TasWater Supplement to
WSA 04-2005 2.1
WSAA Sewage Pumping Station Code of Australia

Version 3.0

TasWater

Document approval and issue notice

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1. Introduction

This Supplement describes the requirements of TasWater (TW) for sewerage pumping station works which are an addition or a variance to those in the WSAA Sewage Pumping Station Code of Australia WSA-04-2005 Version 2.1 herein known as “the Code”. This supplementary document must be read in conjunction with the Code.

The Code and this supporting documentation essentially provides "deemed to comply" solutions for the creation of TW sewage pumping station assets.

Alternative solutions, practices, equipment and methodologies will continue to evolve and offer opportunities to improve the creation of these assets. TW encourages employment of any innovation that offers enhanced productivity and serviceability.

Suggestions or comments using the document improvement request form are welcome and can be sent to: standards@taswater.com.au

PART 1: PLANNING AND DESIGN

1 General

1.1 Scope

This Supplement does not apply to low pressure pumping systems – these systems are covered under the latest edition of Pressure Sewerage Code of Australia WSA 07 and upcoming TW's WSA 07 Supplement.

1.2 Planning

1.2.2 Pumping Alternatives

TW requires documentary evidence that the life-cycle cost of all options has been thoroughly assessed prior to approving construction of the pumping station.

1.5 Planning And Design Responsibilities And Interfaces

1.5.4 Consultation with other parties

(k) The Tasmanian Environmental Protection Agency (EPA).

1.6 Sewer System Design Approach

1.6.4 Design output

Additional dot points:

(f) A Design report detailing all elements of the civil, hydraulic and mechanical design including calculations and assumptions. Eg. sensitivity rating, current and ultimate catchment design loadings (ETs, pumped inflows, ADWF, PDWF and PWWF), pumping system curve, pump and motor efficiency and kWh/kL.

(g) Completed *Sewage Pump Station – Wet Well Level Settings –Set up Drawings TWS-M-0002* (two sheets) for pump stations utilising Taswater standard switchboard design, or modified appropriately if alternative standard pump station switchboard and/or control are proposed.

(h) Electrical Single Line Diagram of the proposed pumping station. (This can be a modification of the TW Small Sewage Pumping Station standard electrical drawings).

(i) A Design Safety Report shall be produced detailing the safe methods of construction and also the ongoing Operations and Maintenance requirements.

2 Concept Design

2.2 Functionality

Replace item (f) with the following:

(f) Provide safe working conditions for operation and maintenance personnel including allowance for vehicular movements and a hard standing area adjacent to the pump station, fall protection grids and provision of fixing points for portable safety railings where required as per AS1657:2013.

2.3 Maintainability

Additional dot points:

(f) A by-pass pumping point is required as part of the pressure main valve pipework.

(g) All electrical equipment including pumps and instrumentation shall be able to be easily and safely removed from the wet well without the need to lean over open access hatches without safe hand railing requirements.

2.8 Septicity Control

2.8.1 General

Additional Paragraphs:

If all possible design parameters have been addressed to minimise the septicity of the sewage in the pump station and pressure main, and a problem of septicity still remains, it may be necessary to chemically dose the pressure main, pump well, and/or the reticulation lines leading to the pumping station.

Where chemical dosing is considered necessary to control septicity then the designer is to include in the design available dosing options, including impacts, advantages and disadvantages, and capital and operating costs associated with the dosing. The approval of the design by TW will also stipulate the acceptable chemical dosing solution.

2.8.2 Detention time

Additional Paragraph:

Detention times for odour generation shall be based on the ADWF gravitational flows and the volume of the pressure main(s). Maximum detention times based on an assumed diurnal profile should also be estimated and provided.

The Concept Design shall address minimisation of detention times of sewage in the pumping station and pressure main(s) for the initial, staged and ultimate development.

2.11 Services

Replace (c) with:

(c) A secure (enclosed in an appropriate hot dipped galvanised lockable cage) above ground metered potable water assembly is required with a certified testable reduced pressure zone backflow device (RPZD) and a 20mm tap with a vandal proof handle to facilitate maintenance works at the station.

2.13 Security

Additional requirements:

Entry to either the pump station building or pad mounted electrical cabinet shall be monitored by the RTU equipment and reported back to the SCADA system if it is deemed to be unauthorised entry.

2.14 Signage

Additional requirements:

TW will provide details of the station identification sign to be installed at the Pump Station which will include TW's asset number for the Pump Station.

Signs identifying confined spaces shall also be provided. The signs shall be located in a prominent position adjacent to the entry of the confined space.

In some instances, "No Parking" signs will also be required. TW will advise when these are necessary.

2.15 Supporting Systems

Additional dotpoints:

(f) Alternative power sources

(g) Dosing and odour services

2.17 Commissioning Plan

2.17.3 Commissioning

Additional requirements:

g) A Factory Acceptance Test (FAT) of the switchboard will be carried which will check the switchboard has been built correctly to the design including point to point testing of the wiring and all items of electrical equipment operate correctly including any interlocking of hardwired circuits.
h) Once the FAT has been successfully completed a Station Function Test will be carried at the switchboard manufacturers premises (or other agreed location) to carry out full functional testing including RTU & SCADA interfacing. This will be in conjunction with TW's SCADA and Automation team.
i) The switchboard will then be delivered to site and involved in the complete Site Acceptance Testing (SAT) to prove the complete installation. Again this will be in conjunction with TW's SCADA and Automation team.
j) The designer is required to submit a commissioning plan at the concept design stage.
k) TW representatives must attend the commissioning.
l) The pre-commissioning record sheets shall be completed and lodged with TW five working days prior to the planned commissioning date.
m) Notification of the upcoming commissioning must be made to TW's Coordinator SCADA & Automation Systems 14 days in advance, to ensure that SCADA is set up, and the SCADA must be pre-commissioned in consultation with him to ensure that all alarms are being received at TW's Communications Centre.
n) The pump station will not be commissioned and deemed operational until all documentation has been provided together with:
    i. Plant data sheets (two hard copies, one digital copy)
    ii. As constructed drawings for Civil, Mechanical & Electrical (two hard copies, one digital) with all levels including float heights to AHD
    iii. SCADA program (two hard copies, one digital)
    iv. Job Safety analysis for all routine maintenance tasks to be performed at the SPS and a frequency table for the maintenance tasks
    v. Two copies of the operational and maintenance manuals inclusive of pump system curves
    vi. Factory witness pump test results for pumpsets ≥ 60kW
    vii. Switchboard factory and site acceptance test certificates completed and signed
    viii. Manufacturer's warranties
    ix. Breakup of overall cost of SPS into Civil, Mechanical, Electrical and SCADA
    x. Table of all electrical calibration and instrument settings on completion of site acceptance testing.
o) Digital drawings shall be in AutoCAD 2010 format.

3 General Design

3.6 Environmental Considerations

3.6.1 General

Insert second paragraph:

Additionally, the project EIA shall include the assessment requirements as outlined in Appendix A of this Supplement.

3.7 Easements

Additional Requirements

Because of the potential for damage if a rising main bursts, the easement width and clearance requirements are considerably greater than those required for gravity sewers.

TW's minimum requirements for easements are as per Table 3.7

Rising Main Diameter DN	Minimum Easement Width (mm)
≤DN150	4 000
DN150< DN ≤ DN300	6 000
DN300≤ DN ≤ DN600	8 000
>DN600	10 000

Table 3.7

Noting that for rising mains ≤DN150 the main is to be located centrally in the easement and for rising mains >DN150 the main is normally to be located one third (1/3) across the easement and if there is a cross fall, the main is to be on the low side.

Any additional specific TW requirements relating to the location of rising mains in an easement shall be specified in the 'Agreement Conditions'.

Crossings etc – the new sewer code references the old water code drawings ie WAT-1211 to Wat-1214 through section 3.8 and 3.9

3.12 Disused or Redundant Items

Insert additional paragraph:

All redundant sewer pipelines (both gravity and rising) with less than 1m cover shall be removed. Redundant sewer pipelines with greater than 1m cover shall be considered on a case by case basis which may require the pipe to be removed or grout filled.

4 Materials Design

4.2 Corrosion Protection

4.2.2 Concrete Surfaces

Insert additional paragraph:

All Exposed non-acid resistant concrete surfaces in the wet well (i.e. well, benching and underside of lid), valve chamber/s and receiving manhole shall be coated with an Epoxy lining system conforming to the requirements of "WSA 201—2017 Manual for selection and application of protective coatings - Second Edition Version 2.1".

4.2.3 Metallic materials

Insert additional paragraph:

All exposed non stainless metallic pipework and valves within the wet-well and valve chamber shall be coated with Luxepoxy 4 or approved equivalent.

Metal work within all pumping station structures including support brackets and rails shall be grade 316 stainless steel (grade 316L passivated for fabricated items) unless dissimilar metal / galvanic corrosion is likely as a result of the stainless steel installation and where electrical isolators cannot be effectively utilised.

5 Pumping Station Design

5.2 Site Selection, Location and Layout

5.2.1 Site selection

Insert additional paragraph:

The designer shall consult with TW if the proposed pump station site is not to be contained within TW land or the relevant Municipal Council land.

In all instances the designer shall prepare a plan for TW that addresses environmental impacts and buoyancy effects.

