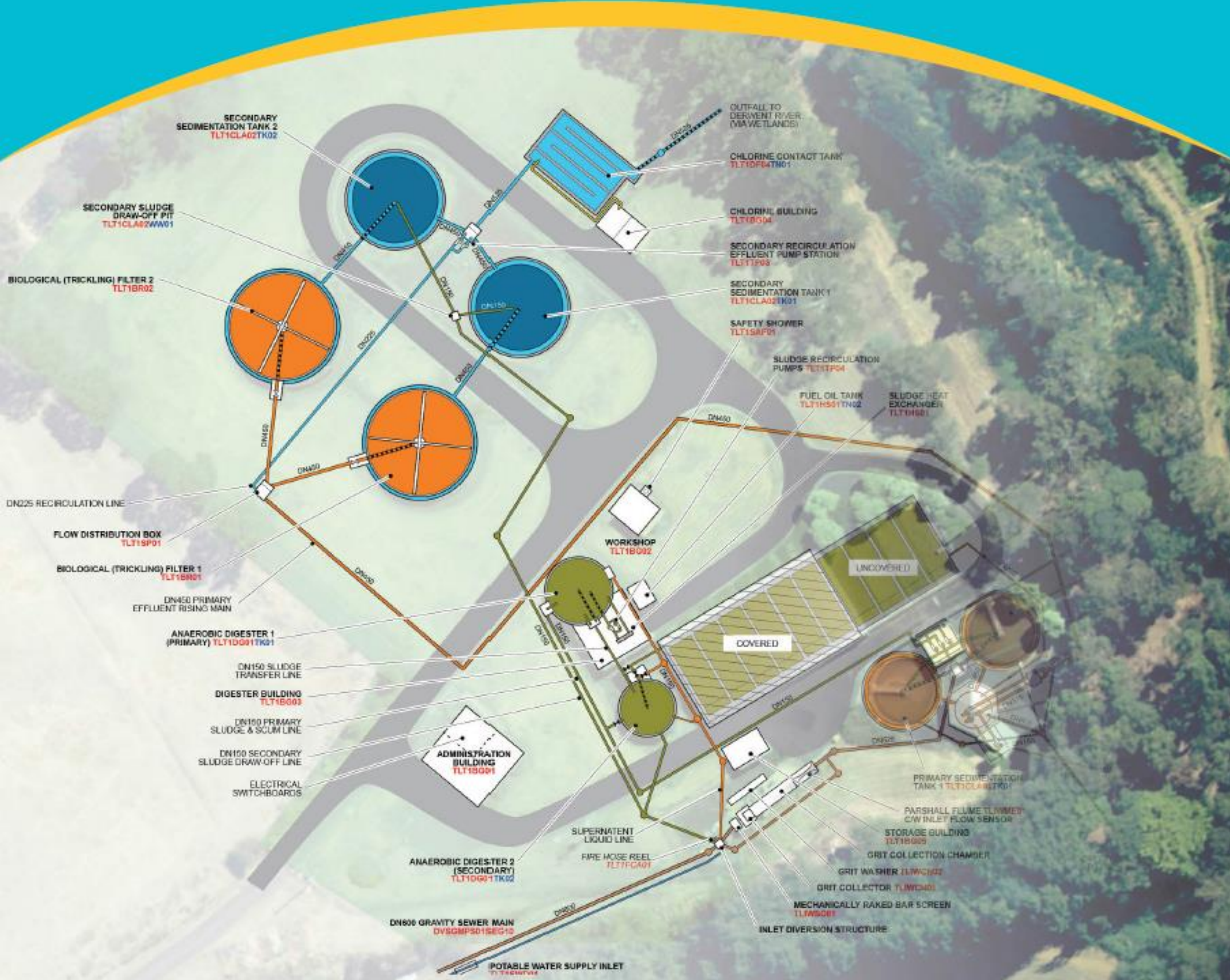
Asset Spatial Data Standard

October 2021, version 2.0



Document approval and issue notice

This is Version 2.0 of the TasWater Asset Spatial Data Standard (ASDS).
This document is authorised for release once all signatures have been obtained.

Approval Type	Name and Position	Signature	Date
Prepared for acceptance	Patrick Kent-Fahey Asset Information Quality Specialist Asset Information	*P. Kent-Fahey*	01/10/2021
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Build status

Version	Date	Author	Reason	Sections
2.0	01/10/2021	Patrick Kent-Fahey	To outline the requirements for providing “as constructed” and other survey data asset data to TasWater	All

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1 Purpose of this Document

1.1 Preface

The purpose of this standard is to describe the requirements for the survey of TasWater (TW) network infrastructure and the supply of resultant information through as constructed survey drawings.

The document covers the following:

- Accuracy and control requirements for the survey of TW's infrastructure
- Templates and other considerations for the supply of as constructed survey drawings to TW
- TW's asset data schema (data structure) for water and sewer network assets
- Connectivity rules for assets represented in as constructed survey drawings and GIS data.

1.2 Scope

This standard applies to the survey and data supply for all as constructed survey drawings supplied to TW as part of the gifted asset handover for a development.

This standard may also be referred to for the spatial data specifications of a particular project or survey request by TW.

This document is specifically for as constructed plans and does not cover all requirements that are necessary for the final acceptance of new infrastructure – refer to TAMFRA03 – Asset Data Handover Requirements for full requirements.

2 Contact Details

2.1 Obtaining a copy of this document

The latest version of this standard will be made available on our website **www.taswater.com.au** under the **Building & Development** section.

2.2 Enquiries and feedback regarding this standard

Current contact details for feedback and enquiries are listed alongside the document and templates on our website **www.taswater.com.au** under the **Building & Development** section.

2.3 Supply of asset data

The supply of asset data that meets the requirements of this standard is to be issued to **assetinfo@taswater.com.au**.

3 Glossary of Terms, Abbreviations and References

3.1 Abbreviations (general)

Abbreviation	Definition
AMIS	Asset Management Information System
AHD	Australian Height Datum
CAD	Computer-aided Design (software)
CCTV	Closed Circuit Television (video for pipeline inspection)
CORS	Continuously Operating Reference Stations network
DLP	Defects Liability Period (warranty period for assets; usually 12 months)
EPU	Estimated Positional Uncertainty
FA	Final Acceptance (occurs after defects liability period)
GDA	Geocentric Datum of Australia
GIS	Geographic Information System
IO	Inspection Opening
MGA	Map Grid of Australia
MH	Maintenance Hole, formerly referred to as Manhole
PC	Practical Completion (hand-over of assets and start of defects liability period)
SPS	Sewage Pumping Station
STP	Sewage Treatment Plant (also referred to as Wastewater Treatment Plant)
SurCOM	Survey Control Marks Database (maintained by DPIPWE)
TW	Tasmanian Water and Sewerage Corporation known as TasWater
WPS	Water Pumping Station
WTP	Water Treatment Plant

3.2 Abbreviations (units of measurement)

Abbreviation	Definition
DN	*Diamètre Nominal* (nominal diameter or pipe size in mm)
km	Kilometre
kPa	Kilopascal (unit of pressure)
l/s	Litres per second
m	Metre (default unit of measure for position, lengths and heights)
m^2	Square metre (default unit of measure for areas)
m^3	Cubic metre (default unit of measure for volumes)
ML	Megalitre (default unit of measure for capacity)
mm	Millimetre (default unit of measure for positional accuracy and diameters)
RL	Reduced level (default unit of measure is metres)

3.3 Glossary of terms

Term	Definition
As constructed	A visual, spatially accurate representation of the relevant infrastructure as it exists in the field including key asset information.
As constructed survey drawings	A particular kind of as constructed drawing file used to provide spatial data for a new development in a survey plan.
Absolute spatial position	As defined in **AS 5488-2013**, *The location of a point on the utility shown by reference to a three-dimensional coordinate system from which can be derived*

	horizontal MGA coordinates … related to the relevant MGA Zone and Geocentric datum, and a vertical position referenced to … AHD.
Positional uncertainty	The uncertainty of the horizontal and/or vertical coordinates of a survey control mark with respect to datum.
Survey uncertainty	The uncertainty of the horizontal and/or vertical coordinates of a survey control mark independent of datum.

