



Design and Construction Standards Manual

Addendum to:

WSA 02 - 2014 Version 3.2 *Gravity Sewerage Code of Australia*

WSA 03 - 2011 Version 3.2 *Water Supply Code of Australia*

WSA 04 - 2022 Version 3.1 *Sewage Pumping Station Code of Australia*

WSA 07 - 2007 Version 1.1 *Pressure Sewerage Code of Australia*

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INTRODUCTION

Purpose and Scope

The following Water Services Association of Australia (WSAA) Codes and the WSAA Product and Material Information Guides have been adopted by Grampians Wimmera Mallee Water Corporation (GWMWater) and therefore apply to the design, construction and maintenance of GWMWater water and wastewater infrastructure:

- a) WSA 02 - 2014 Version 3.2 *Sewerage Code of Australia*
- b) WSA 03 - 2011 Version 3.2 *Water Supply Code of Australia*
- c) WSA 04 - 2022 Version 3.1 *Sewage Pumping Station Code of Australia*
- d) WSA 07 - 2007 Version 1.1 *Pressure Sewerage Code of Australia*

This Design and Construction Standards Manual describes the specific requirements of GWMWater where the Codes refer to such requirements, or which alternative to use when alternatives are offered in the Codes. This Manual is therefore an addendum to the Codes and needs to be read in conjunction with them.

The Product and Material Information and Guidance documents are available on the WSAA website (www.wsaa.asn.au). GWMWater's specific requirements for products and materials are included in **SECTION 5: APPROVED PRODUCTS AND MATERIALS** of this Manual.

Responsibilities

The term Developer **refers to the initiator of the works. The developer** is responsible for the design and construction of water and wastewater infrastructure. **Developer can** refer to consulting engineers, contractors and GWMWater personnel, as well as the owners of land being developed.

The term Infrastructure refers to constructed components of any development, project or scheme. Developers are responsible for the design and construction process.

Alternative Products and Solutions

The WSAA Codes and this Manual provide 'deemed-to-comply' solutions for the creation of GWMWater assets. Alternative solutions, practices, equipment and methods will continue to evolve and offer opportunities to improve the creation of these assets. GWMWater encourages any innovation that offers enhanced productivity and serviceability. GWMWater's approvals process will consider innovative systems but approval must be obtained before the system is installed.

It is the Developer's responsibility to justify any deviation from the requirements set out in the WSAA Codes and this Manual. If a variation is proposed to drawings which have been 'Approved for Construction', the Developer is to obtain written approval prior to construction.

GWMWater will only accept alternative products to those referred to at the WSAA website and as amended in this Manual if it can be demonstrated that such products comply with the applicable standards or specifications, are equivalent to the products referred to and approval has been gained prior to installation.

Using this Manual

The four sections of this Manual each refer to one of the WSAA Codes.

The information is presented in the form of comments, insertions or deletions in sections of the Codes. The section numbers and page numbers shown in this Manual are the sections and page number of the Codes where it is found.

SECTION 1: WSA 02 - 2014 V3.2 SEWERAGE CODE OF AUSTRALIA

PART 0: GLOSSARY OF TERMS, ABBREVIATIONS AND REFERENCES

Where alternative terms are defined in the Code, GWMWater prefers the following:

Term	Definition
Lot control	The area of a lot that can drain to the gravity network at compliant grades.
Nature strip	Used in Victoria instead of "road verge".
Property connection sewer	The GWMWater owned portion of sewer pipe connecting a property.
Property service connection	The GWMWater owned portion of water service pipe connecting a property. Typically, main to meter.
Property sewer drain	The property owner owned portion of sewer pipe connecting a property.
Vertical riser	The vertical component of a property connection sewer. Also known as a jump-up.

PART 1: PLANNING AND DESIGN

Amendments to Standard Drawings

The following amendments to the standard drawings are to be made:

Drawing Number	Amendment
SEW-1106	Add to note 2: 'Inspection opening to be located in serviced property.'
SEW-1107	This connection type is not used by GWMWater
SEW-1108	Y Branch Connections are not permitted
SEW-1109	Add note '5. Use marker tape on all property connection ends.'
SEW-1201	Delete note in Material Column of tables 'Bedding may be omitted if trench base is granular sand or gravel of suitable grading.'

Drawing Number	Amendment																		
SEW-1201, 1202, 1203, 1204	Add 'Pipe embedment aggregates to be according to the following table: Sieve Analysis Percent Passing (Test Method <i>Australian Standard 1141.11.1-2009</i> (Washed)) <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Sieve Size</th> <th>Percent Passing Range</th> </tr> </thead> <tbody> <tr><td>6.7mm</td><td>100</td></tr> <tr><td>4.75mm</td><td>90-95</td></tr> <tr><td>3.35mm</td><td>65-70</td></tr> <tr><td>2.36mm</td><td>35-40</td></tr> <tr><td>1.18mm</td><td>10-15</td></tr> <tr><td>0.60mm</td><td>5-10</td></tr> <tr><td>0.30mm</td><td>0-5</td></tr> <tr><td>0.15mm</td><td>0-2</td></tr> </tbody> </table>	Sieve Size	Percent Passing Range	6.7mm	100	4.75mm	90-95	3.35mm	65-70	2.36mm	35-40	1.18mm	10-15	0.60mm	5-10	0.30mm	0-5	0.15mm	0-2
Sieve Size	Percent Passing Range																		
6.7mm	100																		
4.75mm	90-95																		
3.35mm	65-70																		
2.36mm	35-40																		
1.18mm	10-15																		
0.60mm	5-10																		
0.30mm	0-5																		
0.15mm	0-2																		
SEW-1204	Add note '9. Type 10 support is not approved for plastic pipe.'																		
SEW-1206	Add to note '2. Concrete bulkheads subject to GWMWater approval.'																		
SEW-1208	Add note '8. Vertical risers subject to GWMWater approval.'																		
SEW-1300	Add note '13. Conversion slabs are not accepted by GWMWater.'																		
SEW-1301	Add note '10. Conversion slabs are not accepted by GWMWater.'																		
SEW-1302	Add note '9. A "rocker" pipe is required between a MH and all sewers connected to the MH. The length of the "rocker" pipe shall be 600 mm for PVC and PP pipes, and 1,500 mm for DI and GRP pipes.'																		
SEW-1303	Add note '9. External drop junctions are not permitted by GWMWater.' Add note '10. A "rocker" pipe is required between a MH and all sewers connected to the MH. The length of the "rocker" pipe shall be 600 mm for PVC and PP pipes, and 1,500 mm for DI and GRP pipes.'																		
SEW-1304	Add note '7. Deflections through the MH of greater than 90° are not permitted by GWMWater without written approval.'																		
SEW-1307	Add note: '5. Step irons and ladders for maintenance holes are not permitted by GWMWater.'																		
SEW-1314	Add note '6. Riser shaft cap to be screw type.'																		

1.1 (Pg 59) General - Scope

Modified conventional sewerage systems are not permitted without written approval.

GWMWater does not prepare Concept Plans, but can provide advice of any specific requirements to the Developer. The Developer shall, at the beginning of the development, establish from GWMWater the ability of existing sewer infrastructure to service the land development proposal.

GWMWater may specify sewer mains to be larger or deeper than those needed to service a proposed development in order to provide for future independent development.

2.2.4.2 (Pg 71) Sewage pumping stations (SPSs)

GWMWater require preferential use of gravity sewer to service lots. Without limiting GWMWater's ability to require deeper and/or larger diameter sewers (as per section 1.1 (Pg 59) General - Scope), GWMWater will consider installation of a sewer pump station where;

- a. Servicing the catchment by gravity sewer requires installation of sewer mains deeper than 8m from ground level; or
- b. For mains less than 8m from ground level, the developer provides a geotechnical review by an experienced geotechnical engineer holding a Victorian professional engineering registration (or recognised equivalent) in the relevant discipline, demonstrating (using an evidence-based assessment including but not limited to, soil type and strata assessment, groundwater investigations and detailed numerical modelling) that the sewer cannot be safely constructed using modern construction techniques.

3.3.2 (Pg 79) Traditional design flow estimation method

GWMWater may require detailed hydraulic calculations to be submitted in support of the design of any development. Design flow calculations are to use Appendix B of Part 1 of the Code for EP calculations, or local estimations based on census data at the discretion of GWMWater, and 180L/day/EP as the daily average flow.

3.3.5 (Pg 79) Flow schedule

Flow schedules are to be submitted within a Microsoft Word document in a format that can be edited.

4.2 (Pg 80) Identification of Sewer Systems

See 5.4.6 (Pg 115) Marker Posts.

5.2.3 (Pg 98) Sewer layout

Sewer design shall minimise infrastructure while maintaining access for maintenance. To this end, the following design criteria apply to sewer locations:

- a) For the purpose of minimising infrastructure, for domestic areas sewers shall be constructed parallel to the rear and sides of private properties at an offset of 1.5 m;
- b) For the purpose of maintaining access for maintenance for industrial areas, sewers shall be constructed in the nature strip (road reserve verges);

except where topography, other assets and lot layout does not permit this.

Reasons for deviation from the design criteria should be outlined in the application for approval and access for maintenance must be maintained, if necessary, by provision of 3m

wide access easements. See also GWMWater Policy *Land Acquisitions and Easements for Assets on Private Land (CMS/1752)*.

Sewers shall not be located across the front of lots within the property boundary where satisfactory routes at the back of lots or, in the case of industrial areas, in the nature strip (road reserve verges) are available and viable.

The location of the sewer must consider options for future subdivisional and/or development.

5.2.7.4 (Pg 105) Environmental considerations - Vegetation

The relevant Council's requirements relating to sewers near trees are to be included in the Design Drawings and supporting Documents.

5.2.8 (Pg 106) Detail design considerations - Easements

An easement is required to be created where sewers are installed within private property. The easement shall normally be 3 m wide with the sewer in the centre of the easement. See also GWMWater Policy *Land Acquisitions and Easements for Assets on Private Land (CMS/1752)*. If circumstances require an alternative arrangement, these will need to be approved.

Consideration will be given to shared service easements (stormwater, for example) in consultation with the relevant Authority.

The Developer is responsible for all costs associated with the acquisition of easements that are required for the development.

5.3.6 (Pg 109) Changes in Direction Using a MH

Deflections through the MH:

- More acute than 120° are not permitted
 - Between 90° and 120° are permitted for sewer size up to DN150 if demonstrated necessary for location of mains in accordance with this manual (i.e. along property rear and side boundaries). Requires 1200mm maintenance hole as per 7.6.7 (Pg 158)
- Diameter of MHs
- Less acute than or equal to 90° are permitted

5.4.6 (Pg 115) Marker Posts

GWMWater may request marker posts for gravity sewer maintenance holes (such cases include but are not limited to manholes that are prone to inundation, road sealing, overgrowth or sandblow). Such marker posts shall be cream coloured with a black cap displaying cream or white letters 'MH'.

5.5.7 (Pg 118) Minimum grades for self-cleansing - General

The following Grades table shall guide the selection of As-constructed grades for reticulation sewers servicing residential catchments.

Grades for 150 and 225 mm nominal size pipelines

Pipe Size		150 mm		225 mm	
Minimum Grade		Tenements		Tenements	
1 in X	%	Min.	Max.	Min.	Max.
70	1.4	1	237		
80	1.25	2	221		
90	1.11	6	208		
100	1	11	196	18	609
110	0.91	16	186	23	580
120	0.83	22	178	29	553
130	0.77	28	170	36	530
140	0.71	35	164	43	510
150	0.67	42	158	51	492
160	0.63	49	152	59	475
180	0.56	61	143	73	446
200	0.5			90	422
220	0.45			113	401
250	0.4			145	374
300	0.33			186	339

A minimum 10% construction tolerance is to be allowed in the design grades. The number of tenements to be serviced immediately as well as ultimately shall be considered.

Shallower grades will not be approved.

5.5.9.1 (Pg 121) Maximum Grades - Reticulation and Branch Sewers

Approval of grades generating velocities greater than 3m/s may require specialised infrastructure and will require supporting engineering analysis indicating the suitability of the solution.

5.6.3 (Pg 122) Vertical alignment of sewers - Minimum cover over sewers

As specified in Table 5.11 except the minimum cover is 600 mm in residential property not subject to vehicle loading.

More severe requirements of the responsible road owner shall take precedence.

6.3 (Pg 132) Methods of the property connection - General

Use the 'inspection opening interface method' for the point of connection.

Portions of service connections owned or to be gifted to GWMWater must be a minimum diameter of 100mm, or larger as advised by GWMWater.

6.6.2 (Pg 140) Y - Property connection

Type Y Branch Connections are not permitted.

6.7 (Pg 141) Length of property connection sewers

For end-of-line road crossings, 100 mm property connection sewers up to 25 metres in length are acceptable for individual properties only.

Unless otherwise expressly permitted in writing by GWMWater, property connection sewers shall only exist within easements vested to GWMWater and within the serviced property.

7.1 (Pg 142)

Maintenance chambers are not accepted.

7.2 (Pg 142) Locations of maintenance structures

Change (f) to 'Stepped changes of sewer invert level.'

(g) is replaced by: Changes of pipe material, including going from pipes of the same material but a different profile or ID (e.g. going from profile wall pipes to solid wall or jacking pipes), except:

- i. for the purposes of repair or maintenance, with permission from GWMWater; or
- ii. where extending from a pre-existing main, with written permission from GWMWater.

7.3.2 (Pg 145) Maintenance structure spacing - Reticulation sewers

The maximum distance between maintenance holes is 90 m.

Where a terminal maintenance shaft is permitted it must be within 60m of the maintenance hole as per 7.7 (Pg 159) Maintenance shaft - General.

Other maintenance structures types are not permitted without written consent from GWMWater.

7.4 (Pg 146) Special considerations for location of maintenance structures

Add:

(c) Where the maintenance structure is in a depression and there is potential for stormwater inflow through the cover.

7.5 (Pg 147) Special considerations for connection of new sewers to existing sewers

Water seals on connections are not permitted.

7.6.2 (Pg 148) Types of MH construction

See SECTION 5: APPROVED PRODUCTS AND MATERIALS

7.6.7 (Pg 158) Diameter of MHs

Maintenance holes with internal diameter smaller than 1050mm are not permitted.

Maintenance holes of 1200mm internal diameter are required for the following:

- a) where there are two internal drops.
- b) for sewers of 300 mm diameter or greater.
- c) where three inflow branches are located.
- d) where flow deflections greater than 90 degrees and less than 120 degrees are permitted as per 5.3.6 (Pg 109) Changes in Direction Using a MH.

7.6.9 (Pg 158) Maintenance holes - Ladders, step irons and landings

Ladders or step-irons are not permitted in maintenance holes. A MH is a confined space entry. Any step irons or ladders used in construction shall be removed and the holes shall be sealed with an approved product as given in SECTION 5: APPROVED PRODUCTS AND MATERIALS of this manual.

7.7 (Pg 159) Maintenance shaft - General

Inspection shafts and in-line maintenance shafts are not permitted.

Terminal maintenance shafts are only permitted at the permanent end of reticulation sewers provided a Maintenance Hole is located within 60 m along the flow path of the sewer. At its discretion, GWMWater may grant an exception to this if it benefits a staged development and if the TMS will be removed or replaced in a subsequent stage.