In most instances the designer will need to arrange for a borehole or a number of boreholes to be drilled at the proposed site.

5.2.3 Location and layout

Insert additional paragraph:

The pumping station shall be located such that cranes operating on site are always clear of overhead electrical cables.

Where the pumping station is to be built in low lying, coastal or other flood prone areas:

a) The top slab of the wet-well should be at least 150mm above the 1 in the 100 year flood level and coincident 1 in 100 year storm surge during the predicted Highest Astronomical Tide in 2100 from the nearest tide gauge. The allowance for sea level rise and coincident storm surge is to be calculated using the latest version of "Canute 2.0", available from http://www.sealevelrise.info and shall not be less than 800mm.

When utilising the latest version of Canute 2.0 the following default parameters shall be adopted :

Canute 2.0 Sea-Level Rise Scenario

Dataset	Model
Scenario	Moderate Impact (A1B)
Starting Year	2100
Ending Year	2100
IPCC Version	AR4
Extreme Value Distribution	GEV

Output = Red Curve: exceedance probability for 2100 inclusive under conditions of rising sea level

Storm-surge Climatologies (Beta)

Dataset Model

Output = Red Curve: Tropical Cyclone (TC) storm-surge + tide

b) The base of the power and control cubicle shall be at least 300mm above the level obtained from (a).
c) Access roadways and parking areas shall be trafficable in all weather (1:20 AEP).

5.2.5 Site Layout and Access

Insert additional paragraphs:

The design of the access road to a pumping station shall reflect the size and operating requirements of the largest maintenance vehicle specified by TW required to access the site.

The minimum turning radii around the station and access roads shall however be at least suitable for an 8.8 metre service vehicle as per Austroads Standards Australia – AS HB72-1995. The vehicle must be able to be parked with the rear or side of the vehicle next to the well.

Access road grades steeper than 2% shall be cement stabilised, and roads steeper than 5% must be sealed. In areas where the station is at the end of a dead-end access, the hardstand must allow for the truck to be turned around within the pavement area unless approved otherwise.

The average grade of roads must be no more than 1 in 7 (14.4%) with a maximum of no more than 1 in 5 (20%) for more than 50 metres. Dips must have no more than a 1 in 8 (12.5%) entry and exit angle.

The methodology and route of the electricity authority power supply to the site needs to be considered at an early stage in the design to ensure:

- The TW connection point is as close as possible to the site boundary to minimise TW infrastructure ownership
- High Voltage Transformers shall not be within 20m of the pump station infrastructure to minimise the effect of step and touch voltages during a high voltage earth fault.
- Any overhead cables shall not be installed within a 10m radius of any station infrastructure to avoid accidental contact with overhead cabling during operation and maintenance activities

TW has a selection of mobile, trailer mounted generator sets which will be used to provide temporary power to a station if required. Space must be provided next to the electrical switchboard or station building to allow the generators to be deployed easily and safely.

The switchboard shall be positioned in such a way that

- The manual controls to be provided on the switchboard face the wet well to allow operation while observing the wet well level.
- Occupational Health and Safety consideration are given to space for opening of the wet well covers and opening of the switchboard doors
- The size and number of electrical conduits can be installed in the specific arrangement as defined in the TW standard electrical drawing set

5.3 INLET MH

5.3.3 Pumping station wet-well isolating valve

Insert additional paragraph:

The incoming sewer-isolating valve shall be housed on the inside of the pump well. A knife gate isolating valve shall be used. This isolating valve shall have a non-rising spindle, a mounting flange, an extension spindle and a valve cap that allows the operation of the valve from the top of the pumping station.

The knife gate valve must have a stainless steel body with grade 316 stainless steel blade and a resilient seat.

The mounting flange must be ductile iron epoxy coated integral to the inlet pipe with a weep/puddle flange cast into the wet well wall or fabricated from grade 316L stainless steel and attached to the wet well with Grade 316 stainless steel studs using chemical anchors.

A valve spindle of 25 mm shall be used for valves of ≤ DN300. A valve spindle of 38 mm shall be used for valves of >DN300. If the spindle length is greater than 6 metres, an intermediate spindle support must also be used.

The extension spindle must be adequately supported from the pump well wall. Bolts or anchors of Grade 316 stainless steel must be used for securing the spindle guide assembly to the pump well wall. The valve spindle shall be accessible without the need to remove any covers and shall be housed at ground level.

All valves shall be clockwise closing.

5.4 Wet Well Design

5.4.1 General

Replace sixth (*The design shall…*) paragraph:

The design shall incorporate either a drop pipe from the inlet isolating valve at the end of a horizontal inlet pipe or a steeply-sloped inlet pipe with an isolating valve in the wet-well. In either case, the inlet pipe shall end at least one pipe diameter above the normal pump cut-out level to allow the inlet pipe to drain completely on every pump cycle.

with:

The design shall incorporate a 316L Stainless Steel drop pipe from the inlet isolating valve or HDPE drop pipe as agreed with TW. The drop pipe shall be open-ended at the top to allow rodding/jetting and shall end at least one pipe diameter above the normal pump cut-out level to allow the inlet pipe to drain completely on every pump cycle and an angled bend at the base to direct inflow away from the pump.

All fixings to the well shall be made with 316 Stainless Steel chemical anchors.

5.4.2 Sizing:

Replace criteria (b) and (c) with the following:

(b). Where person-entry is required, a safe system at work risk assessment shall be undertaken to determine the safe working room required to enable operators to work safely and effectively and evacuate / rescue personnel if necessary.

(c). The minimum wet-well diameter shall be:

1.8m Minimum Diameter Wet-Well	Wet-wells less than 4.0m deep
2.2m Minimum Diameter Wet-Well	Wet-wells greater than 4.0m deep

Additional requirements:

(d). The wet-well shall be large enough to accommodate future pumps sized for the ultimate development.

5.4.4 Control levels:

TW has identified the number of preferred control levels which have been specified on drawing TWS-M-0002. The requirements on this drawing must be adhered to when designing the total depth of the wet well and provide the minimum depth required for operation of the SPS utilising the TW standard switchboard design.

The TW standard uses a combination of an analogue level sensor, one high level float and one low level float to identify these levels during operation.

5.4.6 Benching:

The design of the benching should make allowance for the installation of a vertically suspended hydrostatic level sensor to be positioned at the same level as the intake of the pump. This may also include a 100mm diameter guide tube surrounding the sensor to restrict movement of the sensor in the wet well.

5.4.7 Washers:

TW requires that all pump wells ≥ 1.8 metres diameter shall be fitted with a wall mounted wet well washer with a hinged retractable maintenance arm.

Where the diameter of the well is ≥4m then multiple wet well washers shall be installed.

The water solenoids shall have 24V dc coils with surge suppression across the coils to prevent overvoltage during switching.

5.4.8 Wet Well Instrumentation Positioning:

All instrumentation positioned in the wet well must be easily maintainable and/or removable without needing to raise the safety grating over the wet well opening. TW standard instrumentation currently consists of an analogue hydrostatic level sensor and two float switches which are suspended from the inside edge of the wet well concrete roof under the safety grating. If further instrumentation is required the same ease of access and replacement is required.

5.4.9 Wet Well Cable Routing :

All electrical cable routes in the wet well including instrumentation and pump cables must take into account:

- Ease of attached and other equipment removal without cable disconnection
- Maintenance and inspection of the cabling
- Cable length to ensure attached equipment can be moved to maintenance position without disconnection.

5.5 Wet-Well Ventilation

5.5.1 Natural Ventilation

TW only permits the use of natural ventilation for sewage pump stations which have a LOW Hazard Odour Rating as defined in Appendix A of this Supplement.

The minimum height of the educt vent shall not be less than 9m unless odour modelling, using EPA Tasmania recommended software, can demonstrate that a shorter educt vent can be utilised.

The use of canister odour filters should not be used in natural ventilation systems unless it can be confirmed that the system will create enough pressure differential across the filter to draw the required flow of gases. Failure to do this will result in odour gases passing out of the wet well via alternative flow paths such as through cracks around lids or via conduits into the switchboard.

5.5.2 Forced Ventilation

TW requires that all Medium or High Hazard Odour Rated sewage pumping stations be fitted with forced mechanical ventilation.

Forced ventilation shall be capable of changing the total volume of the empty wet-well (and any connected emergency storages that are not isolated from the main system) at least twelve times per hour. This may be reduced to six times per hour with approval from TW if the installed lids are well sealed.

The designer shall detail wet-well ventilation using an induct and educt vent combination. The outlet of the induct vent shaft shall be located one metre above normal duty pump cut-in level and one metre away from the incoming sewer.

The distance between the outlet of the induct vent and the educt vent shall be maximised with the educt vent being located as close as possible to the roof of the wet-well.

Where educt vent shafts are inappropriate for the location then TW will permit the use of odour filters with replaceable media cartridges available from McBerns or Odour Control Systems Australia or similar approved.

Where the pump station has a Medium or High Hazard Odour Rating then consideration shall be given in the design to the installation of a Biofiltration Soil Bed Filter designed by Odour Control Systems Australia or similar approved. Sites with a High Hazard Odour Rating may require an alternative solution to be incorporated in the design, for approval by TW.

All ventilation fan motors shall be 3 phase, 50Hz, 415V.