3.4 Referenced documents

Standard or legislation	Title
AS 5488.1:2019	Classification of Subsurface Utility Information (SUI)
WSA 02-2002-2.3 MRWA Edition v1.0	Sewer Code of Australia WSA 02-2002 Second Edition Version 2.3 Melbourne Retail Water Agencies Edition [Version 1.0]
WSA 03-2011-3.1 MRWA Edition v2.0	Water Supply Code of Australia WSA 03-2011 Third Edition Version 3.1 Melbourne Retail Water Agencies Edition [Version 2.0]
TW Supplement to WSA 03-2011-3.1 MRWA Edition v2.0	TasWater Supplement to Water Supply Code of Australia WSA 03-2011-3.1 MRWA Edition – [Version 2.0]
TW WSA 02-2014-3.1 v2.0 Supplement	TasWater Supplement to WSA 02-2014-3.1 WSAA Gravity Sewerage Code of Australia (Melbourne Retail Water Agencies Edition) [Version 2.0]
TW WSA 04-2005 2.1 v3.0 Supplement	TasWater Supplement to WSA 04-2005 2.1 WSAA Sewage Pumping Station Code of Australia [Version 3.0]
Water Management Act 1999	An Act to provide for the management of Tasmania's water resources and for other purposes
WSA 07-2007-1.1	Pressure Sewerage Code of Australia WSA 07 – 2007 First Edition Version 1.1
TAMST14	TasWater Requirements for Sewer CCTV Conduit
TAMFRA03	Asset Data Handover Requirements
TWS-M-0002	Sewage Pump Station Wet Well Level Settings
Survey Directions	Survey Directions Tasmania : Pursuant to the Surveyors Act 2002 Revision Date : 011020
Standard for the Australian Survey Control Network (SP1)	Standard for the Australian Survey Control Network – Special Publication 1 (SP1) published by the Inter-Governmental Committee on Surveying And Mapping (ICSM)

4 Safety Considerations

Work Health and Safety Act 2012, the Work Health and Safety Regulations 2012, relevant Codes of Practice and relevant Australian Standards must be followed during any survey field work.

Surveyors or contractors must never enter any TW maintenance shaft, manhole or pit for data collection or survey purposes.

5 Supply of Data

5.1 Accepted data formats

5.1.1 As constructed survey drawings

As constructed survey drawings must be supplied to TW as a .DWG format digital drawing that uses TW's template as constructed survey drawing file (.DWG file) with all assets represented in the correct layers and all required block details populated.

Please note that text annotation (labels) will not be accepted as a substitute for tabular data or block details.

5.1.2 Other survey data

Other survey data supplied to TW must be in as GIS format file (shapefiles, geodatabase, or MapInfo TAB or MID/MIF files) fully compliant with the data schema and connectivity rules of this standard.

Note that Geodatabase format using TW's template file geodatabase (GDB) is preferred.

6 Provision of templates

TW has developed template files that match the schema and other requirements listed in this document. It is preferred that asset data supplied to TW is generated using these templates. The following templates for data supply formats are available:

CAD Template (for as constructed survey drawings)
.DWG file containing blocks, attribute template and layers matching the TW data schema.

ESRI GDB Template (for other surveys)
GDB file containing GIS feature classes, with fields and domains that match the TW data schema.

Additionally, the following survey code library templates have been published which may assist surveyors in capturing data in the field and loading into the above templates:

- TasWater ASDS Leica Code Libraries and Stylesheet
- TasWater Trimble Code Library.

As an additional reference, a HTML view of the data schema has also been published.

The latest versions of these templates are available on our website **www.taswater.com.au** under the **Building & Development** section. Alternatively, contact **assetinfo@taswater.com.au** to obtain a copy.

7 Accuracy and Survey Standards

TasWater requires all assets to be represented in as constructed and other survey data with absolute spatial positions meeting the accuracy requirements described in this section.

7.1 Coordinate system and bearing datum

TasWater will accept data supplied in the **Geocentric Datum of Australia 1994** (GDA94) up to 31 January 2022 and data supplied in the **Geocentric Datum of Australia 2020** (GDA2020) from 1 February 2021.

The map projection to be used is **Map Grid of Australia Zone 55** (MGA Zone 55).

Data is not to be supplied using ground distances, truncated coordinates, or other local coordinate systems

NOTE

Even though King Island straddles MGA Zones 54 and 55, TW utilises just MGA Zone 55 for the entire island for administrative efficiency purposes.

All plans must clearly identify the datum for bearings and coordinates in the associated title block of the CAD file.

The coordinates for a survey must be determined specifically for the survey by one of the following methods:

a) Using a previously established permanent survey mark held in SurCOM as the origin of the coordinates
b) Using a CORS network as the origin of the coordinates with a check onto a nearby SurCOM mark to be supplied
c) Using a single CORS base as the origin of the coordinates with a check onto a nearby SurCOM mark to be supplied
d) Using an AUSPOS solution as the origin of the coordinates where no other SurCOM mark is considered suitable, the AUSPOS report must indicate a reliable solution has been achieved.

7.2 Positional uncertainty

TasWater requires that the positional uncertainty of surveys, as described in the Standard for the Australian Survey Control Network (SP1) be determined to provide an indication of the accuracy of the survey relative to the horizontal datum. Each survey must provide an estimation of the positional uncertainty of at least 1 surveyed position, but ideally 2 or more positions. These positions must defined by a physical asset or a reference mark placed during the survey.

For the purpose of estimating the positional uncertainty of derived coordinates, the positional uncertainty of MGA2020 coordinates:

a) of permanent marks held in SURCOM, is the value provided in the SURCOM Survey Control Mark Summary for the GDA2020 datum
b) derived from a satisfactory AUSPOS solution is the positional uncertainty provided in the AUSPOS report, at the 95% confidence level
c) derived from a CORS solution, is the average quality value indicated by the GNSS receiver over two occupations no less than 20 minutes apart, adjusted to 95%

confidence level (A), increased to allow for the positional uncertainty of the CORS base station coordinates (= B) as follows: √. ($A^2 + B^2$). (B is typically 0.012 for CORS stations with a Regulation 13 CORS stations) [1].

The maximum allowable positional uncertainty is shown as below[1], but any deviation of an EPU from 0.05m (AS 5488.1:2019) must be reported with the data, giving reasons for the variation. TW reserves the right to specify different maximum allowable positional uncertainties for any project or survey.

Table 1

Proximity of permanent mark with GDA2020 coordinates with a PU of 0.050 or better	Maximum allowable positional uncertainty
less than 1 km	0.1 metres
less than 5 km, but excluding those less than 1 km.	0.3 metres
All other surveys	0.5 metres

7.3 Vertical datum

Levels must be supplied using the **Australian Height Datum (Tasmania) 1983** (AHD83).

NOTE

Flinders Island utilises a local height datum (**Flinders Island Local Datum**). The datum used for topographic mapping of the Furneaux Group carried out in 1972 is mean sea level as advised by the Division of National Mapping.

The elevation may be determined by the following methods:

a) adopting a previously established permanent survey mark held in SurCOM as the origin of the elevation with a check to one or more nearby SurCOM marks. Marks used shall have a stated height order being one the following:

- 3rd Order
- 4th Order
- Lower 3rd
- Lower 4th

b) if elevations are determined from the CORS network either using a network or single CORS base as the origin of the elevation a check to one or more nearby SurCOM marks must be supplied. Permanent survey marks used for this purpose must meet the criteria specified in 7.3.a

c) using an AUSPOS solution as the origin of the coordinates where no other SurCOM mark is considered suitable. The AUSPOS report must indicate a reliable solution has been achieved.

[1] Survey Directions Section 2.1.3.3 Explanatory Notes

7.4 Quality levels

TasWater uses survey accuracy requirements based on the classifications specified in Australian Standard AS5488-2019 “Classification of Subsurface Utility Information (SUI)”, and using the Survey Uncertainty as defined in the Standard for the Australian Survey Control Network – Special Publication 1 (SP1) published by the Inter-Governmental Committee on Surveying And Mapping (ICSM).

AS5488-2019 defines quality levels of data capture for sub-surface assets as per the table below:

Table 2

Quality Level	Conditions	Horizontal Survey Uncertainty	Vertical Survey Uncertainty
A	Assets exposed and surveyed directly.	±0.05 m	±0.05 m
B	Relative spatial position using existing records, the position of measured surface features and measured subsurface utilities determined by electronic service location or tracing.	±0.3 m	±0.5 m
C	Relative spatial position using existing records and the position of measured surface features to interpolate the location of subsurface utilities	±0.3 m	N/A
D	Indicative position of utilities using existing records, cursory site inspection, anecdotal evidence	N/A	N/A

TasWater has defined its own quality levels in addition for certain scenarios or configurations requiring greater accuracy:

Table 3

Quality Level	Conditions	Horizontal Survey Uncertainty	Vertical Survey Uncertainty
A+	Assets exposed and surveyed directly with enhanced accuracy requirements.	±0.05 m	±0.03 m
High accuracy	Assets exposed and surveyed directly with enhanced accuracy requirements.	±0.02	±0.01

7.5 Sub-surface asset accuracy requirements

For the purpose of as constructed data supply, underground assets such as water and sewer mains must be surveyed with accuracy, precision and methodologies that align with Quality Level A as per AS 5488.1:2019, summarised below:

> **Quality Level A**: Describes a below-ground asset that is validated by a series of sub-surface points and surface features with absolute 3D spatial positioning and confirmed attribute information. The maximum allowable vertical and horizontal tolerance is ±50mm.
>
> *Where the line is not completely visible from line of site between validated points, that segment cannot be classed as quality level A.*

For new assets surveyed as part of an as constructed drawing, TW requires the positions captured for all assets (including above-ground assets) to be captured with a vertical and horizontal tolerance of **± 50 mm.** TW accepts that, due to backfill practices and trenchless renewals, the sub-surface asset ma not always be fully exposed at the time of survey and will accept the following as compliant:

- water and pressurised sewer pipelines where the maximum distance between exposed points defining the asset is 50m, and all intersections and changes in direction/grade are surveyed as 3D positions on exposed points
- straight-segment gravity sewer mains where changes in direction/grade are surveyed as 3D positions on exposed points.

