Pressure Sewerage Code of Australia

Requirement	Clause
The Power and Water Corporation (PWC) has a strong preference for gravity sewers and will only consider pressure sewers or vacuum sewers where it can be demonstrated that whole-of-life costs of gravity sewers and related conventional pumping stations are excessive. PWC has moved to adopt the Pressure Sewerage Code of Australia as the general basis for the design and construction of pressure sewerage infrastructure under its control in the Northern Territory. This document is read as a supplement to the Pressure Sewerage Code of Australia to provide details of those modification and additions to suit the particular requirements of PWC. **PWC is not responsible for 'On-Property' equipment. Approval for pressure sewers to discharge to PWC sewers is contingent on a body corporate being responsible for operation, maintenance and monitoring of 'On-Property' equipment via ongoing maintenance contracts with the equipment supplier or another adequately qualified company.**	PWC Comment
PWC has adopted the 'Planning Guidelines for Water Supply and Sewerage' as issued by the Queensland Department of Environment and Resource Management. PWC has also adopted the WSAA codes and this supplement provides details of those modifications and additions that suit the particular requirements of PWC. This supplement only applies to those areas of the Northern Territory which are: (i) Served by a public sewerage system under the direct control of PWC (ii) New schemes or extensions to existing systems to be taken over by PWC (iii) Areas declared as Sewerage Districts under the Northern Territory Water Supply and Sewerage Services Act The requirements of this supplement in respect of the WSAA codes take precedence over the requirements of the Queensland Planning Guidelines. Preference in design will be given to conventional gravity systems. The use of pressure sewer systems will only be considered if proven to the satisfaction of PWC that a gravity system is not technically feasible. Pressure sewer systems shall not be used in industrial areas. Specific written approval is required for connection of caravan parks to pressure sewer systems. The use of pressure sewer systems is only permitted where specifically approved by PWC.	1.1
The use of grinder pump (GP) or septic tank effluent pump (STEP) systems is permitted only where specifically approved by PWC.	1.2.3

Requirement	Clause
Before the first paragraph, add: "Pressure sewer design shall be separated into two components: • Reticulation Design – this concerns the design of the actual reticulation system including reticulation pipes and appurtenances (eg. isolation valves, flushing points), up to and including the stainless steel isolation valve in the property boundary assembly pit. • On-Property Design – this concerns the design of the property service connection from the pressure main to the property and all the pipework, pumps and appurtenances within the property including the property boundary assembly, the internal pressure property drains, the grinder pump unit, electrical panel and alarms. **PWC is not responsible for 'On-Property' equipment.** All items on the customer's property belong to the customer. **Approval for pressure sewers to discharge to PWC sewers is contingent on a body corporate being responsible for operation, maintenance and monitoring of 'On-Property' equipment via ongoing maintenance contracts with the equipment supplier or another adequately qualified company.** During repairs of breaks or blockages in the pressure mains, PWC may utilise the tee in the property boundary assembly pit to flush or scour the laterals between the property boundary assembly pit and the pressure reticulation sewer." Replace (iv) (H) with: "(H) Locations of clean-outs, flushing points, isolation valves and air release valves"	1.5.3
Replace the existing clause with the following: Planners and Designers shall consult with stakeholders as necessary. *Stakeholders may include, but are not limited to:* *a) Property Owners served (or affected) by the works, including absentee owners;* *b) Tenants* *c) Heritage groups;* *d) Indigenous people groups;* *e) AAPA* *f) Native Title holders;* *g) Municipal councils;* *h) Gas pipeline owners and/or operators;* *i) Road, rail and tram owners* *j) Planning authorities;* *k) Developers of adjacent works;* *l) Environmental and community groups; and* *m) Other utility agencies, including PWC power networks.*	1.5.4