Where mechanical ventilation is utilised in conjunction with odour filters then consideration shall be given to the impact of the pressurisation of the filter and any associated drainage traps which may require the odour filter to be installed upstream of the ventilation fan.

In all installations of forced ventilation the wet well shall remain under negative pressure to ensure all odour is extracted through the discharge pipe.

The replacement costs of replaceable media cartridges, maintenance of the odour bed, power costs etc. shall be included in the life cycle costings.

5.6 Overflow Containment

5.6.1 General

Insert after paragraph 2:

The overflow point must be located below the level of the lowest private Overflow Relief Gully (ORG) in an existing system, or lower than the lowest point in private property in a new development. The designer shall check the level of all ORGs in the contributing system to ensure that they will not overflow.

The designer shall check flotation of the emergency storage.

The designer shall specify a system for cleaning of the storage.

The emergency storage shall be constructed from an approved suitable non-corrosive material such as Fibreglass Reinforced Plastic (FRP), Reinforced Concrete geomembrane lined (high grade HDPE or PVC) or Reinforced Concrete lined with an ultra high build epoxy-based immersion based coating.

5.6.2 Emergency Storage

5.6.2.2 Configurations

Insert after paragraph 1:

The emergency storage is provided to ensure spills do not occur following a mechanical or power outage, allowing maintenance crews time to respond and arrange for eduction of the well.

SPS's shall be provided with a minimum emergency storage to contain the total volume of sewerage inflows at the rate of ADWF over the containment period as determined by *Appendix A – Environmental Requirements* of this Supplement. If there will be staging of any development, then the design will need to provide calculations of ADWF for ultimate and relevant stages and an upgrade pathway for any aspects of the SPS to cater for ultimate capacity.

Where available, the sizing of the emergency storage should be based on computer models and calibrated to actual flows and/or gauged data (as per WSA20_2014 *Design flow estimation incorporating existing systems)*.

SPS's which service a catchment with other SPS's upstream have the following emergency storage requirements:

- If the SPS is not interlocked with the other upstream SPS's, the emergency storage volume must accommodate both the immediate catchment as well as the upstream pumped catchments which can pump into this catchment without interlocks.
- If the SPS is interlocked with other upstream SPS's, the emergency storage volume need only be sized to accommodate immediate catchment (ie. the catchment which drains to the SPS via gravity).

All SPS's must be provided with a total emergency storage volume of not less than 4 hours to enable a maintenance crew to respond to a failure. This storage volume must be provided above the high level alarm level and below the SPS spill level (emergency relief structure) and may be provided in one or more of the following - the wet well, an offline storage tank or pipe, or the incoming pipe network.

As a minimum the emergency storage should not be less than Table 5A.

Table 5A: Minimum Storage Time Requirements

Pump Station Sensitivity	Default Storage Time (hours)	Minimum Storage Time (hours) *
Low	4	4
Medium	4	4
High	8	4

5.6.2.3 Design

Additional paragraphs:

The emergency storage shall be constructed from a non-corrosive material.

For a separate storage system the designer will need to consider and discuss with TW:

- the installation of a storage cleaning system;
- ventilation requirements; and
- level monitoring requirements.

When designing storage structures, the likelihood of flotation shall be thoroughly checked for the load cases specified in Section 5.2.3 of the Supplement (including 2100 predicted sea level rise with coincident storm surge) and provision made to mitigate any buoyancy effects.

5.6.4 Emergency Relief System

Additional requirement:

Where the emergency overflow relief overflow pipe discharges into an unformed drain, creek or water course then the designer shall assess the impacts of the 1:10, 1:20, 1:100 ARI storm events and predicted sea-level rise coincident with storm surge on the effectiveness of the emergency relief – refer Section 5.2.3 of this Supplement.

5.7 Ladders and Platforms

Additional paragraphs:

Ladders shall **not** be included in wet wells, valve chambers and separate emergency storages, unless approved by TW.

Non-trip 316SS Eyebolts shall be provided adjacent to all access points to enable a portable ladder to be tied off so that it cannot move when placed through the access point.

Entry to wet wells shall be in strict accordance with TW's confined space entry procedures utilising a harness as the primary access system with supporting lifeline.

Where ladders are approved/requested by TW they shall be in accordance with SPS-STD-008. The ladders shall be fitted with extendable stanchions and shall be fabricated from stainless steel grade 316 L passivated after fabrication. The rungs shall be fabricated from deformed bar and the stiles shall be drilled for the rungs and welded both sides.

5.8 Wet-Well Access Covers

Additional requirements:

- Covers shall be McBerns, or Austral International unless approved otherwise by TW
- Covers shall finish flush with the slab and shall be gas tight and lockable.
- Bollards shall be placed to prevent vehicle loading on the wet well and valve chamber covers at 1800mm maximum centres.
- The direction of the swing of the covers shall be such that they do not:
    - Impede visibility between any mobile lifting equipment and the wet well when raising and lowering the pumps
    - impede visibility between the switchboard and the wet-well.

5.9 Safety Systems

Additional requirements:

- All covers shall have a hinged 316L stainless steel safety grid underneath the lid to prevent personnel falling into the wet-well and valve chamber. The hinged safety grid shall be constructed such that it can form a safety barrier for operator safety during pump raising/lowering such as the McBerns 'four sided void protection safety lid' or similar approved.
- Suitable maintenance access must be provided to the analogue level sensors and level floats mounted in the wet well without the need to lift the safety grid. This access needs to allow; equipment replacement, equipment cleaning, and equipment depth measurement by measuring cable length laid out on the ground.
- No trip hazards shall be within the immediate vicinity of the well or pit openings which shall include the open lid case.

5.12 Mixers

Additional requirements:

The designer shall determine in conjunction with TW whether mixing is required; if mixing is required and the pump is unable to be fitted with an approved flushing valve, or if the well is too large for a flushing valve to operate efficiently (>4m diameter or depth), an approved electric mixer must be installed in the pump well.

Placement and orientation of mixers is critical to ensure efficient mixing of the well contents.

Mixers shall be sized to ensure that they draw only 85% of full load current under the most adverse well conditions.

The mixer is to be configured to commence just prior to pump start and to run a minimum of two minutes to enable sufficient mixing for solids to be placed in suspension.

The mixer is to be controlled by the pump controller to run at appropriate intervals to achieve sufficient mixing to enable all suspended and floating solids to be pumped out of the wet well.

6 Pumping System

6.2 Hydraulic Design

Additional requirements:

The pump station capacity should cater for the design flow (PWWF) into the SPS without spillage. The pressure main shall be designed to accommodate flow for the next 50 years.

The designer shall plot the initial and ultimate pump station duties on the initial and ultimate system curves and provide these to TW for review.

In addition, if required by TW, the system shall allow for both pumps to be running concurrently and this parallel pump curve shall also be plotted.

6.2.1 Design Flows

Design flows should be based on gauged flow surveys or calibrated modelled catchments with allowance for the ultimate catchment.

Where gauged flows or calibrated models are not available (ie greenfield sites) unless approved otherwise by TW, the default design values in Table 6.1 shall be adopted for use:

Table 6.1: Design Flow Parameters

Abbreviation	Description	Default Value / Comment
ADWF	Average Dry Weather Flow	450 L/ET/day for new/future lots after 2013 540 L/ET/day for existing lots prior to 2013
PDWF	Peak Dry Weather Flow	As defined in Section 3 Flow Estimation of WSA 02 -2014-3.1 and TW's WSA 02 Supplement and including Appendix C Flow Estimation of Undeveloped Areas available at WSAA website with amendments as per this supplement.
PWWF	Peak Wet Weather Flow	

TW requires the design flows in Table 6.2 to be utilised:

Table 6.2: Design Flow Requirements

Design Issue	Design Flow
Detention time[1] (Odour & Septicity)	ADWF
Pump Duty Point[2]	PWWF
Emergency storage[3]	ADWF

[1] Relevant to Clause 10.10

[2] Relevant to Clause 6.4

[3] Relevant to Clause 5.6

6.2.1 Combined Systems

For combined sewerage and stormwater systems design inputs please refer to the TW Sewerage Reticulation Code Supplement Appendix B6.

6.2.2 Flow Balancing

Flow balancing is required to provide consistent flows to sewerage treatment plants (STP) and to avoid sewage overflows. Minimising flows and maximising system storage provides the most efficient delivery of sewage to the treatment plant. Typically it will only affect the last pump station before a plant. It does not apply to stormwater pump stations.

TW operating philosophy is to minimise surcharge problems and maximise efficiency in both the sewerage reticulation system and at the treatment plant.

Flow balancing may involve a variety of pump sizes being installed in the pump station, or by using variable speed drives. Each should be assessed and a final selection made based on:

- capital cost of componentry
- power consumption costs,
- ongoing maintenance costs
- whole of life costs
- the nature of the catchment inflows
- inflow limits imposed by the treatment plant capacity
- limitation of overflow and storage capacity in wet wells
- environmental sensitivity of area where any overflow may discharge
- station design to minimise the settlement of solids in the wet well

6.4 Pump Selection

Additional requirements:

- The preferred pumps shall be ABS, Flygt or Grundfos submersible sewage pumps, other pumps may be considered on a case by case basis, noting that all pumps shall have the following:
    - A single connection cable with 3 phase power, earth and 2 control connections for either microtherm switch or PTS thermistor
    - In the case where the pump supplier is providing extra electrical protection to provide the required warranty the proposed electrical connections are to be included in the single pump cable
    - All pumps > 11 kW require water in oil sensors for early detection of seal failure and proprietary protection relays are to be provided for inclusion in the switchboard (TW's Standard Switchboard Types 2, 3 and 4). This relay shall not directly interrupt power to the pump but shall supply a signal to the RTU controller
    - The pumps and motors shall be capable of being powered using either soft starters or variable speed drives. If VSDs are to be used, the pumps are to be provided with screened power and monitoring cables. Flygt rails and bases shall be provided for all pump stations. Adaptors for other brands of pumps shall be supplied as required.
    - Final selection of the pump model and size is subject to approval from TW.
- Sphere clearance for all wells ≥ 1800mm diameter shall be a minimum of 80mm unless approved otherwise by TW.