> **NOTE**
> It may be necessary to expose the asset by potholing or other non-destructive methods to comply with TW's sub-surface asset quality level requirements.

7.6 Sewer invert vertical accuracy requirements

General sewer invert levels must be surveyed to the requirements of **Quality Level A** (Table 3): vertical accuracy tolerance of **± 50 mm**.

In the event of flat sewers (i.e. 1 in 200 grades) an increased level of survey accuracy will be required. TW requires levels on these grades to be surveyed to **Quality Level A+** (Table 3): vertical accuracy tolerance of **± 30 mm.**

7.7 Connecting to existing infrastructure

For the purpose of as constructed data supply, the survey must capture the position of at least one existing TW asset to which the new infrastructure connects. This position must be represented in as constructed information and/or GIS data and clearly annotated as an existing asset.

8 Spatial Data Requirements

8.1 Layers and object types

Asset classes that are in TW's schema and specified within this standard and the companion data structure HTML document must represented in a CAD drawing or GIS dataset in separate layers with the specified object type (point, line, polyline etc) and block details. TW's templates have the layers and block details/attributes built into them.

8.2 Abandoned/removed assets

Any existing TW asset that is abandoned in place, removed or shortened as part of construction must conveyed to TW as specified below:

- For assets abandoned in place, the same survey requirements apply as with any new asset and they must be represented in as constructed and GIS information as per the relevant asset data schema for abandoned assets within the ASDS data structure HTML.

- Assets that have been removed should be included in as constructed drawings and clearly annotated as 'removed'.

8.3 Photos

Photos are required for each sewer maintenance hole in an as constructed survey or for other asset types as specified by TW for a particular survey job or project.

8.3.1 Maintenance hole photographs

Maintenance holes require two photos:

- Taken from a few metres back to show the maintenance hole in the context of its surrounds (assists with locating)
- Taken from the opening of the maintenance hole with the lid off clearly showing the base and channel.

8.3.2 Photo file naming and format

All photos for a job must be supplied in a single ZIP archive. The photo format must be: JPG Files at 5MP or greater resolution.

Photo file names must be unique for the job that they relate to.

Photos of maintenance holes or other requested assets must have their file names recorded in the relevant attributes of the asset.

8.4 Direction of lines

A sewer gravity main (pipeline) is represented by a single, continuous polyline. The beginning of the line is defined as the starting point of the sewage flow, and the end of the line is the ending point of the flow (in gravity sewer mains, the start is always upstream of the end).

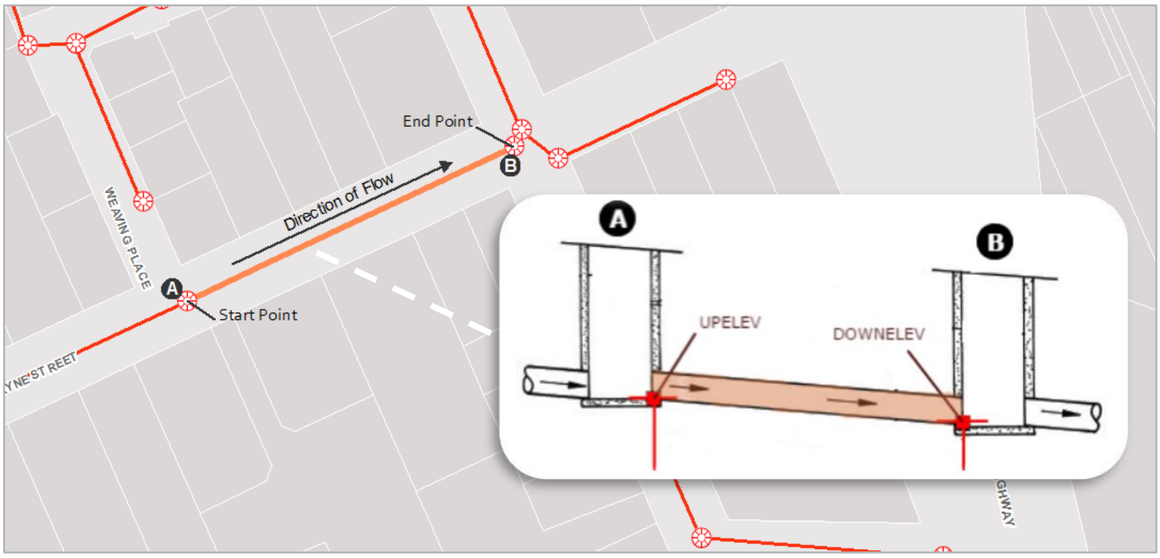


Figure 1 The direction of the GIS/CAD line should reflect the direction of flow

When supplying TW with new asset records for sewer gravity mains, the following rules must be adhered to in delivered GIS or CAD data:

a) For all sewer gravity mains, the direction of the geometry should match the direction of flow. The start point should always be the ‘upstream’ end of the main, and the end point should be the ‘downstream point’.

b) The **DOWNELEV** of a sewer gravity main must not be a higher RL than the **UPELEV**

EXCEPTIONS

The connectivity rules above may not need to apply to **Emergency storage pipes**, **Vent pipes**, **Scour pipes**, **Outfall pipes** or **Overflow pipes**. TW will assess the accuracy of these assets classes on an individual basis.

8.5 Snapping

Where assets are connected, they must be 'snapped' together with a maximum allowable horizontal tolerance of **±10 mm.**

When snapping, use surveyed coordinates as the point of truth to snap other records to (i.e. do not adjust any accurate horizontal positions for the sake of snapping).

With the use of CAD software, 3D polylines should *not* be snapped vertically to surface features such as valves or hydrants but should retain their real depth.

8.5.1 IOs/maintenance shafts

All intersecting pipes (including customer laterals) must be horizontally snapped to the locations of inspection openings and maintenance shafts.

8.5.2 Valves/water mains

Water pipes should be horizontally snapped **to** the horizontal positions of all valves and hydrants that are situated on that pipe.

System valves must not be situated precisely at the intersecting point of a water main T-junction. The valve point must be on the water main to which it is fitted at the accurate, surveyed location.

The only scenario in which a valve can exist at an intersection of pipes is where a *ferrule valve* is installed on a water reticulation main where a lateral line (property service) connects.

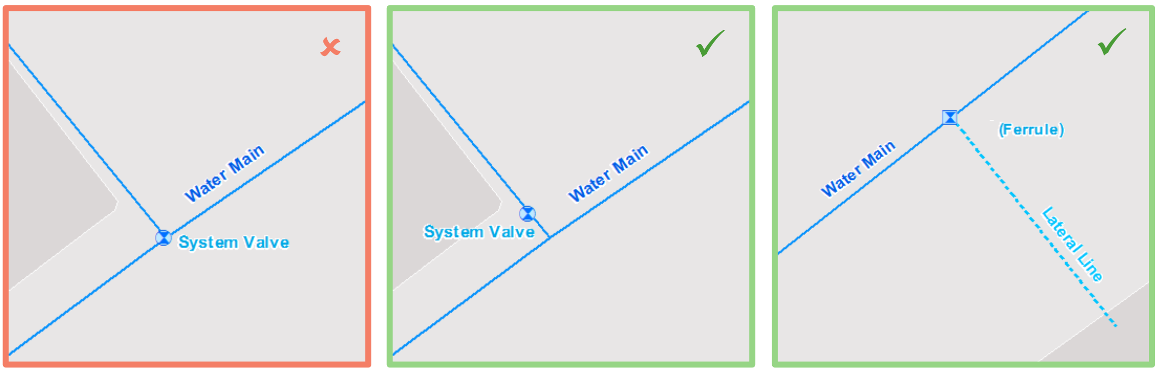


Figure 2 Example of incorrect and correct placement of a valve at a T-junction

8.6 Splitting of linear assets

Linear assets such as water mains or sewer mains are represented in CAD/GIS data as separate 3D polylines. Stretches of pipeline are broken up into individual assets based on a number of rules which are listed below. Each asset is a single, continuous polyline (or 3D polyline) with a unique asset number/identifier. Bends or points of measurement on the asset are represented using vertices.

