



# Design Manual - Sewage Pump Station



DESIGN MANUAL

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<b>System</b>	Asset Performance
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## 1 GENERAL

This Design Manual is provided for the design and construction of sewage pump stations within the cities and townships covered by Goulburn Valley Water. It is intended to be used by both developers and their consultants and Goulburn Valley Water staff and its consultants for projects including developer construct works, new pump stations and replacement or refurbishment of existing pump stations.

This Manual and Goulburn Valley Water's Standard Drawings STD/6 - Sewage Pump Station – General Arrangements and STD/7 - Sewage Pump Station –Structural Details form the basis for the minimum design performance criteria and requirements for Goulburn Valley Water sewage pump stations.

Other than where specifically identified as being a requirement, Goulburn Valley Water will consider and accept alternative pump station configurations to that shown on STD/6 - Sewage Pump Station – General Arrangements. The proposed alternative must equal or exceed the design performance criteria of this Manual and STD/6 - Sewage Pump Station – General Arrangements. Alternative proposals are to be identified and approved in writing by Goulburn Valley Water's Technical Customer Services Coordinator prior to its adoption.

## 2 PUMP STATION NUMBERING

For proposed new sewage pump stations, Goulburn Valley Water shall assign and provide a unique identifying number for that pump station in accordance with its asset management system. For Developer Construct projects, the identifier shall be provided at the Feasibility Report acceptance stage.

All drawings and documentation relating to the pump station shall include or make reference to the unique identifier number.

## 3 REFERENCE DOCUMENTS

The following Australian Standards and safety standards and guidance are referenced within this design guideline.

- AS/NZS 1170: Structural design actions – General principles.
- AS 1657: Fixed platforms, walkways, stairways and ladders – Design, construction and installation.
- AS 4680: Hot-dip galvanised (zinc) coatings on fabricated ferrous articles.
- AS 2129: Flanges for pipes, valves and fittings.
- AS 2741: Shackles.
- AS 2638: Sluice valves for waterworks purposes.
- AS/NZS 4158: Thermal-bonded polymeric coatings on valves and fittings for water industry purposes.
- AS 3578: Cast Iron non-return valves for general purpose.
- AS/NZS 3750.9: T2 Paints for steel structures - Organic zinc-rich primer.
- AS/NZS 4058 Concrete structures - precast concrete pipe.
- AS1023 Thermal protection of electric motors Part 3: Inherent overheat protectors (metric units).
- AS3996 Access Covers and Grates.

- AS4100 Steel Structures.
- Victorian Occupational Health and Safety Act.
- Occupational Health and Safety Regulations.
- WSA 201 Manual for Selection and Application of Protective Coatings.

The following Goulburn Valley Water Standard Drawings, Guidelines, and Water Industry Standards are referenced within this design guideline.

- STD/6 - Sewage Pump Station – General Arrangements.
- STD/7 - Sewage Pump Station – Structural Details.
- S/21 - Standard Drawing Typical Pump Station Site Layout.
- 1.7 Design Guideline – Avoiding Dissimilar Metal Corrosion.
- 1.8 Design Guideline - Stainless Steel selection and use for GVW.
- 1.10 Design Guideline – Electromagnetic Flow Meter Installation.
- 1.10.1 Electromagnetic flow meter below ground installation and pit details W12-W16.
- 1.11 Fixed Platforms, Walkways, Stairways and Ladders Design Guideline.
- 3.4 Design Guideline – Ventilation of Sewer Networks.
- Goulburn Valley Water - General Electrical Specification.
- Goulburn Valley Water – Sewage Pump Station – Specific Electrical Requirements.
- WSA 201 Manual for Selection and Application of Protective Coatings.
- City West Water’s Product Manual.
- Goulburn Valley Water’s Product Manual Supplement.
- Goulburn Valley Water Preferred Equipment List. Note: This document is not available publically; however, a current version can be made available upon request. For developer construct projects, the Preferred Equipment List can be requested from Goulburn Valley Water’s Land Development Group.
- Goulburn Valley Water’s Operation Manual Specifications.