6.6 Submersible Pumps

6.6.1 General

Additional requirements:

An identical spare pump shall be provided when the requirements of 6.3(b) and 6.3(c) are not able to be met, ie the pump is not readily available in the market or interchangeable with other makes/models that are readily available in the market

Any proposal that varies from a two pump, 100% standby configuration, (i.e. one pump duty, one pump standby) must be approved by TW.

6.6.3 Motor selection

Replace dot point (g) with the following:

Pumps 4kW or less are to be started direct on line (DOL).

Pumps > 4kW are to be started using electronic soft starters and must be capable of starting with the motor starting current limited between 300% and 500% of motor full load current.

If the application means the pumps are to be controlled by variable speed drives the pumps shall be provided with screened power and control cables to ensure the effects of Radio Frequency Interference are kept below the current Australian and European requirements.

The designer shall ensure the overall installation satisfies the electrical authority requirements. This shall include any limitation on starting current required by the electrical supply authority.

6.6.4 Standard discharge connection

Additional requirement:

TW requires Flygt discharge connections (duckfoot bend, guiderails and bracket) to be installed in all pump stations to allow ready interchange of pumps. Alternative brands of pumps must be fitted with an adaptor to suit this standard requirement.

6.6.6 Pumpset Lifting Equipment

Additional requirements:

The pump lifting chain shall be AISI 316L Grade 50. The chain shall be sized to carry the weight of the pump, taking into account load carrying reductions for angled two leg slings.

The chain is to be attached to the pump lifting hooks by means of a stainless steel shackle compliant with AS2741-2002. The other end shall be placed on a 316 stainless steel chain hook at pump well entrance.

Each pump set lifting chain will be provided with a 316 stainless steel punched tag at the hanging point which clearly identifies each pump as either Pump 1 or Pump 2 and include the WLL of the chain and the self weight of the pumpset in kilograms (Bridco KW-135502BK tag or similar) .

6.8 Pump Starters and Variable Speed Drives

6.8.1 General

Replace paragraph as follows:

All submersible sewage pumps > 4kW shall use soft starters to control starting currents between 300% and 500% of full load motor current. Pumps with motors ≤ 4kW shall use DOL starters.

6.8.2 Single & Double Speed Starters

Replace Paragraph 2 with:

The types of starters shall also take into account the maximum number of starts that could be required by the pumps under all conditions. i.e. worst case scenario.

Replace the last Paragraph with:

Starter control shall operate at 24V AC, supplied from the 240V AC.

6.10 Emergency Stop

Add additional requirement:

There shall be a minimum of 1 emergency stop on the electrical switchboard to stop all required equipment, including pumps. If the design review deems there is a requirement for additional emergency stops this will perform the same action as the emergency stop on the switchboard.

7 Power System

7.1 General

Add Additional requirements:

Unless approved otherwise, TW requires all installations to adopt the electrical solution as listed in Table 7A.

Table 7A: Electrical Requirements

Type	Size	Configuration
1	2 x Pumps ≤ 4kW	External Switchboard with DOL starters. Duty/Standby or Duty/ Standby/Assist
2	2 x pumps >4kW & ≤ 22kW OR 2 x pumps >22kW & ≤ 37kW	External Switchboard with electronic Soft Starters. Duty/Standby or Duty/Standby/Assist OR Duty/Standby Only
3	2 x Pumps > 37kW or 3 pump sets	Internal Switchboard housed inside a building structure and designed at present as a 1 off solution using the same basic principles as used in the Type 2 above.

Pump Stations requiring Variable Speed Drive (VSD) control are currently being investigated by TW and TW Electrical Design Group should be contacted to discuss the current requirements.

7.1.1 Design Principles

TW have developed their preferred standard pump station solutions to provide:

- Clear definition of the required electrical system including power supply, control system, radio telemetry including software, pump starters, instrumentation and switchboard construction.
- Consistent operating requirements across all pump stations
- Reduced operating costs
- Consistent fault diagnosis and therefore faster rectification

The designer of the pump station electrical installation shall design the pump station in line with TW's applicable electrical specifications and drawings and only deviate from these if they believe the standard design will not fulfil the required statutory requirements, performance or functionality but must first have written approval from TW's Electrical Design Group to do so.

TW's Standard Electrical Drawings detail specific makes of equipment to carry out certain functions. If the designer wishes to use alternative equipment to provide the same functionality this is acceptable as long as this equipment is included on the TW Preferred Electrical Equipment List.

In addition the designer shall only use equipment which is specified on the TW Preferred Electrical Equipment List. Written approval from TW must be received if alternative equipment is to be implemented.

It must be understood that although TW have taken every care with their standard designs it is the responsibility of the designer to ensure every aspect of the completed design and installation meets all legal and statutory requirements.

The following standard documentation shall be adhered to in the design of pump stations for TW:

- TDESTD02 Sewage Pump Station – Electrical Asset Design Standard
- TDEGDL01 Small Sewage Pump Station – Electrical Design and Installation Guidelines

Both of the above standards refer to additional TW documents which further define the TW requirements.

7.2 Power Supplies

7.2.2 Security of Supply

Add Additional requirements:

TW have developed their preferred pump station solutions to provide a standard across the board solution to provide:

The TW standard pump station designs; Types 1, 2 and 3, have allowed for connection of mobile emergency generators via a plug and socket arrangement to the switchboard.

On larger installations Emergency Generator Connection Panels to TW standard drawings will be provided on the outside wall of the building structure.

If an On-site emergency generator or a duplicate power supply from the authority is required this shall be designed by suitably modifying the existing TW Standard designs.

7.2.3 Primary Supply

Add Additional requirements:

TWs Standards designs are around the principle that any single point of failure will not cause the complete stoppage of the pump station with the exception of the main incoming circuit breaker.

For this reason and reasons of safety the power supply system of the switchboard must ensure the following is considered during the design phase:

1. Complete selectivity between the electricity authority Supply Protection Fuses, the pump station main circuit breaker and all downstream circuit breakers. This may mean the supply fuses have to be increased.
2. The fault current capability of the electrical switchboard shall be a minimum of 20kA.

The designer of the pump station shall provide the following information for design approval:

1. Documentation to clearly show the fuse and circuit breaker selectivity has been achieved
2. Documentation showing the supply cables are correctly rated for:
    a. Continuous current rating based on the setting of the switchboard main circuit breaker.
    b. The short circuit fault current based on the protection offered by the supply fuses
    c. The maximum demand of the installation
    d. Maximum voltage drop

3. Documentation to clearly show the cable size is correct.

7.2.5 Emergency Power

TW requires that the power supply to the control system is sufficient to sustain the same number of hours of full load operation as the number of hours of emergency storage identified for the SPS.

7.2.7 Mobile Generator

Add additional requirement:

The connection of the mobile generator shall be via Marechal De-contactors as specified in the TW standard electrical drawings for small type pump stations. For larger stations contained in a building a TW Standard Generator Connection Panel shall be used.

7.2.9 Power Factor Correction

Add additional requirement:

TW require pump stations other than Small Sewage Pump Stations that space shall be provided in the building to allow for future power factor correction equipment.

7.3 Power and Control Cubicle

7.3.1 Design

Replace the first four paragraphs with:

Outdoor Switchboards shall be to TW Standard Switchboard Drawings which specify the required construction.

In addition if the switchboard is to be within 500m of a body of salt water and therefore likely to be prone to salt laden air the internal switchboard shall be made of either Powder Coated Aluminium or Powder Coated Stainless Steel.

All conduits coming into the cabling zone shall be sealed. The 3 x 100mm conduits coming from the wet well shall use proper cable bungs as specified on the TW Standard Switchboard Drawings.

Replace paragraph eight with:

Positioning of the switchboard should mainly take into account:

a) wet well visible from control position;
b) control facing south to limit sun reflection from instrument displays; and
c) provide some protection for operator from prevailing weather.

Replace paragraph nine with:

Internal switchboards should provide the same power and control systems as the outside switchboard but be incorporated in a standard indoor type switchboard.

7.3.2 Low Voltage Switchboards

7.3.2.1 Standards

Add additional requirements:

The TW standard external switchboards shall be designed to withstand a minimum of 20kA fault current.

The incoming circuit breaker shall be set to ensure that the let through energy of the circuit breaker under all fault conditions is less than the equivalent of 8kA for 1 second. (i.e. 64,000,000 I^2t).

Internal switchboards shall satisfy the requirements of this clause in WSA 04.

7.3.2.2 Construction

Add additional requirement:

Outdoor Pump Station switchboards shall be constructed in line with TW Standard Pump Station Requirements.