8.6.1 Pressurised mains

A pipe length is split into individual assets when the following scenarios occur:

1. The size/diameter changes between the two sections of pipe (except in the case of a bypass – see section 9.4)
2. Attribute information changes (i.e. installation date or material)
3. A tee or cross fitting is used to connect multiple sections of pipe
4. In instances when a non-return valve, control valve or zone valve separates the two sections of pipe (except in the case of a secondary control valve on a bypass – see section 9.4)
5. When a pump, pumping station, tank, dam or treatment plant separates the two sections of pipe
6. When a reticulation sub-main separates the two sections of pipe.

Note that a pipe feature is **not** split when the following scenarios occur:

7. An air valve is installed directly on the main
8. An isolation valve (other than a 'zone valve') is installed directly on the main
9. A hydrant is installed directly on the main
10. A property lateral line is connected to the main

8.6.2 Gravity mains

Sewer gravity pipes must only be split into separate assets/lines when they intersect a maintenance hole, maintenance shaft or other network structure such as a pumping station. System inspection openings (see section 10.2.2) do not split the pipes.

9 Survey Measurement Requirements

9.1 Standard measurements

Unless otherwise described in the survey requirements further in this section, the following standard approaches must be used.

Horizontal measurements are to representative of:

- the crown (top-centre) of pipe work
- the centre of the top of the valve, hydrant or instrument where it is directly above the pipe it is attached to.

Vertical measurements are to be taken from:

- the crown (top-centre) of water pipes or any other pressurised pipes
- the invert (bottom-centre of internal pipe) of sewer gravity pipes (measure from manhole)
- the top of the valve, hydrant or instrument at the centre of the asset.

9.2 Pressurised mains

Water mains, rising mains, or sewer mains in a pressure sewer system (where each property pumps sewage into a pipe network) are considered pressurised mains. For gravity sewer capture requirements see section 9.6. Property service pipes are covered separately in section 0.

Pressurised mains must be represented as 3D polylines in CAD drawings/GIS data. Each main must be a single, continuous 3D polyline with each change in direction, or point of measurement reflected by a vertex on the line. Each vertex must have an elevation populated. Separate water mains are delineated by the splitting rules listed in section 8.6.

Absolute 3D spatial positions must be captured at key points with the pipe exposed to the surface (either before back-fill or with pothole conduits left in place). At a minimum, the following points are to be captured:

No.	Explanation
9.2. A	Absolute 3D spatial position at tee or cross intersections of mains including pipes to offset hydrants or valves and rods, riders or loops.
9.2. B	Absolute 3D spatial position half-way along a designed curve of a polyethylene pipe.
9.2. C	Absolute 3D spatial position at any change in direction of a pipe which is facilitated by a fitting.
9.2. D	Absolute 3D spatial position at the assembly or cap at the end of a pipe.
9.2. E	Absolute 3D spatial position half way along any water main which has no other 3D spatial position per the preceding rules above for a straight length of 50 or more.
9.2. F	Measurements for all valves and hydrants, including customer ferrules, installed directly on the pipe as listed in section 9.3. Horizontal positions captured on hydrants and valves must be used as vertexes for the main such that the pipe exactly connects or 'snaps' to those points in the drawing. The elevation of the main at these vertexes should be inferred as accurately as possible (e.g. based on average depth or known valve height).

NOTE

If the pipe is not fully exposed by line of site, the surveyor should be confident that there are no unexposed bends (i.e. confirmed by logs, photographic evidence or visible signs of trench set-out).

9.2.1 Trenchless installs

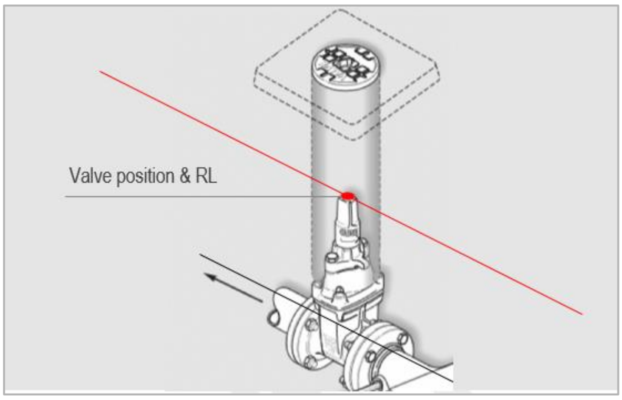
Trenchless methods of pipeline installation preclude the pickup of absolute positions as the pipe cannot be surveyed while exposed. For segments of pipe not laid in trench, TW is to be supplied with bore logs and other information which can be used to appropriately validate the construction against design.

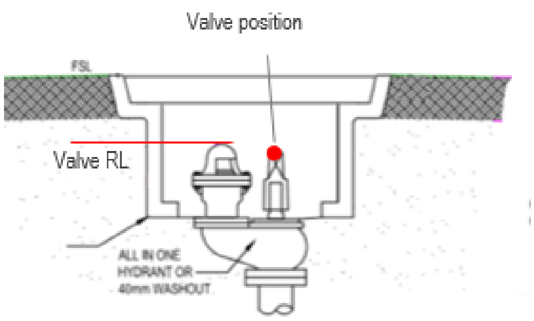
9.3 Hydrants & valves

All hydrants and valves, including customer offtake ferrules must be surveyed and included in as constructed data/drawings as points. They require an accurate horizontal position as well as a vertical RL stored in the CAD block details or GIS attribute data.

These points of measurement should also be used to create vertexes on the underlying water main. The horizontal position should intersect the water main vertex and the elevation of the main at this vertex should be estimated as accurately as possible (e.g. based on average depth or known valve height).

No.	Explanation
9.3. A	Absolute 3D spatial position at the top of the valve head for any valves positioned directly above a water main. The elevation of this point must be added as an RL in the CAD block details or GIS attribute data.
9.3. B	Absolute 3D spatial position on the crown of the tapping band or the top of the ferrule cock for a tapped offtake. The elevation of this point must be added as an RL in the CAD block details or GIS attribute data.
9.3. C	For all-in-one hydrants or other combined valves, the horizontal position of the valve is to be taken from the top of the isolation valve head and the vertical RL measurement is to be taken from the top of the hydrant/valve. The RL must be stored in the CAD block details or GIS attribute data.





9.3.1 Offset valves, hydrants or other water features

In some cases, particularly where the water main is >DN250, hydrants or air valves may be installed in an offset arrangement. In these cases, a DN100 or DN150 pipe branches off the main and connects to a hydrant and/or air valve. This branching pipe may be several meters in length and may have additional isolation valve installed (referred to as an offtake valve in this circumstance).

Examples of correct portrayals of these offset configurations are shown in the figure on the following page.

Figure 3 Example connectivity representation of offset valves or hydrants.

Similarly, TasWater may have sampling points or other instrumentation install offset from a main and the small connecting piece of pipe should be treated in the same way.

Note that:

- The offtake main is to be given the same type as the main it branches off from, regardless of its diameter or other considerations.
- Where an offtake valve exists for the offset valve, it is added as an isolation valve.
- Offtake mains split the pipe at the point of intersection.

9.4 Control/PRV valve assemblies

Flow control valves or pressure relief valves (PRV) are installed in a pit or cage as an assembly with other peripheral valves or instruments such as check valves, strainers and a bypass pipe. These arrangements do not require full survey of all components.

The primary valve of the assembly (i.e. the flow control valve or PRV) is represented as a point in CAD/GIS with an RL stored in the attributes (see the ASDS data structure HTML). If there is a secondary PRV, it must be captured in the same way. The pipework, including the bypass is represented as 3D Polylines as per Section 9.2.

These points of measurement should also be used to create vertexes on the underlying water main. The horizontal position should intersect the water main vertex and the elevation of the main at this vertex should be estimated as accurately as possible (e.g. based on average depth or known valve height).

The bypass pipework does not require survey-accurate mapping and can be represented diagrammatically as long as it fits within the proportions of the pit/cage.

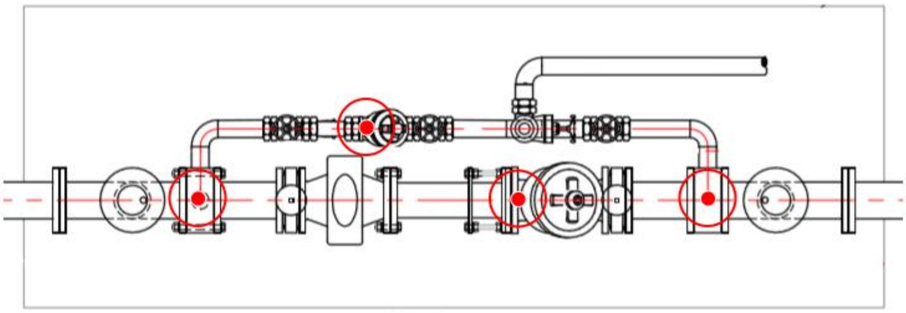


Figure 4

Table 5

No.	Explanation
9.4.A	Absolute 3D spatial position at crown of the pipe directly beside the control valve or PRV. The horizontal position is used as the point for the valve and the vertical measurement is stored in the RL attribute of the valve.
9.4.B	Absolute 3D spatial position at the crown of the pipe wherever the bypass pipework intersects the main. These points are used to map the water mains. As per the splitting rules in section 8.6, the mains are split into sperate 3D polylines at this point.
8.3.C	All horizontal measurements required to map the plan footprint of the building or other structure to standard TW accuracy tolerances (i.e. at each corner). This is represented as a polygon as per section 9.20. Vertical RL measurements are not required.

