REQUIREMENTS

FOR

INDIVIDUAL PRIVATE

SEWAGE PUMP STATIONS

SPECIFIED UNDER

A

BUILDING CONSENT

Version	TRIM	Phase	Date	By
1		Draft	15 April 2013	Victor Mthamo
		Review	2-5 May 2013	Simon Collin/ Ian Johnson/ Don Gracia/ Yvonne McDonald/ Bryan McKay/ Rob Meek
2		Draft 2	14 July 2013	Victor Mthamo
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Contents

1 OBJECTIVES

This document outlines Christchurch City Council's requirements to allow approval for Private Sewage Pump Stations (PSPS) to connect into the Council sewage collection system. It is applicable to a range of property types from individual residential properties to non-residential property types such as hotels, motels, schools.

This document incorporates guidance for design consultants, property owners and contractors on the design, construction, maintenance and operation of PSPS.

2 REFERENCED DOCUMENTS

It is the responsibility of the user of this document to make reference to and/or utilise industry standards not otherwise directly referenced in this document. The following are some of the relevant reference documents.

Design

- Christchurch City Council *Infrastructure Design Standard (IDS)* www.ccc.govt.nz/business/constructiondevelopment/infrastructuredesignstandard.aspx
- Christchurch City Council Sewage Pumping Station Design Specification
- Environment Canterbury *Natural Resources Regional Plan* http://ecan.govt.nz/our-responsibilities/regional-plans/nrrp/Pages/Default.aspx
- Environment Canterbury *Land and Water Regional Plan* http://ecan.govt.nz/our-responsibilities/regional-plans/regional-plans-under-development/lwrp/pages/default.aspx
- New Zealand *Building Code* Compliance Documents B1, G13, G14 and any other NZBC documents that may be relevant to the specific design www.dbh.govt.nz/building-code-compliance-documents
- AS/NZS 3500-2: 2003 Plumbing and drainage - Part 2: Sanitary plumbing and drainage
- AS/NZS 1477: 2006 PVC pipes and fittings for pressure applications
- AS/NZS 2280: 2012 Ductile iron pipes and fittings
- AS/NZS 4130: 2009 Polyethylene (PE) pipe for pressure applications
- AS/NZS 4087: 2011 Metallic Flanges for waterworks purposes
- AS/NZS 4401: 2006 High density polyethylene (PE-HD) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings
- AS/NZS 5065: 2005 Polyethylene and polypropylene pipe and fittings for drainage and sewerage applications
- AS/NZS 1546.1: 2008 On-site domestic wastewater treatment units - Septic tanks
- AS/NZS 1547: 2012 On-site domestic wastewater management
- AS 2129: 2000 Flanges for pipes, valves and fittings
- ISO 10467: 2004 Plastics piping systems for pressure and non-pressure drainage and sewerage -- Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin

Construction

- Christchurch City Council *Civil Engineering Construction Standard Specifications* Parts 1-7 (*CSS*) www.ccc.govt.nz/doingbusiness/css/
- Christchurch City Council *Trade Waste Bylaw* 2006
- AS/NZS 2566.2: 2002 Buried flexible pipelines installation
- AS/NZS 2032: 2006 Installation of PVC pipe systems
- AS/NZS 2033: 2008 Installation of polyethylene pipe systems

It is the responsibility of the designer to ensure that any design submitted to Council is based on the latest version of the above documents.

Where a conflict exists between any Standard and the specific requirements outlined in this document, the PSPS takes preference (at the discretion of the Council).

3 APPROVALS AND CONSENTS

Permission to discharge into the Council network is required in addition to a building consent to install a PSPS. The technical aspects of the consent application will be assessed against the requirements of this PSPS document. Council may, at any time, place conditions additional to those detailed in this document on the owner.

Include the following with the PSPS application on form B-002R Application for Residential Building Consent:

- A Design Report including information detailed in the following clauses;
- Proof of the acquisition of any necessary easements or written approval from the affected parties that the easements will be granted;
- Proof of a formal contract between all affected parties where a multi-unit development will use a PSPS.

Note on the form that the new connection is pumped.

Proof of registration of the PSPS on the title(s) of the property will be required before the Building Consent Code Compliance can be issued.

Access to the PSPS set-up shall be readily available at all times to Council's staff. Pollution resulting from a spill or an accident must be contained and sanitised by owners in accordance with Council's direction.