For end-of-line (terminal) maintenance shafts, utilise a 45degree bend at least 1m past the last oblique, then an additional 200mm of pipe, then another 45degree, then vertical to surface. This is to facilitate access for maintenance equipment to the main and the last oblique.

7.7.4 (Pg 163) High level connection to MCs, MSs and TMSs

Maintenance shafts and Terminal maintenance shafts can incorporate no more than one high-level property connection sewer discharging directly into the riser shaft.

8.3 (Pg 185) Vertical and near vertical sewers - General

Use of vertical or near vertical pipe structures in lieu of MHs are not permitted.

8.4 (Pg 186) Ventilation - Design parameters for vents

Ventilation structures are not required for mains up to DN450mm, however a GWMWater approved epoxy-resin coating of the entry maintenance hole is required where pressure sewer mains discharge to a gravity sewer.

9.1 (Pg 197) Structural design - General

The Developer is required to specify the method of compaction used to achieve the minimum compaction density index as outlined in Section 22.3 of the Code and to include the specification on the Design Drawing.

10.2.3 (Pg 204) Drafting standards - Scale

GWMWater's preferred scales are:

Detail Plan	1:500
Horizontal component of longitudinal sections	1:1000
Vertical component of longitudinal sections	1:100

And for projects with short pipeline lengths:

Horizontal component of longitudinal sections	1:500
Vertical component of longitudinal sections	1:50

10.2.5 (Pg 220) Design drawings - Sewers

Change to: '(i) Type and depth of property service connections.'

Change to: '(j) Directions for connection to existing system including distance and bearing.'

Appendix B (Pg 1) Estimation of equivalent population - General

Design flow calculations should be made using Appendix B and using 180 L/d/EP as the daily average flow, unless written approval is given for an alternative.

Note the typographic error in WSSA Code: For 'Table A2' see page 107 WSA 02 2002 v2.3.

Appendix C (Pg 1) Flow estimation for undeveloped areas - General

Use containment factor 1.3 (as per Table C.3 ARI 5years).

Use C factor (Table C.1 leakage severity coefficient) 1.0 for new and proposed infrastructure. For existing infrastructure, use $C = S_{\text{aspect}} + N_{\text{aspect}}$ with N_{aspect} of 0.5 and S_{aspect} as per:

Formation Name	Soil Aspect, S _{aspect}
swamp and lake deposits (Qm1): generic	0.8
Yamba Formation (Qxy): Generic	0.8
Blanchetown Clay (Qxb): Generic	0.6
Shepparton Formation (Nws): generic	0.6
lake deposits (Ql2): generic	0.6
Calivil Formation (-Pxa): generic	0.6
lunette deposits (Ql1): generic	0.6
dissected colluvium (Qc5): generic	0.5

Formation Name	Soil Aspect, Saspect
colluvium(Qc1): generic	0.5
lunette and lake deposits (Ql): generic	0.5
source-bordering dune deposits (Qdi): generic	0.5
inland dune deposits (Qd1): generic	0.5
White Hills Gravel(-Pxx): generic	0.4
Woorinen Formation (Qxx): Generic	0.4
Albion Formation(-Caa): contact aureole hornfels	0.4
Silverband Formation(Sks): generic	0.4
Albion Formation(-Caa): generic	0.4
alluvium(Qa1): generic	0.4
Magdala Volcanics(-Cxd): generic	0.4
Newer Volcanic Group - basalt flows (Neo): generic	0.3
Ararat Granodiorite(G380): generic	0.3
Burrumbeep Granodiorite(G381): generic	0.3
Mafeking Granodiorite (G396): generic	0.3
Tuloona Granodiorite (G425): generic	0.3
Two Eyed Creek Granodiorite (G387): generic	0.3
Serra Sandstone (Skms): hornfels	0.3
Silverband Formation(Sks): contact aureole hornfels	0.3
Pyrenees Formation (-Cap): hornfels	0.3
Lexington Schist (-Crl): hornfels	0.3
Warrak Formation (-Caw): hornfels	0.3
Leviathan Formation(-Cal): hornfels	0.3
Wartook Sandstone (Skmw): hornfels	0.3
Moora Moora Sandstone (Skmm): contact metamorphic hornfels	0.3
Carrolls Amphibolite (-Crc): contact aureole hornfels	0.3
Deenicull Schist (-Crd): contact metamorphic hornfels	0.3
Rhymney Schist(-Crr): contact metamorphic hornfels	0.3
Good Morning Bill Schist (-Crg): contact metamorphic-hornfels	0.3
Magdala Volcanics(-Cxd): hornfels	0.3
dissected granite-derived colluvium (Nc4): generic	0.3
Molineaux Sand (Qxm): generic	0.3
alluvial terrace deposits(Qa2): generic	0.3
incised alluvium (Na): generic	0.3
Pyrenees Formation (-Cap): generic	0.3
Leviathan Formation(-Cal): generic	0.3
Red Man Bluff Subgroup(Skr): generic	0.3
Glenthompson Sandstone(-Cng): generic	0.3
Warrak Formation (-Caw): generic	0.3
Wonga Schist (Dxo): generic	0.3
Carrolls Amphibolite (-Crc): generic	0.2
Mount Stavely Volcanic Complex (-Cs): generic	0.2
Murray Hill Sandstone(Skrm): generic	0.2

Formation Name	Soil Aspect, Saspect
Major Mitchell Sandstone(Skra): generic	0.2
Moora Moora Sandstone (Skmm): generic	0.2
Curtis Diorite (G386): generic	0.2
duricrust (Czf): generic	0.2
Epacris Hills Granite (G397): generic	0.2
Wycheproof Granite (G332): generic	0.2
Harrow Granodiorite (G407): generic	0.2
Stawell Granite(G379): generic	0.2
Kout Norien Granodiorite(G410): generic	0.2
Serra Sandstone (Skms): generic	0.2
Wartook Sandstone (Skmw): generic	0.2
Kalymna Falls Sandstone (Skrk): generic	0.2
Loxton Sand (Nwl): generic	0.2
Deenicull Schist (-Crd): generic	0.2
Lexington Schist (-Crl): generic	0.2
Rhymney Schist(-Crr): generic	0.2
Good Morning Bill Schist (-Crg): generic	0.2

Replace Table C2 with:

City	I (1,39.35)
Birchip	19.0
Wycheproof	19.1
Ultima	18.2
Charlton	18.8
Sea Lake	18.1
Hopetoun	18.0
St Arnaud	18.4
Rainbow	17.7
Willaura	17.8
Stawell	18.1
Warracknabeal	17.6
Rupanyup	17.7
Lake Bolac	17.6
Jeparit	17.5
Ararat	17.9
Ouyen	17.0
Donald	17.7
Minyip	17.5
Great Western	17.8
Halls Gap	17.7
Murtoa	17.2
Nhill	16.8

City	I (1,39.35)
Dimboola	16.6
Horsham	16.5
Kaniva	16.2
Natimuk	15.8
Serviceton	15.9
Edenhope	15.9

PART 2: CONSTRUCTION

Quality - Inspection and Test Plans

The Developer shall provide GWMWater with a *Notice of Commencement of Works* at the start of the construction. A representative of GWMWater will conduct pre-arranged inspections associated with the excavation and pipelaying, construction of maintenance holes and will conduct a final inspection audit before acceptance of assets.

GWMWater will nominate the location of required compaction tests. This will include at least one test along the trench between each maintenance structure, and may include one test at each maintenance structure. If plastic type manholes are used, a compaction test is required at each metre of rise (for example, a 3m deep manhole will have 3 compaction tests).

The Developer, or their Consultant or Contractor, shall provide GWMWater with certification of trench compaction and vacuum or air pressure test results. When requested, the Developer shall provide GWMWater with quality assurance documentation on activities such as materials handling and storage. All associated costs are to be borne by the Developer, including rectification costs.

12.5.1 (Pg 229) Protection of other services

The Developer is responsible for satisfactorily repairing other Service Owner assets.

13.1 (Pg 236) Approved Products and Materials

See SECTION 5: APPROVED PRODUCTS AND MATERIALS

14.2 (Pg 240) Limits of Clearance and excavation

Where minimum cover cannot be achieved, alternative proposals with supporting analysis demonstrating the integrity and maintainability of the infrastructure are to be submitted to GWMWater for consideration. Any approved alternative proposals are to be specified on the design drawings.

19.3.1 (Pg 264) Compaction of embedment - Methods

Flooding compaction is not permitted.

20.1 (Pg 267) Compaction of trench fill

The Developer is required to specify the method of compaction used to achieve the minimum compaction density index as outlined in Section 21.3 prior to approval of the Design Drawing.

21.1 (Pg 270) Acceptance testing - General

The methods of rectification are to be approved by GWMWater.

21.3.1 (Pg 271) Compaction testing - General

Final certification from the NATA accredited tester and the location of all tests will be required to demonstrate that the specified compaction was achieved at all test locations.

23 (Pg 288) Connection to existing sewers

The Developer shall not commence work which involves entry into live sewer mains or maintenance structures **without written permission from GWMWater.**

A minimum of two working days' notice is required **for** intention to make a connection to the existing sewer network.

25 (Pg 291) Work-As-Constructed details

"Work-As-Constructed" drawings and documentation **must be delivered to GWMWater satisfaction** before Preliminary **Acceptance** can be issued by GWMWater.

Drawings shall be provided in AutoCAD format (with .dwg file extension) and PDF format (with .pdf file extension).

The following "Work-As-Constructed" information is to be provided on drawings and documentation:

- a) Cadastral information including streets, street names, lot numbers and easement locations.
- b) Survey levels at control points and connections to property in metres AHD.
- c) Municipal boundaries.
- d) Sewer pipe material and class.
- e) Pipeline diameter.
- f) Pipeline location including offsets from property boundaries.
- g) Pipeline level (i.e. invert) and grade.
- h) Pipeline distances.
- i) Location of nearby utility services and stormwater drains.
- j) Major features (e.g. creeks, railway lines, power transmission cables).
- k) Details of property connection sewers.
- l) Property connection number.
- m) Directions for connection to existing system including distance and bearing.
- n) Details of maintenance structures, e.g. MH number/description, size, cover type.
- o) Feature surveyed information of maintenance structures, e.g. location, surface level, invert level.**
- p) Vent shaft details – location, diameter, height and material.
- q) Lengths of pipeline between the centreline of structures, e.g. MHs.
- r) Additional geological, construction and safety requirements.
- s) Geotechnical data, special foundation conditions, dewatering requirements.
- t) Lot control and property connection depths.
- u) Month and year of construction.
- v) Costs of constructed assets.

w) Any other relevant information.

Asset attribute data is to be captured for all assets created. Data is to be presented on the as-constructed drawings. A template example of an as constructed drawing (.pdf: [R2021-15057](#), .DWG: [R2021-15058](#), .DWT: [R2021-15060](#)) is available from the Development Officer.

SECTION 2: WSA 03 - 2011 V3.2 WATER SUPPLY CODE OF AUSTRALIA

PART 0: GLOSSARY OF TERMS, ABBREVIATIONS AND REFERENCES

Where alternative terms are defined in the Code, GWMWater prefers the following:

- a) Nature strip is used in Victoria instead of “verge”. It is the area between the footpath and kerb or road carriageway
- b) Property Service Connection
- c) Private water service pipe
- d) Reticulation main - generally water mains DN 250 or less
- e) Distribution main - generally water mains greater than DN 250

Note also that WSAA recommend reclaimed water markers utilise ‘Non-Drinking Water’ however GWMWater require ‘Recycled Water’ as the appropriate naming convention. Use of ‘Non-Drinking Water’ risks confusion with our ‘raw water’ systems and is not permitted. For any taps, it is appropriate to mark ‘Recycled Water Do Not Drink’.

PART 1: PLANNING AND DESIGN

1.2.5.1 (Pg 68) Detailed design - Designer’s needs and responsibilities

The Developer is responsible for obtaining GWMWater’s written approval for deviations from the Water Supply Code and this Manual.

GWMWater does not prepare Concept Plans but can provide advice of any specific requirements to the Developer. The Developer shall, at the beginning of the development, establish from GWMWater the ability of existing water infrastructure to service the land development proposal.

The design proposal shall demonstrate that the new infrastructure provides adequate levels of service, based on the estimated capacity of the existing infrastructure.

When requested by GWMWater, the Developer shall establish the current flow and pressure status of the existing water reticulation system from fire hydrant tests within proximity to the proposed development. These tests are to be at the Developer’s expense and the results are to be submitted with documentation for approval. Hydraulic modelling may be required to confirm impacts.

2.3.4.1 (Pg 67) Peak demands - General

When requested by GWMWater, the Designer is to use GWMWater Billing Data (excluding reticulation system losses) and bulk supply data (including unaccounted-for water) to determine Average Day Demand values.

2.5.3 (Pg 79) Operating pressures – Service pressure

A minimum of 22 m pressure **at ground level at the most disadvantaged property boundary** (to achieve in excess of 20m after losses through the meter and backflow

prevention device) and minimum flow rates as specified in GWMWater’s Customer Charter are required, including Industrial Fire Flows for mains servicing industrial zoned properties and a minimum of 10 L/s at 120 kPa for all urban reticulation hydrants.

2.8.3 (Pg 87 Concept Design (Pumping Stations))

Calculation of average and peak day demand, and average and peak hour demand, for the purpose of sizing pump pressure and flow capacity shall be performed as follows:

1. The data to be used for developing demand profiles and estimates shall be, in order of preference:
 - a. GWMWater remote metering data
 - b. GWMWater billing data
 - c. GWMWater bulk supply data

If none of ‘a’, ‘b’ and ‘c’ are available:

 - d. Use the following litres per person and assume a household of 2 persons per residential lot and adopt an appropriate estimate for commercial and industrial properties:

	Average	Peak
Daily Flow	300 litres per person per average day	Peak Daily Flow = Average Daily Flow × ‘d Factor’ (see appendix C2 WSAA 02) litres per person per peak day
Hourly Flow	‘Average Daily’ ÷ 24 litres per person per average hour	‘Average Daily’ ÷ 24 × 6 litres per person per peak hour

2. If the pump is being sized for an existing catchment, utilise data relevant to that exact catchment, else utilise data from the town in question or from an equivalent data set as advised by GWMWater.
3. Develop daily and hourly demand histograms to identify the 90th percentile peak and average day and hour demands.
4. For pump stations directly supplying customers (distribution or booster pump stations):
 - a. system design must be pressure set point, allowing VSD and series pumps to increase flow at that set point;
 - b. system must be designed to achieve:
 - i. 10 L/s at 120 kPa coincident with a 90th percentile peak hour demand from the most hydraulically disadvantaged residential zoned hydrant.

- ii. 2 hydrants at 10 L/s at 200 kPa each, coincident with a 90th percentile peak hour demand from the most hydraulically disadvantaged commercial/industrial zoned hydrant.
5. Add a growth factor as advised by GWMWater and consistent with any Development Servicing Plans over a 25year horizon.

Fire Detection and Prevention

Pumping stations require smoke alarms. For sites with bushfire risk or sites with less than 2 residential properties within 100m require smoke alarms to trigger critical alarm on GWMWater's SCADA system.

2.9 (Pg 88) Service Reservoirs

Further requirements for 'Service Reservoirs', including tanks and elevated tanks, are as follows.

