Pressure Sewer Design Standards

March 2019

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Appendices

1 Introduction

This document is a supplement to the Engineering Standards for Land Development (ESLD). It documents the technical standards for the design of Pressure Sewer Systems (PSS) in Palmerston North city and must be read in conjunction with the ESLD. Together with the ESLD this document details all the information required as well as design and construction standards to be met by developers when seeking engineering approval for land development serviced by a PSS.

This document does not cover private pumping facilities to the gravity network (known as pump ups). These are addressed in the Pump Stations section of the ESLD.

2 Interpretation

The definition of a Pressure Sewer System and On-Property Pressure Sewer Equipment will be in accordance with the Palmerston North City Council (PNCC) Pressure Sewer Systems Policy (PSS Policy).

3 Standards and Guidance Documents

Further to Section 4.3 of the ESLD and the standard PSS drawings included in the ESLD, the other relevant standards and guidance documents are:

- Palmerston North City Council Pressure Sewer Systems Policy;
- New Zealand Building Code (Clause G9 Electricity and Clause G13 Foul Water);
- AS/NZS 1546.1 - On-site domestic wastewater treatment units - Septic tanks;
- AS/NZS 1547 - On-site domestic wastewater management;
- AS/NZS 3000 – Electrical installations (known as the Australian/New Zealand Wiring Rules);
- AS/NZS 3500.2 – Plumbing and Drainage – Sanitary Plumbing and Drainage;
- Palmerston North City Council Water Supply Mains Pressure Testing Code of Practice;
- Pressure Sewer Manufacturer Guidelines.

4 Application and Use of PSS

The selection of the primary wastewater collection system for a proposed catchment must be agreed with PNCC prior to proceeding with preliminary design. PSS must be used in the pressure sewer areas as defined in the District Plan. The use of pressure sewer systems outside of the mandatory pressure sewer areas is at the discretion of PNCC.

Where a PSS is proposed outside of the mandatory pressure sewer area a detailed technical submission justifying the use of a PSS must be provided in accordance with the PSS Policy.

On-property pressure sewer equipment may or may not be owned by PNCC depending on the circumstances (refer to the PSS Policy). Regardless of the eventual ownership of the on-property pressure sewer equipment all requirements as set out in this standard shall apply.

5 Approved Suppliers and Contractors

Specific pressure sewer system components must only be sourced from an approved supplier, and that same supplier must grant approval of the design and construction of the PSS. Contact PNCC for the current list of approved PSS suppliers. Evidence of the input from an approved supplier shall be provided with the concept plans.

The approved supplier must provide as a minimum the following services:

- Hydraulic design, including modelling if required;
- Input into concept plans including system layout;
- Engagement in a safety in design process;
- Input into engineering drawings, specifications and reports;
- Training of approved system installers and initial oversight of construction;
- Commissioning;
- Troubleshooting/technical support through the Defects Liability Period (DLP); and
- Guarantees / Warranties for the equipment that they have supplied.

The following on-property equipment must be supplied by the approved supplier who provided input into the concept design:

- At development stage:
  - Boundary kits
- At building consent stage:
  - Pumps;
  - Chambers and lids (both trafficable and non-trafficable);
  - Control cabinetry and components, including control devices/systems.

All parts of a PSS must be constructed and commissioned by a Council approved contractor who has been approved for the construction of PSS.

6 System Design

The Developers Technical Representative must have oversight of the PSS system design with input from an approved supplier.

Where a development is to be served by pressure sewer concept plans must be provided and the following must be provided with the concept plans (concept design):

- The operational philosophy of the overall system to show that the design and control requirements have been adhered to (including those for peak smoothing and flushing);

- Evidence of design including future flow rates so demand on downstream infrastructure can be determined by Council;

- For industrial / commercial areas, process data such as estimated daily discharge volumes and peak flow rates as well as sewer discharge characteristics.

6.1 Design Methodology

The design methodology must be relevant to the operation of the system. Where flow control of any kind, such as peak suppression or flushing, is to be utilised, the system must be modelled by the approved supplier.