The owner of the PSPS (pump and pipeline) will be responsible for all costs associated with its use, operation, maintenance and condition assessment, for assessing problems and carrying out repairs within their property. Operation, maintenance and condition assessment from the boundary kit up to and including the point of connection to the Council network (the road side of the boundary kit) will be the responsibility of Council. This may include upgrading the PSPS in the event of any public sewer system pressure change. Appendix 3 shows the responsibility for these works.

Connections in streets reticulated with a pressure sewer system, as recorded on the property's land information memorandum (LIM), are excluded from this document. Details of connections in these zones are available on the Council webpage. In these residential reticulated areas, all components of the pressure sewer system except the lateral between the house and the storage chamber will be owned and maintained by Council. In pressure sewer system reticulated commercial or industrial areas, Council will only own and maintain the network downstream of the boundary kit, with the remainder (upstream of the boundary kit) owned and maintained by the property owner. In both instances, the property owner provides and pays for the electricity to operate the system.

4 DEFINITION OF A PSPS

A PSPS is a pumped sewage system that is privately owned and maintained by the property owner that it serves. Council permits these systems to connect to the public sewer network where:

- A gravity sewer connection is not directly available to an individual property or is not feasible due to the location of the lot.
- The recommended sewer grades cannot be achieved or where there are physical constraints between the dwelling and the public sewer that make a gravity connection difficult.
- An on-site sewerage solution is not practical to implement for reasons which might include adverse environmental, social and/or economic effects, and
- There is no existing capacity in the Council network to accommodate flows from the development proposal using a gravity system and Council is willing to accept these extra flows only if a pumped system with adequate storage, monitoring and control can mitigate impact on the network. In the case of residential properties, the system (pump station, the boundary kit and the control equipment) will be vested with

Council. However, the property owner will be responsible for power costs (clause 7.7). For commercial properties, ownership of the system up to and including the boundary kit will remain with the property owner and Council will own and maintain the pipework on public land.

5 TYPES OF PRIVATE SEWAGE PUMPING STATIONS

There are two common PSPS systems that are acceptable to Council - Pressure Sewer (Grinder) Systems and Septic Tank Effluent Pumped Systems (STEP).

Ensure that an appropriate pump type is selected for the desired application.

5.1 Grinder Systems

Grinder systems are used where sewage solids are pumped. Grinder systems can convey waste up to 6km. However, Council will only accept flows from properties up to a maximum distance of 200m from an approved Council outfall as described in more detail in clause 9.5.

Specify a macerating pump able to pass or grind up 25mm solids, to ensure maintenance of high approach velocities which prevents solid build-up below the pump suction. Ensure that the macerating action is satisfactory when pipe diameters are less than 50mm and that the shredding ring and cutter are replaceable.

5.2 STEP Systems

STEP systems are more expensive than the basic pressure sewer pump station. It is unlikely that such a system would be installed specifically to connect to the public sewer. Therefore these are likely to already exist on a property where either the system's disposal field has failed or the property owner might be faced with on-going maintenance and would like to connect to the Council network.

These systems will typically have multi-chambers with one of the chambers acting as a sedimentation tank. The effluent passes through the other chambers and a screen before it is pumped out relatively free of solids. Ensure that solid particles will not be any greater that those coming from a pressure sewer system (i.e. <25 mm).

STEP systems are suitable for conveying waste up to 200m (also refer to clause 9.5). Since the liquid conveyed in a STEP system is generally septic, consider odour and corrosion issues for the downstream collection system.

6 QUALITY ASSURANCE REQUIREMENTS AND RECORDS

6.1 General

Provide quality assurance records, as detailed in *IDS* clause 3.3 – Project Quality System that cover all relevant activities from design through construction.

6.2 The Designer

Council will only approve designs submitted by consultants/engineers with appropriate skills and experience in pressure sewerage system design. This experience must be to a level to permit membership in the relevant professional body.

6.3 Design Records

Show the following on the design plans:

- the entire length of the pressure main.
- the gravity manhole into which it will discharge, or
- the point of connection into the Council pressure main.

Provide the following information, to support the Design Report:

- pump curves and calculations, which also confirm that pressures are within the required range at any connection to a Council pressure main;
- pump station details;
- hydraulic calculations, preferably presented in electronic form;

- all assumptions used as a basis for calculations, including pipe friction factors;
- where appropriate, calculations carried out for the surge analysis of pressure pipes;
- design checklists or process records.

6.4 Connection to the Council Sewer

The connection of a private pressure main to the Council network and work in Council property (within road reserve) shall be carried out on behalf of the PSPS owner by a Council Authorised drainlayer, as defined on the Christchurch City Council web page at www.ccc.govt.nz/business/constructiondevelopment/authoriseddrainlayers.aspx. A schedule of materials approved for use on the Council's infrastructure is available at www.ccc.govt.nz/DoingBusiness/ApprovedMaterials.