## 4 DESIGN PARAMETERS

The sewage pump station shall meet the following criteria:

### 4.1 General

- All materials and equipment are to have minimum 12 months warranty.
- All coatings to be in accordance with WSA 201 Manual for Selection and Application of Protective Coatings.
- All brackets, access ladders, lifting chains, chemical set anchor bolts, bolts, nuts and washers are to be stainless steel.
- All stainless steel is to be grade 316 or better.
- All mild steel items to be hot dipped galvanised in accordance with AS 4680: Hot-dip galvanised (zinc) coatings on fabricated ferrous articles. All patching or repairs to damaged galvanised coatings are to be undertaken in accordance with AS/NZS 3750.9: T2 Paints for steel structures – Organic zinc-rich primer.
- Fixing of holding brackets to the pump station wall shall be carried out in accordance with manufacturer’s instructions and the relevant Australian Standards.

- Ventilation and odour control to be in accordance with the Goulburn Valley Water's 3.4 Design Guideline – Ventilation of Sewerage Networks.
- Electrical to be in accordance in accordance with Goulburn Valley Water General Electrical Specification and Goulburn Valley Water Sewage Pump Station Specific Electrical Requirements.
- To be a wet well with a submersible pump arrangement. Alternative arrangements will only be considered at the discretion of GVW.

## 4.2 Design

- The pump well structure is to achieve a minimum 100-year design life.
- The pump station shall be underground.
- The structure shall be capable of withstanding external forces from ground pressure and internal forces from liquid loading, including under overflow conditions.
- The pump station must be designed to remain stable under flotation conditions.
- The base must be structurally adequate to support the pumps and other equipment.
- The pump station structure shall be capable of withstanding live loading which may reasonably be expected to be placed on the structure for the duration of its life i.e. traffic loading.
- Be equipped with a minimum of two complete and identical pump sets and associated pipework capable of pumping raw sewage. The pumps shall be a duty/standby arrangement, and must be capable of operating simultaneously.
- Be integrated with Goulburn Valley Water's telemetry system.
- Cleaning and removal of equipment to be achievable without entering the pump station.
- Be provided with an access ladder within the valve pit.
- Pump station wet wells are not to be provided with an access ladder except where directed by Goulburn Valley Water.
- Be fitted with a permanent tubular handrail system around the opening to the pump well. Galvanised handrails are not to be painted.
- Have sufficient depth to command all the land identified in the catchment based on an adopted overall development strategy plan for the area or based on advice from Goulburn Valley Water and the relevant council. For refurbishment or replacement pump stations within fully developed catchments, the depth is to make provision for existing incoming gravity sewers and any planned future trunk sewers.
- Have sufficient storage capacity to hold 3 hours peak dry weather flow for the pump station catchment at full development.
- Disperse odours into the atmosphere via induct and educt ventilation system.
- Have traffic bollards minimum 1.50m high fixed to the perimeter of top slab at no greater than 1.80m centres. The bollards are to be hot dip galvanised and are not to be painted. Refer to standard drawings;
  - STD/6 - Sewage Pump Station – General Arrangements
  - STD/7 - Sewage Pump Station – Structural Details
- Include an Electromagnetic flow meter on the discharge rising main as required.

## 5 PUMP STATION SITE SELECTION

The following criteria shall be met when selecting the pump station site:

- Where possible the pump station should be located centrally within the catchment to minimise depth.
- The selected pump station should avoid gravity sewers being laid at a depth exceeding 6.0 metres within private property.
- Positioned to avoid the associated sewer rising main traversing private property.
- Situated within:
  - A reserve designated in favour of Goulburn Valley Water; or
  - A road reserve subject to approval from the relevant road manager and Goulburn Valley Water. Note: this would normally apply to the refurbishment or replacement of existing pump stations and backlog sewer schemes; or
  - Land that is owned by Goulburn Valley Water.
- The pump station site area/reserve is to be a minimum of 10 metres by 8 metres.
- Sites that require access to a pump station through private property are to be avoided wherever possible and shall be subject to approval by Goulburn Valley Water. Where access to a pump station through private property is approved, a minimum 3.50m wide carriageway easement in favour of Goulburn Valley Water is to be placed on the Title of the affected land.
- The pump station must be provided with a 24-hour all-weather vehicular access road/track/driveway. A suitable driveway crossing with a layback is to be provided in accordance with the relevant council standard where access to the pump station crosses a concrete kerb and channel.
- A suitable driveway crossing with a culvert and headwalls is to be provided in accordance with the relevant council standard where access to the pump station crosses an open earth drain or channel.
- The arrangement of the pump station site must ensure that the available space for maintenance purposes is maximised. A hard stand area must also be provided adjacent to the pump station. Refer to S/21 - Standard Drawing Typical Pump Station Site Layout.
- The pump station top slab finished surface level shall be determined in accordance with the following criteria:
  - Where the site is subject to earth works, the top slab shall set to 150mm above the design finished surface level.
  - Where the site is not subject to earthworks, the top slab shall be set to 150mm above existing surface level.
  - Irrespective of site earthworks and existing surface levels, a pump station situated in an area that is designated by the applicable planning scheme as land subject to inundation by flooding, the finished surface level for the top slab must be a minimum of 150mm above the 1 in 100 year flood level.
- Gravel shall be placed around the top slab sloping away from the slab sufficient to provide safe access to the top slab.
- Not located along an existing or proposed pedestrian/cyclist or vehicle traffic alignment.
- Minimise aesthetic issues for neighbouring properties and the general public.
- Not encumbered by existing or proposed overhead power lines.

