



DS11 – Waste Water Pump Stations

Contents

DS11	Waste Water Pump Stations	2
	11.1 General	2
	11.2 Minimum Requirements	2
	11.3 Regional Council Requirements	3
	11.4 Design Method	3
	11.4.1 General	3
	11.4.2 Calculation of Flows	3
	11.4.3 Freeboard	3
	11.4.4 Wet Well And Storage Chamber Design	3
	11.4.5 Pump Station Inlet Pipe	4
	11.4.6 Pump Model	4
	11.4.7 Pump Selection	4
	11.4.8 Impellers	5
	11.4.9 Power Supply	5
	11.4.10 Control & Alarm Levels	5
	11.4.11 Emergency Storage	5
	11.4.12 Receiving Reticulation	5
	11.4.13 Rising Mains	5
	11.4.14 Butt and Electro-fusion Welded Jointing	6
	11.5 Pump Station Layout	6
	11.5.1 General	6
	11.5.2 Secondary Storage Well	6
	11.5.3 Receiving Manhole	6
	11.6 Fittings and Materials	7
	11.7 Pump Station Services	7
	11.8 Completion Documentation	7



DS11 Waste Water Pump Stations

11.1 General

Wastewater Pump Stations convey wastewater from developed areas where natural landform and gradients do not allow for a gravity system to be used. It is important that factors affecting a Pump Stations operation are understood as the effect of an overflow on the surrounding area and/or watercourses is not desired due to important cultural, ecological and environmental implications and to avoid problems relating to public health and pollution of water bodies.

11.2 Minimum Requirements

The consent holder shall provide a wastewater pumping system:

- when the proposed infrastructure development cannot be adequately serviced by a gravity system
- that is logically located and shall be capable of serving the entire catchment for land uses likely to prevail during its economic life
- that is designed to service the entire catchment area of land beyond the reach of the existing gravity system
- that shall, where necessary for sound engineering design practice, accommodate pumped flows from adjacent areas
- with a design life (hydraulic capacity) not less than 50 years
- that shall satisfy the requirements of the Resource Management Act 1991 minimises any health and safety hazard to the public
- minimizes any ecological and environmental effects

Pumping systems shall include:

- 2 identical submersible sewage pumps, one as a duty pump and the other as a standby
- Each pump shall be capable of discharging the design peak wet weather flow rate from the catchment
- A minimum of 9hrs on-site emergency storage shall be provided based on the average dry weather flow measured between the first stage alarm level and the point of overflow.
- Storage shall be in a designed chamber
- Storage in upstream pipelines and manholes maybe used in calculating storage design but only after the approval has been received from The Authorised Officer
- Installation of the Council's standard alarm and operational data control system is required
- An electrical on-site pump control and telemetry system, assembled and installed in accordance with the Council's standard specification is required



11.3 Regional Council Requirements

Areas not served by a Council owned piped reticulation systems including all rural and rural-residential areas shall comply with the EBOP "On Site Effluent Treatment Regional Plan" either as a permitted or discretionary activity.

11.4 Design Method

11.4.1 General

Unless otherwise approved by The Authorised Officer, the following design methods shall be utilised.

11.4.2 Calculation of Flows

Each pump shall be capable of pumping a peak flow calculated in accordance with DS 6: Waste Water.

11.4.3 Freeboard

The pump station lid levels shall be provided with a minimum freeboard of 300mm above the estimated 1% AEP flood level. This will be of particular concern where the pumping station access is also being utilised as a designated secondary flow path.

11.4.4 Wet Well And Storage Chamber Design

See Drawing 1102

Wet wells and storage chambers shall be designed to accommodate all anticipated loadings with particular regard to the close proximity of maintenance and operations vehicles.

The wet well operational volume (volume between duty pump start and stop level) shall be designed to limit pump starts to a maximum of 15 per hour based on the following formula:

$$\text{Operational Volume} = \frac{900 \times Q}{N}$$

Q = Pumping Rate

N = Number of starts per hour

Operational depth should be a minimum of 500mm.

The design and construction of the wet and storage well foundations shall ensure that no more than 10mm settlement of the completed structure occurs and a factor of safety of 1.2 against flotation is obtained.



A geotechnical investigation report may be required by The Authorised Officer at the time of either the application for resource consent or the development plan approval.

In determining the appropriate wet well diameter the minimum clearance between individual pumps and side clearances shall comply with the manufacturer's recommendations.

A minimum clearance of 100mm all round the well shall be provided through the lid entrance.

Where a separate well is considered necessary to accommodate the emergency storage volume it shall be benched to direct all flow to the outlet point. The benching shall be at a minimum gradient of 1 in 3 to allow self draining. A central channel within the storage well at a minimum of 1% gradient is acceptable.

11.4.5 Pump Station Inlet Pipe

The invert level of the gravity inlet pipe and emergency storage well shall be a minimum of 100mm above the standby pump start level to prevent surcharge of the system during normal operation

Only one gravity pipe may discharge into the wet well and must include an isolation valve.

11.4.6 Pump Model

The Council currently operates Flygt pumps at public stations. In selecting the appropriate pumps the operating conditions shall correspond as closely as possible to the point of maximum pump efficiency. However, final pump selection must be approved by the Authorised Officer in order to facilitate some standardisation of pump model and impellor sizes.

11.4.7 Pump Selection

In calculating the system head losses the effects of all bends and fittings beyond the pump discharge bend shall be allowed for, together with rising main friction losses. Calculations of friction loss should be carried out based on roughness 'k' values of 1.5mm and 0.5mm to ensure that the selected pump is capable of operating over this range of duty points. (Colebrook White formula). If the discharge is to an existing rising main, the head shall be calculated to include the operating head in the existing rising main.