Access

The site must have access via an all-weather track to facilitate maintenance and emergency response. The access must be via public roads, and/or easements vested to GWMWater. See also GWMWater Policy *Land Acquisitions and Easements for Assets on Private Land (CMS/1752)*.

Power - Renewable Readiness

GWMWater require that the design and construction of Infrastructure support future transition to the integration of on-site renewable energy generation and storage systems into the assets to be created, or upgraded with an augmented capacity, to operate at a maximum power demand up to 100kW. Hence, the Developer is to meet the following deemed-to-comply provisions in its design and construction works:

- Provision of additional land/space area for future installation of solar PV arrays ("PV Array Site") in accordance with TABLE 1 and the corresponding computational criteria as enumerated, as follows:
 - (a) The calculated $A_{L/G}$ and $A_{R/S}$ should at least be rounded up to the nearest tens in square metres (m²) to give the minimum area to be reserved for the PV Array Site.
 - (b) The area should either be part of the land reserved for the asset in question or a land adjacent thereto.
 - (c) The rooftop / structure-top area on a building or top surface of a structure (e.g. water storage tank, shed, etc.) to be constructed as part of the assets, or an aggregate area thereof, may be considered provided following criteria are met :
 - (i) The preferred option of the provision of additional land or ground space being required for the PV Array Site is either unavailable or unfeasible as substantiated by the Developer.

- (ii) The minimum aggregate area $A_{R/S}$ calculated as per TABLE 1, is available across multiple suitable buildings and/or structures.
- (iii) The structural design of the affected rooftop or/and structure-top is/are suitable for supporting the aggregate weight of a typical PV array installation based on true-north-facing 20°-30° tilt-mounting or an average static load pressure of 4.0Pa, whichever is the greater.
- (iv) The structural design of the affected rooftop or/and structure-top has/have been certified by a Victorian-registered Professional Engineer as suitable for supporting a typical PV array installation at height based on the existing site conditions and the selected design of Infrastructure - such structural certification must specify the height, surface pitch, wind region, terrain category and purlins & truss design details at a minimum, which influence such suitability.

TABLE 1 : PV Site Array - Space Requirement

Option	Minimum Space Required (m ²)	Notation
Land / Ground space (preferred option)	$A_{L/G} = 30MD + \frac{EC}{100}$	$A_{L/G}$: minimum clear land area (m ²) being required for PV Array Site $A_{R/S}$: minimum clear aggregate rooftop or/and structure-top area (m ²) being required
Rooftop / Structure-top space	$A_{R/S} = 15MD + \frac{EC}{200}$	MD : maximum system power demand (kW) of the assets to be constructed as estimated over its operational life EC : projected annual electricity consumption (kWh/year) of operating and maintaining the assets at its design utilisation capacity and projected load profile

- Provision of additional space for the installation of power conversion equipment (PCE) and battery energy storage system (BESS), whether it is an interior floor space close to a proposed indoor electrical main switchboard/motor control centre (MCC)/equipment control panel (collectively referred to as “MSB”) or an aggregated fully-enclosed space within a single or multiple cabinets dedicated to the same installation, sized in accordance with TABLE 2 meeting the prerequisite conditions.

TABLE 2 : PCE & BESS - Space Requirement

Option	Minimum Space Required (m ³)	Notation	Prerequisite Conditions
Indoor MSB – interior clear space in the vicinity of MSB	$V_{B/S} = A_{B/S} \times H_{FC}$ <i>where :</i>	$V_{B/S}$: minimum clear interior spatial volume (m ³) being required for PCE and BESS installations	The calculated $V_{B/S}$ should at least be rounded up to the nearest tens in cubic metres (m ³) to give the minimum spatial

<p>within a building/shed forming part of the Infrastructure</p>	$A_{B/S} = \frac{3MD}{100} + \frac{7EC}{1000}$	<p>A_{B/S} : minimum clear interior floor area (m²) being required for PCE and BESS installations</p> <p>H_{FC} : full floor-to-ceiling height</p>	<p>volume to be reserved.</p> <p>The interior space should be an appropriately air-conditioned, fully-enclosed and access-restricted area that is suitable for housing electrical assemblies including PCE and BESS installations.</p>
<p>Outdoor MSB – dedicated spare compartment space within MSB and/or spare weatherproof electrical cabinet(s) in the vicinity of MSB</p>	$V_{C/E} = \frac{3MD}{100} + \frac{7EC}{20000}$	<p>V_{C/E} : minimum aggregate clear interior spatial volume (m³) being required for PCE and BESS installations – contained within single or across multiple cabinets / compartments / enclosures being suitable for electrical assemblies.</p> <p>MD : same meaning as defined in the notation of TABLE 1</p> <p>EC : same meaning as defined in the notation of TABLE 1</p>	<p>The calculated V_{C/E} should at least be rounded up to the nearest tens in cubic metres (m³) to give the minimum aggregate spatial volume to be reserved.</p> <p>For aggregated space from multiple enclosures, the minimum spatial volume of each enclosure must not be less than 0.86m³, with each dimension being at least 0.6m.</p> <p>For multiple enclosures including the MSB, spare underground conduits (2 x 50mmØ) must be pre-installed to facilitate future interconnection cabling between each enclosure and MSB.</p> <p>All enclosures including that of MSB must be designed and constructed fit-for-purpose, in compliance with the current version of AS/NZS 61439.</p>

- Provision of fit-for-purpose dedicated cable pits complete with lids, both designed to withstand ‘Class C’ loading in accordance the current version of AS 3996 and installed with effective drainage to minimise water-ponding/waterlogging within the underground interconnected cabling support infrastructure as a minimum, at the following locations :
 - (a) a cable pit (“Array Interface Pit”) at the edge of the reserved ground-based PV Array Site.
 - (b) a cable pit (“Power Interface Pit”) immediately before the cable entry into a building/shed or an outdoor MSB, as the case may be.
 - (c) intermediate cable pit at each turn of direction or every 100m in linear-run, where applicable, along the intended cabling path connecting Array Interface Pit to Power Interface Pit.

- Provision of spare underground HD conduits (2 x 50mmØ) with pit-to-pit draw-strings, end-capped within each pit to minimise excessive water ingress and silt-clogging, to facilitate future underground cabling work.
- Provision of two (2) spare functional units (pre-installed interface switchgears of capacity $I_{S(min)}$) that are ready for connection at the MSB in accordance with TABLE 3 to facilitate future integration of any renewable energy systems.

TABLE 3 : Power Interface - Connection Requirement

Pre-installed Functional Unit (Interface Switchgear)	Feasible Switchgear Rating (A)	Notation	Prerequisite Conditions
Either moulded-case circuit breaker (MCCB) or miniature circuit breaker (MCB)	$I_c = \frac{20MD}{11}$	<p>I_c : calculated capacity (A) of the pre-installed interface switchgear</p> <p>MD : same meaning as defined in the notation of TABLE 1</p>	<p>The calculated I_c should at least be rounded up to the nearest tens in amperes (A) to give the minimum current-carrying capacity of the pre-installed functional unit.</p> <p>The minimum capacity (A) of the pre-installed interface switchgear $I_{S(min)}$ should be the lesser of I_c and I_N.</p> <p>The actual rating of the functional unit should be the next available standard rating from the selected manufacturer, based on $I_{S(min)}$.</p> <p>The pre-installed functional unit must be at least of the same breaking capacity or short-circuit withstand strength as the proposed MSB design.</p>
	$I_N = I_o$	<p>I_N : nominal capacity (A) of the pre-installed interface switchgear</p> <p>I_o : rated MSB capacity (A) proposed for the operating assets</p>	

For Infrastructure designed with, or upgraded with an augmented capacity to operate at, a maximum electrical demand exceeding 100kW, the Developer shall consult GWMWater on the specific requirements for renewables-readying the new assets to be designed and constructed.

Capacity

Optimal capacity depends on the allowable outage for incoming water, the demand for outgoing water and impacts on water quality. Rural supply systems have an allowable outage of three days. Water treatment plants have an allowable outage of one day. Urban water systems have fire flow demands. Drinking water systems have requirements for chlorine contact time and chlorine residual.

Capacity may be provided by a combination of elevated tanks, ground tanks and/or earthen storages.

A tank or set of tanks:

- If fed from rural pipeline, must be sufficiently sized to meet three days average demand; and
 - If fed from water treatment plants must:
 - Meet 1.5 times peak day demand
 - Meet Australian Drinking Water Guidelines for:
 - minimum chlorine contact time; and
 - minimum chlorine residual (based on hydraulic modelling).
 - If fed from more than one bore, must be sufficiently sized to meet 5 hours peak day demand; and
 - If fed from only one bore, must be sufficiently sized to meet 1.5 days peak day demand; and
 - If servicing urban customers, they must also be sufficiently sized to meet one average day demand concurrent with four hours of urban fire flow (10 L/s at 120 kPa at the most hydraulically disadvantaged urban hydrant); and
 - If servicing industrial customers, they must also be sufficiently sized to meet one average day demand concurrent with four hours of industrial fire flow (20 L/s at 200 kPa at the most hydraulically disadvantaged industrial property, either as 20 L/s from one hydrant or 10 L/s from two hydrants); and
 - Must reflect growth requirements in any relevant Development Servicing Plan, including any required provisions for future capacity upgrades (such as provision of land and installation of additional blanked junctions); and
 - If the set of tanks include an elevated tank, it must meet capacity requirements as set out above either:
 - on its own; or
 - minimum 5 hours peak day demand in the elevated tank and the remainder made up by ground tanks and lift pumps to the elevated tank with alternative energy source (such as battery or generator) (provision of power to site must be aligned with GMWWater's renewable energy plan) ;
- and
- The effect of water carting and other contingencies may be used to reduce the capacities required above.

Note also that Water Treatment Plants shall be sized such that a downstream storage sized to 1.5 peak day demand is diminished by no more than ten per-cent during three consecutive peak days, assuming the plant produces water 20 hours per day (allowing 4 hours per day for backwash and incidental downtime).

Redundancy

A plan must be established for continuation of service in the event of failure or offline maintenance of the tank. The plan must be included in the O&M Manual. Options depend on the operating environment and required level of service, and include but are not limited to: do nothing, dual tanks, alternate supplies, and water carting.

Configuration

A single tank may be permitted where alternative redundancy has been established.

Multiple tanks may be required or preferred for:

- Increased redundancy
- Cost reduction
- To allow offline maintenance

A bank of poly tanks may be considered (for cost reduction purposes) provided that safe access is maintained for removal of accumulated sediment by scouring and jetting, or vacuum cleaning.

Where multiple tanks are installed, they must be configured with appropriate valves such that flow can be directed:

- through any of the tanks independent of the others (to allow offline maintenance); and
- all tanks simultaneously (for the purpose of reducing the maximum water age).

The operating procedures must be documented in the O&M Manual.

Materials - Water Quality

Tank materials (including any coatings, joint seals, curing agents, chem-set anchors and the like) in contact with water must meet AS:4020. Evidence must be provided to GWMWater's satisfaction.

Materials - Longevity

Selection of tank material should include an NPV assessment taking into account expected life and ability to detect and prevent deterioration (assets cannot be assessed as safe may be replaced earlier due to risk despite manufacturer claims for longevity).

Contaminant Ingress

For tanks used in potable supplies, design must prevent contaminant ingress (includes but not limited to filtered water tanks, clearwater tanks and chlorine contact tanks).

Ventilation

Ventilation is not required for poly tanks.

Ventilation is required for all other tanks to limit corrosion of the roof structure and assist in supporting water quality and in minimising OHS risks during confined space entry.

Ventilation shall be achieved by inlet ventilation openings provided at the top of the wall strake together with ventilators located at the centre of the roof structure. Ventilators shall be designed for 6 air changes per hour based on the air volume above TWL. All ventilators shall be designed to prevent vermin access (via marine grade aluminium mesh or stainless-steel mesh) and shall avoid contaminant ingress by drainage.

Level Sensor

Level sensor(s) interfaced with SCADA are required sufficient to allow SCADA visibility of the on-line and accessible volume in storage under all valving scenarios.

Flow Meter

Requirement for a flowmeter is to be confirmed with GWMWater. If a flow meter is required, it shall be a MagFlow meter interfaced with SCADA.

Scour & Overflow

Each tank must have a scour outlet. Each tank must be equipped with an overflow pipe. This may be connected into the scour pipe provided there are no valves at or downstream of the connection. For tanks greater than 50kl the overflow must be a minimum of 200mm above top water level (TWL) and 300mm clear (vertically) of any roof component. The scour and overflow must waste to stormwater; or, if stormwater access is not available, to a natural drainage pathway. For wasting water flows, an energy dissipation pit or structure is required for all elevated tanks and for ground tanks wasting to a natural drainage path.

Stormwater Drainage

The tank roof and surface level adjacent the tank must be designed to direct flow of rainwater away from the tank and must be designed to prevent surface water flow or accumulation within 2m adjacent the tank (to protect the foundations).

3.3 (Pg 97) Hydraulic design – Pressure Class of System Components

The minimum pressure class of pipes shall be PN 16 in urban water supply systems and PN 12 in rural supply systems.

4.3.2 (Pg 105) Ductile Iron Pipeline Systems – Sizes and configurations

Pre-tapped connectors are not required.

5.2.4 (Pg 122) Reticulation design for water quality – Reduced size mains

In reference to Fig 5.2, for courts, a closed loop of DN63 HDPE pipe is required. Fire hydrants shall be installed before the loop on DN100 pipe.

5.4.1 (Pg 124) Location of water mains - General

GWMWater will not accept pressurised mains installed in private property. See also GWMWater Policy *Land Acquisitions and Easements for Assets on Private Land (CMS/1752)*.

5.4.2 (Pg 125) Location of water mains - Water mains in road reserves

Where pipelines are to be constructed beneath existing or proposed road pavements any of the following pipe materials shall be used in accordance with **SECTION 5: APPROVED PRODUCTS AND MATERIALS; WATER NETWORKS** of this document:

- a) Ductile iron cement lined (DICL) PN 20 pipes.
- b) Modified PVC PN 16 Series 2 pipes.
- c) Oriented PVC PN 16 Series 2 pipes.
- d) HDPE PN16 PE100

The pipes shall extend at least 500 mm behind the back of the kerb, or if there is no kerb, at least 500 mm beyond where a future kerb is expected to be, i.e. beyond the road shoulder, or open drain.

The use of these pipe materials shall apply to both the lateral crossing of roads and longitudinally along the road or shoulder.

The minimum depth of cover beneath existing or proposed road pavements shall be 750 mm, or greater if required by the road authority.

5.4.4 (Pg 126) Location of water mains - Water mains in easements

The Developer shall be responsible for all costs associated with the acquisition of easements that are required within the development. GWMWater will not accept pressurised mains installed in private property. See also GWMWater Policy *Land Acquisitions and Easements for Assets on Private Land (CMS/1752)*.

5.4.11 (Pg 132) Location of water mains - Crossings of creeks or drainage reserves

It is the responsibility of the Developer to determine from the relevant Catchment Management Authority (CMA) the design requirements for crossing the river, creek or drainage reserves.

5.11 (Pg 143) General design - Property services

Property services are installed after consent to connect is given. No tappings are permitted prior to consent to connect. No tappings are permitted without an account holder and a water meter. This effectively precludes tappings at the time of water main construction (known as 'dry tappings').

Tapping of water mains greater than DN 300 is not permitted.

Property services must be in accordance with GWMWater Connection to Water Services Policy.