If no flow control mechanism is to be utilised, system must be designed by the approved supplier using the Probability Method as outlined in WSA-07. When applying the Probability Method to size pipes, the designer must perform a sensitivity analysis on input parameters such as flow per capita, pipe characteristics and pump units connected and in operation to ensure the selected pipe size meets the design criteria listed in Section 6.2.

6.2 Design Criteria

The PSS must be designed to meet the following criteria:

- One PSS chamber, boundary kit and control panel per dwelling (or per dwelling plus one Dependant Dwelling Unit; or per Dwelling plus one Minor Dwelling Unit - refer also PSS Policy);

- Utilisation of the on-property storage chamber as part of the normal operation of the system in combination with minimised pipe sizes;

- Maximum total dynamic head of 55m;

- Minimum velocity of 0.6m/s (to be achieved at least once every 24 hours);

- Maximum velocity of 3.5m/s;

- Maximum in-network retention time of 6 hours, i.e. the total sewage retention time between upstream entry point at boundary kit and downstream pressure main discharge point. This is to be based on the weighted average of the accumulated retention time in each zone against the total number of connections;

- With the minimum the number of connection points to the existing gravity system.

6.3 Staging and Septicity

If the development is to be staged the staging methodology shall be proposed and approval for it sought at concept plan stage. For a staged development the design of the system must ensure that self-cleansing of the system occurs during each phase of development to ensure the risk of septicity is kept to a minimum. Evidence of this, including details of design residence times and velocities at each stage must be supplied with the concept design.

Automated flushing within each part of the network may be used to address the risk of septicity. Automated flushing may also be required in accordance with section 9.2 of this document. Details of any automated flushing must be included in the concept design. This must function during all stages of the development.

If flushing cannot be feasibly achieved by flow control, due to large pipe diameters, staged installation of smaller diameter twin trunk mains may be considered by PNCC. Provision for future twin trunk mains must be installed as part of the first stage of the development and details provided with the concept plans.

Manual flushing as a solution must be authorised by PNCC and may only be utilised in exceptional circumstances. The cost of manual flushing must be met by the developer. Additional infrastructure to facilitate the flushing of mains (such as flushing tanks) will not be permitted.

6.4 Design Flows

If a PSS system is expected to service a wet industry or other high-water user, approval must be sought from PNCC at concept design stage that a PSS is an appropriate method of servicing the development. Conversely for an existing PSS approval must be sought from PNCC at the investigation phase for the building consent if the system is intended to service a wet industry or other high-water user.

Design flows for dry weather must be in accordance with Section 4.6 of the ESLD. For wet weather flow design a peaking factor of 1.2 shall be applied for pressure sewer systems.

6.4.1 High Flow Connections

For connections with the potential to create high peak flows, a suitable means of mitigating the high peak flows must be designed and installed at the time of building consent. Examples of circumstances when high peak flows may be generated include:

- Swimming pool discharges (can be up to 2 l/s for 4 minutes);
- Facilities able to host large events;
- High flow trade premise connections for which a PSS may be an appropriate method of servicing.

The typical mitigation measure is expected to comprise a buffer storage tank to allow for a modulated discharge of wastewater to the pressure sewer system.

In the case of a residential property with a swimming pool the following should be considered:

- reducing pool pump flows;
- an electrical feed from the control panel to the pool backwash pump. This relay should cut power to the backwash pump whenever the alarm is activated.

An appropriate solution to mitigate high peak flows must be confirmed with the PSS supplier and evidence of its feasibility supplied with the building consent application.

6.5 Velocities

The minimum design velocity is 0.7m/s to minimise sedimentation while the maximum design velocity is 3.0m/s to prevent scour.

6.6 Chamber Volume

Standard chamber sizes from approved suppliers must be utilised. Details of the standard chamber sizes can be obtained from the approved suppliers. If an installation requires a non-standard chamber approval must be sought from PNCC at building consent stage.

For residential installations the chamber must be sized to provide storage in the chamber above the pump start level equivalent to 24 hours at Average Dry Weather Flow. For trade premise installations the size of the chamber must be selected based on the specific flows for that installation but shall provide a minimum of 24 hours storage. In all cases details of the chamber volume selection are to be supplied with the building consent application.

