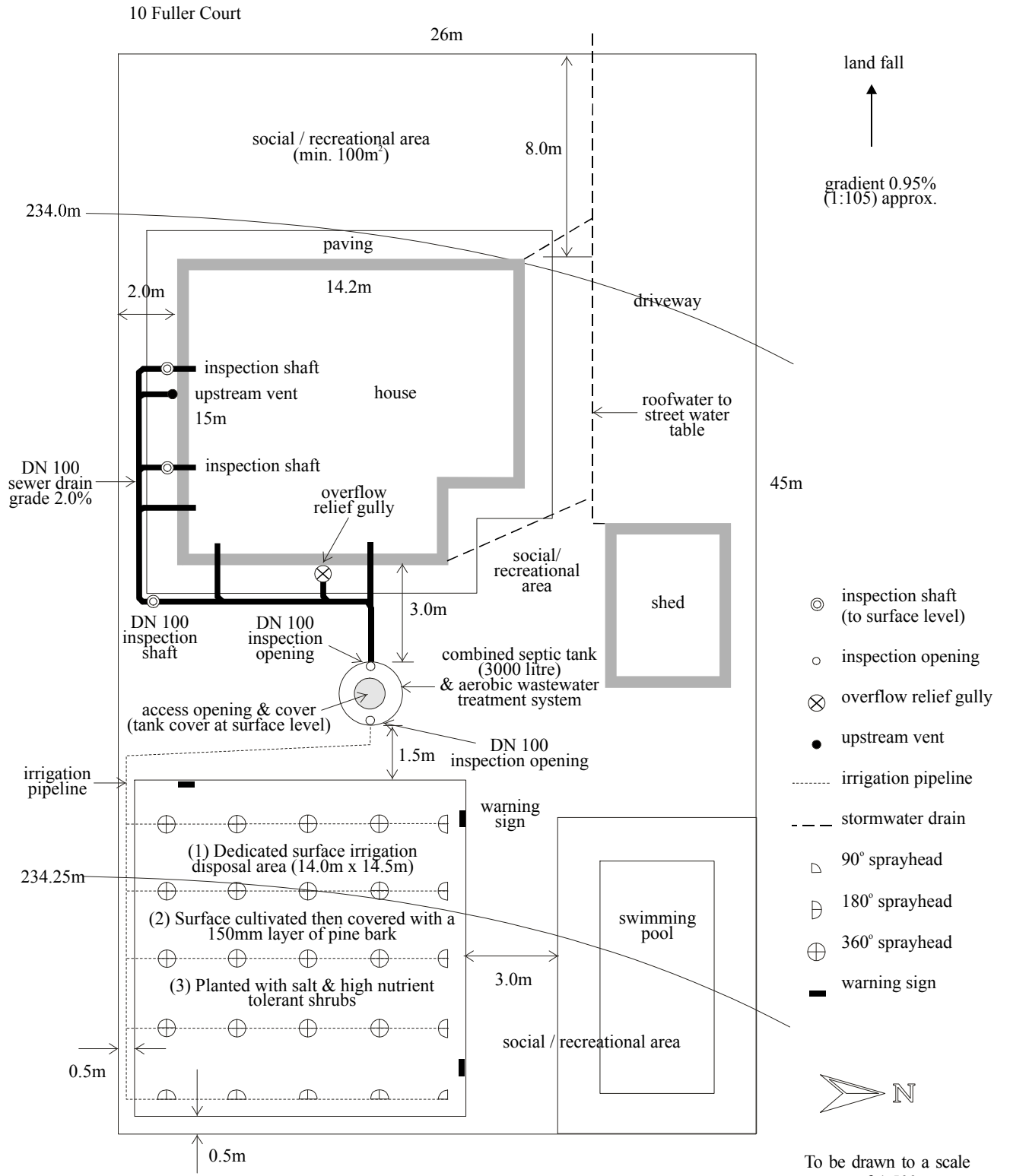
TWO TANK SYSTEM - SINGLE IRRIGATION AREA