- Has electricity supply capable of meeting pump station loading (with all pumps operational) within electricity supply regulations for both amperage and voltage.
- Soil conditions are suitable or may be made suitable.
- The pump station is to be located to minimise the length of rising main.

## 6 PUMP WELL AND VALVE PIT CONFIGURATION

### 6.1 General

The pump well and valve pit shall meet the following design criteria:

- The wet well to be a minimum internal diameter of 1950mm.
- Capable of accommodating two submersible pumps, associated pipe work, electrical wiring, access equipment and room for personnel to stand and work.
- Free head room space of two (2) metres minimum shall be provided for the full floor area of the pump well.
- A 50 mm uPVC pipe shall be provided to discharge wastewater from the valve pit into the pump well with a 50mm diameter angled ductile iron flap check valve. The floor of the valve pit is to be sloped towards the discharge pipe at a grade of not less than 1 in 30 as detailed on Goulburn Valley Water's Drawing STD/6 - Sewage Pump Station – General Arrangements.
- There shall be a separate valve pit adjacent to the pump well. The valve pit is to be a minimum internal diameter of 1950mm. Alternatively, the valve pit may be square having a minimum internal dimension of 1750mm.
- The pipework within the valve pit is to include a tee to provide a temporary connection point for a by-pass pump that would draw directly from the pump well and discharge into the rising main. It is intended to be used for emergencies or planned maintenance works.
- Pump well and valve pit covers providing access shall have a minimum clear access of 1290mm x 750mm and 900mm x 750mm respectively. The designer is to ensure pumps can pass through pump well opening.
- Covers are to be two part aluminium lids with hasps and staple for installation of padlocks. The covers shall be of sufficient size and orientation to facilitate installation and removal of equipment and plant as well as access by personnel into the pump well and valve pit.
- The lids shall be capable of being secured in the open position with a stainless steel chain. One end is to be looped around the handrail and securely joined to be tamper resistant, at the other end of the chain there is to be a corrosion resistant spring loaded karabiner clip securely attached so to be tamper resistant. A tab is to be welded to the underside of the lid with a hole of sufficient size to enable the karabiner to be easily and quickly attached. The tab is to be placed to enable fixing of the karabiner without entering within the handrails. The maximum chain length is to ensure that the lid cannot be held open at less than a 90 degree position.
- Where covers are to carry vehicular or similar traffic loading, Gatic lids are to be installed. Under these circumstances bollards are not required.
- Covers are to have confined space warning signs affixed. The size, design and positioning of the warning signs can be provided by Goulburn Valley Water upon request.
- Two hinged mesh safety covers are to be installed beneath the aluminium or Gatic lids to allow regular inspections, wash down etc. without a fall from heights risk.



The safety covers shall be capable of being secured in the open position. As a minimum, these shall comprise of a frame with SL81 mesh and are to be hot dip galvanised prior to installation. They are to be fitted at the top of the well with a 30mm gap between the mesh covers and lids when closed. They are to be rated to the strength requirements of AS3996 Access Covers and Grates and to provide a secure work platform for inspection and washing down of the pump well. The support frame is to be secured into the well with stainless steel bolts and hinges.

- All metalwork in the pump well and valve chamber must be corrosion protected or of metal type which is not adversely effected by raw sewage i.e. grade 316 stainless steel.
- The pump well floor is to be shaped to avoid retention of wastewater and material that enters the pump well. Where this is achieved through the placement of mass concrete, the concrete is to be placed at a slope of 1 to 1 and positioned to minimise corner area without impeding the removal of pump well equipment.