6.7 Materials

All pipelines for PSS must be constructed from PE100 PN16 (SDR11) pipes that comply with the ESLD. PSS mains and lateral joints and connections to the boundary kit must be electrofusion or butt fusion jointed. Pipework from the boundary kit to the chamber may be electrofusion or butt fusion or compression jointed.

Chambers must be made of polyethylene or fibre reinforced plastic (FRP). Chamber lids must be made of polyethylene, be child safe and be capable of being locked.

Pumps shall be fully submersible and specifically designed for use in pressure sewer systems.

7 Network Requirements

7.1 Network Layout

The network layout must be designed in accordance with the ESLD and to meet the following criteria:

- PSS mains must have a minimum cover in accordance with the ESLD and a maximum cover of 1.5m;
- Pressure sewer laterals on private property must have a minimum cover of 600mm where likely to be crossed by vehicles and 450mm elsewhere;
- Bending radii must be greater than 100 x OD of the pipe where the pipe may be tapped on the bend or minimum 75 x OD otherwise;
- Vertical deflections in the alignment must be no greater than 1m in 10m (10%), to reduce the risk of air build-up in the system.

The minimum pipe size for pressure sewer pipes including laterals, is DN40.

7.2 Isolation Valves

Isolation valves must be positioned:

- On both upstream legs of any three-way branch;
- On the pressure main within 1m downstream of the last house serviced by the pressure sewer system;
- So that there are sufficient valves to allow the isolation of the network into blocks serving no more than fifty properties.

7.3 Air Release Valves

PSS pipelines shall be designed in accordance with Section 7.1 to minimise the need for air valves. If a significant high point is unavoidable then an air valve must be installed.

Air valves must be designed to meet the minimum head required to seal the air valve and so eliminate the requirement for drainage. Air valves may be offset no more than four metres from the main. Some minor realignment of the pressure main to minimise this offset may be considered. The pipe connection from the main to the air valve must be the same diameter as the main.

Air valves must be specifically designed for wastewater applications and must meet the following minimum requirements:

- Be rated to PN16;
- Have an epoxy coated cast iron body;
- Be of a double acting anti slam type;
- Be mounted inside a dedicated pit with a Class B vented cover;
- Have an isolation valve to allow maintenance without disruption to PSS main.

Provision of odour treatment at air valve installations may be required. The odour treatment device must be designed to manage intermittent discharges over a range of air flows, be low-profile, damage resistant and effective.

7.4 Flushing Points

Flushing points must be installed:

- On each branch or sub-zone where the number of connections on a branch line exceeds five (5);
- Downstream of isolating valves, except where there is a downstream flushing point within 100m;
- At 500m intervals along straight sections of main.

In accordance with the wastewater system layout requirements of the ESLD, flushing points must be installed in a location that is easily accessible for operation and maintenance, being a location where a tanker truck (or equivalent) can be safely parked and operated, given the traffic conditions and access arrangements.

7.5 Flow Metering

A flow meter must be installed at each of the points of discharge to the gravity network. Meters must be in-line electromagnetic flow meters with a pressure sensor, capable of being connected to Council's telemetry system or another communication method as approved by Council.

7.6 Connection to Existing Sewer System

The number of discharge connections between the PSS and the existing gravity system must be minimised. All proposed points of connection must be approved by PNCC.

Flow velocities shall not exceed 1.5 m/s at the discharge point. A minimum 4m length of gravity discharge pipe shall be provided prior to the discharge entering the existing gravity sewer system to control turbulence.

Odour treatment should be installed at the receiving manhole if the age of the incoming flow is likely to be over four hours. The odour treatment device must be designed to manage intermittent discharges over a range of air flows, be low-profile, damage resistant and effective.