FIGURE 1: TYPICAL SITE LAYOUT PLAN



TWO TANK SYSTEM - SPLIT IRRIGATION AREA

FIGURE 2: TYPICAL SITE LAYOUT PLAN



To be drawn to a scale of 1:500

(Schematic & reduced for printing)

SINGLE TANK SYSTEM

FIGURE 3: TYPICAL SITE LAYOUT PLAN

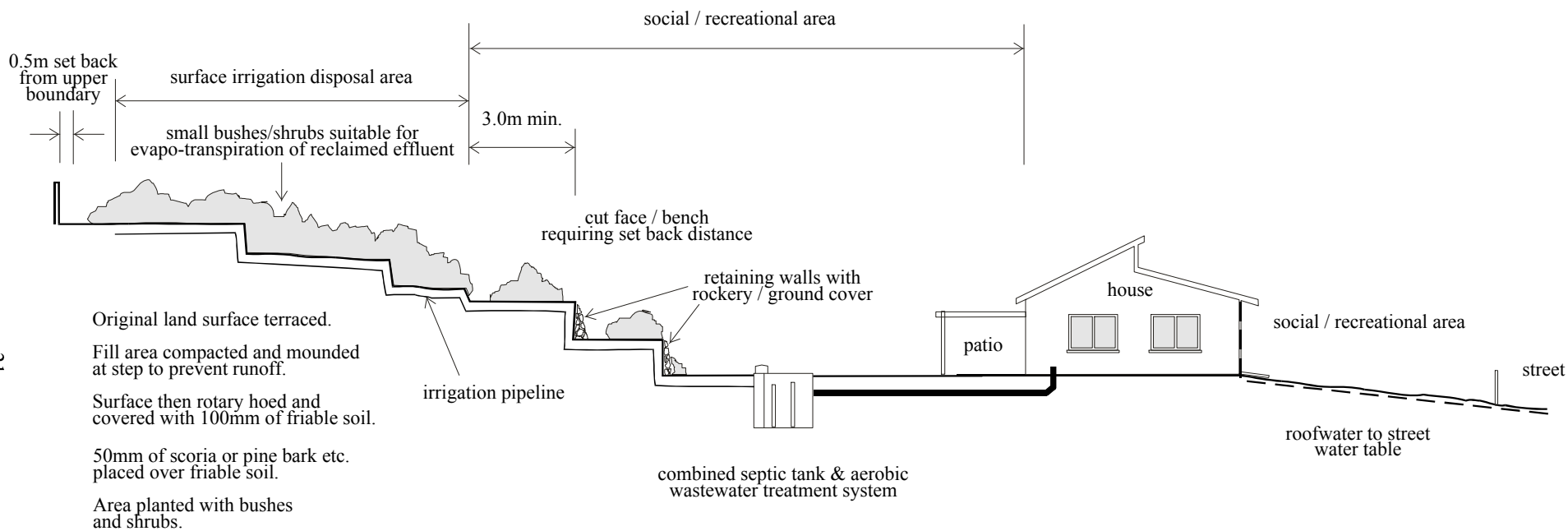
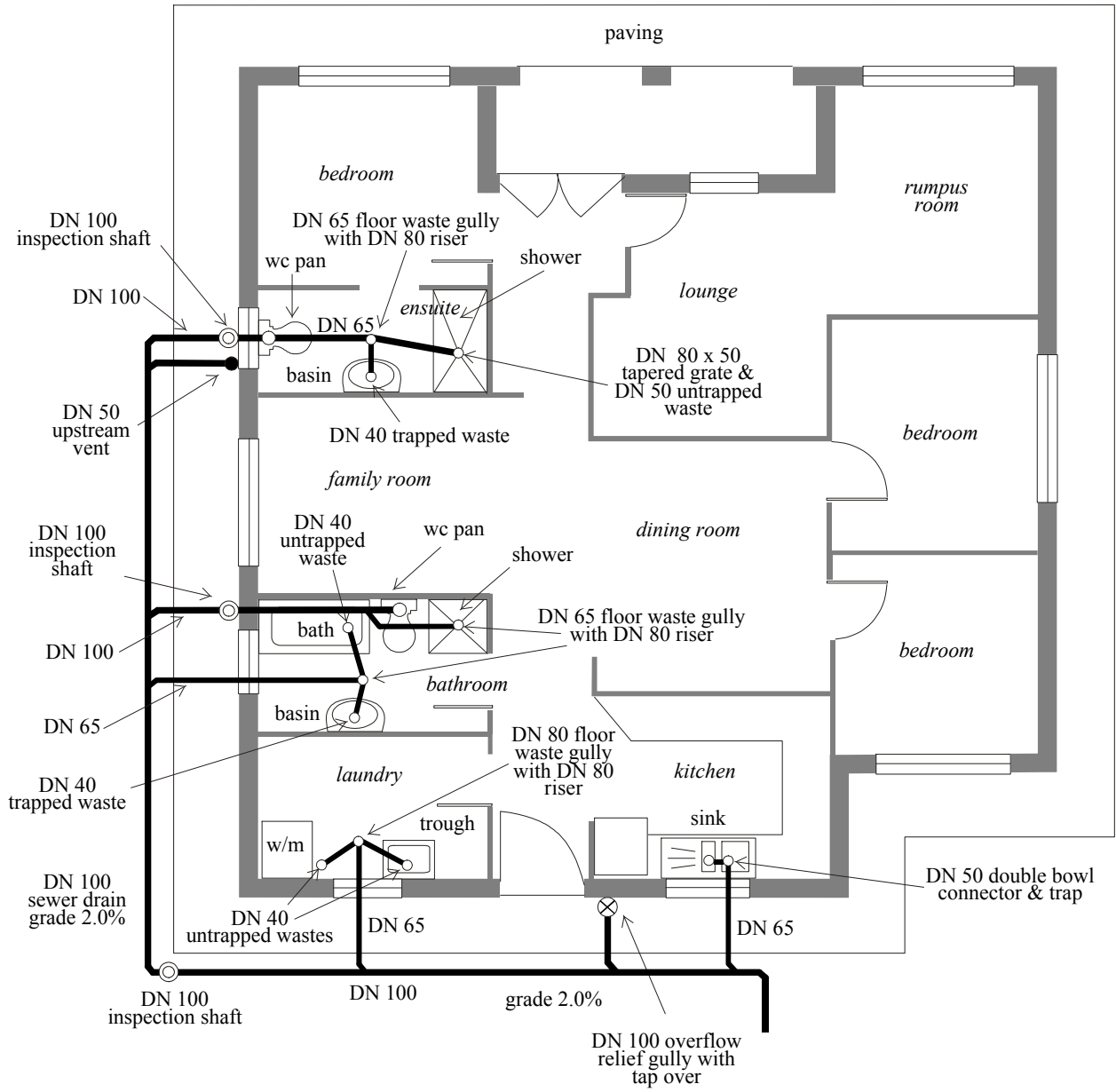