## 6.2 Personnel Access

The pump well is a confined space and shall be treated as such under Occupational Health and Safety regulations.

Pump station wet wells shall not be fitted with an access ladder unless specifically directed by Goulburn Valley Water. This will be determined at the Feasibility Stage. Where required, stainless steel ladders are to be fabricated and installed in accordance with AS 1657: Fixed platforms, walkways, stairways and ladders – Design, construction and installation and Goulburn Valley Water 1.11 Fixed Platforms, Walkways, Stairways and Ladders Design Guideline.

Access to the valve pit shall be facilitated by a stainless steel ladder fabricated and installed in accordance with AS 1657: Fixed platforms, walkways, stairways and ladders – Design, construction and installation and Goulburn Valley Water 1.11 Fixed Platforms, Walkways, Stairways and Ladders Design Guideline. The ladder is to be either a retractable ladder or fitted with telescopic handrails to extend the regulation distance above the top slab level.

A permanent handrail system (refer to AS 1657: Fixed platforms, walkways, stairways and ladders – Design, construction and installation and Goulburn Valley Water 1.11 Fixed Platforms, Walkways, Stairways and Ladders Design Guideline) is to be installed around the opening to the pump well. The handrail system is to contain a self-closing gate and latch on two (2) sides that can be locked in the open position. The gates shall be free from obstruction, such as the aluminium covers when in the open position. The handrail shall make provision to securely attach the aluminium lids when in the open position.

## 6.3 Pump Well Ventilation and Odour Control

Unless otherwise directed, the pump station shall be ventilated by means of an induct vent and an educt vent stack.

Ventilation components are to be designed and installed in accordance with the Goulburn Valley Water 3.4 Design Guideline - Ventilation of Sewer Networks.

The vent stack is to be designed for wind loading in accordance with AS/NZS 1170: Structural design actions – General principles.

The vent stack is to be installed in a location where it does not impede access and opening of doors, lids on the pump well or the control cabinet. Further, the location for the vent stack must comply with the relevant council and other service agency requirements that may be affected by the installation.

## 7 PUMP WELL CONSTRUCTION

Pump wells shall be purpose built concrete structures. Any other material must have prior approval from Goulburn Valley Water.

The pump well shall have a minimum clear 2.0m head room space for the entire floor area of the pump station. For example, an internal valve pit on a pre-fabricated package pump station is not to impede headroom.

Concrete pump wells may be either cast in-situ or pre-cast. The concrete is to contain sulphate resistant additive and is to have calcareous aggregate.

Pump stations constructed in accordance with standard drawing STD/6 - Sewage Pump Station – General Arrangements may consist of pre-cast 1950mm internal diameter Class 4 Rubber Ring Jointed-Reinforced Concrete Pipe (RRJ-RCP) with centrally placed reinforcement. Pre-cast pipes are to conform to AS/NZS 4058 Concrete structures - precast concrete pipe.

The excavation for the pump station must be backfilled with 3% cement stabilised sand for the full depth.

The pump well must include an internal liner system that is to substantively protect and maintain the asset life of the concrete structure. The liner system adopted must comply with WSA 201 - Manual for Selection and Application of Protective Coatings and specifically the requirements for Concrete Wet-wells operating under Extreme Exposure conditions as noted in Table 5.6 – Recommended Coating Systems for Treatment Plants and Pump Stations. Note: Goulburn Valley Water will not accept CAC or NOV systems for new pump stations. However, a CAC system is acceptable for refurbishing existing pump stations.

The designer shall nominate the internal liner system to be adopted at the detail design stage of the process. This information is to be shown on the design drawings along with the proposed product name and manufacturer. A product specific Technical Data Sheet is to be submitted with drawings.

Application or installation of the nominated liner system to the concrete surfaces is to be undertaken strictly in accordance with the manufacturer's requirements and WSA 201 - Manual for Selection and Application of Protective Coatings. Quality assurance is to be undertaken in accordance with Section 2 of WSA 201 - Manual for Selection and Application of Protective Coatings. All associated Quality Assurance documentation, including a completed Inspection and Test Plan, is to be provided to Goulburn Valley Water at the completion of the project.

Alternative pump stations arrangements are to demonstrate they meet, or exceed the standard shown on STD/6 - Sewage Pump Station – General Arrangements as a minimum.