8 On-Property Equipment

8.1 Pressure Sewer Chamber

The pressure sewer chamber on the property must be located:

- As close as possible to the point in the gravity pipework from the dwelling where all flows join to minimise the length of gravity pipework;
- To meet the minimum clearance distances to structures as specified in the PNCC Wastewater Bylaw (the chamber is considered a service opening in terms of the Bylaw) and to underground services as specified in the ESLD;
- To provide access at all times for maintenance (e.g. not under a deck or in a carport, garage or shed). The minimum requirement is safe pedestrian access. Access through buildings or dwellings is not acceptable;
- In a non-trafficable location. Acceptance of any alternative is at the discretion of PNCC and any such application must be accompanied by evidence that a non-trafficable location is not viable. A non-standard chamber design and trafficable lids to be rated to minimum Class C loading (AS3996) will be required in these cases;
- Clear of any low spots prone to ponding;
- A suitable distance from any property boundaries to avoid impacts on adjacent properties;
- In a position that minimises the amenity impact of equipment on the use of the property and allows for possible future development (e.g. to the side of lawn areas rather than centrally).

To avoid floatation and settling, installation and backfill requirements must be appropriate for the local ground conditions. If the weight of the tank is not sufficient to prevent floatation, additional anchoring to hold the tank in place must be provided.

Chambers will generally be vented through the cover. If a pump chamber is in a flood prone area, a watertight lid with an external vent is required.

Where there is insufficient space on-property, placement of the storage chamber within the road reserve may be considered. The location of an off-property storage chamber must be approved by PNCC. In all cases power is to be provided from the private dwelling's electrical switchboard.

For existing properties, the position of the pressure sewer chamber on site must be agreed with PNCC and the property owner prior to proceeding.

8.2 Boundary Kit

A property boundary kit must be installed for all properties served by a pressure sewer system. The concept plans must detail the proposed location of all boundary kits.

The boundary kits must be installed at a uniform distance from the property boundary. The following considerations, in descending order of priority, must guide the location of the boundary kit:

1. For a single dwelling the boundary kit should be located as near as practical to the property boundary, in the road reserve. Where a grassed strip exists between the back of the footpath and the boundary, the boundary kit is to be located in that strip.

2. The boundary kit should be located so as to avoid obstructions of the service line both on the public and private property side.

3. The boundary kit is to be located in a 'non- trafficable' location.

4. If the boundary kit cannot be located in accordance with (1) above, the boundary kit is to be located in compliance with (2) & (3) above.

5. Failing (1) above, the boundary kit can be located in the road reserve so that it can be easily found by operations staff.

6. Failing (1) and (5) above, the boundary kit is to be located within the private property but in a location easily locatable by operations staff using the main access to the property, i.e. near the driveway or front path.

7. Locate in carriageway with trafficable property boundary kit.

The location of boundary kits serving properties in a private right-of-way must be approved by PNCC, but will generally be in accordance with the typical common land connection position detail.

8.3 Connection to the PSS Network

The connection of the pressure sewer lateral to the pressure sewer network must be by means of a EF saddle tee or integral PE tee piece, cut and EF socket welded into the pressure main. Self-tapping EF saddle tees are permitted on all pipe sizes down to and including DN50 pressure main pipes, provided that the tapping does not reduce the internal diameter (i.e. greater than 30 mm for a typical single pump connection).

When installing EF saddle tees, the pressure main pipe must be peeled with a rotary pipe peeler and cleaned according to the manufacturer of the EF saddle tee. All EF saddle tees must be pressure tested in accordance with the PNCC Water Supply Mains Pressure Testing Code of Practice.

8.4 Power and Control Box

Power to the pump must be provided from the electrical switchboard of the private dwelling that is serviced by the pump. This must be a dedicated circuit not shared with any other connections.

The control box must be mounted on the side of the house with a minimum clearance of 1.2m from the bottom of the box to ground level. The control box should be located within line of sight of the chamber. The distance between the control box and the chamber should be typically be 10m, but must be less than 30m. The location of the control box should be as visually unobtrusive as possible.

The cable conduit must not to be connected to the controller. An air gap of a least 100mm must be provided, with individual glands used for cable entries.

Detailed specification, installation and wiring drawings for the control boxes must be provided at concept plan stage.