The system static head shall be based on the difference in level between the flange of the pump discharge bend and the highest point on the rising main system.

The pump and rising main selection shall ensure the minimum velocity in the rising main is 1m/s and the maximum velocity is 3m/s (at Peak design discharge rate).



11.4.8 Impellers

To prevent unnecessary blockage all pumps shall be fitted with an 'N' impeller approved by the Authorised Officer. Where a mini pump station is constructed to service 5 lots or less, some departure from this Code may be acceptable, however, approval is required from the Authorised Officer.

11.4.9 Power Supply

All pumps shall be operated from a three phase electrical power supply system.

11.4.10 Control & Alarm Levels

Low level alarm for more	- set to activate if the water level drops below cut out level than 1 minute.
Pump stop level	- minimum submergence level of pumps.
Duty start level	- 150mm below incoming sewer invert level
Standby start level	- 100mm above duty cut-in level
High Level Alarm	- 100mm above stand-by cut-in level
Critical Alarm	- 100mm below spill level

11.4.11 Emergency Storage

A total of 9hrs emergency storage must be provided upstream of the pumping station. This volume may include the upstream pipelines and manholes but only after the agreement of the Authorised Office has been received.

Specifically designed emergency storage chambers may be required to supplement the volume provided by the collection system.

11.4.12 Receiving Reticulation

The gravity pipeline system to which the station discharges, shall be designed to accommodate the discharge of the duty pump operating in combination with the peak wet weather flow from the adjoining gravity network.

11.4.13 Rising Mains

Only PE80 or PE100 pipes conforming to AS/NZS4130 shall be used for rising mains. The required minimum pressure rating for a rising main shall be PN 10. Higher rated pipes may be necessary. Other materials may be considered by the Authorised Officer.



Pipe selection shall take into account a 100 year service life, and include derating due to operating temperature, and derating due to 107 cycles of cyclic water hammer load causing pressure swings from 1.5P to 0.5P.

A safety factor of not less than 1.25 shall also be included to determine the pipe pressure class.

PE fittings fabricated from pipes shall be derated due to stress concentrations in the fabricated fittings. Manufacturer's recommendations shall be strictly followed with regard to the extent of derating required for each type of fabricated fitting.

11.4.14 Butt and Electro-fusion Welded Jointing

11.5 Pump Station Layout

11.5.1 General

The Council's typical wastewater pumping station layout details are shown on Drawing 1101. Alternative layouts or prefabricated stations may be considered for approval on a case by case basis.

The proposed pump station shall be located on a separate lot solely for that purpose and be provided with a permanent access of not less than 3.0m paved width. An adequate turning area shall be incorporated adjoining the station wet well and control cabinet to accommodate light commercial maintenance vehicles, unless immediate access to the roadway is possible. The control cabinet shall not be situated close to a roadway in a position where it may be damaged by "out of control" vehicles.

In addition to the land required to construct the pump station, wet well and valve chamber, an area of 5 x 5 metres shall be available to accommodate a bio-filter, either at the time of construction or in the future.

11.5.2 Secondary Storage Well

Where a secondary storage well, in addition to the pump wet well, is to be provided, it shall be positioned in close proximity to the valve chamber to allow ready access.

11.5.3 Receiving Manhole

The manhole immediately upstream of the pump station shall be constructed with its invert a minimum of 450mm below the invert of the outlet pipe to trap gravel, rocks and other solid objects and prevent them entering the pump station wet well. This manhole must be a minimum of 1200mm diameter. (refer to drawing 1102)



11.6 Fittings and Materials

Refer to approved materials list

11.7 Pump Station Services

All pump stations shall be provided with a water supply connection through a standard 25mm Council metered water connection and include 25mm supply to a standard female Camlock hose connection located within, or directly outside the backflow preventer cabinet. See Drawing 1112.

A second 25mm water supply connection (including 240 volt solenoid valve) shall be installed within the backflow preventer cabinet to facilitate supply should a washdown sprayer be installed within the pump station wet well. For this purpose 25mm (ID) MDPE pipe should also be installed from the solenoid valve into the wet well with sufficient pipe to reach the centre of the well. See Drawing 1112.

The water supply shall be protected by a Reduced Pressure Zone 25mm backflow preventor to comply with AS/NZ 2845.1:1998 and in accordance with the Water sections of this Code.

This shall be located adjacent to the station and at least 300mm above ground level. See Drawing 1112.

Each station shall be fitted with a standard on site electrical control system and alarm/operational data system. These shall be compatible with the Council's standard system. A copy of the standard details for these works is provided in the Electrical Drawings.

11.8 Completion Documentation

The following documentation shall be submitted to The Authorised Officer prior to the issue of the Practical Completion Certificate and application for s224(c) certification:

- Commissioning test sheets
- The manufacturers operating and maintenance manuals for all pump station components. (hard copies)
- Certificate of Compliance for the constructed works. This will summarise what testing and verification has been undertaken and state that the works have been constructed in accordance with all requirements of the contract documents and Council's Development Code.
- Calibration Certificates (factory and on-site)
- Electrical and fault current calculations
- Confirmation of earthing compliance



- As-built drawings
- Marked up hardcopy of construction drawings
- Electrical Drawings (hardcopy and electronic drawings)
- Instrument & Control Drawings (hardcopy and electronic drawings)