6.5 Construction Records

Submit as-built records when applying for the Code Compliance, including pipe diameters, type and class and pump duties, curves and information on the date of manufacture of the pump(s) or PSPS units and a complying pressure test, carried out in compliance with *CSS: Part 3* clause 14.3 – Pressure pipes on the portion of the pressure sewer within Council property.

7 PUMPING STATION

Appendix 1 gives the general layout of a private sewage pumping station using a grinder system and Appendix 2 gives the general layout of a private sewage pumping station under a STEP system. Proprietary pump stations that comply with the following requirements may be used.

7.1 Pumps

The Council has approved a number of pumps for use in the city. As at the date of this manual the following are the approved pumps:

- E-One (http://www.ecoflow.co.nz); and,
- Aquatec (https://www.humes.co.nz/aquatec-pressure-sewer/).

These pump systems have demonstrated capability to be integrated to and function efficiently with the approved remote control and monitoring system - the OneBox panel (clause 7.7).

Where a PSPS has been approved by Council because the downstream network is at capacity for a gravity system (clause 4) the following shall be observed:

- Only one of the approved pumpsets shall be installed.
- The IOTA OneBox control system shall be installed to manage flows into the network.

Where a PSPS is required for reasons other than the lack of downstream network capacity (clause 4) other pump brands can be installed provided they meet the requirements of this PSPS manual.

Specify pumps able to achieve a mean pipe velocity of 1 m/s against static and pressure line friction as required by clause 9.1 - Velocity. There will be some pressure in the Council pressure main if that is the outfall.

Take into account the geodetic head, the frictional losses (clause 9.7 – Pipe friction) and the velocity head to determine the manometric/total dynamic head (TDH). Select the optimal duty point using the design flow rate. Make sure that the motor specified is adequate over the full range of proposed TDHs.

7.2 Pump Chamber

Design the pump chamber:

- with a sealed lid preventing the ingress of surface water.
- including venting through the polyethylene cover or by a vent fitting.

- with cleaning access.
- to be sealed against groundwater.

7.3 Wetwell Storage Volume

Provide a minimum total wetwell storage volume equal to 24 hours Average Sewer Flow from the source, as determined using the values in *IDS* clause 6.4 – Sanitary Sewer design Flows. As at July 2013, the ASF is:

220 litre/day x 2.7 persons per household = 594 litres per household

This total storage volume represents the sewerage stored between the pump start level and the overflow level. This volume excludes the volume taken up by the pump, pipework and its mountings.

Increase this storage capacity if there is the possibility of an increased number of people or a greater flow associated with the private station source.

Provide an operating storage which is the greater of:

- the pipe volume (clause 9.4 – Pipe volume);
- 20% of the total storage held between the pump start and the invert of the influent line, or
- the wetwell volume (between Pump Start and Stop Level) that limits the pump starts to a maximum of 10 per hour, as well as accommodating a minimum 300mm depth.

7.4 Pump Operating Levels

Table 1 shows the recommended design minimum levels.

Table 1 - Wetwell Capacity and Operation

<table>
<tr><td rowspan="2">Control</td><td rowspan="2">Storage Depth</td><td colspan="2">Storage Volume</td></tr>
<tr><td>Active</td><td>Total</td></tr>
<tr><td>Invert Level</td><td>Alarm Level</td><td></td><td></td></tr>
<tr><td></td><td>≥300 mm</td><td>Emergency Storage (≥50%)</td><td rowspan="4">Total Storage</td></tr>
<tr><td>Pump Start</td><td rowspan="3">≥300 mm</td><td rowspan="3">Active Storage (≥20%)</td></tr>
<tr><td></td></tr>
<tr><td>Pump Stop</td></tr>
<tr><td></td><td colspan="2">Pump Motor Height + 50 mm</td></tr>
<tr><td colspan="4">Chamber Floor Level</td></tr>
</table>

Set the Pump Start control point (e.g. switch) as low as possible to minimise the volume of sewage stored in the tank after each cycle. In setting the Pump Stop level, ascertain the pump motor height and then add at least 50mm to provide adequate cover to the pump.

Control the water by control switches (floats) or sensors. Sensors may include ultrasonic sensors, pressure sensors or other reliable types available on the market.