A redundant 40mm PVC-U conduit for future cabling between the chamber and the control box must be installed. The duct must butt up to the chamber at one end and must terminate underground no more than 100mm below the control box.

A label clearly identifying the telephone number to call in case of an issue with the PSS must be installed on the exterior of the control box.

8.5 Relocation of On-Property Equipment

If the property owner wants to relocate any part of the PSS (e.g. pump, control panel, pipeline) written approval must be obtained from PNCC. Detailed designs must be provided to PNCC showing the relocation complies with all the requirements of this document.

A building consent or building consent exemption will be required as part of the PNCC approval process for the relocation. Where written approval is granted the full costs of the relocation shall be borne by the applicant/property owner.

9 Control and Operational Systems

9.1 Standard Control and Alarm Boxes

The following minimum features must be provided as standard on all alarm and control panels:

- Audible alarm with manual and auto reset, with the manual reset mounted outside of control panel (audible alarm with resident activated off switch, visual alarm that can only be switched off by maintenance authority);
- Visual red light, with the flashing light sequence that gives an indication of the specific fault;
- Manual and timer reset capacity;
- High and low voltage protection;
- Over pressure protection;
- Visual hours run display;
- Ability to record and store a downloadable history of events;
- Adjustable start delay after power failure;
- Back up battery to power control box during power loss;
- Provision of space and ability for future retrofitting of a SIM card for texting of alarms and/or integration with the PNCC telemetry system;
- Insulated lockable cover with corrosion resistant hinges;

- Rated to IP65 or greater.

9.2 Control Requirements

In all PSS systems the local pump station controls must provide for the following outcomes:

- Pump stop/start levels which prevent wastewater in the chamber going septic;
- Maximum pump starts per hour which meet pump manufacturer recommendations;
- Delayed diurnal starts to minimise pressure sewer network pipe sizing.

In developments where the ultimate number of lots will exceed 100 or where specifically required by PNCC then the following additional control requirements will apply:

- Provision for reducing peak discharge flows from the development by smoothing the diurnal flow peaks;
- Provision of automated flushing within each part of the network such that the minimum scouring velocity is achieved at least one time per day;
- Controlled recovery from a prolonged power outage which limits peak flows and avoids repeated over-pressure pump stop/start cycling.

The programming necessary to achieve the outcomes and requirements must be developed at the concept design stage. Each of the control solutions must be developed in such a way that it can accommodate and perform effectively during all stages of the development with no requirement for re-programming.

It is expected that the above control outcomes will be achieved by programming the individual PSS controllers in blocks or groups using timing delays or triggers. If the developer wishes to provide for a more sophisticated networked control system to achieve the outcomes this must be discussed with PNCC at concept design stage. The installation of a more sophisticated control system does not necessarily require PNCC ownership of the on-property equipment.

10 Testing and Commissioning

10.1 Network

PSS pipe work must be pressure tested in accordance with the ESLD and the PNCC Water Supply Mains Pressure Testing Code of Practice.

After testing all valves must be opened and flushing must be carried out. Flushing must be done from the extreme ends of the system throughout the entirety of the system, including all branches. The network must be divided up for the flushing.

Note that a consent notice will be applied to all lots in the subdivision requiring that all requirements of the concept design is adhered to at building consent stage.