7.3.2.4 Degree of Protection

Replace paragraphs two and three with the following:

Outdoor Pump Station switchboards shall be constructed in line with TW Standard Pump Station Electrical drawings.

Internal switchboards shall be minimum of IP54

7.3.2.9 Internal Arcing Fault

Replace with the following:

Internal arcing fault protection shall be in line with the requirements of AS3000.

7.3.3 Meter Requirements

Add the additional requirement:

TWs Standard design provides a metering section. The designer is to satisfy themselves that this is acceptable to the electricity supply company's requirements.

7.3.4 Lighting

No internal lighting in the external switchboards is required. An external light on a pole shall be provided at all outdoor switchboards.

8 Control and Telemetry System

8.1 General

Add the additional paragraph:

Refer to TW document TDEGDL01 – Small Sewage Pump Station Electrical Design and Installation Guideline for control and telemetry system requirements and TDESTD25 Small Sewage Pump Station - Control Software Functional Description for functional requirements.

8.2 Operating Levels and Settings

Replace levels with the following:

a) Overflow
b) High level
c) Assist Pump On
d) Duty Pump On
e) Pumps Off
f) Low Level

8.3 Pumping Control

8.3.1 Control Design

Replace with the following:

The Control Design shall be as per TW TDESTD25 Small (Tow Pump) Sewage Pump Station - Functional Description and TDEGDL01 Small Sewage Pump Station Electrical Design and Installation Guideline.

TW will provide standard control and telemetry software. Noting:

'A Duty/Standby/Assist' function will only be permitted after consultation and approval by TW and the pump is only brought into service (automatically) to operate either:

- Simultaneously with the 'duty' pump should the liquid level rise substantially within the well as a result of:
    - A partially choked 'duty' pump; or
    - Extreme inflow conditions arising from major storm events; or
- To take the role of the 'duty' pump for the station in the event of either a failure or overload of the initial duty pump; or
- Failure of the RTU controller resulting in hardwired control of both pumps.

When undertaking the renewal or upgrade of an existing pump station consideration shall be given to the existing incoming power supply and switchboard which may prevent the pump station from being able to operate in Assist mode. i.e. there is to be an electrical interlock to ensure that only one pump will run at any one time.

8.3.2 Control Switches

In place of 'Flush with Manual' TW utilise a 'Low Level Override' mode to allow the operator to run the pump below the low level float switch in manual mode.

8.3.3 Control Systems

Replace with the following:

TW preferred solution for pumping stations is control via a Radio Telemetry Unit (RTU). As stated in 8.1 the designer shall contact TW and request the details of the required system.

8.3.4 Emergency Back-Up Control

Add the following:

TW Pump Station Standard Electrical Design uses hard wired float switches as Emergency Back-Up Control of the control system.

8.3.5 Pump Starts and Interlocks

Add the following:

TW Pump Station Standard Electrical Design (TDEGDL01) uses timers to prevent simultaneous starting of pumps but does not prevent running of two pumps simultaneously.

8.4 Alarms

8.4.1 General

Add the following:

TDESTD25 Small (Two Pump) Sewage Pump Station - Functional Description provides the list of alarms to be provided from pump stations.

8.5 Alarm Status Monitoring and Control Telemetry

TDESTD25 Small (Two Pump) Sewage Pump Station - Functional Description provides the list of alarms and alarm severities contained in the standardised RTU and SCADA programs. Some alarm severities are to be reviewed on a site by site basis. Alarm severities requiring review shall be done in accordance with TW TOMSTD02 – Alarm Philosophy for SCADA Alarms.

8.6 Telemetry Hardware

8.6.1 General

TW has nominated two preferred RTU equipment manufacturers

All new telemetry installations are to be assessed according to the legacy system they are connected to and the equipment they utilise.

Refer to section 8.11 of this Supplement and contact TW for requirements of a specific site.

In addition, TW have developed standard RTU software for the two preferred RTU equipment manufacturers. The latest version of this will be requested from TW and modified if necessary for a specific installation. The TW standard Functional description of the Sewage Pump Stations is only to be used to describe how the Pump Station functions. RTU software shall not be produced from scratch from the functional description.

8.6.2 Software

TW has developed standard control software for the nominated RTUs and SCADA and the latest version of this software will be requested from TW and may only be modified with TW approval. The TW TDESTD25 Functional Description Describes how the Pump Station control software operate. RTU software shall not be produced from scratch from the functional description.

8.7 Operating Levels and Default Settings

TDESTD25 Small Sewage Pump Station - Control Software Functional Description details operating levels and alarm definitions. TW drawing TWS-M-0002 (2 sheets) should be completed for all pump stations detailing operating and alarm levels. This drawing provides the minimum depth for operation of the standard control contained within TW standard switchboard designs.

8.8 Equipment and Devices

8.8.1 General

Devices and equipment to be used as part of the proposed pumping station have been identified on TW Pumping Station Standard Electrical Drawings. If they are not specifically identified in the standard drawings then the designer will consult the TW Preferred Electrical Equipment list for the information.

8.8.2 Flow Measurement

A flanged mag-flow meter is required to be installed. The meter shall be located following the valve chamber and shall be installed in accordance with the manufacturer's requirements particularly with respect to the required number of straight diameter lengths upstream and downstream of the meter. The brand of meter shall be either Siemens, Endress, Hauser or ABB and the installation shall incorporate a thrust-type dismantling flange.

An isolating valve (resilient seated clockwise closing sluice valve) shall be included in the rising main 10 pipe diameters downstream of the mag flow meter.

8.8.5 Level Sensor

See comment in Section 8.8.1 above.

8.8.6 Float Switch

Two TW preferred float switches are required in each pump station. One as High Level and One as Low Level.

8.8.7 Site Access Monitoring

TW Standards require door monitoring of all external doors of the outdoor electrical cabinet with the exception of the Power Authorities Meter Cabinet access door.

A buzzer/light combination and a key switch are also required to warn the operator that the intruder alarm has been activated and they need to operate the key switch.

Pump Stations consisting of a building will have door switches on all access doors including emergency doors which will feed back to the station RTU and SCADA.

8.10 Wiring Numbering Conventions

These are to follow the system currently used on the TW Pump Station Standard Electrical Drawings.

8.11 PLCs & RTUs

These requirements will be in accordance with the current TW Standard Drawings.

Where applicable the standard hardware adopted shall be:

- RTU (Remote Terminal Unit): Schneider Electric SCADAPack RTU range consisting of the SCADAPack 334E utilised on both water and wastewater pumping stations and the SCADAPack 330E utilised at smaller sites such as water reservoirs.
- Radio and Repeater equipment: Schneider Electric Trio Radio range.
- Where radio infrastructure is not available, the use of Telstra NextG has been established for TW-S. Currently the Cybertec range of modems is being utilised.

9 Wet-Well Pipework

9.1 Pump Discharge Pipe Work

9.1.1 General

Additional requirements:

Vertical Pipework shall be supported at a maximum 1.5m intervals if DI or 1.0m intervals if HDPE using 316L Stainless Steel support brackets fabricated from a minimum of 8mm thick plate and fixed to the wall with 316 Stainless Steel chemical anchors.

The discharge pipe work shall include a scour line to enable the pressure main to be drained back to the wet-well or into an adjoining sewer reticulation system.

9.1.2 Sizing

Additional requirements:

The minimum diameter shall be DN 100 unless TW approves otherwise.

9.1.3 Type

Additional requirements:

Grouting of penetrations through block outs shall be carried out using non-shrink epoxy grout with at least the same strength as the parent concrete. In addition a bead of Sikaswell S-2 or similar approved shall be applied central in the section which may require local concrete thickening.

Discharge pipe work in the wet well and valve chamber shall be either High Density Polyethylene (HDPE), Ductile Iron (DI) or 316 Stainless Steel unless otherwise approved by TW.

All flanged HDPE shall be installed with 316 Stainless Steel backing rings.

All exposed metallic pipe work; excluding stainless steel, within the station and valve chamber is to be coated with products approved under APAS Specification 0213 available from http://www.apas.gov.au/DocList.asp

9.2 Valve Applications

9.2.1 Isolating valves

Additional requirements:

Gate valves shall have non-rising stems, be **resilient seated and clockwise closing** with the direction of closing to be stamped on the valve spindle (or handwheel) as appropriate.

All valves contained within the valve chamber shall be valve key operated to avoid the need to access the chamber.

9.2.3 Scour/Emergency By-Pass Connection

Additional requirements:

- The pressure main shall scour back to the wet well.
- An emergency by pass pumping point within the valve chamber pit is required at every installation. The facility shall include a branch line from the pressure main incorporating a sluice valve, a non-return valve, a 90º bend and a flanged riser to a lockable Bauer Type B Female Coupling (Camlok) within 100 mm of the top of the valve chamber. The sluice valve must be able to be operated from the surface above the valve chamber.

9.2.4 Sewage air-release valves

The minimum diameter shall be DN 80. Air valves must be of the type approved for use on sewer mains. Air valves shall be located in a concrete pit fitted with a lockable aluminium (or "Terra Firma" type) cover. Provision must be included in the design to allow air to escape from the pit. On long rising mains, it may be necessary to provide odour control on all or some air valve discharges.