Concrete pump well structures are required to have the wall penetrations filled with Epoxy Resin. Wall penetrations are to be cored and not broken out to prevent stress cracks.

### 7.1 Design Criteria

The pump well structure is to be designed in accordance with AS 3600 with a minimum concrete strength of  $F'c = 32 \text{ Mpa}$ .

Where a pump station design undertaken in accordance with standard drawings STD/6 - Sewage Pump Station – General Arrangements is submitted for consideration, the consultant shall provide documentation of its application and certify that its design is structurally sound for the site specific application.

Where an alternative pump station is proposed, structural certification is to be provided by a registered building practitioner when the drawings are submitted for endorsement by Goulburn Valley Water. The structural computations are to be provided.

A site-specific assessment is to be made regarding the flotation risk and the structural design is to incorporate any measures required to provide resistance to flotation.

Notwithstanding the calculated the storage volume for the pump station, the floor of the pump station is to be not less than 1500mm below the invert of the incoming gravity sewer. This is to allow sufficient space to set up pressure switches and float switches to operate in an efficient manner, particularly when the catchment is fully developed.

Inlet penetrations are to be cored and not broken out to minimise stress cracks.

In all cases the pump well is to have a design life of 100 years being in contact with wastewater and ground water having the following characteristics:

Parameter Description	Column 1 Wastewater Characteristics	Column 2 Groundwater Concentration Characteristics
Total Dissolved Solids	3,000 mg/L	10,000 mg/L
Sodium	1500 mg/L	3,000 mg/L
Chloride	1500 mg/L	3000 mg/L
EC mS/m	500 mS/m	1500 mS/m
pH	4.5-11	5-10
Calcium	200 mg/L	300 mg/L
Magnesium	100 mg/L	200 mg/L
Total Hardness	500 mg/L	1000 mg/L
Temperature	38°C	Ambient
SO4	2000 mg/L	200 mg/L

## 8 PIPEWORK

### 8.1 General

Pipework shall be generally arranged in accordance with STD/6 - Sewage Pump Station – General Arrangements. Acceptable materials for the pump station pipework are as follows:

- Ductile Iron Epoxy Lined pipe (DIEL). Application of Epoxy lining is to be carried out by the manufacturer of the pipe and fittings and is to be applied at the factory. An approved epoxy material supply and application system is to be used in accordance with the WSA 201 Manual for Selection and Application of Protective Coatings. The epoxy coating is to be applied internally and externally by an accredited applicator in accordance with WSA 201 Manual for Selection and Application of Protective Coatings and the manufacturer's requirements.
- Stainless steel to be grade 316 or better.
- Polyethylene pipe to be a minimum class PE100 PN16. Polyethylene pipe is **not** to be cast through any concrete walls.

### 8.2 Discharge Pipework

- All bolts, nuts, washers, brackets etc. must be stainless steel, Grade 316.
- Where stainless steel contacts other metals i.e. dissimilar metals, isolation is to be considered in accordance with 1.7 Design Guideline – Avoiding Dissimilar Metal Corrosion and 1.8 Design Guideline – Stainless Steel Selection and Use for GWV.
- Dismantling joints must be provided, e.g. Uniflange.
- All pipework attached to side walls or at changes in direction shall be supported in accordance with manufacturers specifications or as defined by structural assessment.
- Velocity in pipework is not to be less than 0.9m/s and is not to exceed 2.5m/s.
- Pump station pipework is not to be of a larger diameter than the rising main diameter, unless directed by Goulburn Valley Water.
- Where pipework is supported by brackets, the brackets must be capable of meeting the loading specifications contained within AS4100 Steel Structures. The brackets shall be affixed using M12 stainless bolts either by:
  - Chemical set anchor bolts installed in accordance with AS/NZS 3750.9: T2 Paints for steel structures - Organic zinc-rich primer and manufacturer's instructions and specifications; or
  - Stainless steel ferrules installed either prior to pouring of caisson or post fitted by means of penetrations through the wall of the pump well with stainless steel nuts and washers.
- All joints must be flanged and provided with 3mm thick full face neoprene gaskets and a hardness of Durometer Shore 'A'  $50 \pm 5$  to prevent joint leakage.
- All flanges and gaskets must be drilled off centre in accordance with Table C of AS 2129.
- The bypass pumping tee contained within the valve pit is to be situated on the downstream side of one of the non-return valves. The tee shall be installed as follows:
  - 100mm diameter flange aligned in a vertical upwards facing position
  - 100mm sluice valve with a hand wheel
  - 100mm S/S camlock coupling.
- All pipework connections are to be flange joints within the pump well and valve pit.