FIGURE 4: TYPICAL SECTION THROUGH CUT / BENCHED SITE



To be drawn to a scale of 1:100

FIGURE 5: BUILDING LAYOUT PLAN

(Schematic & reduced for printing)

APPENDIX I

GUIDELINES FOR THE DESIGN & MANUFACTURE OF AEROBIC WASTEWATER TREATMENT SYSTEMS

These guidelines detail the general requirements to be addressed in an application to the SA Health Commission for approval to manufacture an aerobic wastewater treatment system for sale in South Australia.

Application to include:

1. Two sets of plans of the system drawn to a scale of 1:100 (or larger as appropriate for detail) and showing all details and dimensions and flow process as well as operating capacities of the various compartments.
2. A comprehensive technical, engineering specification detailing the method of manufacture, treatment process, operation and cycle processes/functions. Details of pumps, blowers, pipework, media, valves, disinfection, alarms, electrical controls etc. are also to be provided along with information as to the component and product life and maintenance requirements. (Refer also to the section below on *Requirements for manufacture*)
3. Details on the maximum hydraulic and BOD₅ loadings for the system (ex septic tank), based on 50 grams BOD₅ and 150 litres daily flow and per person equivalent.
4. Information on the suitability of the system for operation with spa baths and or food waste disposal units and or other limitations.
5. Two copies of the manual/s for the system including requirements for the installation, operation, care and maintenance of the system are to be provided with the application. The manual/s must provide detailed advice to the owner/operator of the system, on the operation of the system, alarm conditions and fault finding and remedial action, as well as detailing common problems associated with improper use and action to avoid such problems.
6. Details of the sludge-scum return system.
7. Details of the irrigation system as supplied and to be installed including installation instructions.

REQUIREMENTS FOR MANUFACTURE

All aerobic wastewater treatment systems must be designed and constructed so that:

1. The aerobic wastewater treatment system incorporates primary treatment. This can be provided by an appropriately sized separate septic tank or septic tank compartments within the treatment tank.
2. The method and materials of construction are capable of ensuring structural integrity during installation; and operational modes in either an empty or full state and ensuring that no structural failure or movement occurs when the tank is transported or lifted for placement into the excavation. This is to be confirmed by engineering calculations/ certification. The engineering calculations/certification must also make reference to the maximum loadings for the cover, noting suitability or non-suitability for vehicular or pedestrian loadings, and the maximum depth that the tank can be installed and the maximum loadings on the wall of the tank where increment rings/risers are used.
3. The materials, parts and equipment are suitable for a sewerage environment and their intended purpose. Provide an indication of the life of the tank, components and motors/blowers.
4. A joint or junction of internal division walls to either the floor or internal/external walls will remain water-tight during transport and installation and will remain water-tight and prevent the flow from one compartment during operation and at all other times. Stainless steel brackets and fasteners are to be used to attach non-integral walls to the integral walls of the tank in addition to rebating/grouting. That the junction of any prefabricated concrete

components to be tight-fitting and effectively sealed with a suitable sealing/ bonding agent applied as per the manufacturer's instructions and in a tradesman-like manner and such sealing/bonding agent must be adequate to withstand transportation, handling and operational conditions without failure.

5. The treatment tank/compartments are watertight and not subject to the ingress or egress of water through the walls, floor or cover.
6. All pipe entries/penetrations through all walls are formed with collars cast into the walls.
7. The unit is constructed in such a manner that, at the time of installation, the cover will be located 100mm above finished ground level. Where this is not possible the tank may be extended to surface level by the provision of increment rings/risers (see Item 8) or by one or more shafts, access openings and covers as detailed in Chapter 6 of the SA Health Commission Code *Waste Control Systems - Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia*, for septic tanks over 5000 litre capacity. All serviceable equipment *must* be readily accessible and removable from the shafts.

Where riser shafts at a reduced diameter are used, the shaft diameter must be sufficiently large enough for any pipework therein and enable removal of any of the serviceable equipment/materials and provide safe access by persons carrying out the work. Where deeper than 1.2m access ladders are to be fitted.