5.11.2 (Pg 143) Property services - Connections to water mains

Property services must be in accordance with GWMWater Connection to Water Services Policy.

5.11.3 (Pg 144) Property services - Services, outlets and meters

Valves installed in service connections are to comply with Australian Standards AS 4796-2001 and AS 1628-1999 / Amendment 1-2001.

7.1 (Pg 180) Structural design - General

The Developer is required to specify the method of compaction used to achieve the minimum compaction density index as outlined in Section 19.3. The method is to be included in the design documents submitted for approval.

7.4.2 (Pg 182) External forces – Pipe cover

The minimum cover for water mains is:

- a) 600 mm for non-trafficable areas and all nature strips.
- b) 750 mm beneath trafficable areas, existing or proposed road pavements, or greater if required by the road authority.

7.5.1 (Pg 185) Geotechnical considerations – General

Approval is required for the use of pipe support types in this section.

7.9.2.2 (Pg 194) Pipeline anchorage – Concrete Thrust blocks

Minimum concrete strength for thrust blocks shall be 20 MPa.

7.9.2.4 (Pg 199) Pipeline anchorage – Timber and Recycled Plastic Thrust blocks

Timber thrust blocks are not acceptable as permanent support. Recycled plastic blocks may be used for pipes up to and including 100 mm nominal diameter.

7.10 (Pg 205) Bulkheads and trenchstops

Approval is required for the use of concrete bulkheads.

8.2.7.1 (Pg 224) Stop valves – location and arrangements - General

Valves shall be provided at all junctions between mains and shall be located in the nature strip at least 300 mm from any kerb or trafficable area (if no kerb), unless otherwise approved.

Where the Tee is in the nature strip further than 300 mm from a kerb, the valve(s) shall be flush against the Tee (as per Arrangement 1).

Where the Tee is located in the road pavement or within 300 mm of the kerb the valve(s) shall be installed three metres further in from the corner of a property boundary (as per Arrangement 2).

Stop valves located in trafficable areas are not permitted, unless no other alternative is available.

In rural areas, stop valves are to be installed in accordance with the GWMWater *Rural Pipeline Design Specification*.

8.8.8 (Pg 245) Hydrants - Hydrant spacing

The maximum hydrant spacing in urban districts shall be 90 metres unless otherwise agreed by the relevant local Council in consultation with GWMWater.

8.8.9 (Pg 245) Hydrants - Hydrant location

Fire hydrants must be installed in accordance with ordinance 56.09-3 to the Victorian Planning Scheme Provisions. For more information see [Statutory planning subdivision | CFA \(Country Fire Authority\)](#).

In rural areas, above ground-type hydrants are to be installed in accordance with the GWMWater [Standard Drawings - Rural Pipelines \(R2021-48120\)](#).

Fire plug covers are to be marked 'FP' or 'Fire Plug' as approved by GWMWater in consultation with the relevant Council.

Marking must be in accordance with CFA requirements [Identification of Street Hydrants for Firefighting Purposes](#) (or as amended).

The type of hydrant cover for non-trafficable conditions shown in Fig 8.33 is not approved by GWMWater.

Cast iron fire plug covers are required for all urban and rural hydrant locations. Other materials will not be accepted by GWMWater.

Any more severe CFA and Fire Rescue Victoria requirements take precedence.

8.10.3 (Pg 249) Marking of Surface Fittings

Covers and surrounds for recycled water isolation valves shall be lilac coloured.

8.11.2 (Pg 253) Appurtenance location marking - Marker posts and plates

Marker posts are required for valves, hydrants and meters that are outside Urban Supply Districts.

Marker posts for water meters shall be blue-coloured with white caps, with a white letter M on a blue or black marker plate.

Marker posts for isolation valves, scour valves and air release valves:

- For recycled water, marker posts shall be lilac coloured with white cap and lilac or black letters on white marker plates and shall include the lettering 'RECYCLED WATER'.

- In all other cases shall be yellow-coloured with black caps, with black letters on white marker plates.
- Letting shall be:
 - V for isolation valves
 - SC for scour valves
 - AV for air release valves

9.2.1 (Pg 254) Design drawings - General

Drawings shall be provided in AutoCAD format (with .dwg file extension) and PDF format (with .pdf file extension) for acceptance by GWMWater before “Construction Issue” design drawing can be issued.

PART 2: CONSTRUCTION

11.2 (Pg 261) Order of construction, testing and commissioning

The Developer shall provide a *Notice of Commencement of Works* to GWMWater at least two working days prior to the start of the construction. The Works Quality Controller will conduct inspections associated with the excavation and pipe laying and will conduct a final inspection audit before acceptance of assets.

The Developer, or their Consultant or Contractor, must provide (i) pressure testing of new urban water mains and/or new urban sewer (gravity) mains and (ii) NATA trench compaction testing. All tests must be carried out in the presence of **GWMWater's Project Officer or nominated representative.**

Pressure testing results and NATA certification of trench compaction must be provided to GWMWater with 48 hours of testing taking place.

All costs associated with compliance checks are the responsibility of the Developer, including rectification costs for non-compliant construction works and retesting.

11.5.1 (Pg 262) Protection of property and environment – Protection of other services

A level of information is available via the *Before You Dig Australia* service (previously known as *Dial Before You Dig*). The Developer may request GWMWater to locate underground services at the Developer's cost (see [Assets Pipelines Locations Policy CMS/749](#)).

12.1 (Pg 271) Authorised products and materials

See SECTION 5: APPROVED PRODUCTS AND MATERIALS, WATER NETWORKS

13.1 (Pg 276) Excavation - Precautions

The Developer is required to comply with the Occupational Health & Safety Legislation and GWMWater's Occupational Health & Safety Policy and Procedures.

15.13 (Pg 290) Valves, hydrants and surface boxes and fittings

Surrounds for valves shall be painted yellow using road surface marking paint.

In accordance with CFA requirements, surrounds for hydrants shall be white.

15.18 (Pg 292) Appurtenance location marking

See 8.11.2 (Pg 253) Appurtenance location marking - Marker posts and plates.

19.3.1 (Pg 306) Compaction testing - General

The Developer is required to specify the method of compaction used to achieve the minimum compaction density as specified in Table 19.1 prior to approval of the Design Drawing.

Final certification from the NATA accredited tester and the location of all tests will be required to demonstrate that the specified compaction was achieved.

19.4.1 (Pg 310) Hydrostatic pressure testing - General

The Contractor must supply all fittings necessary to execute the test.

20.1 (Pg 314) Disinfection - Application

Disinfection in accordance with GWMWater Policy and Procedure ([CMS/3316](#)) all new drinking water mains and any existing drinking water mains taken out of service during construction is required for all sizes of main.

22.1 (Pg 318) Connections to existing water mains - General

The Developer is required to give GWMWater a minimum of five (15) working days' notice before a connection to existing water mains is to proceed. This is to allow for the resourcing of GWMWater operational staff and the provision of *Interruption to Water Supply* notices to effected customers.

The interruption time is for a maximum of three (3) hours.

24 (Pg 323) Work-As-Constructed details

“Work-As-Constructed” drawings and documentation are required before Preliminary Acceptance can be issued by GWMWater.

Drawings shall be provided in AutoCAD format (with .dwg file extension) and PDF format (with .pdf file extension).

These drawings shall include the information as for the Design Drawings (Clause 9.2.4 [Pg 229] of the Code) amended to reflect the actual construction details.

Asset attribute data is to be captured for all assets created. Data is to be presented on the as-constructed drawings. A template example of an as constructed drawing ([R2021-15057](#)) is available from the Development Officer.

SECTION 3: WSA 04 -2022 V3.1 SEWAGE PUMPING STATION CODE OF AUSTRALIA

PART 1: PLANNING AND DESIGN

1.2.2 (Pg 69) Planning - Pumping alternatives

See 2.2.4.2 (Pg 71) Sewage pumping stations (SPSs) under SECTION 1: WSA 02 - 2014 V3.2 SEWERAGE CODE OF AUSTRALIA.

1.5.1 (Pg 71) Planning and design responsibilities - General

The Developer is responsible for obtaining written approval for deviations from the Code and this Manual.

1.5.2 (Pg 71) Planning responsibilities

GWMWater does not prepare Concept Plans, but can provide advice of any specific requirements to the Developer. Present flows at the station are to be determined at this stage.

1.6.4 (Pg 75) Sewer system design approach - Objectives of design

Change (d) to: 'Compliance with environmental requirements including, but not limited to, noise, odour, visual, erosion and landscaping requirements. Evidence of compliance with these shall be provided prior to approval for construction.'

2.2 (Pg 78) Concept design - Functionality

Peak wet weather flow shall be calculated as 'Design Flow' per WSA 02 Appendix C and as amended in this document.

Risk analysis shall be carried out to identify the likelihood of an overflow, where it will occur and how it can be restricted.

2.5 (Pg 79) Concept design - Due diligence requirements

Contingency

A contingency plan shall be prepared as per Figure 2.1 in Code and be approved by GWMWater prior to construction commencing.

Fire Detection and Prevention

Pumping stations require smoke alarms. For sites with bushfire risk or sites with less than 2 residential properties within 100m require smoke alarms to trigger critical alarm on GWMWater's SCADA system.

Environmental

The Developer shall liaise with the Environment Protection Authority Victoria and comply with any sewerage system overflow licence requirements.

2.9 (Pg 82) Odour Management

The designer shall provide evidence that odour generation and control has been considered. This will include calculations (detention times based on average dry weather flow) that demonstrate odour generating potential and how any odours generated will be treated. This will include ventilation calculations and configurations as described in this Manual.

The design shall ensure that the level of hydrogen sulphide discharge from maintenance holes is not likely to cause odours.

The designer will liaise with GWMWater on proposed ventilation and odour control measures.

2.12 (Pg 83) Concept design - Access

In site selection of the new pump station. If the proposed area is not fronted by a public road, appropriate arrangements to obtain unfettered legal access to the pump station is required (i.e. by means of fee simple ownership of land, carriageway easement or lease).

The Developer shall confirm vehicle access requirements with GWMWater.

2.14 (Pg 83) Concept design - Signage

Signs identifying confined spaces must be provided. Each sign must display the classification of the confined space and must be located in a prominent position adjacent to the entry of the confined space.

'No Parking' signs may also be required.

3.2 (Pg 62) Design tolerances

The required coordinate system is MGA Zone 54 for horizontal alignment in metres.

3.14.1 (Pg 97) Commissioning plan - General

The Developer is to submit a commissioning plan at the design stage, for acceptance by GWMWater.

GWMWater representatives must attend the commissioning.

GWMWater will run through a pre-commissioning checklist with the Contractor prior to commissioning. Pre-commissioning will detect any non-compliant items and give the Contractor a chance to rectify before officially commissioning the site.

4.2.3 (Pg 101) Corrosion protection – Concrete surfaces

See SECTION 5: APPROVED PRODUCTS AND MATERIALS, SEWER PUMP STATIONS

4.2.4 (Pg 101) Corrosion protection – Metallic surfaces

See SECTION 5: APPROVED PRODUCTS AND MATERIALS, SEWER PUMP STATIONS

5 (Pg 107) –Products and Materials

See SECTION 5: APPROVED PRODUCTS AND MATERIALS, SEWER PUMP STATIONS

6.2.1 (Pg 123) Pumping station design – Site selection

The Developer shall be responsible for liaising with all stakeholders to determine their requirements, if any, at the preliminary design stage. Stakeholders may include the relevant council, CMA, EPA, DSE, VicRoads, electricity authority and other interest groups. Their requirements are to be included in the preliminary design presented for approval of site location.

Avoid locating a pump station near overhead power lines.

The design shall address environmental impacts and buoyancy effects.

A geotechnical investigation of the proposed site is required.

Under developer works, the developer will be responsible for providing land for pump stations. The land (together with any means of legal access to the land) required by GWMWater for the proposed pump station shall be vested in fee simple in the name of 'Grampians Wimmera Mallee Water' to be freehold land owned by GWMWater at no cost to GWMWater. See also GWMWater Policy *Land Acquisitions and Easements for Assets on Private Land (CMS/1752)*.

GWMWater service vehicles require unimpeded, direct access from the public road to the pump station. A 24-hour, all-weather track must be provided for GWMWater service, repair, carrying a generator or lifting equipment direct access to the pump station. The access tracks must be constructed to carry the weight of a fully loaded truck (min. weight 40 tonnes) and a min. of 3.5 metres wide. This track must be located in GWMWater freehold land, crown land, road reserve, or in private land with carriageway or access easements (or alternatively an explicit land access agreement) in service of this clause provided on the titles.

6.3.2 (Pg 125) Pumping station design - Inlet MH

Grit chambers, screens or isolation valves for inlet maintenance holes are not required.

6.3.3 (Pg 126) Pumping station wet-well isolating valve

A clockwise closing grade 316 stainless steel knife-gate valve shall be fitted at the inlet of the wet-well. The spindle must be adequately supported. A cast iron valve cover shall be cast into the wet-well slab for access to the extension spindle.

6.4.2 (Pg 127) Wet-well design - Sizing

(d) The wet-well shall be large enough to accommodate future pumps sized for the ultimate development.

Minimum capacity for wet-well is 2 hours of a peak wet weather flow (calculated as 'Design Flow' per WSA 02 Appendix C and as amended in this document). This is intended to provide adequate allowable outage and response time to conduct planned and reactive maintenance.

6.4.6 (Pg 128) Wet-well design - Benching

Minimum acceptable floor grade is 1.0%.

Sumps are not required for wet-wells with multiple pumps.

6.5.1 (Pg 129) Wet-well ventilation - Natural ventilation

A cast iron 180° hooked "Ashdown" vent with galvanised vermin proof covers is to be provided as an induct vent. It shall be located at a position where it is not a tripping hazard.

GWMWater requires a new DN150 stainless steel odour vent cored through the concrete top of the wet-well to be provided. The vent stack shall be finished with a black stainless steel flange at the end.

6.6.2 (Pg 131) Emergency Storage

The designer shall consider the following additional guidelines:

- Peak dry weather flows should be based on a calculation of two times average dry weather flow if no peak flow data is available
- The total response time shall be 2 hours or as advised in writing by GWMWater
- The storage should be designed such that floatables will not enter the environment during an overflow

6.8 (Pg 144) Wet-well access covers

GWMWater requires a **McBerns style** pit access safety system or GWMWater approved equivalent shall be used for the wet well access covers.

GWMWater requires min. of two (2) lockable, two-part hinge lift, 6 mm tread-plate aluminium cover fitted with safety mesh (fall prevention system) shall be fitted on all new or refurbished pump station wet-wells.

McBerns style fall prevention system refers to yellow, 'lift-out' safety grills and access cover perimeter fencing.

Covers shall be sized a minimum of 25 mm larger than the wet-well opening to minimise entry of rain and dust into the wet-well.

Bollards will be required to prevent vehicle loading on the wet well and valve chamber covers if the site is not enclosed by a security fence.

6.10 (Pg 145) Pumping station design - Grit collection

Grit collection is not required.

6.11 (Pg 145) Pumping station design - Screens

Screens are not required.

7.2 (Pg 146) Pumping system - Hydraulic design

The rising pressure main shall be sized to accommodate future design flows.

Estimation of peak wet weather flow (PWWF) shall be calculated as 'Design Flow' per WSA 02 Appendix C and as amended in this document.