- Where uniflanges are used, bolts are to be stainless steel of 12mm shaft diameter.

## 9 PUMPSETS, RISING MAIN AND FLOWMETERS

There shall be two complete pump sets, one on duty and one on standby. The pumps shall be the make and type referred to in Goulburn Valley Water's Preferred Equipment List unless otherwise approved by Goulburn Valley Water.

Pumps shall be the submersible type capable of passing a 75mm diameter sphere through the impeller and driven by a non-overloading direct coupled motor. The pumps are to be for use in wastewater applications containing solids and fibre.

The pumps are to be mounted on a pedestal and capable of removal from the well by a stainless steel lifting chain without personnel having to enter the pump well.

The pumps are to be sized to have a minimum capacity capable of pumping Peak Wet Weather Flow of fully developed catchment discharge unless otherwise directed.

For residential developments, the pump capacity/sizing is to be calculated using the Peak Wet Weather Flow (PWWF). However, the adopted design flow rate may be higher than the catchment PWWF to ensure a minimum 0.9m/s self-cleansing velocity is achieved for the sewer rising main. PWWF can be calculated as follows:

$$\text{PWWF} = 6 \times \text{Average Dry Weather Flow (ADWF)}$$

Average Dry Weather Flow (ADWF) is to be calculated as follows:

$$\text{ADWF} = 175 \text{ litres per person per day}^{(1)} \times \text{Population Density}^{(2)} \times \text{Number of lots}^{(3)}$$

### Notes:

1. Based on network modelling and statistical data, Goulburn Valley Water adopts an average sewer loading of 175 litres per person per day.
2. Population density is the average population per household for any given town based on Australian Bureau of Statistics (ABS) figures. The current published population density for the relevant town is to be used in the calculation. The current population density can be obtained either from the ABS website or from Goulburn Valley Water.
3. The number of lots refers to the total lots within the fully developed pump station catchment. The total number of lots can be based on an adopted Overall Development Plan (ODP) or an estimated lot yield per hectare in consideration of the nature of the proposed development i.e. average lot size.

Example calculation for pump station capacity:

### Calculating ADWF

*Population density = 2.5 people per household*

*Number of lots = 300*

*Flow per person per day = 175*

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$$\begin{aligned}ADWF &= 175 \text{ litres per person per day} \times \text{Population Density} \times \text{Number of lots} \\ &= 175 \text{ litres/day/person} \times 2.5 \times 300 \\ &= 131,250\text{l/day} \\ &= 1.52\text{l/sec}\end{aligned}$$

#### Calculating PWWF

$$ADWF = 1.52 \text{ litres/second}$$

$$\begin{aligned}PWWF &= 6 \times ADWF \\ &= 6 \times 1.52\text{l/s} \\ &= 9.12\text{l/s}\end{aligned}$$

Pump station wet well storage capacity is to be capable of holding three (3) hours of Peak Dry Weather Flow (PDWF) calculated as follows:

$$PDWF = \text{Peaking Factor (PF)}^* \times ADWF$$

\*Note: PF is different for each site. The PF value is to be obtained from Goulburn Valley Water for the particular location of the proposed pump station.

Example calculation for wet well storage capacity:

$$\begin{aligned}\text{Peaking factor} &= 2.5 \text{ (example value)} \\ ADWF &= 1.52\text{l/s or } 5.472\text{m}^3\text{/hr} \\ \text{Holding time} &= 3 \text{ hours}\end{aligned}$$

$$\begin{aligned}\text{Storage capacity} &= PF \times ADWF \times 3 \\ &= 2.5 \times 5.472 \times 3 \\ &= 41\text{m}^3/3 \text{ hrs}\end{aligned}$$

Capacities for pump station catchments that may incorporate residential, industrial/commercial developments, schools, shops and shopping centres, motels, hospitals, nursing homes etc. are to be calculated from first principals on an equivalent population basis. For the methodology, refer to the section on “Flow Estimation” within the “WSA – Sewerage Code of Australia – Melbourne Retail Water Agencies Edition” for the acceptable methodology. Designers are to ensure the correct version of the Code as currently adopted by Goulburn Valley Water is used for the assessment. Designers are to be aware that Goulburn Valley Water adopted its own parameters when assessing developments, based on sewer models. Contact is to be made with Goulburn Valley Water to obtain these parameters prior to proceeding to detail design.