7.5 Electrical Connections

Connect and hardwire the pumping unit to an individual property's switchboard using a separate dedicated circuit breaker at the property's existing meter box. Connect power to the pump via a quick disconnect coupling, not hard wiring.

Specify electrical equipment that complies with the relevant New Zealand Standards.

Council is not responsible for powering and maintaining the pump or the power source.

Make electrical connections to the pump and sensors in a fully weatherproof control cabinet, mounted between 1.3 and 1.8m above ground level, above flood levels and close to the pump chamber.

Install a corrosion resistant conduit of at least 75 mm diameter to accommodate wiring between the wet well and cabinet. Specify a diameter large enough to pass the electrical cables through, so that an electrician is not required to disconnect the pump.

Seal the conduit to prevent corrosive gases or moisture travelling up the conduit into the cabinet, using foam rubber, foam sealant or similar which can easily be unsealed if the plug and cables require removal.

7.6 Pump Controls

Install all controls within the control cabinet including the following controls, as a minimum:

- Pump/Panel Circuit Breaker.
- A switch with On/Off/Auto positions.
- Alarm and Control Components (clause 7.8 – Pump and system protection and clause 7.9 - Alarms).
- Battery backup for alarms.
- IOTA OneBox Panel for remote monitoring and control for systems installed in areas where there are network capacity issues (clause 4 and clause 7.7).

7.7 IOTA OneBox Panel

All PSPS in areas where the network capacity is limited shall be installed with an IOTA OneBox control panel at the pump owner's cost. Where these are installed on:

- Private residential properties, the OneBox control panel shall be vested in Council. Council will take responsibility for the operation and maintenance (except wilful damage). The property owner will be responsible for power costs (clause 4).
- Commercial properties, the OneBox control panel and all the other associated system equipment up to and including the boundary kit will remain in private ownership. Council will own and maintain the pipework on public land down to the outfall (clause 4).

The OneBox allows the Council to remotely monitor and control the pump station. In a storm event, the pump station can be prevented from pumping, so that there is no additional flow from this site when the downstream network is full.

The IOTA OneBox is not required on systems approved for reasons other than the network capacity constraints (clause 4) and standard control boxes (as described in clause 7.6) can be installed. Such systems will not be vested with Council and will instead remain in private ownership except for the pipework on public land down to the outfall.

7.8 Pump and System Protection

Protect the pump motors from:

- No flow through the pump
- High pressure
- Low pressure
- Thermal overload
- Low Voltage

7.9 Alarms

Provide an alarm that is:

- connected to a circuit separate from the pump supply.
- a combined audio (buzzer) and visual (red light) alarm. Position the red light prominently and set it to activate at the invert level of the inlet.
- provided with a mute button to manually silence the buzzer. The red light shall remain active until the fault is rectified.
- connected to a battery back-up to provide power in case of mains power outages.

7.10 Buoyancy

Parts of Christchurch have high groundwater levels. Consider the effect of the watertable on the tank's installation and mitigate where necessary. If the weight of the tank is not enough to prevent flotation, detail adequate anchoring to hold the tank in place including under seismic loading.

7.11 Valves

All valves must be proven for sewage application. Do not specify water supply valves as they rapidly block when passing sewage.

8 CONNECTIONS

The owner of the property shall meet all costs associated with connecting the PSPS to the existing sewer system, including the supply and ownership of the system up to and including the boundary kit.

Christchurch City Council has developed a detailed wastewater hydraulic model for the City. Contact the City Water and Waste Unit to confirm whether or not there is capacity in the network to accommodate the additional discharge from the PSPS.

Where the capacity of the Council network is limited, Council may decline the request to discharge, may require the applicant to provide their own on-site storage during the peak times or may request improvements to the existing network pipe(s) or other relevant infrastructure to allow the connection (clauses 4, 7.3 and 7.7). The PSPS owner is not compelled to accept any particular option.

8.1 Connection of Building to Pumping Unit

Detail the connection of the building to the pump in accordance with the *Building Code* and other relevant documents in clause 2 – Referenced Documents.

Detail grease traps or grease interceptors between the building and the pumping unit where it is expected that the wastewater will have high concentrations of fats, oils or grease. These fittings shall be operated and maintained by the PSPS owner. Separate guidelines apply where there is an excessive concentration of fats, oils or grease and a trade waste discharge may be required.

Extend inlet pipes to wet wells below the low water elevation in the wetwell, in order to reduce turbulence and odours.

Detail an overflow (blockage) relief to prevent surcharge within the building. Site the overflow relief point to ensure that any discharge does not create a nuisance and that the discharge point remains visible and accessible.