Requirement	Clause
Darwin and Alice Springs – design for electrical outage of 90 minutes duration. Other Centres - obtain design advice from PWC in regard to electrical outage duration, however, the design point will not less than 90 minutes. Designers and Developers should consider requirements for items (b), (d) and (e), when completing a contingency plan, however, responsibility for provision and/or operation and maintenance of these items does not rest with PWC. Similarly, PWC is not responsible for provision and/or operation and maintenance of 'on-lot' pressure pipes	2.5
Add: (c) maximum number of properties serviced per pumping zone shall not exceed 35 (ie. not more than 35 properties shall pump via a pressure main to a gravity sewer or sewerage pump station or treatment site); (d) multiple discharge routes and valving shall be provided to facilitate operation and maintenance of pressure mains, plus to minimise sewage detention times when flows in early years are low.	2.7
Pressure sewer systems shall not be used in industrial areas. In the second paragraph, delete "industrial" and insert "property". PWC Trade Waste Guidelines must be adhered to.	2.8.2
After the final paragraph, insert: "Where required by PWC, a stainless steel vent shaft ≥10 metres shall be installed at any point where gas or air is released from pressure reticulation mains to the atmosphere (eg. gas release valves)."	2.9
Control/alarm panels may be attached to the external wall of the building on the property being serviced, thus affecting building occupants if operation of the control/alarm panel is audible above background noise levels. Excluding audible alarms, the control/alarm panel shall not produce sound levels exceeding 30dBA at one metre.	2.11
The developer shall prepare an Owner's Manual for the 'on-lot' pressure sewer equipment. A copy of this manual shall be provided in the document pocket of the alarm panel enclosure on each property. An additional copy of the Owner's Manual shall be to each property owner annually. A telemetry system shall be provided for the maintenance contractor to remote monitor alarms and faults with the 'on-lot' pressure sewer equipment. As a minimum, the telemetry system shall enable remote monitoring of pump protection alarms and trips, level alarm/s and over-pressure protection alarms and trips.	2.12.3
Comply with PWC procedural guidelines for handover of assets.	2.13.1
Insert the following in lieu of the first, second and third paragraphs: "Pump controls fitted to the pressure sewerage collection/pump units shall include: 1. Level controls (Pump Stop, Pump Start, High Level Alarm, Overflow Alarm) 2. Pump protective controls (overvoltage, undervoltage, thermal overload 3. Over-pressure protection"	2.13.2.2

Requirement	Clause
Delete the last paragraph and insert: 'The maximum system operating pressure shall not exceed 60m head during normal operation (ie. excluding pressure surges)." After the last paragraph, add: "Data-logging of pump start/stop, pump run times, over-pressure protection alarms and trips, level alarms and pump protection alarms shall be provided within the control panel. Download of this information shall be possible via an easily accessible communications port on the control panel. Electronic copies of this information shall be provided to PWC annually."	2.13.2.2 (cont)
Coordinates to be specified to MGA. Pine Creek and west of Pine Creek falls within Zone 52. East of Pine Creek falls within Zone 53.	3.2
Before the first paragraph, insert the following: "Specialist geotechnical assessment shall be made for all pressure sewers where historical data or other evidence indicates potential geotechnical problems eg. soils with low horizontal bearing capacity when waterlogged, talus slope, mine subsidence, land fill or refuse dumping. Where geotechnical assessment is undertaken, test points shall be no more than 150 metres apart and shall be completed to a depth at least 1.5 metres deeper than the design trench depth. For each test point, soil classifications, actual groundwater level and maximum seasonal groundwater level shall be identified For each test point, vertical and horizontal bearing capacity shall be determined for waterlogged conditions. A copy of the geotechnical report shall be provided to PWC before approval of design designs is sought."	3.4
Before construction commences, Aboriginal Areas Protection Authority (AAPA) clearances shall be obtained, including a set of clearances in the name of the Power and Water Corporation. Add: (m) areas under control of an aboriginal land council (n) areas where Native Title has been granted Add: "(ix) minimisation of transportation of seeds and weeds via importation of fill and bedding materials After the final paragraph, ad: "Before construction commences, Aboriginal Areas Protection Authority (AAPA) clearances shall be obtained, including a set of clearances in the name of the Power and Water Corporation."	3.6.1