Consideration should be given to selecting a pump which is capable of meeting both initial development discharge requirements and the fully developed catchment discharge i.e. the current development and any possible future development areas within the vicinity of the pump station. Pump efficiency is to be assessed and opportunities for maintaining high efficiency by changing impeller size, as the catchment is developed need to be considered.

The cut in/cut out levels must be set to give maximum of 10 pump starts per hour per pump.

The pumps and pedestals shall be coated in accordance with Manufacturers specifications and WSA 201 Manual for Selection and Application of Protective Coatings. The coating must be suitable for a sewage environment.

Pump sets shall have moisture detection equipment which isolate that pump set and signal a pump set fault via the telemetry system when moisture is sensed. The motor thermistor overload protectors shall be in accordance with AS1023 Thermal protection of electric motors Part 3: Inherent overheat protectors (metric units). A seal probe relay is an acceptable mechanism for detecting the intrusion of moisture into the pump sets.

Pump curves plotted with the rising main discharge characteristic curves shall be provided when pump station design plans are lodged.

The friction loss of the rising main shall be calculated using formulas, charts or table from one of the following assessment techniques:

- Colebrook White.
- Hazen Williams Formula.
- Manning Formula.

Computations shall be provided of calculation of rising main friction losses including valves, bends and other items, which cause friction loss when the pump station design is lodged with Goulburn Valley Water.

### 9.1 Flowmeters

An electromagnetic flowmeter is to be installed on the discharge from all sewage pump stations. For small catchment pump stations (for example less than 50 connections), Goulburn Valley Water may at its discretion remove the requirement for a flowmeter to be installed.

Electromagnetic flowmeters are to be installed in accordance with Goulburn Valley Water Sewage Pump Station Specific Electrical Requirements and 1.10 Design Guideline – Electromagnetic Flow Meter Installation.

## 10 PUMP INSTALLATION

### 10.1 Guide Rails

Guide rails are to be fabricated from two number 50mm diameter Grade 316 Stainless Steel circular hollow section with 5mm wall thickness.

### 10.2 Guide Rail Fixing

Guide rail fixing is to be to the pump well access entrance and pump well floor. Rails are to have stainless steel anti-spread brackets located at not greater than 2.0-metre centres. Refer Goulburn Valley Water Drawing No. STD/6 - Sewage Pump Station – General Arrangements.

### 10.3 Lifting Chain

Lifting chains are to be stainless steel with a minimum link size of 10mm and capable of lifting 200 kg without exceeding yield stress. The chain is to be inspected, certified and tagged accordingly. Chain is to be attached to pump lifting hooks by means of a stainless steel shackle in accordance with AS 2741: Shackles. The other end of chain shall be

placed on a stainless steel chain hook at pump well entrance in similar position as pump guide rail holding bracket and is to be easily accessible without the need to open the safety mesh covers.

#### 10.4 Pump ID Plate

An engraved ID plate will be fixed to the inside of the pump station opening inside the well identifying the pump number below, which match the pump control and SCADA system, such as PUMP 1.

### 11 VALVES

#### 11.1 General

Valves are to be supplied in accordance with City West Water's Product Manual on the MRWA portal and Goulburn Valley Water's Product Manual Supplement.

The following valve types are to be supplied and installed to the pump well and associated works.

- 1 No. isolation valve of same diameter as sewer main is to be located on the incoming gravity sewer main either in the manhole immediately prior to the pump station or in the pump station. The valve is to be a sluice valve or where space is insufficient to accommodate a sluice valve, a knife gate valve shall be installed.
- 2 No. non return valves of swing check type with cast iron casing and bronze disc located in the valve pit on the discharge pipework.
- 3 No. sluice valves as rising main isolation valves with cast iron casing and bronze wedge located in the valve pit on the discharge pipework.