NOTE

In some cases the bypass pipe is oriented vertically rather than horizontally. In those cases, they should be represented horizontally in CAD/GIS data to diagrammatically show the bypass function.

9.5 Water connections

Water connections comprise customer meters, property service pipes and their connection to the water reticulation main (generally by a tapping band with a ferrule cock). Pipework that extends into the property beyond the meter box is not TasWater owned and does not need to surveyed per this document.

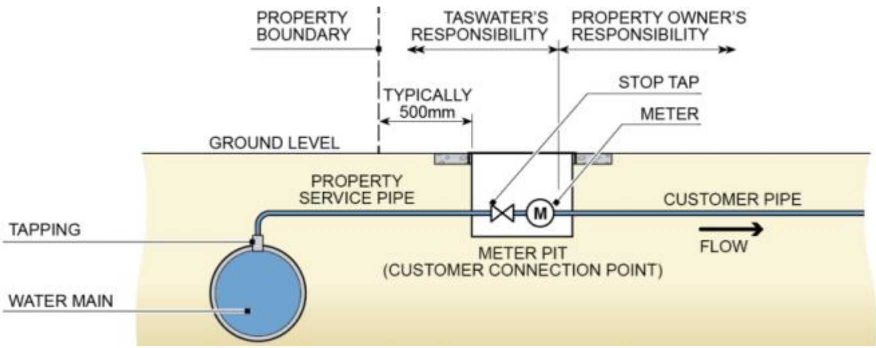


Figure 6

- **Customer connection points** are represented as a point located at the meter (or blanked end of lateral line).
- A **lateral line (property service pipe)** is a single 3D polyline that begins at the water main and ends at the customer connection point. Changes in direction or other points of measurements are reflected as vertexes on the line.
- A **ferrule cock**s are represented as a point located on the pipe where the lateral line is tapped to the main. These are not always present.

No.	Explanation
0. A	Absolute 3D spatial position at the ferrule cock or other fitting where it connects to the main. This point must also be used as the start of the lateral line, including the elevation value. This point should also be used to create a vertex on the underlying water main. This is the same measurement as 9.3. B.
0. B	Absolute 3D spatial position at the crown of the pipe right before the meter. This should be used as the horizontal position of the customer connection point. This point must also be used as the end of the lateral line, including the elevation value.
0. C	Absolute 3D spatial position at any T-intersection of water laterals/property service pipes (i.e. where multiple customers connect in a manifold or fork-split service arrangement).
0. D	Absolute 3D spatial position at any bend of a of water laterals/property service pipe.

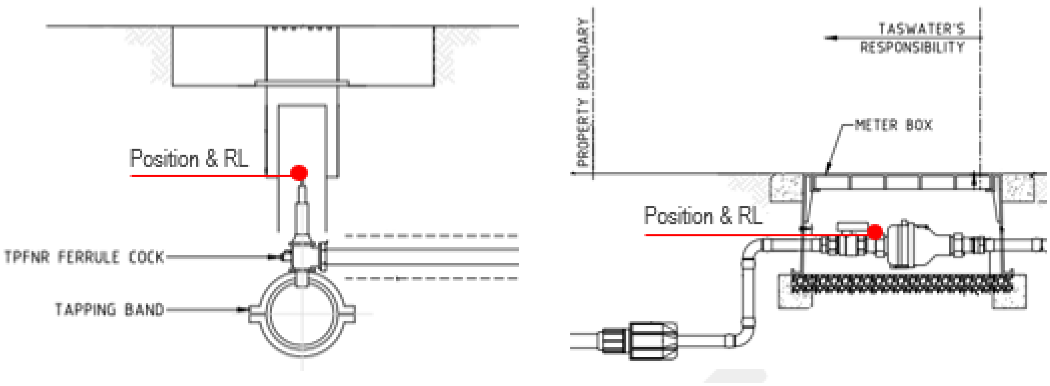


Figure 7

9.5.1.1 Split service connection

WSAA defines a split service as:

> *A service pipe that bifurcates into two services to provide on property connection points for two properties from a single connection at the water main*

These are also known as dual services or shared connections.

The correct configurations for split connection are shown in Figure 8 below. Split services generally come in two forms, as shown on the following page.

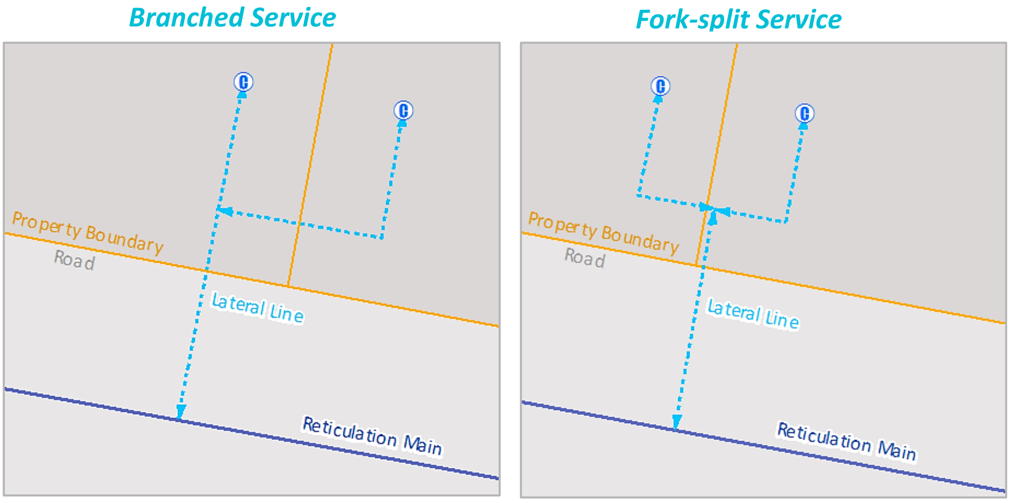


Figure 8: Correct representation for each type of split service

In a branched split service, a lateral line extends from the water reticulation main to a customer connection point. At some point along this lateral, another lateral line is connected and extends to another adjacent customer.

Fork-split services require three separate lateral lines. A lateral line extends from the main to a point within the property boundary. From this point, two lateral lines branch out and connect to the individual customer service connections.

The point at which the lateral lines connect to each other in a split service must be surveyed with absolute positional accuracy and be used to snap the intersecting lateral lines.

9.5.1.2 Manifolds

A manifold is a configuration of several customer meters together at the same location, running connected along a small feeding pipe (generally DN32 to DN40). A manifold can have two or more connections.

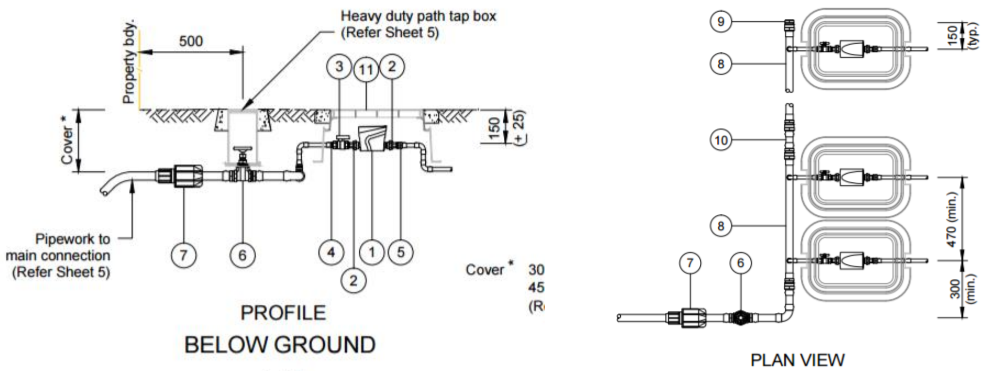


Figure 9: Diagram of typical meter manifold installation

Figure 10 on the following page demonstrates the correct way to represent a manifold in GIS or CAD for the two standard arrangements.