8. Where increment ring/risers are used to raise the tank walls to the required surface level, the materials of construction, wall thickness and diameter is to be the same as for the tank and that all junctions/joints between the tank, increment rings/risers and the cover are to be rebated and sealed watertight. This is to be confirmed by engineering calculations/certification.
9. There is no construction joint as in the external walls until at least 300mm above the working liquid level of the tank.
10. Access and inspection openings are provided with covers designed and attached in such manner as to be *childproof*.
11. Where the system is being used for *intermittent occupation*, it must remain operational; that is, sufficient chlorine be supplied to ensure adequate disinfection of the reclaimed effluent for the period of non use and the electricity to the system must not be cut off or disconnected for the period of non use.
12. Noise levels during system operation should be less than 40dB(A) during continuous operation.
13. The capacity of the chlorination chamber is based on the type of chlorine compounds used; unstabilised chlorine requires 30 minutes retention at peak flow; stabilised chlorine requires 2 hours retention at peak flow. Provide details of the method of disinfection/ chlorination including contact time and the type of chlorine compounds used and calculations confirming contact time.
14. The tank is marked with the manufacturer's name, model number, hydraulic and BOD₅ loading. Depending on the method and materials of construction additional information may be required; for example, plastic tanks must be marked with the weight of the tank and installation instructions.
15. Air requirements are to be based on 2.4kg oxygen per 1kg BOD₅ per day with an oxygen transfer rate of 4.0% unless evidence substantiating a higher transfer rate in wastewater is presented. Provide details of the method of air entrainment and confirmation that sufficient air is supplied for treatment. eg. blower and diffuser specifications etc.
16. The quantity of media is usually based on the requirements for rotating biological contactors; that is 8 grams BOD₅ per m². Provide details of the type of media installed within the system and confirmation that sufficient media is supplied for treatment.
17. The effective capacity of the treatment chambers is based on;
 - aeration - minimum 24 hours retention (maximum daily flow) and provision of surge loading and sludge/scum accumulation.

- settlement - minimum of 2 hours at peak flow
18. The system is maintained to the requirements of the manufacturer. Provide details of the maintenance/servicing of the system as supplied by the manufacturer or an appointed agent.
 19. Safety devices eg., thermal overloads are fitted to the electric motors. Confirm that electrical controls, blowers, compressors and non-submersible pumps are located above ground in non-traffic areas and are firmly secured using anti-vibration mountings in a well ventilated housing. All electrical connections and wiring must be installed by an appropriately licensed electrical worker and shall comply with the requirement of the supply authority service rules and Australian Standard AS3000 SAA *Wiring Rules*.
 20. The quality of the reclaimed effluent produced by the system complies with the following;
 - BOD₅ less than 20mg/l,
 - Suspended Solids less than 30mg/l,
 - Faecal coliforms not greater than 10/100ml,
 - Free Residual Chlorine not less than 0.5mg/l.
 Results of effluent monitoring is to be included with the application confirming system capability under normal and heavy use cycles.
 21. Alarm systems are provided to indicate electrical or mechanical malfunction. Refer to Section 4, *System description - Alarm Systems* of this Supplement for details on alarm requirements.

Information submitted with the application must make reference to the above. However, other designs or methods of treatment are not necessarily excluded, but full details of the proposed system including confirmation of design parameters must be forwarded with the application.

The Public and Environmental Health (Waste Control) Regulations enable the SA Health Commission to require field testing and or trials of any system, with all costs for such testing being borne by the applicant.

APPENDIX II

AEROBIC WASTEWATER TREATMENT SYSTEM B.O.D. LOADINGS

The following data is provided to assist with determining BOD₅ loading of the system based on use conditions. In some cases it may require the addition of a range of uses to obtain the total BOD₅ loading.

Airports (highest daily number)

- 8 grams per passenger per day
- 20 grams per employee per day

Caravan parks, camping sites

- 160 grams per site - casual occupation
- 180 grams per site - permanent occupation
- 120 grams per site - camping site

Child day-care centres (highest daily number)

- 40 grams per person - including children and staff

Churches, public halls (highest daily number)

- 8 grams per person, *plus*
- 5 grams per person - where kitchen provided

Clubs (highest daily number)

- 15 grams per person, *plus*
- 5 grams per person - licensed area, bar trade, *plus*
- 5 grams per person - restaurant, meals area, *plus*
- 20 grams per employee

Coffee / tea shops (highest daily number)

- 10 grams per person, *plus*
- 20 grams per employee

Coin operated laundry

- 350 grams per machine, *or*
- 65 grams per load

Construction camps (highest daily number)

- 50 grams per person

Holiday camps (highest daily number)