The Developer shall plot the hydraulic grade line of the initial and future pump station duties on the pressure main longitudinal section and provide these for review.

7.4 (Pg 147) Pumping system - Pump selection

Refer to SECTION 5: APPROVED PRODUCTS AND MATERIALS of this manual for approved pumps.

Final selection of the pump model and size is subject to approval from GWMWater.

7.6.2 (Pg 149) Submersible pumps - Impeller selection

Impellers must be of the single vane type unless another type is approved for special circumstances.

7.6.6 (Pg 150) Submersible pumps - Pumpset lifting equipment

Refer to SECTION 5: APPROVED PRODUCTS AND MATERIALS of this manual.

8.1 (Pg 154) Power system - General

GWMWater require that the design and construction of Infrastructure support future transition to the integration of on-site renewable energy generation and storage systems into the assets to be created, or upgraded with an augmented capacity, to operate at a maximum power demand up to 100kW. Hence, the Developer is to meet the following deemed-to-comply provisions in its design and construction works:

- Provision of additional land/space area for future installation of solar PV arrays ("PV Array Site") in accordance with TABLE 1 and the corresponding computational criteria as enumerated, as follows:
 - (d) The calculated $A_{L/G}$ and $A_{R/S}$ should at least be rounded up to the nearest tens in square metres (m^2) to give the minimum area to be reserved for the PV Array Site.

- (e) The area should either be part of the land reserved for the asset in question or a land adjacent thereto.
- (f) The rooftop / structure-top area on a building or top surface of a structure (e.g. water storage tank, shed, etc.) to be constructed as part of the assets, or an aggregate area thereof, may be considered provided following criteria are met :
 - (v) The preferred option of the provision of additional land or ground space being required for the PV Array Site is either unavailable or unfeasible as substantiated by the Developer.
 - (vi) The minimum aggregate area $A_{R/S}$ calculated as per TABLE 1, is available across multiple suitable buildings and/or structures.
 - (vii) The structural design of the affected rooftop or/and structure-top is/are suitable for supporting the aggregate weight of a typical PV array installation based on true-north-facing 20°-30° tilt-mounting or an average static load pressure of 4.0Pa, whichever is the greater.
 - (viii) The structural design of the affected rooftop or/and structure-top has/have been certified by a Victorian-registered Professional Engineer as suitable for supporting a typical PV array installation at height based on the existing site conditions and the selected design of Infrastructure - such structural certification must specify the height, surface pitch, wind region, terrain category and purlins & truss design details at a minimum, which influence such suitability.

TABLE 1 : PV Site Array - Space Requirement

Option	Minimum Space Required (m ²)	Notation
Land / Ground space (preferred option)	$A_{L/G} = 30MD + \frac{EC}{100}$	$A_{L/G}$: minimum clear land area (m ²) being required for PV Array Site $A_{R/S}$: minimum clear aggregate rooftop or/and structure-top area (m ²) being required
Rooftop / Structure-top space	$A_{R/S} = 15MD + \frac{EC}{200}$	MD : maximum system power demand (kW) of the assets to be constructed as estimated over its operational life EC : projected annual electricity consumption (kWh/year) of operating and maintaining the assets at its design utilisation capacity and projected load profile

- Provision of additional space for the installation of power conversion equipment (PCE) and battery energy storage system (BESS), whether it is an interior floor space close to a proposed indoor electrical main switchboard/motor control centre (MCC)/equipment control panel (collectively referred to as “MSB”) or an aggregated fully-enclosed space within a single or multiple cabinets dedicated to

the same installation, sized in accordance with TABLE 2 meeting the prerequisite conditions.

TABLE 2 : PCE & BESS – Space Requirement

Option	Minimum Space Required (m ³)	Notation	Prerequisite Conditions
Indoor MSB – interior clear space in the vicinity of MSB within a building/shed forming part of the Infrastructure	$V_{B/S} = A_{B/S} \times H_{FC}$ <p>where :</p> $A_{B/S} = \frac{3MD}{100} + \frac{7EC}{1000}$	<p>$V_{B/S}$: minimum clear interior spatial volume (m³) being required for PCE and BESS installations</p> <p>$A_{B/S}$: minimum clear interior floor area (m²) being required for PCE and BESS installations</p> <p>H_{FC} : full floor-to-ceiling height</p>	<p>The calculated $V_{B/S}$ should at least be rounded up to the nearest tens in cubic metres (m³) to give the minimum spatial volume to be reserved.</p> <p>The interior space should be an appropriately air-conditioned, fully-enclosed and access-restricted area that is suitable for housing electrical assemblies including PCE and BESS installations.</p>
Outdoor MSB – dedicated spare compartment space within MSB and/or spare weatherproof electrical cabinet(s) in the vicinity of MSB	$V_{C/E} = \frac{3MD}{100} + \frac{7EC}{20000}$	<p>$V_{C/E}$: minimum aggregate clear interior spatial volume (m³) being required for PCE and BESS installations – contained within single or across multiple cabinets / compartments / enclosures being suitable for electrical assemblies.</p> <p>MD : same meaning as defined in the notation of TABLE 1</p> <p>EC : same meaning as defined in the notation of TABLE 1</p>	<p>The calculated $V_{C/E}$ should at least be rounded up to the nearest tens in cubic metres (m³) to give the minimum aggregate spatial volume to be reserved.</p> <p>For aggregated space from multiple enclosures, the minimum spatial volume of each enclosure must not be less than 0.86m³, with each dimension being at least 0.6m.</p> <p>For multiple enclosures including the MSB, spare underground conduits (2 x 50mmØ) must be pre-installed to facilitate future interconnection cabling between each enclosure and MSB.</p> <p>All enclosures including that of MSB must be designed and constructed fit-for-purpose, in compliance with the current version of AS/NZS 61439.</p>

- Provision of fit-for-purpose dedicated cable pits complete with lids, both designed to withstand 'Class C' loading in accordance the current version of AS 3996 and installed with effective drainage to minimise water-ponding/waterlogging within

the underground interconnected cabling support infrastructure as a minimum, at the following locations :

- (d) a cable pit (“Array Interface Pit”) at the edge of the reserved ground-based PV Array Site.
 - (e) a cable pit (“Power Interface Pit”) immediately before the cable entry into a building/shed or an outdoor MSB, as the case may be.
 - (f) intermediate cable pit at each turn of direction or every 100m in linear-run, where applicable, along the intended cabling path connecting Array Interface Pit to Power Interface Pit.
- Provision of spare underground HD conduits (2 x 50mmØ) with pit-to-pit draw-strings, end-capped within each pit to minimise excessive water ingress and silt-clogging, to facilitate future underground cabling work.
 - Provision of two (2) spare functional units (pre-installed interface switchgears of capacity $I_{S(\min)}$) that are ready for connection at the MSB in accordance with TABLE 3 to facilitate future integration of any renewable energy systems.

TABLE 3 : Power Interface - Connection Requirement

Pre-installed Functional Unit (Interface Switchgear)	Feasible Switchgear Rating (A)	Notation	Prerequisite Conditions
Either moulded-case circuit breaker (MCCB) or miniature circuit breaker (MCB)	$I_C = \frac{20MD}{11}$	<p>I_C : calculated capacity (A) of the pre-installed interface switchgear</p> <p>MD : same meaning as defined in the notation of TABLE 1</p>	<p>The calculated I_C should at least be rounded up to the nearest tens in amperes (A) to give the minimum current-carrying capacity of the pre-installed functional unit.</p> <p>The minimum capacity (A) of the pre-installed interface switchgear $I_{S(\min)}$ should be the lesser of I_C and I_N.</p> <p>The actual rating of the functional unit should be the next available standard rating from the selected manufacturer, based on $I_{S(\min)}$.</p> <p>The pre-installed functional unit must be at least of the same breaking capacity or short-circuit withstand strength as the proposed MSB design.</p>
	$I_N = I_o$	<p>I_N : nominal capacity (A) of the pre-installed interface switchgear</p> <p>I_o : rated MSB capacity (A) proposed for the operating assets</p>	

For Infrastructure designed with, or upgraded with an augmented capacity to operate at, a maximum electrical demand exceeding 100kW, the Developer shall consult GWMWater

on the specific requirements for renewables-readying the new assets to be designed and constructed.

Sufficient power shall be supplied to operate pumps, instrumentation, lights, general power outlets and SCADA. Two 10 amp general power outlets shall be supplied. Residual Current Devices shall be provided on all socket outlets. Surge diverters shall be installed.

The electrical installation shall comply with *AS/NZS 3000:2007 Electrical Installations wiring rules*, including amendments, and all other relevant standards, regulations, codes of practice and rules.

Only electricians registered with the Office of the Chief Electrical Inspector shall install the electrical equipment. A Certificate of Electrical Safety shall be provided for the electrical installation work.

All work shall be carried out in accordance with *AS/NZS 4836 Safe Working on Low-Voltage Electrical Installations* and the Office of the Chief Electrical Inspector's *Code of Practice for Safe Electrical Work on Low Voltage Electrical Installations* (see www.esv.vic.gov.au).

8.2.2 (Pg 154) Power supplies - Security of supply

Extra Low Voltage shall be provided from an adequately protected, regulated power supply.

A 90 amp "Marechal" emergency generator inlet socket shall be installed in the side of the power and control cubicle to suit GWMWater generators. A manual changeover switch from mains to emergency power supply is required with interconnection to ensure that the mains and emergency sources cannot be simultaneously connected.

8.2.3 (Pg 154) Power supplies - Primary supply

The design, equipment, materials and installation of the Works shall comply with the following criteria:

Maximum Ambient Temperature:	+50 °C
Minimum Ambient Temperature:	-10 °C
Maximum Relative Humidity Non-Condensing:	95 %
Useful service life of electrical equipment:	20 years

The Works shall function correctly within the supply system limits defined in the Victorian Electricity Distribution Code (see www.esc.vic.gov.au). The Works shall comply with the requirements of the Victorian Service and Installation Rules (see www.victoriansir.org.au).

8.2.5 (Pg 155) Power supplies - Emergency power

The Developer is to consult with GWMWater as to the need for an on-site emergency power supply for any particular pumping station.

Note that for sites requiring 12/24 volt backup power supply, GWMWater SCADA Standards include 12/24 volt DC Charger and Battery as the standard installation. **These standards can be provided on request.**

8.2.9 (Pg 156) Power supplies – Power factor correction

Electrical and electronic equipment shall be capable of operating over the full range of power supply quality defined in the Victorian Electricity Distribution (VEC) Code (see www.esc.vic.gov.au), or appropriate power conditioning shall be provided to ensure the correct function of the equipment.

As per the VEC Code:

- a) The site power factor must be kept within the specified limits or a power factor correction shall be provided if required to comply with this requirement.
- b) The site harmonic distortion currents must be kept below the specified limits.
- c) The three-phase supply phase currents must not deviate from the average of the three-phase currents by more than 5%.
- d) The site electrical equipment shall not cause voltage fluctuations at the point of common coupling greater than that specified.

8.3.1 (Pg 156) Power and control cubicle - Design

The power and control cubicle shall:

1. be fabricated from 3.0 mm marine grade aluminium or approved equivalent.
2. be externally powdercoated Colorbond® Rivergum Green™.
3. be internally painted white
4. be continuously welded with radiused corners and all visible joints ground smooth.
5. have stiffening provided to panels and doors where necessary to prevent distortion or drumming.
6. have doors that swing open to 180° and can be fixed in the 90° and 180° position.
7. have pad-lockable or key-lockable doors as advised by GWMWater.
8. be level and plumb and bolted to a concrete plinth at least 75 mm high that is of adequate thickness to support the switchboards.
9. have a minimum free space of 400 mm high by 600 mm wide by 300 mm deep for the installation of the Remote Telemetry Unit.
10. have a minimum of 20% additional free useable space on the mounting plate for future works.
11. be appropriately ventilated for when the ambient temperature inside the switchboard is likely to exceed the rated value of any of the components installed inside the switchboard.
12. have correctly sized cable glands fitted at all cable entry points.
13. be vermin proof.
14. have power mains cable entry from the bottom.
15. have a metal pocket inside the control door to hold an A4 binder.

16. be located so that doors can open safely and provide a safe working area away from the wet-well.

17. Include a fan or air conditioner and associated logic control to automatically maintain adequate operating temperatures for the components within the cubicle.

A minimum of three conduits shall enter the wet well from the cubicle - one conduit for pump power cables, one conduit for control cables and wet well lighting, and one conduit for communication and instrumentation cables. The minimum conduit size shall be 63 mm diameter for power and 40 mm diameter for control and communication. Conduits shall be sealed to prevent gas entering the cubicle.

8.3.4 (Pg 160) Power and control cubicle - Lighting

Lights shall be provided in the wet-well (250 watt), and inside each cabinet of the cubicle. When required, external lighting (80 watt) shall be installed overhead on a three metre pole.

9.3.2 (Pg 161) Pumping control - Control switches

The pump selection switch does not require a "Flush with Manual" position.

9.3.3 (Pg 162) Pumping control - Control systems

Add to (a):

'The telemetry RTU shall be as per Clause 9.6.1 (Pg 166) Telemetry hardware - General in this Manual.'

9.4.1 (Pg 163) Alarms - General

The following alarms shall be capable of being sent back via telemetry:

- a) RTU Comms to Site Failure
- b) Wet Well Level High
- c) Wet Well Level High High
- d) Wet Well Level Low
- e) Wet Well Level Signal Fault
- f) Wet Well High Level Float Active
- g) Pump 1 Fault
- h) Pump 1 Unavailable
- i) Pump 2 Fault
- j) Pump 2 Unavailable
- k) Pump 1 Thermistor Fault
- l) Pump 2 Thermistor Fault
- m) Pump 1 Power High
- n) Pump 1 Power High High
- o) Pump 1 Power Signal Fault
- p) Pump 2 Power High
- q) Pump 2 Power High High

- r) Pump 2 Power Signal Fault
- s) RTU Battery Low
- t) RTU Comms from Site Failure ('heartbeat' style alarm)
- u) RTU Mains Supply Failure
- v) Electrical Supply Phase Failure
- w) Site Intruded (access door, access hatch and/or switchboard)
- x) Vent Fan Fault

9.6.1 (Pg 166) Telemetry hardware - General

See SECTION 5: APPROVED PRODUCTS AND MATERIALS, SEWER PUMP STATIONS

9.6.2 (Pg 167) Software

Integration of a new pump station site into GWMWater's SCADA system will be by GWMWater.

9.8.1 (Pg 169) Equipment and devices - General

The following switches shall be installed:

- a) Mains power supply switch.
- b) Two pump controller switches.
- c) Station attended switch.
- d) Local remote selector.
- e) Two fault reset buttons.
- f) Circuit breakers.
- g) Re-set switch (RTU) accessed from the closed electrical cabinet. Allows a simple manual reset to occur without the need for a qualified electrician to open the cabinet.

9.8.2 (Pg 169) Equipment and devices - Flow measurement

A Siemens MAGFLOW MAG 6000flow meter (or GWMWater approved equivalent) is required on the pressure main. The flow meter will be positioned inside the external flow meter pit downstream of the external valve chamber.

9.8.5 (Pg 170) Equipment and devices - Level-sensors

Ultrasonic level sensors are preferred.

Proposals for use of differential pressure transducers will be considered.