#### 11.2 Sluice Valves

All sluice valves shall conform to the following criteria:

- Meet the requirements of AS 2638: Sluice valves for waterworks purposes.
- Valve pressure class to be determined based on design conditions with appropriate safety factors considered.
- Be clockwise closure with non-rising spindles.
- Be flange type drilled off centre to Table C in accordance with AS 2638: Sluice valves for waterworks purposes.
- Terminate with a stem cap and shall be key operated, unless specified otherwise;
- Have internal and external protective coating using an approved thermal-bonded coating. Note: valves approved for use by City West Water or have WSAA appraisal can be deemed to comply.
- Where specified, handwheels shall be manufactured from ductile cast iron. They shall be sized so as to unseat and seat the valves under all likely service conditions using a rim pull force on the handwheel of less than 40 Newton. Handwheels shall be painted with 2 coats of epoxy enamel.

#### 11.3 Non Return Valve

All non-return valves shall conform to the following:

- Non-return valves are to be swing check type
- Valve pressure class to be determined based on design conditions with appropriate safety factors considered
- Manufacture in accordance with AS 3578 Cast Iron non-return valves, general purpose.



- All non return valves install must have an external positioning indicator.

Ductile iron valves may be used subject to internal and external protective coating being an approved thermal-bonded coating in accordance with AS /NZS 4158.1 Polymeric coatings for water industry purposes, Part 1.

#### 11.4 Knife Gate Valve

Knife gate valves are to be Bi-directional with non-rising stem, Grade 316 Stainless Steel. Component and Grade 316 Stainless Steel extension spindle to be supported by Grade 316 Stainless Steel support brackets at 1500mm maximum spacing. Valve to be supplied complete with valve key cover box and all nuts, bolts and washers and gaskets for insertion between Table C flanges, drilled off centre. Note: valves approved for use by City West Water or have WSAA appraisal can be deemed to comply.

#### 11.5 Valve Pit Drain - Angled Flap Check Valve

A 50mm diameter angled flap check valve suitable for sewage purposes, to be fitted to the drain from the valve pit into the pump well. Note: valves approved for use by City West Water or have WSAA appraisal can be deemed to comply.

#### 11.6 Air Valve

Air valves are to be located at all 'high points' along the rising main except at the rising main discharge point. Goulburn Valley Water only accepts stainless steel combined air release valves for sewage. Note: valves approved for use by City West Water or have WSAA appraisal can be deemed to comply.

## 12 WATER SUPPLY

A reticulated water supply is not required to be provided other than for the following situations:

- Large pump stations.
- Wet well/dry well pump station configurations.
- Where specifically directed by Goulburn Valley Water.

Should a potable water supply be provided for a pump station, the size, components and installation requirements shall be advised by Goulburn Valley Water.

## 13 ELECTRICAL AND TELEMETRY

Refer to Goulburn Valley Water General Electrical Specification and Sewage Pump Station – Specific Electrical Requirements.

## 14 PUMP STATION DOCUMENTATION

Prior to Goulburn Valley Water issuing Preliminary Acceptance for the pump station, the following information is to be provided in accordance with the Goulburn Valley Water Operation Manual Specifications available on Goulburn Valley Water's external website.

- Provide an Operation Manual, refer to Clause 1.2.2.3 of the Goulburn Valley Water Operation Manual Specifications.

- Provide an Operation Manual Process Element refer to Clause 1.2.2.4 of the Goulburn Valley Water Operation Manual Specifications.
- Detailed “As Constructed” drawings provided in hard copy and electronic (DWG and PDF) format. Refer to Clause 1.3.3 of the Goulburn Valley Water Operation Manual Specifications. Drawings are to include:
  - Final levels to Australian Height Datum (AHD)
  - Full pump specification including duty, make, model, motor rating, curve number, impeller diameter, etc.
  - Location plan.
- “As Constructed” electrical and electronic wiring diagrams are to be produced in accordance with AS 1102: Graphical symbols for electro technology, AS1103, AS1104 and HB3 – Electrical and Electronic Drawing \_no PW.
- Pump controller and telemetry system operation and maintenance hand book with warranty cards completed to suit the type installed.
- Where installed, a location plans for the magnetic flowmeter and cabling, with a copy to be fixed to the inside of the control cabinet.
- All associated Quality Assurance documentation for the pump well liner system, including a completed Inspection and Test Plan.
- Lifting equipment (chain) inspection and certification documentation.
- Structural computations.
- P&ID.

## 15 STANDARD DRAWINGS

The standard GVW drawings applicable to this document are:

- STD/6, Sewage Pump Station - General Arrangements
- STD/7, Sewage Pump Station –Structural Details
- S/21 - Standard Drawing Typical Pump Station Site Layout.