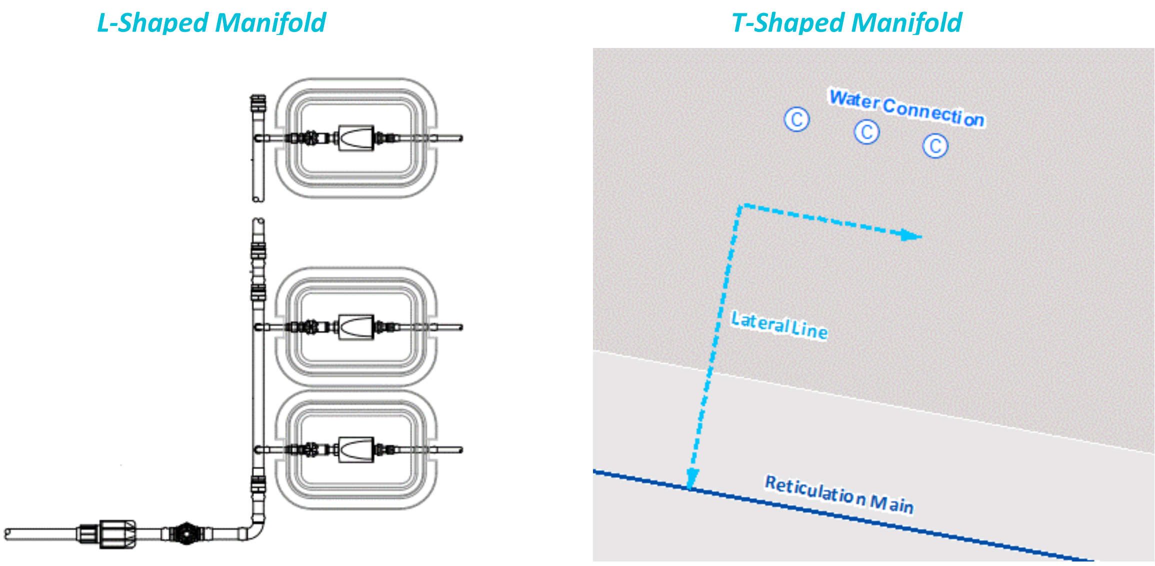


Figure 10 Correct spatial representation of manifold arrangements in GIS data

The examples used show three and four connections; however, the same rules apply to any number.

An L-shaped manifold is represented by a lateral line extending from the reticulation main, and then bending to extend across the manifold connections. Connection points (meters) do not require individual connection lines to the shared lateral line and can be located with relative measurement rather than absolute positions.

9.5.1.3 Stranded connections

Stranded connections occur on strata titles where sub-meters for units are situated within the property boundary and connected with privately-owned pipework. Figure 11 below demonstrates how these should be represented in GIS or CAD data.

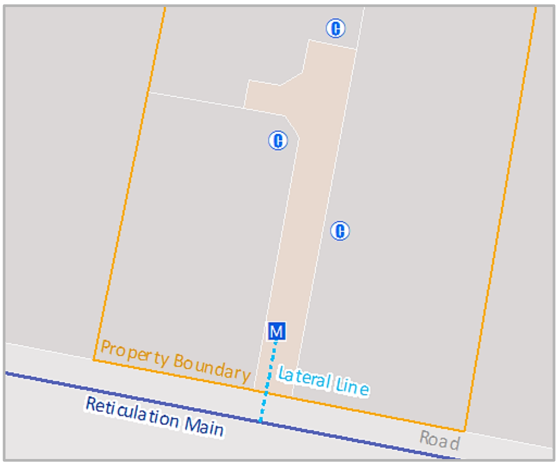


Figure 11 Correct representations of stranded meters in GIS data

A lateral line should connect the connection point for the master meter with the reticulation main. Each sub-meter should be entered as a connection point but does not require any connecting pipework to be supplied. The master meter should be surveyed as per a normal connection and each sub-meter should have its location surveyed. Private pipework past the mater meter does not require survey or representation in CAD drawings or GIS data.

9.6 Sewer gravity mains

Sewer gravity mains are any sewer pipe which transports sewage by gravity rather than pressure. These are generally straight segments between maintenance holes or other access shafts and can be surveyed using their start and end within these structures.

Sewer mains are represented as a polyline which extends from the invert of the pipe in the upstream maintenance hole or structure to the invert of the pipe where it ends by entering the downstream maintenance hole. The lines do *not* need to be extended into the manhole channel or structure to snap. Figure 12 below illustrates the points within a maintenance hole that represent the start or ends of gravity mains.

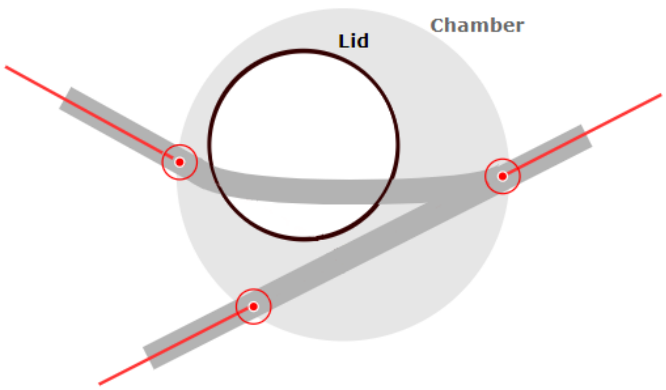
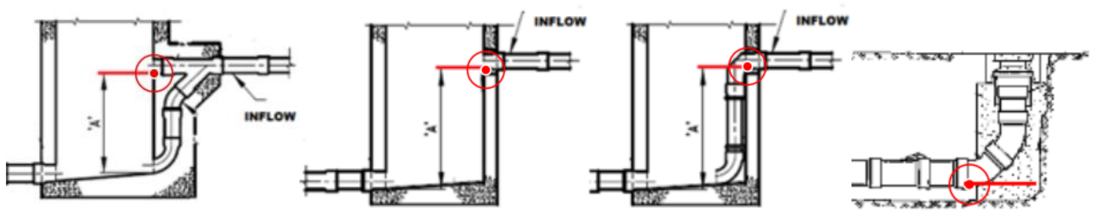


Figure 12 An example of three gravity mains that are measured at the entry/exit to the maintenance hole.

No.	Explanation
9.6. A	Absolute 3D positions at the inverts of the pipes where they enter (inflow) or exit (outflow) the maintenance hole (or other structure/well). For 'dropper' type inflows or other arrangements, the positions and inverts that are captured reflect the point at which the main enters the chamber as in the diagrams below. Intruding pipework and the 'dropped' pipework does not need to be measured.  The vertical RL component of these measurements must be inputted to the block details of the line in CAD in the UPELEV and DOWNELEV attributes.
9.6. B	For curved segments, at a minimum, horizontal positions must be taken at the crown of the pipe at the beginning, end and centre of the curve. These measurements should be taken with the pipe exposed to the surface at these positions (at a minimum) and used as vertexes on the line.

NOTE

Additionally, CCTV surveys are required for new sewer gravity mains. TW requirements for CCTV are in a separate document, **TAMST14 – TasWater Requirements for Sewer CCTV Conduit**

9.7 Sewer maintenance holes

Maintenance holes on sewer gravity mains are represented in CAD/GIS as a point located at the centre of the lid.

Additionally, vertical RL measurements are required and should be stored in the block/attributes as described in section the ASDS data structure HTML.

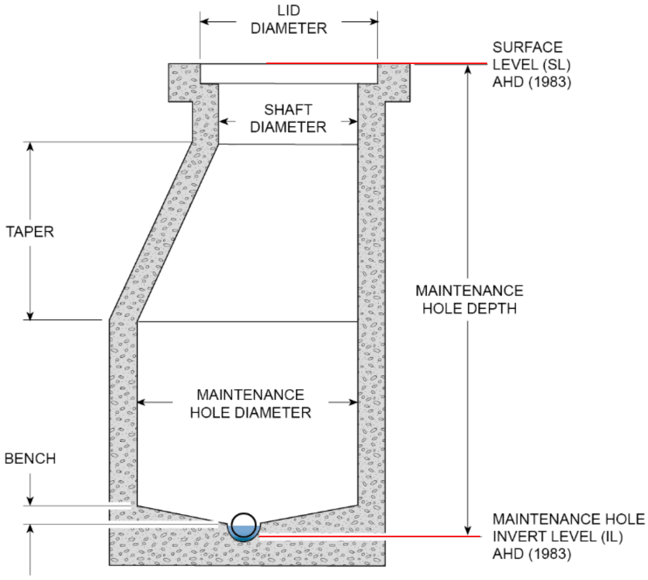


Figure 13 Standard components of a maintenance hole

No.	Explanation
9.7.A	The absolute 3D spatial position at the centre of the lid. The vertical measurement must be added to the SL attribute in the block details of the maintenance hole.
9.7.B	The invert level (IL) of the maintenance hole, measured at the invert of the outflowing pipe where it connects to the maintenance hole.
9.7.D	The diameter of the maintenance hole.
9.7.E	The absolute 3D position at the invert of each intersecting pipe within the maintenance hole as per section 9.6.

9.8 Sewer maintenance shafts & inspection openings

Maintenance shafts and inspection openings, also referred to as rod eyes or lampholes. are represented as a point.