9.3 Valve Chamber

9.3.1 General

Additional provisions:

- A separate valve chamber is required.

9.3.2 Design

Additional requirements:

Operation of the isolation valves and the scour valve is required from the surface.

The wet-well roof slab shall incorporate the covers of the valve chamber unless otherwise approved. The valve chamber covers shall be large enough to enable crane access to remove valves for maintenance purposes. For valves greater than DN150, removal must be able to be carried out as a "direct lift" operation.

The valve chamber drain back to the pump-well shall be DN 100 PVC minimum and include a screwed stainless steel floor waste in the floor of the valve chamber and a "P" Trap back to the well. The outlet in the well shall be fitted with a Hume- King Flood gate or approved equivalent.

The depth of the valve chamber shall be the minimum necessary to accommodate the valves while providing the minimum cover to the rising main exiting the chamber.

All isolation valves shall be resilient seated clockwise closing.

9.3.3 Dismantling Joints

Additional requirements:

Where there are no bends in the valve chamber to facilitate dismantling, TW requires dismantling joints to be provided in the valve chamber. Thrust restraint in the form of pipe puddle flanges shall be incorporated into the chamber walls as required.

In vertical pipe work the dismantling joint shall be at the top of the pipe.

9.3.5 Pressure main Tappings

Additional requirements:

TW requires a minimum of one DN25 pressure tapping on the common discharge manifold on all installations suitable for a pressure gauge complete with 316SS Ball Valve and plug.

9.3.6 Access covers

Additional requirements:

Non-trafficable Covers shall be fabricated from 6mm thick aluminium chequer plate 5251-0 and 6061-T6 structural members unless approved otherwise by TW.

Trafficable covers shall be Class C “Terra Firma” type GRP rectangular covers, unless approved otherwise by TW

10 Pressure Main

10.2 Location of Pressure Mains

10.2.1 General

Pressure mains in easements are not permitted unless agreed with TW prior to completing the final design.

10.3 Hydraulic Design

10.3.5 Velocity in Pressure Mains

The velocity shall be reduced to a maximum of 2 m/s before discharge to receiving sewer.

Replace the second last paragraph with the following:

Velocities for initial and ultimate flows shall be less than 3 m/s.

10.3.6 Sizing of Pressure Mains

The internal diameter shall not be less than DN 80 or the pump outlet.

10.4 Design Pressures

10.4.3 Surge

Additional requirement:

The designer shall provide TW with a surge analysis for all pressure mains supporting the pipe selection.

10.6 Plastics Pipe

10.6.2 Fatigue Design for Thermoplastics Pipes

Additional requirement:

The designer shall provide the results of the fatigue analysis supporting pipe selection.

10.9 Pressure Main Valves

10.9.2 Isolation Valves

Additional requirements:

Gas release valves and scour valves adjacent to isolation valves shall be provided as required to facilitate draining and refilling of the pressure main and to permit online cleaning and maintenance.

Isolating valves shall be resilient seated sluice valves – clockwise closing.

10.9.3 Gas Release Valves

Two-way air valves shall be provided on all high points on rising mains.

Additional requirements:

The designer shall submit plans of proposed air release valve locations for TW approval prior to completing design plans.

The air release valve shall be a kinetic non-slam type complying with WSAA Product Specification WSA PS - 275 “Air Valves for Pressure Applications - Sewerage” available from the WSAA website.

In determining the location of the air release valve the following factors are to be considered:

- Hydraulic profile
- proximity to properties;
- venting requirements and subsequent odour issues; and
- aesthetics of the vent.

10.9.5 Scours

Additional requirements:

Scour points shall be provided on all low points on rising mains. They shall include a branch line from the pressure main incorporating a resilient seated sluice valve. Where possible the scour points shall drain to a separate sewer. Otherwise they shall include a 90^0 bend and a flanged riser to terminate with a blank flange within 100 mm of the top of the pit.

The minimum diameter of all scour lines shall be DN 100 or larger as indicated in Table 10.3.

10.10 Odour and Septicity Control

Additional requirements:

The designer shall provide calculated detention times and design adequate odour and septicity controls. The designer shall ensure that the sulphide generation potential in rising mains that discharge to standard manholes is kept to a level that is not likely to cause nuisance odour.

10.11 Receiving System

10.11.2 Discharge MHs

Additional requirements:

Where the receiving sewer is substantially deeper than the normal depth of the pressure main, an open ended internal drop bend shall be provided in the receiving MH.

Induct and educt vent shafts shall be provided to the receiving sewer MH unless approved otherwise by TW.

All Exposed non-acid resistant concrete surfaces in the receiving manhole shall be coated with an Epoxy lining system conforming to the requirements of specification “WSA 201—2017 Manual for selection and application of protective coatings - Second Edition Version 2.1”.

The receiving structure shall be as far as possible from residential properties.

11 Structural Design

11.1 Difficult Ground Conditions

Additional requirement:

The word “Difficult” shall be ignored in the title of section 11.1.

The designer shall arrange for a geotechnical assessment and address the requirements of Sections 11.1.1 and Section 11.1.2 regardless of ground conditions.

11.2 Structures

11.2.1 Design loads and forces

Additional requirement:

All structures shall be designed to resist full buoyancy forces, as applicable, including the occurrence or a possible perched water table and in low lying coastal areas the predicted sea level rise for YR 2100 with a coincident storm surge event.

For the buoyancy check the following equation shall be utilised to determine the minimum depth of the plug:

$$d = \frac{2.4D^2.H}{1.4(D+2t)^2} - H - \frac{W}{1.4}$$

Where:

d = depth of plug (metres)

D = internal diameter (metres)

H= depth of well from top of wall to bottom of plug (metres)

t= wall thickness (metres)

W= water depth of water table from top of wall (metres)

11.2.5 Pumping station walls

Rectangular walls are not permitted.

11.3 Pressure Mains

11.3.2 Products and Materials

Additional requirement:

Only pipes and fittings listed in TW Approved Products List and the associated purchasing specification shall be used. Pressure mains must comply with colour and marking requirements of the purchasing specification to differentiate pressure sewerage mains from potable water and recycled water pressure mains. (These colours are currently PVC pipe coloured cream; PE pipe coloured black with cream stripes.)

Pipe type, size, class and series shall be clearly notated on design and as-constructed drawings.

The minimum pressure class of pipes and fittings shall be PN16.

All PVC pipe shall be O-PVC Series 2 Colour Cream (neither lighter than RAL 080 90 20 nor darker than RAL 075 80 20).

12 Supporting System

12.1 Services

12.1.2 Water

Replace paragraph two with:

The water service shall terminate with a standard 20 mm connection within a surface box cast in the slab adjacent to the wet well.

Additional requirements:

The designer shall confirm the required diameter of the water service taking into account the minimum service pressure in the area, the length of service from the water main to the pump station and the flow rates required by the well washers and other fittings requiring a water supply in the pump station.

12.2 Materials Handling

12.2.1 Lifting Equipment

Additional requirements:

The pump lifting chain shall be AISI 316 L Grade 50. The chain shall be sized to carry the weight of the pump, taking into account load carrying reductions for angled two leg slings.

The chain size shall be less than 10 mm for small pumps, but larger pumps will require 12 mm or 16 mm, particularly where a lower bridle is used to attach to two eyebolts.

The Dee shackles used shall be 316 stainless steel, manufactured to comply with AS 2741.

Eyebolts provided by the manufacturer as part of the lifting arrangement to equipment shall be manufactured to comply with AS 2317.

At the top of the lifting chain a 316SS name plate shall be installed clearly identifying the Pump Number and the self weight of the pumpset.

Where the individual weight of the removable section of the pumpsets is less than 500kg at a maximum reach of 2m then a permanent on-site davit is not required. Where this condition is exceeded then a permanent davit is to be installed and the requirement for load testing incorporated into the commissioning plan.

12.3 Site Security

Additional requirements:

TW will specify if security fencing is required. Security fencing shall not impede access to pump station equipment.

Manually operated vandal proof security lighting shall be provided to illuminate the site for all fenced installations.

12.4 Fire Control

Fire fighting facilities must be provided in accordance with the requirements of any building permit issued by Council.

15 Design Documentation and Drawings

15.2 Design Drawings

15.2.1 General

Design Drawings and Work As Constructed (WAC) drawings shall be prepared in accordance with TW requirements.

Except where otherwise notified, the requirements are as set out in this Section. The information to be shown in the Design Drawings and WAC drawings shall include, but not be limited to, that detailed in clause 15.2 of the code and the following.

Structures

Add the following requirements:

(i) Details of all inlets and property connection sewers.

(j) Water seal requirements.

15.2.5 Pressure Mains and Sewers

Add the following additional requirements:

(n) Position of rising main and sewers relative to property boundaries.

(o) Insets and diagrams (amend as constructed drawings).

(p) Ties and downstream chainages.

PART 2: PRODUCTS AND MATERIALS

16 Products and Materials Overview

16.3 Responsibilities

16.3.1 Water Agency

Additional dotpoint:

(c) Unless otherwise specifically agreed, only products endorsed in the TW Approved products lists shall be used.

The TW Approved Products List is currently under production, in the interim, TW has adopted the CWW approved products list which is available from:

http://www.mrwa.com.au/Pages/Products.aspx:

and for electrical equipment

TW Preferred Equipment List Technical Standard TDESTD21

Exceptions to these lists specifically nominated in this document are considered to be TW approved products. Alternative products require the approval of TW prior to their use.