8.2 Connection to an Existing Gravity Main

Make the lateral connection to the gravity main in the following ways, in order of Council's preference:

- directly into a manhole on the gravity sewer;
- to an existing 100 mm diameter lateral at the boundary of the property; or,
- through installing a 100 mm diameter "Y" junction on the gravity sewer.

Detail connections made directly into a manhole with a drop structure in the manhole which discharges directly into the flow as described in *IDS* clause 6.6.4 –Drop structures in manholes. Council may require the provision of a non-corrosive pipe installed for the length of sewer from the discharge manhole to the next downstream manhole and will require the provision of an inert lining to all internal surfaces of the pressure main discharge manhole.

Detail the connection to the 100 mm diameter lateral or "Y" junction using a reducer and a 50mm diameter threaded transition. Detail an inspection point on the 100 mm diameter lateral adjacent to the connection.

8.3 Connection to an Existing Pressure Main

This connection type excludes urban areas reticulated with a pressure sewer system reticulated area. Refer to *IDS* clause 6.8.8 – Pressure sewer system detailing.

For details regarding connection to a Common Pressure Main refer to *IDS* clause 6.2.4 – New developments. A private pressure main is not permitted to inject into another private pressure main unless by mutual agreement between the private parties. The additional discharge into the Council network will also require permission from the Council and the permission, if granted, would be subject to the requirements of this document.

Where approval has been given to connect to a Council pressure main:

- Council will supply the maximum and minimum pressures expected at the connection to the pressure main. Specify a pump that produces a pressure within this range.
- The total design and post commissioning pressure in the PSPS lateral at the point of connection to the Council network shall not be greater than the maximum expected pressure within the Council pressure main, to prevent interference with its operation. Confirm these pressures in the PSPS design and commissioning documentation, through providing pump specifications and calculations as part of the design report.
- If issues are identified with pressures post-commissioning and prior to handing over the equipment downstream of the boundary kit to Council, Council will require the owner of the PSPS to remedy the situation. Approval to discharge into the Council network may be suspended until the situation has been rectified.
- Specify fitting materials for the connection which are approved. See http://www.ccc.govt.nz/CCC.Web.ApprovedMaterials/business/constructiondevelopment/approvedmaterialssearch.aspx for details of approved materials.

Construct the connection using either:

- A tapping band. A tapping band shall not be permitted if the pressure main is over half the diameter of the existing Council pressure main;
- A ductile iron tee cut in using Gibault joints;
- A polyethylene tee welded in by an approved contractor, if the Council pressure main is polyethylene.

When connecting to an existing Council pressure sewer, detail a boundary kit in a concrete box or riser that is large enough to allow servicing and operation of the valves, without having to carry out any excavation. The boundary kit shall include:

- a gate valve fitted on the connection to the pressure main;
- a sewage type reflux (non-return) valve fitted on the private station side of this gate valve.

Install the boundary kit as close to the Council pressure main as possible and preferably just within the property at the road boundary, for safety reasons.

8.4 Accessing the Council Network via Other Properties

Running the PSPS conveyance pipeline via other private properties should be avoided, if possible.

Where this cannot be avoided, provide written approvals from the owners of the property through which the pipeline will run when requesting Council approval to discharge, including details of the easements to protect access to the public sewer, in case the properties change ownership. Council ownership will only apply to part of the pipeline that is on public land.

9 PIPELINES

9.1 Velocity

Design to a minimum flow velocity of 0.7 m/s, to achieve flushing of solids in the pipeline, and a maximum velocity of 2.5 m/s. A mean velocity of 1 m/s is recommended to achieve pipe flushing, reduce water hammer and minimise frictional losses, thus reducing energy consumption.

9.2 Pipe Material

The following materials are acceptable for pressure mains:

- PVC-u (To AS/NZS 1477)
- polyethylene (To AS/NZS 4130)
- ductile iron (to AS/NZS 2280)

Base the selected pressure class on an analysis of the pressure main and its maximum pump head. The recommended minimum pressure ratings are:

- PVC-u – 900 kPa
- polyethylene – 800 kPa
- ductile iron – 800 kPa

9.3 Pipe Sizing

Specify pressure pipes with a minimum internal diameter of 32mm.

9.4 Pipe Volume

Table 2 below provides pipe volumes and minimum flows in pipes of different sizes that are necessary to achieve the minimum design velocity in clause 9.1- Velocity. Pipes with the same nominal diameters may have different internal diameters (ID). Use the actual internal diameter when calculating the pipeline volume.