Requirement	Clause
Add the following after final paragraph: "Note that trees and some landforms, particularly in desert areas, can form part of an aboriginal sacred site. If there is any doubt, then the advice of the Aboriginal Areas Protection Authority should be sought, and if necessary, an AAPA certificate obtained and paid for by the developer. Developers should be aware that significant delays may occur should AAPA certificates not be obtained in time to commence construction. Power and Water will not accept any site that has been the subject of destruction of sacred sites until all outstanding issues resulting from that destruction have been finalised and final AAPA certification issued. **Severe penalties apply under NT law for destruction of sacred sites.**"	3.6.3
At the end of the clause, add the following: "In coastal areas subject to storm surge, electrical switchboards and electrical connection points shall be set at least 0.9m above the storm surge level."	3.6.5
Delete the third paragraph ("For some Water Agencies, an easement over private property…") and insert: "An easement over private property is not the preferred location for a pipeline and may only be used as temporary solution pending future permanent pipeline within a road reserve". Delete the paragraph "*Typical situations where the Water Agency may approve …*". Delete the paragraph "Specific requirements for the use of an easement …" and insert the following: "Where a vacuum or pressure main must be located within a residential lot, it shall be in accordance with the PWC Policy for Minimum Easement Dimensions, Conditions and Restrictions for Water and Sewerage infrastructure. All easements in favour of PWC shall be inline with the Power and Water Corporation Easement Policy 'Minimum Easement Dimensions for Power and Water Corporation'. Pressure Mains (DN) / Minimum Easement Width (m) ≤ 150 / 3 >150 to ≤450 / 6 The easement is generally to be centrally located over the pressure or vacuum main. Pressure mains located within private land may be subject to increased easement requirements to the satisfaction of PWC, where: • the pressure or vacuum main is not parallel to the property boundary • there is a shared alignment for services approved by the relevant authorities • there more than one PWC asset within the easement"	3.7.1
Concrete encasement can only be used where crossing under a waterway or open drain.	3.10

Requirement	Clause
After the last paragraph, insert: "To enable future maintenance of 'On-Property' pressure laterals, a minimum offset from building lines is required."	3.12.1
Deviation from standard alignment is not permitted without specific PWC written approval.	3.12.2
Minimum vertical clearances shall be 300mm. **Pressure sewers shall be laid below water mains wherever possible.** Consult with service owners to confirm requirement for crossing gas, oil or fuel lines and comply with all requirements imposed.	3.12.4
Delete "where necessary" from (b) (iii).	3.15.1
Pressure sewer systems shall not be used in industrial areas. In the second paragraph, delete "industrial" and insert "property". PWC Trade Waste Guidelines must be adhered to.	3.15.2
Replace 'WSA 02' with 'WSA 02 and PWC Supplement to Sewer Code of Australia WSA 02'.	4.2
Surge and fatigue analyses shall be undertaken for all pressure sewers. Unless surge analysis is completed and a report provided to PWC, a default surge pressure of three times the maximum system operating pressure shall be used for design (ie. 180m head). Fatigue analysis shall utilise de-rating factors for fatigue and temperature from WSAA TN4. A minimum design temperature of 30 degrees Celsius shall be used. Minimum hydrostatic test pressure shall be 1,000kPa. Where the fatigue life of pressure mains is less than the nominal asset design life given at Table 1.1 (ie. 100years), replacement costs will be included in whole-of-life cost analysis.	4.3
Replace 'WSA 02' with 'WSA 02 and PWC Supplement to Sewer Code of Australia WSA 02'. For D (Wet Weather Dilution Factor), use a factor of 2.0 (ie. D = 2.0) for both tropical and arid areas.	4.4.1
Refer 4.4.1 above.	4.4.2
Swimming pool or spa filter backwash or pump-out is not permitted to be discharged to sewer. Where inflow volumes will exceed the operating volume and the peak inflow exceeds pump discharge rate, an appropriately sized retention tank or flow control device shall be installed to limit inflow to the collection tank to less than 50% of the pump discharge rate.	4.4.3

<table>
<tr><th>Requirement</th><th>Clause</th></tr>
<tr><td>Dynamic modelling is preferred.

Where an existing system is to be extended, verify that the proposed pumps match with or are entirely compatible with pumps already installed in the system

Where probability modelling is used, all pumps shall be identical and the minimum number of pumps to be assumed to be operating concurrently under normal circumstances shall be:

<table>
<tr><th>Number of Collection / Pump Units Connected to Zone</th><th>Minimum Number of Pump Units Assumed to be Operating Concurrently for Design Purposes</th></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>2 - 3</td><td>2</td></tr>
<tr><td>4 – 9</td><td>3</td></tr>
<tr><td>10 – 18</td><td>4</td></tr>
<tr><td>19 – 30</td><td>5</td></tr>
<tr><td>31 - 35</td><td>6</td></tr>
</table>
</td><td>4.4.4.1</td></tr>
<tr><td>DO NOT USE SIMPLIFIED DESIGN FLOW EQUATION.</td><td>4.4.4.2</td></tr>
<tr><td>Allowance for head losses due to air entrapment shall be assumed to be 10% of the height of any descending section of main without a gas release valve.