The backup level sensors are to be three hard-wired float switches which shall be installed with control philosophy as follows:

- a) Middle float starts duty pump (pumps to alternate duty on start-up).
- b) Lowest float stops duty pump.
- c) Highest float stops duty pump (assumption is that there is a fault), starts standby pump and activates alarm.

9.9 (Pg 175) Instrumentation (Displays)

The following instrumentation shall be installed:

- a) Two 5 digit hour run meters.
- b) Two 5 digit start counters.
- c) Two amp meters (3 phase switching if 3 phase is used).
- d) Power authority meter.
- e) Siemens MAGFLOW MAG 6000 flow meter
- f) Pump well level indicator.

together with the capability of the RTU to relay the relevant information to GWMWater's Operations Management Centre SCADA.

10.1.2 (Pg 177) Pump discharge pipework - Sizing

Add: "(c) So that a constant internal diameter is maintained, except where pipe may need to expand to satisfy Clause 11.3.6: Velocity in Pressure Mains in the Code."

10.1.3 (Pg 177) Pump discharge pipework - Type

Discharge pipework in the wet-well and valve chamber shall be as per Clause 16.3.1 in this Manual.

Internal vertical pipework shall be supported with approved brackets at:

- a) maximum 2 m intervals for DINL or Stainless steel
- b) maximum 1.5 m intervals for PE100.

10.2.1 (Pg 177) Valve applications - Isolating valves

Isolating valves shall be resilient-seated gate valves and be clockwise closing.

10.2.2 (Pg 178) Valve applications - Non-return valves

A swing-type check valve shall be used.

10.4 (Pg 181) Emergency Pumping Arrangements

An emergency by-pass or scour is required on each pump discharge line. The scour will enable the pressure main to drain back into the wet-well or into the adjoining sewer reticulation system if required in an emergency situation.

The scour setup will include an upward facing Tee (finished with a blank stainless steel flange) and valve pipe work and stainless steel bolts either side.

A scour arrangement is not required at the valve chamber for the pressure main to be drained directly back into the wet-well.

10.3.1 (Pg 178) Valve chamber - General

Add:

(f) A tapping point with a ball valve suitable for a pressure gauge **is** required on each discharge line.

A separate valve chamber is to be provided. GWMWater requires a new min. 1500mm (width) x min. 1500mm (length) external valve chamber to be provided at a minimum distance of 1:2 pipe diameter on the pump discharge side of the wet well. Buried valves are not permitted.

Supply and install a drainage pipe from the new valve chamber pit into the wet well.

Flow Meter Pit

A new min. 900mm (width) x min. 900mm (length) external flow meter pit is required at a 1: 5 pipe diameter ratio downstream of the new valve chamber on the pump discharge side. This spacing is required to ensure accurate metering.

The flow meter (Siemens MAGFLOW MAG 6000) shall be installed in flow meter pit.

Buried flow meter are not permitted.

Supply and install a drainage pipe from the flow meter pit into the wet well.

11.2.1 (Pg 184) Location of pressure mains - General

Pressure mains must be located in road reserves unless special approval is granted by GWMWater to locate them elsewhere.

11.3.5 (Pg 195) Hydraulic design - Velocity in pressure mains

The maximum velocity prior to discharge to the receiving sewer shall be 2 m/s to minimise the release of gases. An expansion of the pipe diameter at the outlet may be required.

11.9.1 (Pg 204) Pressure main valves - General

Pressure mains shall be designed at gradients that minimise the number of high and low points in order to reduce the need for gas release valves and scour points.

11.9.2 (Pg 204) Pressure main valves - Isolation valves

A resilient seated gate valve is required at any connection to another sewer rising main.

11.9.3 (Pg 204) Pressure main valves - **Air release valves**

Two-way gas-release valves shall be provided on all high points on pressure mains except at the discharge point. The minimum diameter shall be DN 80. For aesthetic purposes gas release valves may need to be located in a concrete pit fitted with a lockable aluminium or concrete cover and the pit shall allow air to escape. 0.9.5 (Pg 133) Pressure main valves - Scours

Scour points shall be located within a concrete pit fitted with a lockable cover. They shall include a branch line from the pressure main incorporating a resilient seated gate valve.

Where possible, the scour points shall drain to a separate maintenance hole in accordance with the standard internal drop connection details given in WSA 02-2002 Drawing No. SEW-1306. Alternatively a quick connector type coupling for a vacuum tanker shall be installed at the end.

11.11.2 (Pg 207) Receiving system - Discharge MHs

Where pressure sewer mains discharge to a gravity sewer, a GWMWater approved epoxy-resin coating of the first entry maintenance hole may be permitted instead of installing vent shafts.

12.2.1 (Pg 209) Structures - Design loads and forces

The design of the wet-well shall include a drainage layer below the in-situ base slab or the precast concrete base slab as per Clause 31.1 in this Manual.

12.2.2.2 (Pg 211) Concrete structures - Concrete strength

Structures shall be sulphate resistant with a minimum concrete strength of 40 MPa.

12.2.5 (Pg 212) Structures - Pumping Station walls

Rectangular walls will not be approved by GWMWater.

12.2.7 (Pg 213) Structures - Top Slab

The concrete top slab shall:

- a) be on one level and incorporate well covers, storage area for removed covers, power and control cubicle and valve pit.
- b) be free of trip hazards to personnel and the general public.
- c) have finished surface level above any local drainage levels.
- d) be positioned so that all surface water drains away.

Landscaping should blend the finished surface of the slab into the surrounding terrain.

12.3.2 (Pg 213) Pressure mains - Products and materials

See SECTION 5: APPROVED PRODUCTS AND MATERIALS, SEWER NETWORKS

12.3.4.2 (Pg 214) Pressure mains - External forces - Cover

The minimum cover to the top of the pressure main shall be 1000 mm in nature strips and footpaths and 1200 mm in roadways. Pressure mains shall be laid below water mains wherever possible.

12.3.4.3 (Pg 215) Pressure mains - External forces - Trench Design

The Developer is required to specify the method of compaction used to achieve the minimum compaction density index for pipeline trenches and all excavations for other structures as outlined in Table 36.2 of the Code prior to approval of the Design Drawing.

12.3.10.2 (Pg 223) Pressure main anchorage - Thrust blocks

Timber blocks are not accepted by GWMWater. Recycled plastic blocks may be permitted for pipes up to and including 100 mm nominal diameter.

13.1.2 (Pg 225) Supporting systems - Water

GWMWater regularly flushes out wet-wells and will advise the Developer on the size of the water service to be installed at the Developer's cost. Components shall include a PE80 PN 16 poly water service, an above ground water meter (if not in a fenced compound, locate within a lockable cover attached to a marker post) and above ground backflow prevention (Reduced Pressure Zone Device (RPZD)), terminating at a 20 mm diameter hose bib tap.

13.2.1 (Pg 226) Materials handling - Lifting Equipment

MILLER DURAHOIST DH- 7ZP footing system (or GWMWater approved equivalent product) are to be installed in suitable location as to command access to the entirety of the wet-well without limiting access, and installed in a way that minimises tripping hazard.

The footing system enables a rated DuraHoist (Millers) system to be fitted in accordance with current GWMWater standard equipment.

14 (Pg 228) Design Review

The Developer is required to comply with the Occupational Health & Safety Legislation and GWMWater's Occupational Health & Safety Policy and Procedures.

15.1 (Pg 229) Documentation

All documents and calculations must be submitted and accepted by GWMWater prior to any construction work commencing on site.

15.2.1 (Pg 229) Design drawings - General

Amend:

'(c) Location and position of sewers relative to property boundaries.'

Add:

'(i) Pump specification - impeller size, number of stages, pump ratings, starter motor characteristics.'

All drawings must be approved by GWMWater prior to any construction work commencing on site.

Detailed design drawings shall be provided in AutoCAD format (with .dwg file extension) and PDF format (with .pdf file extension) for acceptance by GWMWater before “Construction Issue” design drawing can be issued.

PART 2: CONSTRUCTION

20.1 (Pg 322) Telemetry system - Compliance with Authorities, statutes, regulations and standards

GWMWater will advise on requirements to connection to its SCADA network.

28.14 (Pg 348) Pipe laying and jointing - Location markers

Isolation valves covers for all pressure mains shall be painted using orange road marking paint.

If required by GWMWater, location marker posts for scour valves, gas release valves and isolation valves shall be orange coloured with black coloured tops with marker plates in accordance with Reference Standard Drawing WAT-1300.

29.1 (Pg 354) Wet-wells and maintenance holes - General

A 150 mm drainage layer shall be established below the in-situ base slab or the precast concrete base slab, of compacted, approved coarse (approx. 20 mm) screenings.

32 (Pg 363) Connection to existing gravity sewers

The Developer shall not commence work which involves entry into live sewer mains or maintenance structures until approval is given by the Works Quality Controller.

A minimum of two working days' notice is required of intention to make a connection to the existing sewer network.

34.3.1 (Pg 367) Compaction Testing - General

Final certification from the NATA accredited tester and the location of all tests will be required to demonstrate that the specified compaction was achieved at all test locations.

35.1 (Pg 382) Commissioning - General

The Works Quality Controller or delegate must be in attendance for the commissioning.

GWMWater representatives must attend site commissioning.

37.1 (Pg 386) Work-As-Constructed details - General

“Work-As-Constructed” drawings and documentation are required before **Preliminary Acceptance** can be issued by GWMWater.

Drawings shall be provided in AutoCAD format (with .dwg file extension) and PDF format (with .pdf file extension). A detailed set of structural and electrical drawings is required. Asset attribute data is to be captured to the satisfaction of GWMWater for all assets created. Data is to be presented on the as-constructed drawings.

The “Work-As-Constructed” drawings shall include updated information for details specified for the design drawings (Clause 15.2.1 of the Code) plus:

- a) Pump specification – impeller size, number of stages, pump ratings, starter motor characteristics.
- b) Pump identification details – make, model, type, year of commissioning, serial numbers.
- c) Motors – ratings (voltage), power (kW), make, type, serial numbers.
- d) Concrete Pits – volume, wall thickness
- e) Pipework – material, length, diameter, class, series
- f) Instrumentation – make, model, serial number
- g) Valves – diameter, type
- h) Lifting equipment - lift capacity (kg), make, model
- i) Flow meter - diameter, make, model, serial number
- j) Electrical control panel – Capacity (kVa)
- k) SCADA equipment – make, model
- l) UPS / Trickle Charged Battery Backup – make, model, Capacity (kVA), Output (Amps)
- m) PLC – make, model, Capacity (megabytes)
- n) Generator – kVA, make, model, serial

The Developer shall provide Operation and Maintenance manuals (electronic copy and two hard copies), including electrical and electronic wiring diagrams.

PART 3: STANDARD DRAWINGS

Drawing Number	Amendment
SPS-1301	Buried valves are not permitted - a valve chamber is required.
SPS-1400	Grit collection is not required.
SPS-1401	Grit collection is not required.
SPS-1601	Add note '11. The minimum cover to the top of the pressure main shall be 1000 mm in nature strips and footpaths and 1200 mm in roadways.'

SECTION 4: WSA 07 – 2007 V1.1 PRESSURE SEWERAGE CODE OF AUSTRALIA

PART 0: GLOSSARY OF TERMS, ABBREVIATIONS AND REFERENCES

The following describes GWMWater's preference for terms to be used in documentation and drawings.

- a) Sewage and grey water flows down **property drains** into a **pump well unit**, consisting of a purpose-built **collection tank** and **grinder pump**, installed on each property.
- b) A **property discharge line** from the pump well unit leads to the **pressure sewer mains** usually located in road reserves.
- c) Each property has a **boundary kit**; a check valve, an isolation valve and a flushing point; located just inside the roadside property boundary.
- d) The system is fitted with an audible and visual alarm system, located in a **control panel**, to warn that the fluid level in the pump well unit has exceeded the high-high level.

Planning, design, construction and acceptance of assets shall be in accordance with GWMWater *Servicing of Subdivisions and Developments Policy* and GWMWater *Design Guidelines for Pressure Sewer Systems*.

PART 1: DESIGN

1.1 (Pg 36) General - Planning

Prior to approving construction of a pressure sewer system, a benefits analysis is to be completed, assessing the financial, social and environmental impact for the community and GWMWater.

A clear benefit for a pressure sewer system over a gravity sewer system needs to be established.

1.2.3 (Pg 37) Pressure sewer systems – Description

Septic Tank Effluent Pumping systems are not permitted.

1.5.3 (Pg 39) Design responsibilities

GWMWater do not prepare Concept Plans and will advise the Developer of any specific requirements.

The Developer shall liaise with GWMWater in determining the most appropriate discharge point for the pressure sewer main(s).

Design drawings are to be prepared in the AutoCAD format (with .dwg file extension).

1.5.4 (Pg 41) Consultation with other parties

The Developer shall be responsible for liaising with all stakeholders to determine their requirements (if any) at the preliminary design stage. Stakeholders may include the relevant council, VicRoads, Telstra and other interest groups. These third party requirements shall be included in the design information submitted for approval.

2.2 (Pg 45) Concept design - Functionality

GWMWater will enter into a service agreement with each customer serviced with a pressure sewer and issue a Property Owner's Manual at the time that consent to connect is granted. It will provide general information about the pressure sewer systems and instructions on what to do in the event of an incident such as an alarm activation or a power blackout. The GWMWater customer charter applies to the conditions of the agreement.

2.13.1 (Pg 50) Commissioning plan - General

The Developer is to submit a commissioning plan at the concept design stage, based on GWMWater's Pressure Sewer commissioning checklist.

3.2 (Pg 56) General design - Design tolerances

The required coordinate system is MGA Zone 54 for horizontal alignment in metres.

3.7.1 (Pg 59) Easements - Reticulation sewers

An easement is required over pressure sewer reticulation mains where installed within private property. The easement shall be 3 m wide and the sewer shall be in the centre of the easement unless written approval is otherwise given. GWMWater will not accept sewer rising mains or pressurised sewer trunk mains installed in private property. See also *GWMWater Policy Land Acquisitions and Easements for Assets on Private Land (CMS/1752)*.

3.7.2 (Pg 60) Easements - On-property components

Easements are not required for on-property components.

3.12.3 (Pg 61) Obstructions and clearances - Clearance from structures

A minimum offset of 1 m from building structures is required.

3.12.4 (Pg 61) Obstructions and clearances - Clearance requirements

Pressure sewer mains shall be laid below water mains with specified clearances wherever possible.

3.12.5 (Pg 61) Obstructions and clearances - Crossings

Pressure sewers are to be sleeved in pipes for major road crossings, designated waterways, rail crossings and other critical crossings.

Grouting is not required between the pressure sewer main and the sleeve pipe.

3.15.1 (Pg 64) Sewage quality - Septicity

Where pressure sewer mains discharge to a gravity sewer, a GWMWater approved epoxy-resin coating of the entry maintenance hole may be permitted instead of installing vent shafts.

4.2 (Pg 66) Gravity Sewers

Where pressure sewer mains discharge to a gravity sewer, a maintenance hole is required and a GWMWater approved epoxy-resin coating of the entry maintenance hole is required.

4.3 (Pg 66) Hydraulic design - Design inputs and outputs

The design shall be based on the approved supplier pump well units and be prepared in accordance with the GWMWater *Design Guidelines for Pressure Sewer Systems*.

The Designer is required to size the pressure sewer network to ensure it is appropriate for current use but make provision for future uses if feasible.