- 50 grams per person

Hospitals

- 200 grams per bed

Hotels, motels

- 80 grams per room/unit, *plus*
- 50 grams per person - permanent resident/staff, *plus*
- 10 grams per person - bar trade, *plus*
- 10 grams per person - dining room, lounge area, *plus*
- 20 grams per person - non-resident staff, *or*
- 25 grams per person - non-resident staff - shower provided

Medical consulting rooms

- 20 grams per person - staff, *or*
- 25 grams per person - staff - shower provided, *plus*
- 40 grams per consulting room

Nursing home

- 90 grams per bed

Offices

- 20 grams per employee, *or*
- 120 grams per 100 square metres

Public swimming pool (highest daily number)

- 10 grams per person, *or*
- 15 grams per person - shower provided, *plus*
- 20 grams per employee

Public toilets (highest daily number)

- 10 grams per person, *or*
- 15 grams per person - shower provided

Residential premises including apartments, flats, townhouses

- 50 grams per person

Restaurants (highest daily number)

- 10 grams per meal - no liquor licence, *or*
- 15 grams per meal - with liquor licence, *plus*
- 20 grams per employee per shift

Rest homes, boarding and lodging houses

- 50 grams per person, *plus*
- 20 grams per non-resident employee, *or*
- 25 grams per non-resident - shower provided

Roadhouses, service stations

- 20 grams per employee per shift, *or*
- 25 grams per employee per shift - shower provided, *plus*
- 10 grams per car, *plus*
- 200 grams per bus

Schools, kindergartens

- 15 grams per person - staff and students, *or*
- 20 grams per person - staff and students -shower provided, *plus*
- 5 grams per person - canteen facilities

Seminar, conference rooms (maximum capacity)

- 20 grams per person, *or*
- 25 grams per person - meals provided - no liquor licence, *or*
- 30 grams per person - meals provided - liquor licence

Shopping centres

- 150 grams per 100 square metres, *or*
- 20 grams per employee

Sports centres (highest daily number)

- 30 grams per person, *plus*
- 20 grams per employee per shift

Staff ablutions, work place installations

- 20 grams per employee per shift, *or*
- 25 grams per employee per shift - shower provided, *plus*
- 5 grams per employee per shift - canteen facilities, *or*
- 10 grams per employee per shift - hot meals provided

Tavern

- 10 grams per person - bar trade, *plus*
- 15 grams per person - dining room, *plus*
- 20 grams per employee - non-resident staff

Theatres

- 10 grams per seat

Theatres - drive-in

- 10 grams per car space

Wineries

- 8 grams per person - wine tasting, *plus*
- 15 grams per person - meals dining, *plus*
- 20 grams per employee - non-resident staff

NOTE: *BOD₅ loading based on 50 grams per person ex the septic tank.*

APPENDIX III

SUITABLE PLANTS FOR THE SURFACE IRRIGATION DISPOSAL AREA

NOTE: *This list is only intended to provide a selection of trees, shrubs and other plants which may be considered suitable for the surface irrigation disposal area. However, because of wide climatic and soil variations it is essential that further investigations be made with your local plant nursery before finalising your plant choice to suit your particular locality and site conditions.*