Use long radius bends.</td><td>4.5.3.2</td></tr>
<tr><td>For grinder pump pressure sewer systems and STEP systems, the maximum flow velocity shall not exceed 2.5 m/s.</td><td>4.5.3.4</td></tr>
<tr><td>After the final paragraph, add the following:

“Unless otherwise advised by PWC, adopt standard gravity sewer alignment allocation for pressure sewer rising mains.

Pressure sewer rising mains located within private land may be subject to increased easement requirements to the satisfaction of PWC, where:

• the pressure main is not parallel to the property boundary
• there is a shared alignment for services approved by the relevant authorities
• there more than one PWC asset within the easement”</td><td>5.1.4</td></tr>
<tr><td>After the final paragraph, insert the following:

“Where pressure sewers are located in road reserves, the alignment shall conform to that nominated on the service allocation plan and by gaining approval from PWC and the relevant road authority or Council. Refer also ‘Service Allocations in Road Reserves’ in Section 4 of Volume 2 of the Power Supply Volumes of PWC’s Standard Drawings (drawing numbers SO2-4-1-XX).

Where pressure sewers are in road reserves, the alignment shall generally be 1.5m from the property boundary.

Where pressure sewers are less than 1.5m from the property boundary, easements in favour of PWC shall be provided over the adjacent portion of the property.</td><td>5.1.5</td></tr>
</table>

Requirement	Clause
Where pressure sewers cross roadways they shall be at right angles to the roadway. Where a pressure sewer main is required to cross multi lane carriageway or a major road, including all roads controlled by DCI, or an intersection or roundabout, PWC may specify extra protection methods or different pipe materials to minimise the requirement for future maintenance."	5.1.5 (cont)
Use PWC standard drawing W2-2-09 with code PS used in lieu of SR.	5.1.6
Insert additional clause, "5.1.7 Bends" as follows: "90° bends shall be avoided. Use two 45° bends separated by a distance greater than 3 pipe diameters."	5.1.7
Adopt flow velocities and pipe profiles to minimise the need for gas release or vacuum breaker valves. In particular, avoid high points above the discharge level that will drain at low flows. Gas release valves shall only be installed with PWC approval, where the Designer demonstrates that P>1.0 cannot be achieved as outlined at Appendix A.	5.2.1
Delete reference to Standard Drawing PSS-1005.	5.3.4
Insert "(d) at incoming reticulation pressure mains (ie. at tee's)". Delete the final paragraph "Isolating valves shall be capable of being locked in the open and closed positions."	5.4.2
Design shall avoid the need for vacuum break or gas release valves. Gas release valves shall only be installed with PWC approval, where the Designer demonstrates that P>1.0 cannot be achieved as outlined at Appendix A. Delete reference to Standard Drawing PSS-1006.	5.5.1
Install gas release or vacuum break valves aboveground in appropriate secure enclosures. Installation in chambers below ground is not permitted.	5.5.5
Delete the second paragraph "All dead-ends to pressure sewers…" and insert "All dead-ends to pressure sewers shall be provided with a lockable, end flushing point." After (iv), insert additional dot point as follows: "(v) At high points for manual release of air during maintenance activities."	5.6.2
All flow meters to be magflow type with telemetry connected to PWC SCADA.	5.7
Insert additional clause 5.8.1 "Receiving System - General" as follows: "The impact of a pressure sewer discharging to a gravity sewer and downstream system/catchment shall be assessed. In conducting this assessment, it shall be verified that the ultimate flows from the pressure sewer were allowed for in the original design of the receiving gravity sewer when calculated in accordance with WSA 02 and PWC Supplement to Sewer Code of Australia WSA 02. The pressure sewer shall discharge in manner that does not cause loss of water seals in customer sanitary drains and fixtures."	5.8.1