10.2 On-Property Equipment

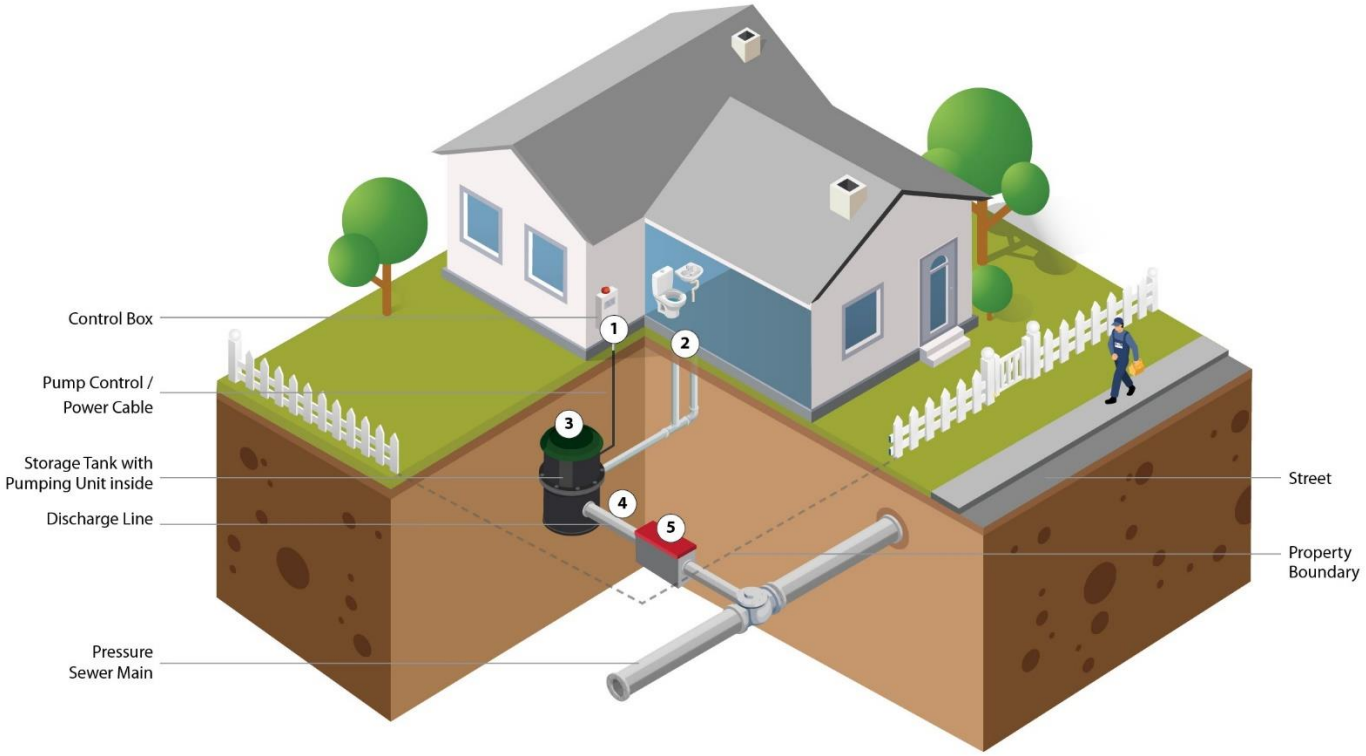
PSS pipe work must be pressure tested in accordance with the ESLD and the PNCC Water Supply Mains Pressure Testing Code of Practice.

The supplier's recommended start-up and commissioning procedure must be followed and all supplier checklist and/or QA forms completed. The relevant serial numbers must be recorded on the checklist. The commissioning process shall be completed by a Council approved contractor who has been approved for the construction of PSS under the supervisions of the appropriate Council staff.

All supplier checklist and/or QA forms, as well as post construction drawings and documentation must be provided to the Council prior to issuance of Code Compliance.