No.	Explanation
9.8.A	Absolute 3D position at the centre of the lid. The vertical component of this measurement must be inputted into the SL field of the block details/attributes.
9.8.B	3D spatial position at the invert of the gravity main that the shaft/opening provides access to (as indicated in Figure 14 below). The vertical component of this measurement must be inputted into the IL field of the block details/attributes. For terminal maintenance shafts/rod eyes, this position is also required for the start of the gravity main (see section 9.6)

Figure 14 illustrates the measurement points for standard maintenance shafts.

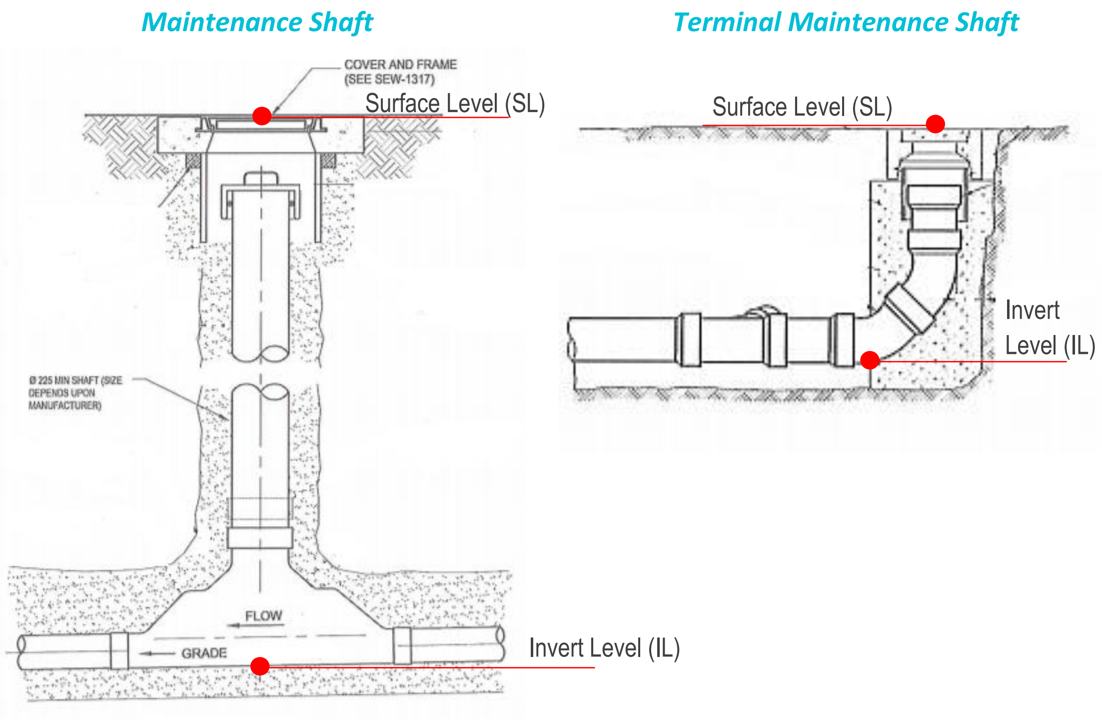


Figure 14 Data requirements for components of typical maintenance shafts (Based on WSAA 02-2002 Drawings SEW-1316, SEW 1350-M

9.9 Sewer gravity connections

Gravity sewer customer connections are represented by a customer connection point at an inspection opening (IO) and a lateral line pipe connecting the IO to the sewer main. TW data does not include the pipe connecting the house to the customer connection point.

- **Customer connection points** are represented as a point located at the centre of the inspection opening lid.
- A **lateral line (property service pipe)** is a single polyline that begins at the customer connection point and ends at a sewer main or maintenance hole. Bends can occur along pipes and are represented using vertices.

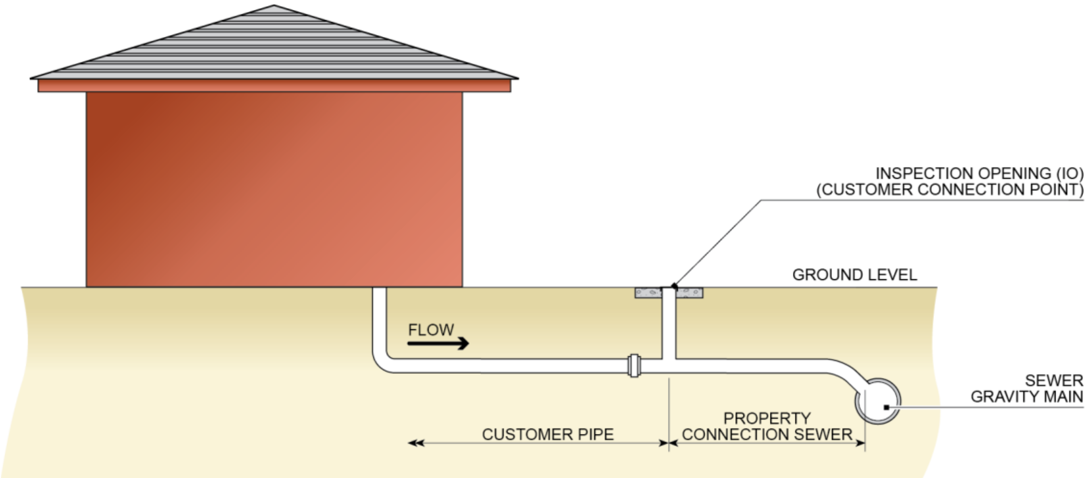


Figure 15 A diagram of a typical sewer (gravity) customer connection point (note that a similar arrangement occurs when a boundary trap is used instead of the IO)

No.	Explanation
9.9.A	Absolute 3D spatial position at the centre of the IO lid. This is the location of the service connection point.
9.9.B	RL measured at the invert of the pipe at the base of the IO. This level must be entered into the USIL field of the block details/attributes of the lateral line.
9.9.C	Horizontal position of the centre of the property connection pipe where it intersects the gravity main. This position may be derived from the design drawings or surface markings and therefore does not have the standard accuracy requirements.

9.10 Pressure sewer connections

Pressure sewer customer connections use a domestic pump station to connect a property to a pressurised sewer network. A connection is comprised of:

- A **collection tank** that has a pump installed within it. This is represented in CAD/GIS data as a single point located at the centre of the collection tank lid.
- A **property boundary assembly** which contains valves within a pit near the property boundary. This is represented in CAD/GIS data as a single point located at the centre of the pit.
- A **pressure sewer lateral line** that runs from the storage tank to the pressurised sewer main via the boundary assembly. This is represented in CAD/GIS data as a polyline that snaps to the pressurised sewer main, the boundary assembly and ends snapped to the storage tank point.
- A **control panel** for the pumping station. This is represented in CAD/GIS data as a point located at the control panel.

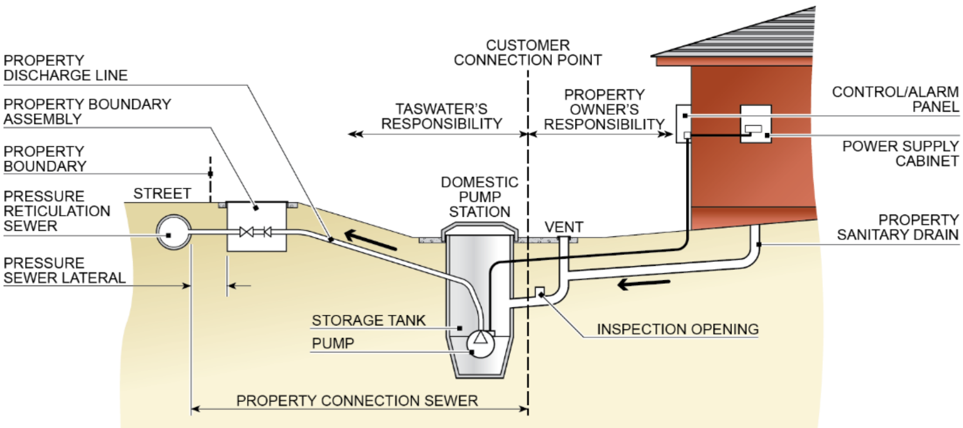


Figure 16 Arrangement and components of a sewer pressure unit installation

No.	Explanation
9.10.A	Absolute 3D spatial position a t the crown of the property pipe where it connects to the pressure reticulation sewer. This requires that the point of intersection be exposed at the time of survey.
9.10.B	Absolute 3D spatial position at the centre of the boundary assembly lid.
9.10.C	Absolute 3D spatial position at the pump within the storage tank.
9.10.D	Horizontal position at the vent at the surface.
9.10.E	Horizontal position at the control/alarm panel. This position does not require high accuracy (±500mm is sufficient).