PART 3: CONSTRUCTION

19 General Construction

19.5 Protection of People, Property and Environment

19.5.3 Disused/Redundant sewer and pressure mains

All disused sewer pipe with less than 1m of cover shall be removed. Redundant sewer pipelines with greater than 1m cover shall be considered on a case by case basis which may require the pipe to be removed or grout filled.

21 Electrical Works

21.4 Consumer Mains

21.4.1 Point of Supply

Additional requirements:

Depending on the distance between the point of connection and the TW Pump station position the following electrical installation of the mains supply shall be provided:

a) 10m or less

The power supply cable shall be run directly to the pump station switchboard in an underground heavy duty electrical conduit of minimum diameter 50mm.

b) Greater than 10m but less than 100m
The power supply cable shall be run directly to the pump station switchboard in an underground heavy duty electrical conduit of minimum diameter 100mm and any change of direction shall use solid sweeping bends. At the ends of the conduits within 2m of where they enter the switchboard or at the supply point this size may be reduced due to space constraints. Under no circumstances shall flexible conduit be used for changes of direction.

In addition, if the conduit route runs down hill to the pump station a cable pit shall be provided within 2m of the pump station and provide drainage of any water which may infiltrate the conduit and therefore prevent it from entering the switchboard.

c) Greater than 100m

If the total cable length is to be greater than 100m the installation requirements are the same as b) above but with the additional requirements that intermediate pits are required to ensure no single conduit run is longer than 100m. The pits shall be designed to carry the expected type of traffic across them, sealed to prevent stormwater ingress and shall be large enough to ensure the minimum bending radius of the cable within the pit is not less than that of the 100mm conduit sweeping bends.

In addition the underground cable route from the Aurora Supply point to the pump station shall follow the TW access road but shall be off to the side to ensure it can be easily accessed if possible. Cable pits shall be placed so they are not normally driven over but are able to support a vehicle in the case when they are.

32 Pipe Embedment and Support

32.1 General

Where pressure mains trench details are not covered by Table 1 on drawing SPS 1601 the pressure main trench detail shall be adopted based on the requirements for water mains on drawing MRWA-W-202.

PART 4: Standard Drawings

Drawings Not Used

The following drawings have been deleted:

SPS-1200

SPS-1201

SPS-1202

SPS-1203

SPS-1204

Additional Drawings

The following standard drawings have been included:

Table B: Additional Drawing Register

TW ADDITIONAL STANDARD DRAWINGS	
TW Standard Drawings	Title
TWS-M-0002	Sewage Pump Station – Wet Well Settings – Set Up Drawings

DOCUMENT IMPROVEMENT REQUEST

DOCUMENT IMPROVEMENT REQUEST		
TW's Supplementary Manual to WSA 04-2005 Version 2.1		
FROM: Name:		
Position/Title:		
Section/Company:		
Address:		
Email:	Phone:	Fax:
Signature		Date:
TO: Asset Strategy, TasWater		
Email: enquiries@tastwater.com.au		
SUGGESTED IMPROVEMENT		

List of Acronyms and Abbreviations

Acronym	Meaning

Add	**Authority**	Tasmanian Water and Sewerage Corporation trading as TasWater (TW)
	Water Agency	to also include the Tasmanian Water and Sewerage Corporation trading as TasWater
	TW Standards	Nominated National Codes which may incorporate specific TW requirements for design and construction of infrastructure and the manufacture and supply of associated products and materials, and other documents including supplements to National Codes prepared and published or adopted by TW from time to time.
	'agreement conditions'	means any conditions and requirements specified in the "TW Response to Council Notice of Planning Application Referral", "TW Certificate of Certifiable Works", the "Permit to Construct TW Infrastructure" and any "Approved Drawings".
	Sewage Pumping Station Environmental Guidelines	Guideline documents prepared by the Department of Primary Industries, Water and Environment in December 1999

ll ABBREVIATIONS

Add	**CWW**	City West Water
	DIEL	Ductile iron epoxy lined
	DE	Dead end
	EPA	Environmental Protection Authority
	ET	Equivalent Tenement
	PWWF	Peak Wet Weather Flow
	SEW	South East Water
	TW	TasWater

APPENDIX H - ENVIRONMENTAL REQUIREMENTS

(Replaces *The Tasmanian Sewage Pump Station Environmental Guidelines – December 1999*)

The Tasmanian Sewage Pump Station Environmental Guidelines – December 1999 has been superseded by the WSAA Standards and this Supplement to the Sewage Pumping Station Code of Australia WSA 04-2005. While the WSAA Codes and TW Supplements replace the objectives and design requirements of these Guidelines, *Appendix A – Environmental Requirements* provides the risk based approach performance objectives and environmental protection requirements for SPSs.

H1. STATUTORY REQUIREMENTS: POLICY CONTEXT

The *State Policy on Water Quality Management 1997* is a statutory policy developed under Tasmania's *State Policy and Projects Act 1993*. The Policy is designed to establish a water quality management framework in harmony with frameworks being developed by other jurisdictions under Australia's National Water Quality Management Strategy.

Section 28 of the *State Policy on Water Quality Management 1997* deals specifically with sewage pumping stations.

Amongst the objectives of the Policy are: "to ensure that diffuse and point source pollution does not prejudice the achievement of water quality objectives *and* that pollutants discharged to waterways are reduced as far as is reasonable and practical by the use of best practice environmental management."

These two elements: (a) the achievement of water quality objectives, and (b) the use of best practice techniques – are fundamental to the management of pumping station overflows. The use of "best practice environmental management" is also a requirement of the *Environmental Management and Pollution Control Act 1994*.

5.1 Protected environmental values

The establishment of water quality objectives (sometimes generally referred to as "environmental objectives" is determined by values which the community place upon water. Values can be equivalent to uses. Under the State Water Quality Management Policy, values fall into five main categories. These values are called Protected Environmental Values, or PEVs:

A. Protection of Aquatic Ecosystems

(i) Pristine or nearly pristine ecosystems

(ii) Modified (not pristine) ecosystems

(a) from which edible fish, crustacea and shellfish are harvested

(b) from which edible fish, crustacea and shellfish are not harvested

B. Recreational Water Quality and Aesthetics

(i) Primary contact

(ii) Secondary contact

(iii) Aesthetics only

C. Raw Water for Drinking Water Supplies

(i) Subject to coarse screening only

(ii) Subject to coarse screening plus disinfection

D. Agricultural Water Uses

(i) Irrigation

(ii) Stock watering

E. Industrial Water Supply

H3. CLASSIFICATION OF PUMPING STATION SENSITIVITY

Classification in the three categories of “high”, “moderate” or “low” derives from both risks to the receiving environment, and risks to human health. Note that even the “low” sensitivity category requires a high level of protection in regard to SPS design (see section 9.4).

Categories default to the highest value. The categorisation scheme is set out below:

Table H3 SPS Location Sensitivity:

SENSITIVITY: The classification defaults to the highest value	Low	Medium	High
HEALTH INDICATORS:			
Overflow may reach habitable area (note that the "high" rating is the default which can be amended by a risk assessment)			
Overflow may reach water used for aquaculture (note that the "high" rating is the default, which can be amended by a risk assessment)			
PROTECTED ENVIRONMENT VALUES **Receiving water values:**			
A1. **Protection of Aquatic Ecosystems** (i) Pristine or nearly pristine ecosystems			
A2. **Protection of Aquatic Ecosystems** (ii) Modified (not pristine) ecosystems (a) from which edible fish, crustacea and shellfish are harvested (non-commercial) Subject to risk assessment.			
A3. **Protection of Aquatic Ecosystems** (a) from which edible fish, crustacea and shellfish are harvested (commercial)			
A4. **Protection of Aquatic Ecosystems** (b) (ii) Modified (not pristine) ecosystems from which edible fish, crustacea and shellfish are not harvested			
B1. **Recreational Water Quality and Aesthetics** (i) Primary contact (subject to risk assessment)			
B2. **Recreational Water Quality and Aesthetics** (ii) Secondary contact (subject to risk assessment)			
B3. **Recreational Water Quality and Aesthetics** (iii) Aesthetics only			
C. **Raw Water for Drinking Water Supplies *** (i) Subject to coarse screening only (ii) Subject to coarse screening plus disinfection			
D1. **Agricultural Water Uses** (i) Irrigation (subject to risk assessment)			
D2. **Agricultural Water Uses** (ii) Stock watering (subject to risk assessment)			
E. **Industrial Water Supply** (excluding aquaculture) Subject to risk assessment			

* Category C: this PEV applies to water used as an intake source for reticulation for public use (i.e. town water supplies), and for registered private water supplies (advice on these may be gained from the local council). The Raw Water for Drinking Supply PEV does NOT apply to the taking of water from surface waters by individuals for private use for the purposes of drinking under riparian right provisions.

H3.2 Risk Assessment:

Where a risk assessment is used to amend a risk rating, the risk assessment should take into account the likely health and environmental impact of overflows from the particular pumping station. The assessment must be in writing and must be recorded in a form which can be recalled, and can provide evidence that due diligence has been taken in respect to the decision.

H4. PERFORMANCE OBJECTIVES

The sewerage service provider should specify the target overflow frequencies on which the overall performance of the system will be assessed.