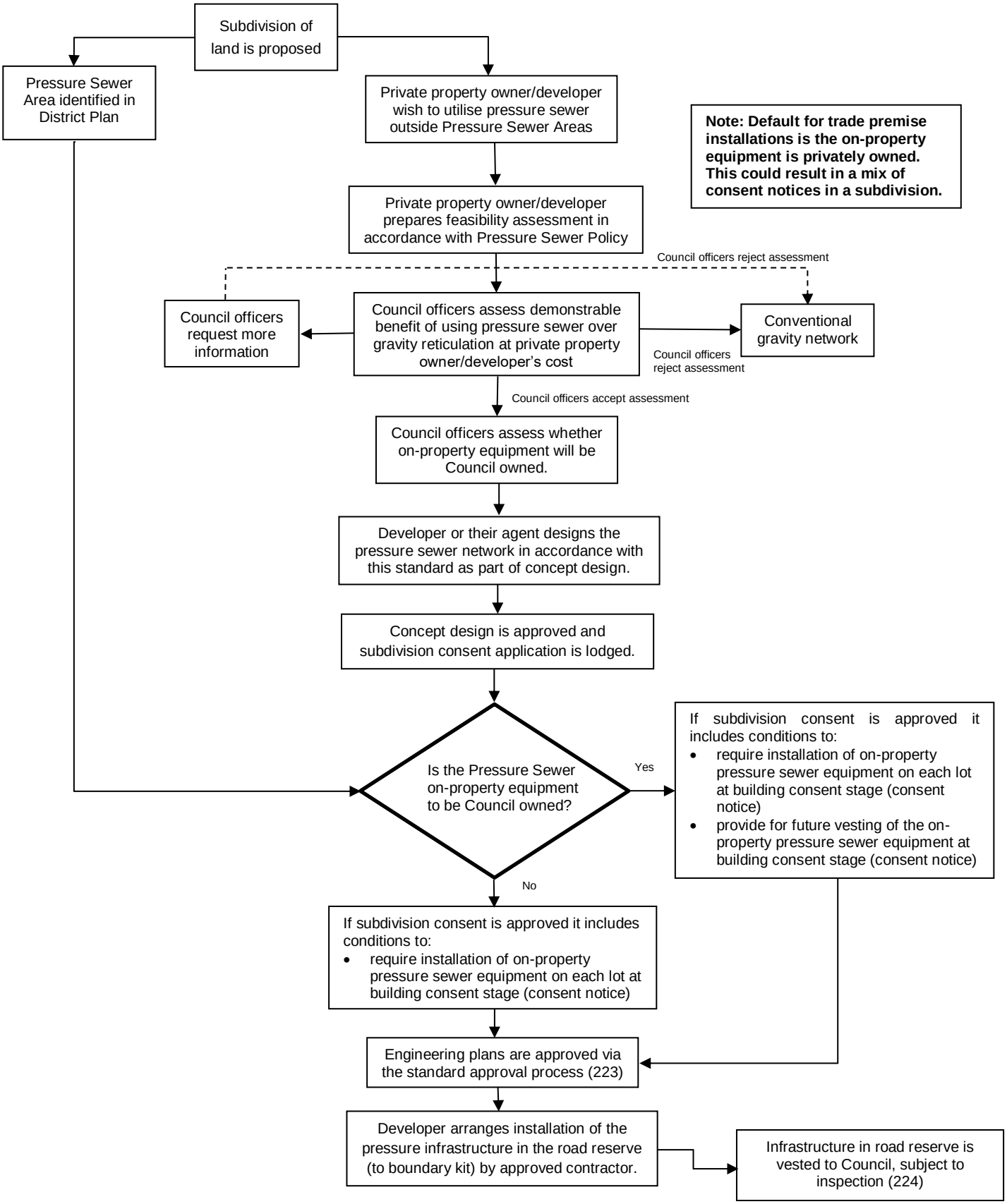
Note this section also applies when on-property equipment is relocated in accordance with section 8.5 of this document.