4.4.3 (Pg 67) Peak flows from homes and required pumping rates

Swimming pool or spa filter backwash or pump-outs shall not be discharged into the sewer due to high chlorine levels and/or inflows being above pump capacity. Alternative arrangements shall be used for discharge.

For a standard residential property with a mean daily discharge of <600 litres, a single progressing cavity grinder-pump unit, which has operating parameters between 0.4 litres/sec @ 50 metre head and 0.8 litres/sec @ 10 metre head, housed in a 900-litre collection tank is acceptable.

4.4.4.1 (Pg 68) Design flows - General

The probability method is accepted for minor pressure sewer systems. As the pump units will be identical, the minimum diameter of DN63 shall be used.

4.4.4.1 (Pg 68) Design flows - Simplified design flow equation

This equation shall not be used.

4.5.2 (Pg 70) Sizing of pressure sewers - Minimum pipe sizes

The minimum pipe size in pressure mains shall be DN 63 to facilitate electrofusion tapping saddles for property sewer laterals.

5.1.4 (Pg 73) Pressure sewer design - Alignment of pressure sewers

90° bends shall be avoided by using two 45° bends or by curving the pipe.

5.1.5 (Pg 73) Pressure sewer design – Pressure sewers in road reserves

The minimum horizontal clearance from a water main shall be 600 mm.

5.4.1 (Pg 75) Isolation valves - General

An external resilient seated gate valve is required at the discharge point of a pressure main discharging into a maintenance hole or at any connection to another sewer rising main.

5.4.2 (Pg 75) Isolation valve locations

Add:

- a) on each upstream branch of a Tee
- b) both sides of critical crossings, e.g. major road or rail.

The location of all isolation valves shall be in the nature strip at least 300 mm from any kerb or trafficable area (if no kerb), unless otherwise approved. Where isolation valves are installed at Tees, they should be located flush against the Tee, else at the nearest practical location in the nature strip. The locations should minimise pedestrian hazards by avoiding clustering of surface fittings in the footway at intersections.

5.4.3 (Pg 75) Isolation valve covers and surrounds

Valve box covers shall be painted orange with 'SEWER VALVE' embossed (not painted), and shall be rated for non-vehicle or vehicle loading as appropriate to the location.

5.6.2 (Pg 77) Flushing points and scours

Add to (c): 'On pressure mains with no customers (for example when transferring to a treatment plant) an interval of greater than 500 m may be permitted.'

Lockable covers are required for all flushing points in accordance with GWMWater requirements, which shall be rated for non-vehicle or vehicle loading as appropriate to the location.

5.7 (Pg 78) Flow meters

Depending on the types and numbers of property serviced GWMWater may require a flow meter to be installed to collect system performance data. The Developer shall be responsible for the costs of installation of the GWMWater approved flow meter.

6.1.1 (Pg 79) Property sewer service design

GWMWater requires Design Drawings to be submitted showing the on-property components for each property as per drawing PSS 1100.

6.3 (Pg 79) On-property design - Vacant lots

Pressure sewer laterals shall not be installed from the pressure sewer main to vacant land until the lot is developed.

6.5 (Pg 82) Design and layout of new on-property components

Overflow relief shall be provided by the overflow relief gully installed in the property's sanitary drain.

The collection tank must be installed:

- At a maximum of 3 m (to the centre of the tank) inside the council approved front building setback;
- Outside of any enclosed space and with a minimum 2m separation from buildings and other structures (including retaining walls);
- Clear of a 45-degree foundation zone of influence;
- Clear of vehicular traffic;
- Outside of any drainage path or depression which may become flooded in wet-weather (if unavoidable, seek approval from GWMWater to seal the tank lid and add a vent pipe from the near side wall of the tank routed to the building wall to a vent point above the roofline (refer to AS 3500)); and
- With a minimum 3m vertical clearance from the top of the tank.

If positioning of the collection tank to meet all the above requirements is not practical, then consult GWMWater.

The Property Boundary Kit must be installed:

- 1m inside the front property boundary line;
- In alignment with the collection tank; and
- Perpendicular to the street reticulation pipework.

The property discharge line must be installed:

- Wholly within the lot of the property being serviced.
- Aligned parallel to property boundaries or road frontage.
- Located to maintain adequate clearance from structures.
- Located to allow easy access for repairs and maintenance.

Any relevant construction and landscaping must maintain:

- Required vertical and horizontal clearances; and
- A clear pathway from:
 - The street to the tank; and
 - The tank to the control panel.

6.6 (Pg 83) On-property design – Control and alarm panels

Control panels shall be installed in accordance with GWMWater's approved supplier requirements.

The control panel must be installed:

- In a clearly visible location in a direct line-of-site from the collection tank;
- On:

- The external wall of the building on the property being serviced and within 10m of the centre of the collection tank; or if this is not possible
- A free-standing fully galvanised pole (as per AS 3000) within 4m of the centre of the collection tank;
- At a height of between 1.2 and 1.5m above ground/pavement level immediately below the unit; and
- With an IP56 rated local isolation switch at a distance no greater than 300mm from the control panel.

7.1 (Pg 84) Collection Pump/Units - General Design Requirements

Capacity

Minimum acceptable tank capacity is equal to 1.5 times the average daily discharge.

For a standard residential property with a mean daily discharge of <600 litres, a single progressing cavity grinder-pump unit, which has operating parameters between 0.4 litres/sec @ 50 metre head and 0.8 litres/sec @ 10 metre head, housed in a 900-litre collection tank is acceptable.

For commercial/industrial and public/community facilities, the mean daily discharge must be assessed and the pump capacity, number of pumps and collection tank volume selected accordingly.

Alarms, SCADA and Communications

The pump shall be configured to start operating at a designated 'High' level and stop operating at a designated 'Low' level. An alarm system shall be fitted which is activated by a 'High High' level alarm switch and which provides visual and audible warning to the property owner, and raises an alarm in GWMWater ClearSCADA. An alarm shall be raised in GWMWater ClearSCADA if the 'High High' alarm becomes unresponsive.

The audible alarm shall have an acknowledgement switch available to the resident (i.e. external to the control box) to silence the audible component of the alarm. The audible alarm shall run for a maximum of five (5) minutes. The visual alarm kill switch shall be accessible only to GWMWater staff or their agents. The alarm shall be configured to not reactivate before the control system is reset. The control panel shall have a reset procedure, which can only be carried out when the panel is opened. The procedure could use the 'OFF/Auto/ON' switch or a separate 'Reset' button.

Where the pump fails to operate, the system shall automatically retry after ten minutes.

It is desirable for the pump controller to locally record:

- total pump run hours; and
- a record of events covering a minimum of 24hours and including:
 - Pump starts
 - 'pump on' switch failed to operate;
 - over temperature;

- over pressure;
- overload (amps); and
- well level 'High High'.

It is desirable for the pump controller to allow:

- locally recorded data to be viewed;
- alarms to be cleared; and
- local changes to be made, including changes to:
 - well level pump set points; and
 - pressure sensor pump set points.

In certain cases, GWMWater may require 'Two-Way Communications'. Where 'Two-Way Communications' are specified, the following apply:

- the system shall;
 - allow alarms to be cleared from within GWMWater ClearSCADA; and
 - provide the ability to start, run, stop and reset/restart pumps from within GWMWater ClearSCADA; and
- it is desirable that the system:
 - allow changes to be made in GWMWater ClearSCADA, including:
 - well level pump set points; and
 - pressure sensor pump set points; and
 - show in GWMWater ClearSCADA:
 - pump running;
 - 'pump on' switch failed to operate;
 - over temperature;
 - over pressure;
 - overload (amps);
 - well level;

Level Sensor

Level sensing is required for triggering pump operation and the 'high-high' level alarm switch.

The primary sensors may be integral to the pump unit, or separate from the pump.

A separate level sensor shall be used to detect 'high-high' level in the pump well and to provide a 'high-high' level alarm signal. This shall be a back-up system to provide an alarm should the main level system fail.

Level sensors may be pre-installed at the factory. If not factory installed, the installer must be adequately trained to install the sensors and correctly set their levels.

Pressure Sensor

Fitted with a pressure switch to stop the pump operation when the downstream pressure head exceeds 50 metres.

Pressure sensors are required to be installed on the pump unit when the pressure main discharges into a sewer rising main or large pressures are generated by some pump units in the system (e.g. servicing elevated lots). This will enable the pump unit/s to be set to not run against the sewage pump station upstream or when there are excessive pressures in the pressure sewer pipelines.

7.2.1 (Pg 84) Emergency storage - general

Options (c) and (d) only are approved for emergency storage. The Developer will need to determine if sufficient emergency storage is provided in the standard collection tank otherwise a larger tank or emergency storage will be required.

7.7 (Pg 86) Connection to customer sanitary drain

GWMWater will own and maintain on-property components in accordance with its Servicing of Subdivision and Developments Policy ([CMS/762](#)) and Property Connection policies ([CMS/3232](#), [CMS/2464](#)).

8.5 (Pg 88) Service connection pipework - Surface boxes

Boundary kits are to be sourced from GWMWater's approved supplier.

Lockable covers are required for all boundary kits, which shall be rated for non-vehicle or vehicle loading as appropriate to the location.

Boundary kits shall be located just inside the property boundary, preferably one metre from the boundary of an adjacent property and clear of driveways or parking areas. It shall be easily accessible to operations staff.

9.2.1 (Pg 89) Pressure sewers - General

The Developer is required to specify the method of compaction used to achieve the minimum compaction density index as outlined in Section 21.3 prior to approval of the Design Drawing.

9.2.2 (Pg 89) Pressure sewers - Pipe cover

For property discharge lines in private property, the minimum cover shall be:

- a) 450 mm for non-trafficable areas
- b) 600 mm for trafficable areas.

For pressure sewer mains, not including property discharge lines, the minimum cover shall be:

- a) 600 mm for nature strips and driveway crossings.
- b) 750 mm for roads and other trafficable areas.

Road authority requirements will take precedence where they are greater than the above.

PART 2: PRODUCTS AND MATERIALS

10.4 (Pg 99) Product and Material Standards and Specifications

See SECTION 5: APPROVED PRODUCTS AND MATERIALS, SEWER NETWORKS.

10.7.2 (Pg 103) Polyethylene (PE) pipes and fittings

Pressure pipe materials shall be electrofusion welded PE100 PN16 polyethylene.

10.7.3 (Pg 103) Pipeline identification

Pipes shall be black with cream-stripes as per the Code.

PART 3: CONSTRUCTION

13.5.1 (Pg 124) Protection of people, property and environment – Safety of people

The Developer is required to comply with the Occupational Health & Safety Legislation and GWMWater's Occupational Health & Safety Policy and Procedures.

13.5.3 (Pg 125) Protection of people, property and environment – Dis-used / Redundant sewers, drains and tanks

The property owner is responsible for removing or decommissioning disused sewers, sanitary drains and septic tanks.

13.6 (Pg 128) Affected party notifications

The Developer shall not commence work which involves entry into live sewer mains or maintenance structures until approved by the Works Quality Controller. A minimum of two working days' notice of the connection being made to the existing sewer is required.

14.2 (Pg 129) Authorised Products and Materials

See SECTION 5: APPROVED PRODUCTS AND MATERIALS

15.1. (Pg 133) Compliance with authorities, statutes, regulations and standards

Only electricians registered with the Office of the Chief Electrical Inspector shall install the electrical equipment.

A Certificate of Electrical Safety shall be provided for the electrical installation work.

All work shall be carried out in accordance with *AS/NZS 4836 Safe Working on Low-Voltage Electrical Installations* and the Office of the Chief Electrical Inspector's *Code of Practice for Safe Electrical Work on Low Voltage Electrical Installations* (see www.esv.vic.gov.au).

18.5 (Pg 140) System installation and jointing - Trenchless installation

Pipes installed by boring shall be of continuous length without joints.

18.7 (Pg 140) Thrust and anchor blocks and restrained joints

Thrust blocks are required at unrestrained joints including horizontal and vertical bends, tees, crosses, dead ends and reducers. Timber blocks are not accepted. Recycled plastic blocks may be used for pipes up to and including 110mm nominal diameter.

18.8 (Pg 140) Pressure sewer laterals, property boundary assemblies

GWMWater shall approve of the tapping process and fittings.

18.10 (Pg 141) Pipeline tracer wires and detectable marking tapes

For pipes installed by open trenching, marker tape with stainless steel tracer wire shall be located 150 mm above the pipe in accordance with WSA PS-318 (refer www.wsaa.asn.au).

18.15 (Pg 143) System installation and jointing - Location markers

Location markers are required for flushing points, gas release valves, isolation valves and road crossings.

Isolation valve covers for all pressure mains shall be painted using orange road marking paint.

If required by GWMWater, location marker posts for flushing points, gas release valves and isolation valves shall be orange coloured with black coloured tops with marker plates in accordance with Reference Standard Drawing WAT-1300.

21.1 (Pg 149) Inspection and acceptance testing - General

The Developer shall provide GWMWater with a *Notice of Commencement of Works* prior to construction. The Works Quality Controller or delegate will conduct pre-arranged inspections associated with installation of pressure sewer mains and installation of on-property components and will conduct a final inspection audit before acceptance of assets.

The Developer (or their Consultant/Contractor) shall provide GWMWater with the results of water pressure tests and certification of trench compaction tests. All associated costs are to be borne by the Developer, including rectification costs.

21.3.1 (Pg 147) Compaction testing - General

Final certification from the NATA accredited tester and the location of all tests will be required to demonstrate that the specified compaction was achieved at all test locations.

21.4.1 (Pg 152) -Pressure Testing - General

Pressure testing of all polyethylene pipes is required, in accordance with approved GWMWater procedure.

24.2 (Pg 161) Work-As-Constructed details

Work "As Constructed" drawings and documentation are required before **Preliminary Acceptance** can be issued by GWMWater.

In addition to the minimum provisions in "As-Constructed" drawings, plans showing the on-property components for each property are to be provided as per drawing PSS 1100 in the Code.

Drawings shall be provided in AutoCAD format (with .dwg file extension) and PDF format (with .pdf file extension).

Asset attribute data is to be captured for all assets created. Data is to be presented on the as-constructed drawings. A template example of an as constructed drawing (.pdf: [R2021-15057](#), .DWG: [R2021-15058](#), .DWT: [R2021-15060](#)) is available from the Development Officer.

Evidence of construction to standard is required:

- In situ photo of every:
 - thrust block
 - valve
 - junction
 - elbow
 - tapping

All photos must be GPS located (metadata) (location accurate to within 1.0m) and time stamped (visual and metadata).