Achievable performance will depend on the age and condition of the sewerage system, as well as its design, and maintenance regime. Recommended maximum frequencies (for a system combining a mixture of 'new' and 'old' areas) are set out in the table below:

Table H4 - MAXIMUM TARGET OVERFLOW FREQUENCIES: overflow events per ten-year period

Sensitivity	Dry weather	Wet weather
low sensitivity SPS location	5	20
moderate sensitivity SPS location	2	10
high sensitivity SPS location	0.1	1

Note that these figures are targets, not mandatory requirements, and do not take into account unforeseeable or unpredictable events (such as pipe breaks caused by ground movement). They are also statistically based, and represent probabilities which may not, of course, occur within any given time period.

H5. ODOUR MANAGEMENT

H5.1 Introduction

Sewage pumping stations can be the source of significant odour problems. Odours can emanate from sewage pumping station enclosures in the form of a gas plume. The plume can either rise and disperse into the atmosphere, or form a gaseous pocket with some degree of stability. In either circumstance the resulting odours can cause nuisance to nearby residents.

H5.2 Statutory provisions on odour

Odour emissions can be an offence pursuant to the *Environmental Management and Pollution ControlAct 1994* section 53, under the heading '*Offence of causing environmental nuisance'.*

An 'environmental nuisance' is defined as:-

> *'the emission of a pollutant that unreasonably interferes with, or is likely to unreasonably interfere with, a person's enjoyment of the environment.'*

Unless the site is designated as a Level 2 activity (which is not the case with sewage pumping stations), control of odour emissions is the responsibility of the local council in which the machinery is installed, and therefore nuisance complaints will generally be investigated by local government. Authorized officers such as environmental health officers will perform such investigations. Where a council officer (appointed under section 21 of EMPCA) is satisfied that a person has committed a prescribed offence, an environmental infringement notice can be served in respect of that offence.

H5.3 Performance objective

Sewage pumping stations must not produce odorous emissions in contravention of Section 53 of the *Environmental Management and Pollution Control Act 1994.*

In order to protect the general community from odour nuisance, a performance design and operating guideline for odour generating facilities is recommended as follows:

> *The odour detectable at the boundary of the facility shall not exceed 1 odour unit for more than 0.1% of the hours in any given year.*

Note that 1 odour unit represents the odour threshold for a given pollutant. The objective recommended above represents no more than 9 hourly exceedances per year.

H5.4 Identifying odour hazard

In managing odour hazard, and (as part of this exercise) in considering the siting and design of the pumping station, it is useful to evaluate the local situation with respect to odour hazard. The degrees of odour generation hazard can be classified as low, medium, and high. **Table 10.4.1** provides an *indicative* guide to classifying odorous gas generation hazards from sewage pumping stations.

Table H5 – Odour Hazard classification system from sewage pumping stations

Odour hazard classification	External circumstance		Internal circumstance	
Parameter	*Topography*	*Buffer zone*	*Residence times*	*Trade waste*
How to measure	Level height difference measured between top of pumping station vent and residence or business floor	Distance measured between the pumping station and the nearest residence or business.	Time weighted average measured in the sewerage system, including upstream system and pumping station wet well based on the ADWF	Determined trade waste constituents
Low	**Greater than 5 metres**	Greater than 30 metres	Are less than 2 hours	none
Medium	Between 2 & 5 metres	Between 20 & 30 metres	Between 2 and 5 hours	**Liquid Trade Waste Categories 1 & 2** +
High	**2 metres or less**	20 metres or less	Are 5 hours or more	**Liquid Trade Waste Categories 3 & 4** +

+ For the definition of the liquid trade waste categories and associated criteria refer to the TW Liquid Trade Waste Pricing & Management Policy available from the TasWater website.

H5.5 Odour management

Odour management is largely related to control of septicity and the provision of ventilation. Careful attention to design of odour control facilities is required to comply with statutory requirements and ensure that resident complaints are minimised. Key aspects of the design process should be:

- emphasis on controlling odour generation should be on eliminating potential odour generation at the source;
- a septicity analysis should be undertaken;
- a wind direction and strength analysis should be undertaken.

Selection of solutions available to the designer will depend on the particular site. Some examples of typical solutions to consider, with an indication of where they might be most applicable (in terms of hazard classification) are:-

Low hazard

Natural stack ventilation induct/educt system and plume dispersion to atmosphere

Forced stack ventilation and plume dispersion to atmosphere

Medium hazard

Ventilation stack odour filter treatment canister

Biological earth/organic filter treatment bed (biofilter)

High hazard

Biotrickling Filter (BTF)

Odour scrubber system

Oxygen injection system

H6. NOISE MANAGEMENT

H6.1 Introduction

Sewage pumping stations can be the source of significant noise problems. Noise can emanate from sewage pumping station motors, pumps, and ventilation fans. The vibrations can either be minimised or attenuated within the enclosure structure, or not be attenuated, and the result can be complaints from nearby residents.

The significance of the noise can be influenced by such *external* factors as time of day (low ambient noise at night), wind direction, topography, and proximity of nearby buildings.

Internal factors such as the pumping station location (underground or aboveground) pump motor power, fan size, and building enclosure materials can all be important factors.

When considering noise and noise management, the designer should take into account the worst case design situation which often occurs during night time when ambient noise is likely to be lower and sensitivity is higher.

H6.2 Noise management

Noise management is largely related to the station location, particularly in relation to background noise from traffic and other sources. Building materials and detailed sealing of the enclosure are also major issues. Careful attention to design of noise control is required to comply with statutory requirements and ensure that resident complaints are minimised.

H6.3 Technical issues

There are four basic considerations in regard to noise (i.e. sound) management:

- Minimization of the generation of sound energy;
- Minimization of the objectionable characteristics of the sound;
- Reduction of sound energy using attenuation measures such as sound absorption;
- Deflection of sound energy away from sensitive receiving sites.

All four aspects should receive explicit consideration in the design and siting process:

- Design specifications for pumps, motors and other equipment should aim for the minimum sound levels in line with minimizing the effects of the pumping station once installed;
- Any equipment which may produce tonal sound should be carefully scrutinized to ensure the design minimizes tonal components;

- Pumping stations should be placed underground wherever possible;
- Sound absorption can be ineffective if the installation is not designed correctly in its early stages. Retrospective installations of sound attenuation barriers are difficult and should be avoided;
- Vibration of equipment can lead to unsatisfactory sound emissions. Design of suitable supports for the pumps and their connections should be investigated in the original design of the installation;
- Regular maintenance is essential. Noisy equipment should be repaired or replaced as soon as possible. The design of the site should enable easy access to the machinery;
- Lights or sirens to indicate emergencies should be considered in relation to the proximity of residential premises. Lights would be preferable to a siren if the installation is close to residential premises as a siren could cause an environmental nuisance.

H6.4 Performance objective

Annoying noise (environmental nuisance) is regulated under S. 53 (3) of the *Environmental Management and Pollution Control Act 1994*. It should be noted that even though sound levels can be set under regulations, action can still be taken under this Act if a person is aggrieved by noise.

The penalties for persons who commit an offence under this section are discussed under “Odour Management” above.

Unless the site is designated as a Level 2 or Level 3 activity (which is not the case with most sewage pumping stations – unless they are an integral part of a much larger development), control of sound emissions is the responsibility of the local council in which the machinery is installed.

A7. RECEIVING WATERS ASSESSMENT TEMPLATE

1. Do any of the values from H3 apply to the receiving waters? – note that the sensitivity (low, medium or high) defaults to the HIGHEST value.

SENSITIVITY: The classification defaults to the highest value	**Low**	**Medium**	**High**
HEALTH INDICATORS:			
Overflow may reach habitable area (note that the "high" rating is the default which can be amended by a risk assessment)			
Overflow may reach water used for aquaculture (note that the "high" rating is the default, which can be amended by a risk assessment)			
PROTECTED ENVIRONMENT VALUES **Receiving water values:**			
A1. **Protection of Aquatic Ecosystems** (i) Pristine or nearly pristine ecosystems			
A2. **Protection of Aquatic Ecosystems** (ii) Modified (not pristine) ecosystems (a) from which edible fish, crustacea and shellfish are harvested (non-commercial) Subject to risk assessment.			
A3. **Protection of Aquatic Ecosystems** (a) from which edible fish, crustacea and shellfish are harvested (commercial)			
A4. **Protection of Aquatic Ecosystems** (b) (ii) Modified (not pristine) ecosystems from which edible fish, crustacea and shellfish are not harvested			
B1. **Recreational Water Quality and Aesthetics** (i) Primary contact (subject to risk assessment)			
B2. **Recreational Water Quality and Aesthetics** (ii) Secondary contact (subject to risk assessment)			
B3. **Recreational Water Quality and Aesthetics** (iii) Aesthetics only			
C. **Raw Water for Drinking Water Supplies *** (i) Subject to coarse screening only (ii) Subject to coarse screening plus disinfection			
D1. **Agricultural Water Uses** (i) Irrigation (subject to risk assessment)			
D2. **Agricultural Water Uses** (ii) Stock watering (subject to risk assessment)			
E. **Industrial Water Supply** (excluding aquaculture) Subject to risk assessment			

2. Which of the above values apply to the situation of the SPS and its receiving waters? Discuss:

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