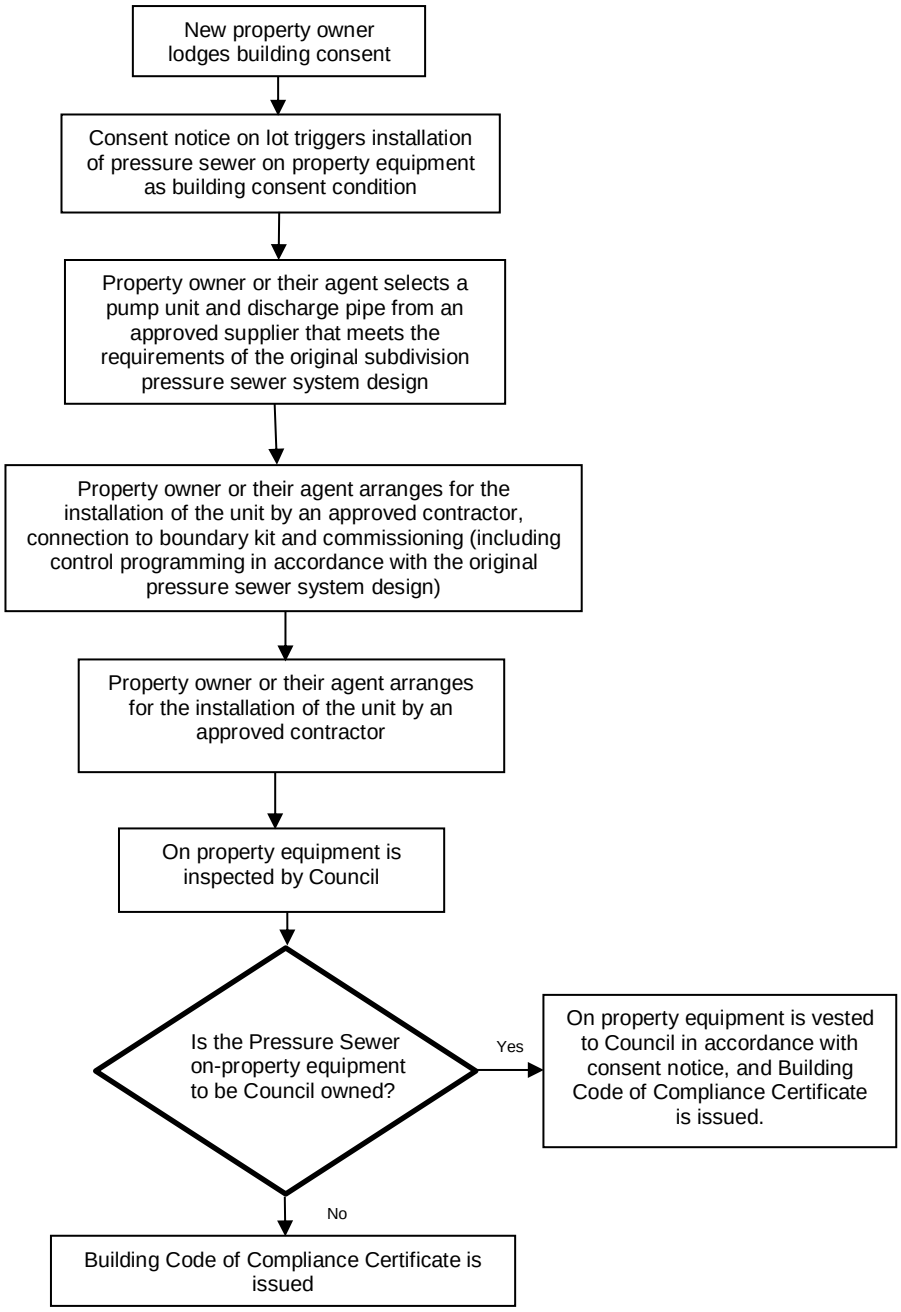
Appendix A. Parts of a Pressure Sewer System

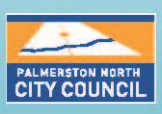


1. The electrical power controls and alarm
2. The household plumbing and wastewater line
3. Storage Tank with Pumping Unit inside
4. A discharge line from the storage tank to boundary kit
5. A boundary valve assembly inside a buried box with a plastic lid located just inside or outside your property

Appendix B. Pressure Sewer System Development Flow Charts




New property owner lodges building consent
Consent notice on lot triggers installation of pressure sewer on property equipment as building consent condition
Property owner or their agent selects a pump unit and discharge pipe from an approved supplier that meets the requirements of the original subdivision pressure sewer system design
Property owner or their agent arranges for the installation of the unit by an approved contractor, connection to boundary kit and commissioning (including control programming in accordance with the original pressure sewer system design)
Property owner or their agent arranges for the installation of the unit by an approved contractor
On property equipment is inspected by Council
Is the Pressure Sewer on-property equipment to be Council owned?
Yes
On property equipment is vested to Council in accordance with consent notice, and Building Code of Compliance Certificate is issued.
No
Building Code of Compliance Certificate is issued



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