PART 4: STANDARD DRAWINGS

The following amendments to the standard drawings are to be made:

Drawing Number	Amendment																		
PSS-1000	<p>Add note '6. Refer to clause 9.2.2 in this Manual for minimum cover requirements.'</p> <p>Add 'Pipe embedment aggregates to be according to the following table':</p> <p>Sieve Analysis Percent Passing (Test Method <i>Australian Standard 1141.11.1-2009 (Washed)</i>)</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th style="text-align: center;">Sieve Size</th> <th style="text-align: center;">Percent Passing Range</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">6.7mm</td><td style="text-align: center;">100</td></tr> <tr><td style="text-align: center;">4.75mm</td><td style="text-align: center;">90-95</td></tr> <tr><td style="text-align: center;">3.35mm</td><td style="text-align: center;">65-70</td></tr> <tr><td style="text-align: center;">2.36mm</td><td style="text-align: center;">35-40</td></tr> <tr><td style="text-align: center;">1.18mm</td><td style="text-align: center;">10-15</td></tr> <tr><td style="text-align: center;">0.60mm</td><td style="text-align: center;">5-10</td></tr> <tr><td style="text-align: center;">0.30mm</td><td style="text-align: center;">0-5</td></tr> <tr><td style="text-align: center;">0.15mm</td><td style="text-align: center;">0-2</td></tr> </tbody> </table>	Sieve Size	Percent Passing Range	6.7mm	100	4.75mm	90-95	3.35mm	65-70	2.36mm	35-40	1.18mm	10-15	0.60mm	5-10	0.30mm	0-5	0.15mm	0-2
Sieve Size	Percent Passing Range																		
6.7mm	100																		
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3.35mm	65-70																		
2.36mm	35-40																		
1.18mm	10-15																		
0.60mm	5-10																		
0.30mm	0-5																		
0.15mm	0-2																		
PSS-1001	Add note '7. Concrete encased pipe is not permitted.'																		
PSS-1007	Add note '8. Lockable covers are required for all flushing points.'																		
PSS-1101	Add note '4. GWMWater responsibility for components is defined in Clause 6.5 in this Manual.'																		
PSS-1102	Add note '8. Lockable covers are required for all boundary kits.'																		

SECTION 5: APPROVED PRODUCTS AND MATERIALS

Products to be installed by or gifted to GWMWater for ongoing ownership, operation and maintenance, must:

- be in accordance with the Preferred Products listed herein

OR

- be approved equivalents with written approval from GWMWater.

Note that any and all materials in contact with drinking water must meet AS:4020. Evidence of AS:4020 compliance must be provided to GWMWater’s satisfaction.

WATER NETWORKS

Item	Preferred Product(s)		
Water Pipes			<i>Minimum Class* & Diameter</i>
	<i>Material</i>	<i>Joints</i>	<i>Urban Systems</i>
			<i>Rural Systems (Stock & Domestic)</i>
	PVC-U (Series 2)	RRJ#	PN 16 - ≥ DN 100 mm
	PVC-M (Series 2)	RRJ#	PN 16 - ≥ DN 100 mm
	PVC-O (Series 2)	RRJ#	PN 16 - ≥ DN 100 mm
	Steel	Various	PN 20 - ≥ DN 100 mm
DICL (internal sealant and PE sleeving)	RRJ	PN 20 - ≥ DN 100 mm	
HDPE PE100	Electrofusion or Welded	PN 16 - ≥ DN 63mm	
	<p style="background-color: yellow;">*Pressure class (after any fatigue de-rating under WSAA 03 - 3.6.4) is to be at least 1.5 times the maximum design pressure.</p> <p style="background-color: yellow;">#GWMWater requires spigot-socket elastomeric seals for PVC pipes. Elastomeric seals shall be in accordance with supplier recommendations.</p> <p style="background-color: yellow;">Where pipelines are to be constructed beneath existing or proposed road pavements any of the following pipe materials shall be used:</p> <ol style="list-style-type: none"> <li style="background-color: yellow;">a) Ductile iron cement lined (DICL) PN 20 pipes. <li style="background-color: yellow;">b) Modified PVC PN 16 Series 2 pipes. <li style="background-color: yellow;">c) Oriented PVC PN 16 Series 2 pipes. <li style="background-color: yellow;">d) HDPE PN16 PE100 		

	<p>The pipes shall extend at least 500 mm behind the back of the kerb, or if there is no kerb, at least 500 mm beyond where a future kerb is expected to be, i.e. beyond the road shoulder, or open drain.</p> <p>The use of these pipe materials shall apply to both the lateral crossing of roads and longitudinally along the road or shoulder.</p> <p>The minimum depth of cover beneath existing or proposed road pavements shall be 750 mm, or greater if required by the road authority.</p> <p>The following materials are not approved:</p> <ul style="list-style-type: none"> • ABS (Acrylonitrile Butadiene Styrene) • MDPE (Medium Density Polyethylene) ('Rural Poly') • GRP (Glass Reinforced Plastic) <p>Approved Pressure Pipe Fittings:</p> <ul style="list-style-type: none"> • Ductile Iron (fusion coated or thermal bonded polymeric coated) - min. pressure class PN 16 • MSCL Welded or Elastomeric Seal (Fusion coated and factory tape applied external coatings) • Electrofusion welded PE100 PN16 polyethylene.
<p>Water Storage Tanks</p>	<p>Marvplate panel tanks are to have internal liners with a minimum guarantee of 15 years 'Sandwich' style panel tanks are not accepted. A structural infill slab is required. Ring beam foundations are not accepted. Where their use is accepted, poly tanks may have a crushed rock or road-base foundation, minimum 200mm thick.</p>
<p>Water Storage Tanks - Other</p>	<p>Any internal fittings and external aboveground pipework and fittings are to be grade 316 Stainless Steel. Design will be subject to review and sacrificial anode or impressed current cathodic protection systems may be required.</p>
<p>Flow Meters (bulk and operational intelligence)</p>	
<p>Domestic Meters</p>	
<p>Level Sensor</p>	

WATER PUMP STATIONS

Item	Preferred Product(s)
Pumps	WSAA approved products. Soft start or VSD controllers are required.

SEWER NETWORKS

Item	Preferred Product(s)								
Gravity Sewer Pipes	<ul style="list-style-type: none"> PVC-U (Plain Wall) RRJ SN 8 for \geq DN 150mm, SN 10 for DN 100 mm. Polypropylene (Profile) (e.g. SewerPro) RRJ SN 10 for \geq DN 150 mm Polyethylene (Plain Wall) Welded SDR 17 PE80 \geq DN 150 mm is permitted where bored installation is required for a road crossing or for environmental reasons. <p>Note: The minimum acceptable diameter for gravity sewer mains is 150mm without written approval by GWMWater.</p> <p>Note: The maximum length of PVC pipe is limited to 3 metres.</p> <p>Note: The use of two or more types of pipe material on a single run of pipe between adjacent maintenance holes is not accepted.</p> <p>Requirements for elastomeric seals in gravity and rising main pipes:</p> <ul style="list-style-type: none"> For domestic wastes only: <ul style="list-style-type: none"> EPDM - Ethylene propylene diene monomer SBR - Styrene Butadiene Rubber CR - Chloroprene Rubber For industrial or commercial wastes: <ul style="list-style-type: none"> CR - Chloroprene Rubber <p>Note: Non-return (reflux) valves are not to be used in gravity pipe systems.</p>								
Sewer Rising Main Pipes	<p>Pipes must be cream coloured or include a cream coloured marking stripe.</p> <p>Approved sewer rising main pipes:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #cccccc;">Material</th> <th style="background-color: #cccccc;">Joints</th> <th style="background-color: #cccccc;">Min. Class & Diameter</th> <th style="background-color: #cccccc;">Comment</th> </tr> </thead> <tbody> <tr> <td>PE100 (preferred)</td> <td>Electrofusion Welded</td> <td>PN 16 - \geq DN 100 mm</td> <td></td> </tr> </tbody> </table>	Material	Joints	Min. Class & Diameter	Comment	PE100 (preferred)	Electrofusion Welded	PN 16 - \geq DN 100 mm	
Material	Joints	Min. Class & Diameter	Comment						
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	<table border="1"> <tr> <td>PVC-M (Series 2)</td> <td>RRJ</td> <td>PN 16 - ≥ DN 100 mm</td> <td rowspan="2">Spigot-socket and elastomeric seals only</td> </tr> <tr> <td>PVC-O (Series 2)</td> <td>RRJ</td> <td>PN 16 - ≥ DN 100 mm</td> </tr> <tr> <td>DICL (anti-corrosion internal sealant and PE sleeving)</td> <td>RRJ</td> <td>PN 20 - ≥ DN 100 mm</td> <td>Sealant such as high alumina cement mortar.</td> </tr> </table>	PVC-M (Series 2)	RRJ	PN 16 - ≥ DN 100 mm	Spigot-socket and elastomeric seals only	PVC-O (Series 2)	RRJ	PN 16 - ≥ DN 100 mm	DICL (anti-corrosion internal sealant and PE sleeving)	RRJ	PN 20 - ≥ DN 100 mm	Sealant such as high alumina cement mortar.
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	<p>Note: Pressure class (after any applicable fatigue de-rating) is to be at least 1.5 times the maximum design pressure.</p> <p>The following materials are NOT approved:</p> <ul style="list-style-type: none"> a) Steel Pipe b) ABS (Acrylonitrile Butadiene Styrene) Pipe c) PVC-U Pipe d) Glass Reinforced Plastic Pipe <p>Approved sewer rising main fittings:</p> <ul style="list-style-type: none"> a) Ductile Iron (fusion coated or thermal bonded polymeric coated) b) MSCL Welded or Elastomeric Seal (Fusion coated and factory tape applied external coatings) c) Electrofusion welded PE100 polyethylene. 											
Pressure Sewer Pipe	<p>Pipes must be cream coloured or include a cream coloured marking stripe.</p> <p>Pressure pipe materials shall be electrofusion welded PE100 polyethylene, minimum pressure class PN16.</p>											
Sewer Valves	See Gravity Sewer Pipes, Sewer Rising Main Pipes and Pressure Sewer Pipe.											
Sewer Manholes – Concrete & Epoxy Coatings	<p>All joints in precast concrete maintenance shall be sealed using adhesive mastic impregnated carrier backed with PVC laminate.</p> <p>The minimum grade of concrete for MHs is 25 Mpa at 28 days and is to be sulphate-resistant. Certification from the concrete supplier or pre-cast material supplier is required prior to design approval and is to be noted on the drawing.</p> <p>The minimum accepted exposure classification of concrete in maintenance holes is B2 as defined in <i>AS 3735-2001 Concrete structures for retaining liquids</i>.</p> <p>Repair of blemishes in concrete manholes to be made with Sulphate resistant cement (with 25-30% total fly ash, by weight as cement replacement) is to be used for repairs of all</p>											

	<p>maintenance structures. Where applicable, reinstatement of epoxy coating as per below.</p> <p>Approved epoxy resin products for internal sealing of concrete maintenance holes:</p> <ul style="list-style-type: none"> • for domestic only wastes <ul style="list-style-type: none"> ○ Epirez 133 General Purpose Epoxy Mortar Binder with Epirez Epoxy Mortar Aggregate Extender ○ Parchem Construction Supplies – Nitomortar EL, minimum thickness of 5 mm, and Nitomortar ELS, minimum thickness of 3 mm. • for industrial or commercial wastes <ul style="list-style-type: none"> ○ Epirez 133AR Acid Resistant Epoxy Mortar Binder with Epirez Epoxy Mortar Aggregate Extender
Sewer Maintenance holes – Other	<p>Equivalent polypropylene (PP) products with WSAA and MRWA approval are approved for use in GWMWater systems in accordance with the use detailed under those approvals and limited to a depth of 4m and not below groundwater level. Compaction tests are required at every 1m of rise in accordance with “Quality - Inspection and Test Plans” above. The developer may propose installation below groundwater level and specify the method of floatation protection for GWMWater consideration.</p>
Sewer Maintenance Shafts	See ‘Gravity Sewer Pipes’ for approved materials.
Pressure Sewer Units & Boundary Kits	<ul style="list-style-type: none"> • Aquatec Pressure Sewer systems • Aquatec Boundary kits
Trade Waste	GWMWater will review and approve trade waste treatment and monitoring products as part of the trade waste agreement.
Flow Meters	As per SEWER PUMP STATIONS

SEWER PUMP STATIONS

Item	Preferred Product(s)
Concrete Corrosion Protection	Sulphate resistant concrete shall be used to provide corrosion protection. If no educt vent is installed, exposed concrete surfaces in the wet-well shall be epoxy coated with Sewpercoat

	(Parchem) or GWMWater approved equivalent product.
Metallic Corrosion Protection	<p>Refer to Clause 16.3.1 in this Manual for details on discharge pipework and all other metal work in the wet-well and valve chamber.</p> <p>All other metal-work within the wet-well (i.e. valve guide-rails, lifting chains, supporting brackets, hooks, valve extension spindles, knife-gate valves) shall be Grade 316 Stainless Steel or better unless dissimilar metal galvanic corrosion is likely as a result of the stainless steel installation.</p> <p>Design will be subject to review and sacrificial anode or impressed current cathodic protection systems may be required.</p>
Pumps	<p>Approved pumps are submersible with hard iron n-type single vane impellers, unless another type is approved for special circumstances. Final selection of the pump model and size is subject to approval by GWMWater.</p> <p>Pumps rates greater than 2kW require suitable 'soft start' controllers.</p> <p>GWMWater may require VSDs in some circumstances.</p> <p>In addition, for staged development, GWMWater requires a 'smart pump' (Flygt Concertor Pump or GWMWater approved equivalent).</p>
Lifting Equipment	<p>MILLER DURAHOIST DH- 7ZP footing system (or GWMWater approved equivalent product).</p> <p>Systems requiring capacity over 150kg will require a suitably engineered electric hoist.</p>
Pipework	<p>Discharge pipework in the wet-well and valve chamber shall be welded polyethylene PE100 or Grade 316 stainless steel.</p> <p>For inlet pipework, see applicable standards in SEWER NETWORKS.</p>
SCADA & RTU	<p>GWMWater will advise the prescribed products in accordance with the current GWMWater SCADA and RTU standards. The RTU will be installed by GWMWater's accredited SCADA system contractor at the Developer's expense.</p>
Generator Plug	<p>One of the following with an amp rating greater than the power consumption of the site:</p> <ul style="list-style-type: none"> • 50 amp 'Clipsal' style generator inlet socket

	<ul style="list-style-type: none"> 150 amp 'Marechal' generator inlet socket
Level Sensor	<p>Ultrasonic level sensors are preferred.</p> <p>Proposals for use of differential pressure transducers will be considered.</p> <p>Backup level sensors are required and must be three hard-wired float switches with stilling tubes.</p>
Flow Meter	<p>Siemens Mag5100W or Mag6000</p> <p>ABB WaterMaster</p>

WATER TREATMENT

Item	Preferred Product
Flow Meters - Process and Bulk Water Meters	<p>One of the following shall be used as the standard meter for the WTP:</p> <ul style="list-style-type: none"> Siemens Mag8000/Mag6000 ABB WaterMaster
Flow Meters - Domestic Supply	Elster/Honeywell V200
PLC (Programmable Logic Controller)	PACSystems Rx3i from Emerson Automation (formerly GE IP)
Dosing Pumps	None specified.
Chlorine Analyser	Analytical Technology Inc (ATI) Q46H
Chlorine Probe	<ul style="list-style-type: none"> Analytical Technology Inc (ATI) Georg Fischer Signet 2630
pH Probe	<ul style="list-style-type: none"> HACH pHc101 ThermoFisher Orion Yokagawa pH Analyser EXApH402 HACH HQ40D (Multi Probe Handheld)
Turbidity Analyser	<ul style="list-style-type: none"> HACH 1720E (or equivalent) HACH 2100Q (Handheld)
Spectrophotometer	<ul style="list-style-type: none"> HACH DR1900

Raw water drinking water separation	<ul style="list-style-type: none">• Double block and bleed configuration is required.
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