Requirement	Clause
Insert additional clause 5.8.2 "Receiving System – Discharge Structure" as follows: The discharge structure (receiving structure) shall be designed so that energy of the sewage in the pressure sewer is dissipated and the transition of flow to gravity is achieved with a minimum of turbulence. Where the proposed pumping rate exceeds two-thirds of the capacity of the downstream gravity sewer, the system design shall be referred to PWC for review. No connections other than the pressure sewer shall be made to the discharge structure. *The section of the pressure sewer immediately upstream of the discharge structure should be on a grade rising towards the discharge structure, such that the pressure main is aligned in a straight line with the out-flowing gravity sewer for a minimum distance of ten times the pressure sewer DN.* The soffit of the pressure sewer inlet into the discharge structure should be the same level as the soffit of the outgoing gravity sewer, provided that this gives a drop between 30mm and 150mm in the invert across the discharge structure. Reference Standard Drawing SPS-1405."	5.8.2
Delete reference to Appendix B. Provide pressure sewer laterals to vacant lots, including large lots (>0.5 ha) sized to suit the maximum number of dwellings that may be developed on the lot within current zoning limitations. Termination shall be "Capped Method" (refer Figure 6.1) using electrofusion transition adaptor PE/Stainless Steel Female Thread and PE plug.	6.3
Control and alarm panels shall be located above surge level and 1:100 year flood level. Control and alarm panels shall be located to avoid unnecessary disturbance to occupants during normal operation however initial response to alarms from on-site systems and rectification of on-lot faults shall be the responsibility of the property owner. Notwithstanding this, a flashing light alarm shall be located where visible from the street.	6.6
Darwin and Alice Springs – design for emergency response time of 90 minutes. Other Centres - obtain design advice from PWC in regard to emergency response times, however, the design point will not less than 90 minutes. The emergency storage volume shall be the volume within the collection tank between the alarm level and the overflow level. **Volume of the sanitary drain shall not be considered when calculating emergency storage volumes.**	7.1

Requirement	Clause
Only options (c) and (d) are permitted. Residential loading rate in the Northern Territory is 300 L/EP/day. Minimum emergency storage volume shall be equivalent to three hours of peak dry weather flow (PDWF). For residential developments, this is obtained by multiplying the average dry weather flow (ADWF) by the diurnal peak factor, **r.** ADWF = Q_a = EP x 300/24/3600 L/s = EP/288 L/s $r = \left(1.74 + \frac{330}{EP^{0.55}}\right)^{0.5}$ = Diurnal Peak Factor (Peak Flow/Ave Flow) Where EP = Equivalent Population of the area served by the collection tank Use the following Table S2 to identify the number of EP/dwelling.	7.2.1
Facilities for emergency bypass pumping and/or pump-out are not required.	7.2.2
For residential properties, a cross-check on collection tank sizing can be made using the method at Appendix C below.	7.4
The limit of PWC network infrastructure shall be at the property connection side of property boundary assembly.	7.7
Not applicable.	7.8
Maintenance fitting shall be provided.	8.1
Minimum cover over pipes in road reserves or trafficable areas shall be 750mm or 1200mm under major roadways, and 600mm elsewhere.	9.2.2
Delete Appendix B	Appendix B

Table S2 Residential Population Density by Zone

Zone	Allowance (EP)
SD - Single Dwelling Residential (including rural dwellings)	3.5 per dwelling unit
MD – Multiple Dwelling Residential	2.2 per dwelling unit
MR – Medium Density Residential	2.0 per dwelling unit
HR – High Density Residential	2.0 per dwelling unit
CV - Caravan Park	2.0 per caravan

Requirement	Clause
Add Appendix C as follows:	Appendix C

APPENDIX C

Calculate the average inflow rate using the formula:

$$Q_i = Q_p + \frac{V_b}{t}$$

Where Q_i ≡ average inflow rate over time period t (litres/second)
Q_p ≡ pump discharge rate (litres/second)
V_b ≡ buffer volume (litres)
t ≡ time period t (seconds) – use 300 seconds

For V_b, use the volume difference between the pump start and alarm level.

One Pump Chamber Volume Unit (PCVU) is equivalent to Q_i of 0.1 litres/second.

For t = 300 seconds, the PCVU's for fixtures can be assumed as follows:

Fixture	PCVU
Bain Marie	2
Basin	1
Bath (including shower over bath)	7
Bidet	1
Cleaner's Sink	3
Commercial Kitchen Sink	2
Domestic Washing Machine	3
Domestic Dishwasher	2
Domestic Kitchen Sink (single or double)	1
Glass Washer	2
Laboratory Sink	1
Laundry Trough	2
Shower (not over bath)	2
Slop Hopper	1
Urinal (4 stalls or up to 2.4m length)	2
WC	1

For residential properties, provided the sum of PCVU's for fixtures discharging the collection tank is less than (10 x Q_i), then the collection tank/pump unit should be adequate.

NOTE: This cross-check method assumes that residents will limit discharges to sewer if the high level alarm on the collection tank/pump unit sounds, or if the electricity supply fails.