The pipe volume per metre is the minimum quantity of sewerage that should be purged through a line for each metre in length. Council will use this value to verify the flow velocity.

Table 2 also gives, for each pipe diameter, the flow rate (L/s) necessary to achieve the target mean flow velocity. For example, a 32mm conveyance pipe needs a flow rate of 0.56 L/s to achieve the 0.7 m/s minimum velocity.

Table 2 - Pipeline Volumes, Minimum and Average Flow Rates in typical pipes per metre length

Pipe Diameter[1]	Volume of Pipe[2] (litres/m)	Q_{min} (ℓ/s)[3] for v = 0.7 m/s	Q_{avg} (ℓ /s)[3] for v = 1 m/s
32 mm	0.80	0.56	0.80
40 mm	1.26	0.88	1.26
50 mm	1.96	1.37	1.96
63 mm	3.12	2.18	3.12

1 Use the internal diameter of the pipe
2 $V_p = \pi \times \text{radius}^2 \times \text{length}$
3 Q_{min} or $Q_{avg} = V_p \times v$

As a general rule, the maximum pipe volume should be 200 litres for single pump systems and 300 litres for duplex pumping systems. Where this is not the case, demonstrate how the minimum velocity of 0.7 m/s is achieved or what appropriate mitigation, such as pipe flushing, is provided to manage odours and septicity.

9.5 Maximum Allowable Distance to an Outfall

Clause 9.4 above discusses the maximum permissible pipe volumes and these can be used to provide guidance as to the theoretical distance a PSPS can pump to the outfall.

Irrespective of the maximum theoretical distance, Council has set the maximum practical distance to an approved outfall at 200 m to manage odour issues and risk to the Council network. Properties more than 200 m away from a Council outfall will not get approval to discharge to the network.

9.6 Pipe Flushing

Specify the pipe sizing and use the pump design process to ensure that the pipe volume between the pump chamber and the Council discharge point is:

- fully purged during each pump cycle;
- stored in the pipelines for the minimal time possible, ideally not more than 8 hours between pump starts or purges.

Ensure that the volume from the preceding pump cycle is fully replaced during the following pumping cycle to minimise septicity. Select the system pump(s) and size the wetwell storage volume to facilitate this pipe flushing.

If the pipe volume will not be purged within the following 8 hours provide a flushing system that adds fresh water to the wetwell at the low end of each pumping cycle. Add this water at a higher rate than the pumping rate, to a volume at least equal to the pipe volume. Any flushing system connected to a drinking water supply system must be fitted with a Council approved backflow preventer, installed under a building consent. Information on how to apply and the relevant forms is available at www.ccc.govt.nz/homeliving/goaheadbuildingplanningS00/buildingandplanningprojects-s02/plumbing-s02s0304/backflowpreventers-s02-s0304-0209070-01.aspx.

Council may also require the PSPS owner to reduce or eliminate the effects of hydrogen sulphide release through aeration or chemical addition as hydrogen sulphide can have adverse effects on Council's sewerage network if not properly managed.

9.7 Pipe Friction

Base friction loss calculations on either the Hazen-Williams formula or the Colebrook White equation. Adopt appropriate factors for these equations and submit these calculations and any underlying assumptions with the design.

9.8 Air and Vacuum Valves

The reticulation system may also require the use of air valves. Where required, detail air relief valves at all high points in the system. Where air release devices are used, consider odour control for example activated carbon or soil filters, especially where the air valves are close (within 50m) to neighbouring dwellings.

Detail a vacuum break valve, suitable for use with sewage systems, to the pressure pipe at its highest point, to prevent siphoning of the pressure pipe. Mount the valve vertically above and as close to the pressure pipe as possible. Specify an isolating gate or ball valve between the pressure pipe and the vacuum break valve.

9.9 Pipe Installation

Detail minimum depths of cover for pipelines from the finished surface in accordance with the recommendations of *IDS* clause 7.9.5 – Cover over pipes. Provide details in the Design Report if the minimum cover cannot be met.

Council recommends the laying of detection wires over the pressure pipe, to aid later location

9.10 Minimum Separation Distances

Specify minimum separation distances complying with Table 3, unless statutory minimum separation distances such as those required under the regional council's planning documents are greater. The regional council's statutory documents may require consent for installation within these separation distances. If the above distances cannot be achieved, e.g. when crossing an infrastructure type, obtain written permission from the appropriate authorities.