<i>Botanical name</i>	<i>Common name</i>	<i>Approximate height in metres</i>
TREES		
<i>Agonis flexuosa</i>	Willow Myrtle	5 - 6 m
<i>Acacia baileyana</i>	Cootamundra Wattle	3 - 5 m
<i>Banksia spp.</i>		3 - 10 m
<i>Casuarina glauca</i>	Swamp Oak	6 - 12 m
<i>Casuarina stricta</i>	Drooping She Oak	3 - 5 m
<i>Casuarina cunninghamiana</i>	River She Oak	6 - 10 m
<i>Callistemon viminalis</i>	Red Bottlebrush	3 - 6 m
<i>Callistemon salignus</i>	White Bottlebrush	3 - 6 m
<i>Eucalyptus robusta</i>	Swamp Mahogany	6 - 9 m
<i>Eucalyptus saligna</i>	Sydney Blue Gum	15 - 20 m
<i>Eucalyptus grandis</i>	Flooded Gum	10 - 20 m
<i>Eucalyptus camaldulensis</i>	River Red Gum	15 - 20 m
<i>Eucalyptus cosmophylla</i>	Cup Gum	5 - 6 m
<i>Hymenosporum flavum</i>	Native Frangipani	3 - 6 m
<i>Leptospermum laevigatum</i>	Coast Tea Tree	5 - 6 m
<i>Melaleuca armillaris</i>	Bracelet Honey Myrtle	3 - 4 m
<i>Melaleuca quinquenervia</i>	Broad Paperbark	5 - 7 m
<i>Melaleuca nesophila</i>	Western Tea Myrtle	2 - 4 m
<i>Pittosporum spp.</i>		2 - 4 m
<i>Syzygium paniculatum</i>	Bush Cherry	8 - 10 m
<i>Tristania laurina</i>	Kanuka	3 - 5 m

<i>Botanical name</i>	<i>Common name</i>	<i>Approximate height in metres</i>
SHRUBS		
<i>Abelia x grandiflora</i>	Abelia	2 - 3 m
<i>Acacia floribunda</i>	Gossamer Wattle	2 - 4 m
<i>Acacia longifolia</i>	Sallow Wattle	2 - 4 m
<i>Acacia iteaphylla</i>	Flinders Range Wattle	2 - 3 m
<i>Cotoneaster spp.</i>		2 - 4 m
<i>Cortaderia selloana</i>	Pampas Grass	2 - 3 m
<i>Cyperus alternifolius</i>	Umbrella Grass	0.5 - 1 m
<i>Cyperus papyrus</i>	Papyrus	1 - 2 m
<i>Cassia spp.</i>		1 - 3 m
<i>Chamelaucium uncinatum</i>	Geraldton Wax	2 - 4 m
<i>Dryandra formosa</i>		1 - 3 m
<i>Eremophila spp.</i>		1 - 2 m
<i>Grevillea spp.</i>		1 - 3 m
<i>Hebe spp.</i>	Veronica	0.5 - 1 m
<i>Iris pseudacorus</i>	Yellow Flag Iris	0.5 - 1 m
<i>Nerium oleander</i>	Oleander	2 - 3 m
<i>Melaleuca decussata</i>	Cross leaved Honey Myrtle	1 - 2 m
<i>Phormium tenax</i>	New Zealand Flax	2 - 2.5 m
PERENNIALS/GROUND COVER		
<i>Aster novi-belgii</i>	Perennial Aster	0.5 - 1 m
<i>Canna</i>		1 - 2 m
<i>Chrysanthemum frutescens</i>	Marguerite Daisy	1 m
<i>Chrysanthemum maximum</i>	Shasta Daisy	1 m
<i>Gazania ringens</i>	Black eyed Susan	0.4 m
<i>Impatiens spp.</i>		0.4 m
<i>Salvia uliginosa</i>	Bog Salvia	0.4 m
<i>Viola spp.</i>		0.4 m

<i>Botanical name</i>	<i>Common name</i>	<i>Approximate height in metres</i>
CLIMBERS		
<i>Bougainvillea spp.</i>		variable
<i>Clematis spp.</i>		variable
<i>Hardenbergia violacea</i>	Purple Coral Pea	variable
<i>Hibbertia scandens</i>	Snake Vine	variable
<i>Jasminum grandiflorum</i>		variable
<i>Jasminum polyanthum</i>		variable
<i>Jasminum officinale</i>	Common Jasmin	variable
<i>Kennedia rubicunda</i>	Dusky Coral Pea	variable
<i>Lonicera japonica</i>	Japanese Honeysuckle	variable
<i>Passiflora spp.</i>	Passion Flower	variable
<i>Vitis coignetiae</i>	Glory Vine	variable