Table 3 - Minimum Separation Distances

Structure	Separation Distance (m)[1]
Buildings and structures	0.5
Adjacent property boundaries	0.5[2]
Water supply well	20
Surface waterways	20
Council watermains	5

1 Refer to the *Natural Resources Regional Plan* and *Land and Water Plan* for other statutory requirements.

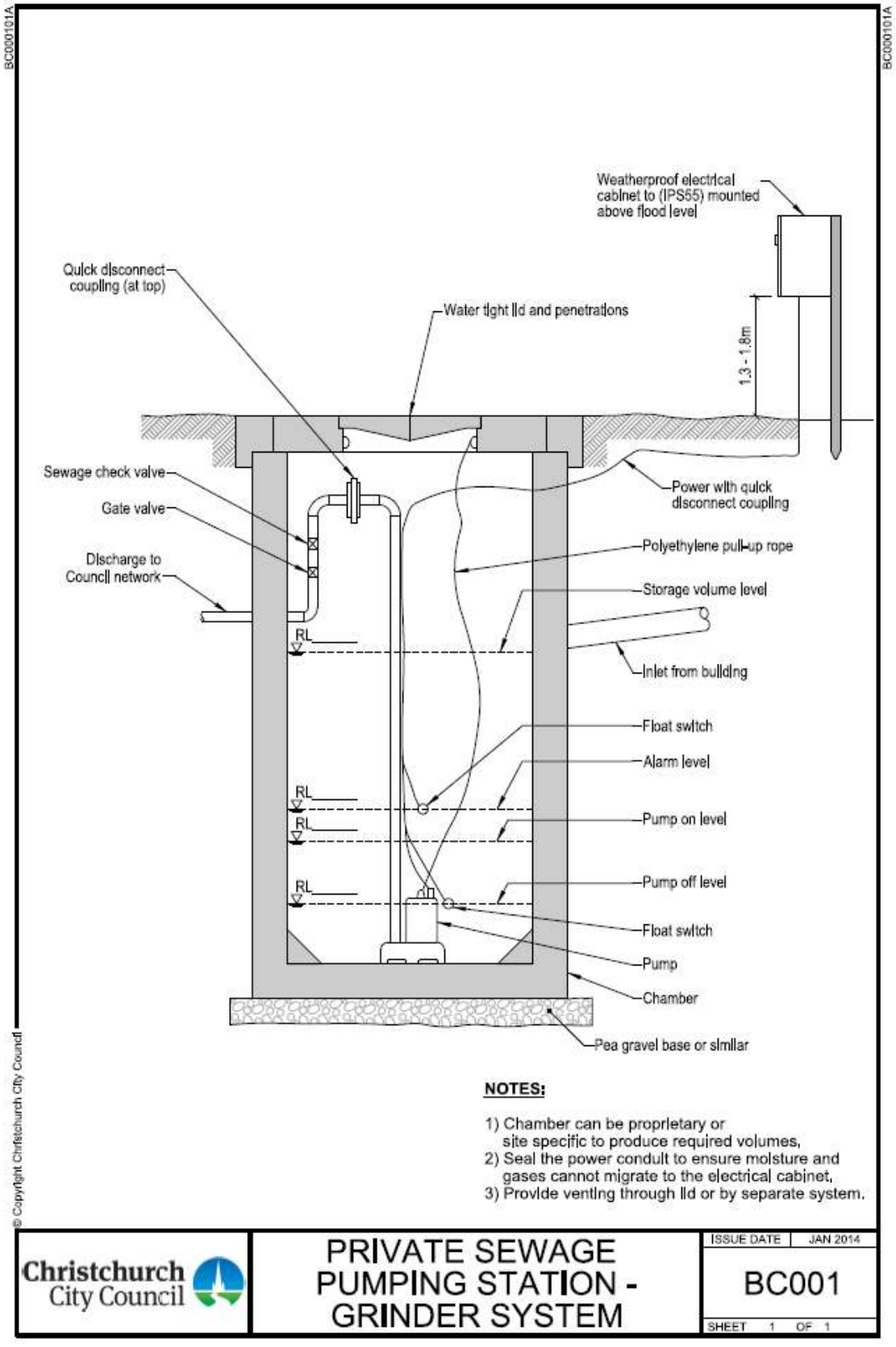
2 May cross property boundaries with written permission from the neighbouring property owners.

10 OPERATION AND MAINTENANCE

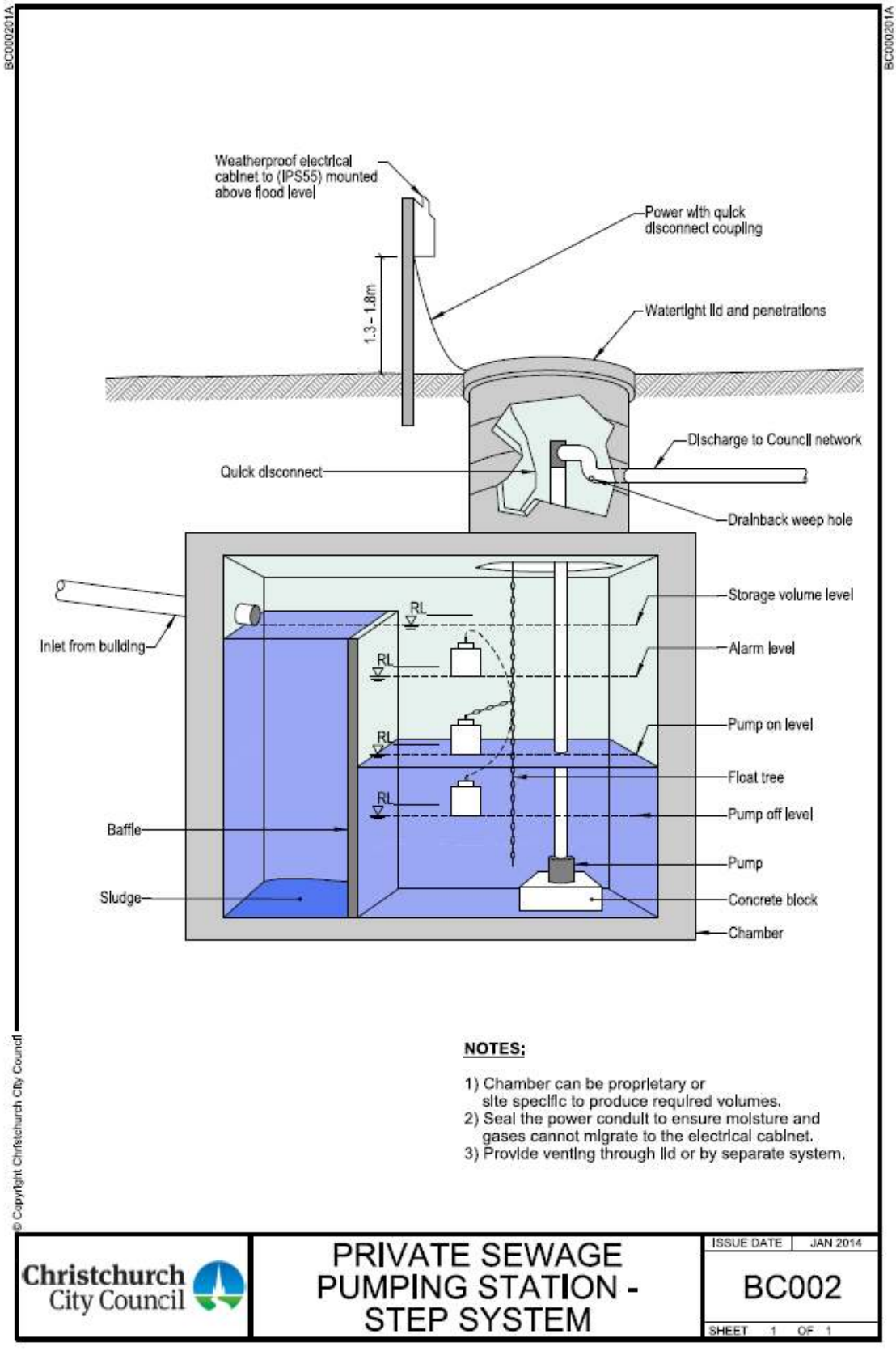
Provide a full home owner's manual to the PSPS owner, which sets out in detail the operation, maintenance and repair requirements, including:

- Numbers and/or web site details for further enquiries;
- Emergency phone number of service agent;
- What to do if the alarm sounds or flashes;
- What to do in the case of a power failure;
- Routine inspection requirements and checklists; and,
- Operation and maintenance responsibilities (including tank maintenance, odour control devices, etc.)

APPENDIX 1 PRIVATE SEWAGE PUMP STATION SCHEMATIC (GRINDER SYSTEM)



APPENDIX 2 PRIVATE SEWAGE PUMP STATION SCHEMATIC (STEP SYSTEM)



APPENDIX 3 PRIVATE SEWERAGE PUMPING STATION SYSTEM REPAIR FLOWCHART