9.11 Sewer rising mains

Sewer rising mains are a kind of sewer pressure main which typically extend from a pumping station into a receiving maintenance hole to transport sewage from one catchment to another. They can also transfer sewage around a treatment plant (e.g. into a lagoon). They are represented in CAD or GIS data as 3D Polylines.

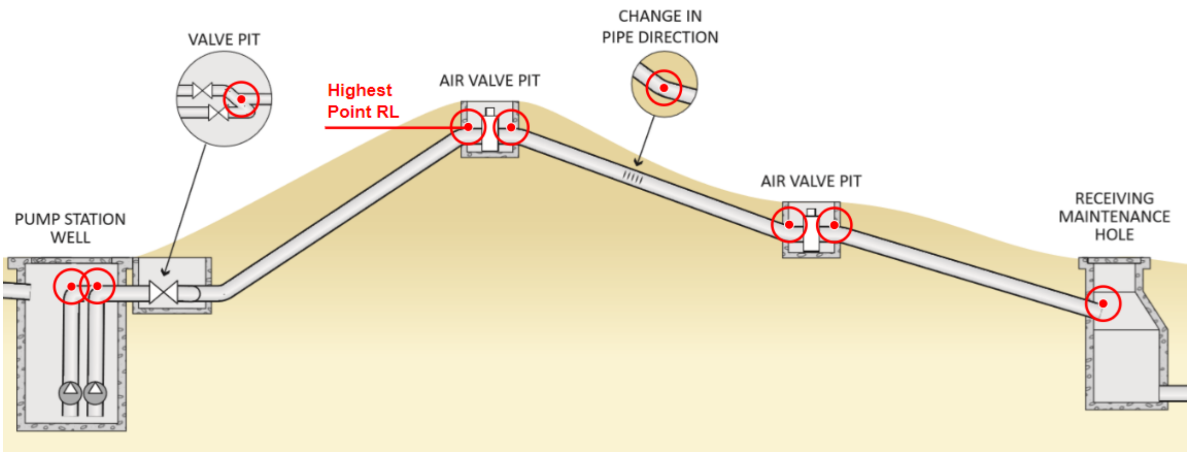


Figure 17

This is generally comprised of several separate mains. In the common scenario shown in Figure 17 above, two individual rising mains start in the pumping station well and end where they intersect in a valve pit. From there, a new, singular, rising main extends all the way to the receiving maintenance hole.

Other changes in direction of the pipe or points of measurement should be reflected as vertexes on the line but do not break it into multiple lines.

No.	Explanation
9.11.A	Absolute 3D spatial position of the crown of the rising main where it bends vertically to exit the well.
9.11.B	Absolute 3D spatial position of the crown of the pipe wherever it enters or exits a valve pit or other structure.
9.11.C	Absolute 3D spatial position of the crown of the intersecting point of two or more rising mains.
9.11.D	Absolute 3D spatial position of the crown of the rising main where it enters a sewer maintenance hole.
9.11.E	Absolute 3D spatial position of any articulated bend or change in profile of the rising main taken at the crown of the pipe.
9.11.F	The RL at the highest point of the rising main. This value is stored in the attributes of the rising main as listed in the ASDS data structure HTML. This is not required for shorter lengths of rising main prior to leaving the pumping station.

9.12 Tanks

Tanks should be represented in as constructed drawings/information as a polygon defining the footprint of the tank.

No.	Explanation
9.1. A	Absolute 3D spatial position at the centre of the top of the tank. The position should be used as the centre of the asset boundary polygon and the vertical component is stored in the attribute/block details of the asset boundary. Where this is not obtainable (i.e. tank has no roof or is not able to be safely or practically accessed), the centre does not need to be captured – instead the base of the tank must be surveyed with sufficient accuracy and precision and the RL of the top of the tank must by applying the height of the tank to the RL at the base.
9.2. B	Other horizontal measurements (to TW accuracy standards) around the base or top of the tank as required to draw its extent. As an example, for a circular tank, this may involve a measuring points to get the radius or diameter of the tank – the extent can then be plotted as a circle from the centre point.
9.3 .C	RL at the base of the tank. This is stored in the attribute/block details of the asset boundary polygon as the Surface Level (SL).

9.13 Sewer pumps

Sewer pumps are represented as a point in CAD/GIS data as a point representing the location of that pump.

No.	Explanation
7.9. A	Absolute 3D spatial position of the pump taken from the top of the pump. The vertical measurement at this point must be stored in the attribute/block details of the CAD drawing.

9.14 Sewer wet wells

Wet wells must be represented as a polygon defined by the area of the well.

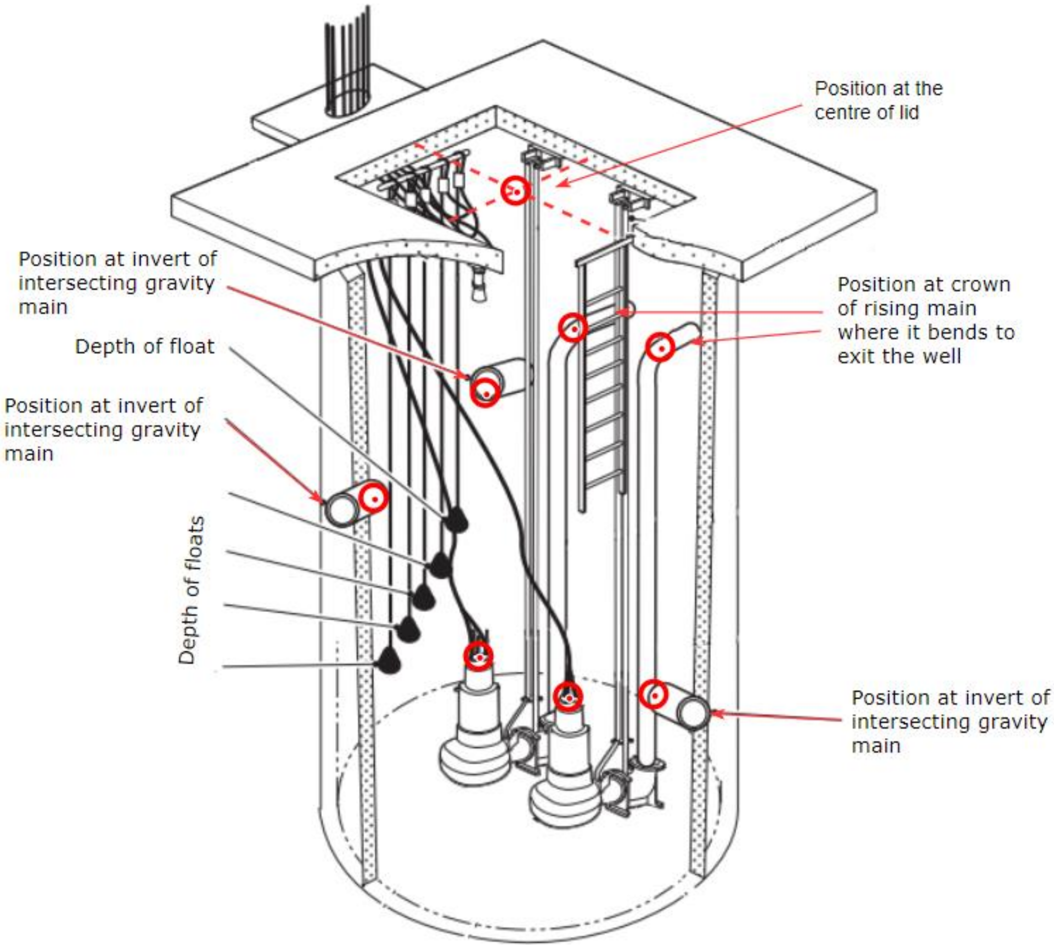


Figure 18

No.	Explanation
9.4. A	Absolute 3D spatial position at the top of the well taken from the centre of the well lid.
9.4. B	Any horizontal measurements required to map the polygon area of the well to TW accuracy tolerances (i.e. each corner of a rectangular well, or two opposite points of a circular well to plot by diameter).
9.4. C	The depth of the well measured to an accuracy of ±30mm. This is stored in the D IL attribute/block details of the asset boundary polygon.
9.4. D	The absolute 3D spatial position at the invert of any open gravity pipes that connect into the well. Each connecting gravity pipe must be represented as its own line with these levels stored as attributes (see section 9.6).
9.4. E	The absolute 3D spatial position at the crown of any pressurised main within the well where it exits. Each connecting pressurised pipe should be represented at its own line with these levels stored as Z-values.
9.4.F	The depth of each float from the top of the well (refer to TWS-M-0002, Sewage Pump Station Wet Well Level Settings) for details.

9.15 Sewer emergency storage structures

Emergency storage structures are designed to temporarily store a certain volume of sewage in the event of an emergency to reduce the risk of an overflow. They are generally comprised of the storage tank itself, connecting sewer pipework, a connecting electrical conduit, one or more maintenance hole access shafts, a washer system and may have an attached vent stack.

The following diagrams illustrate the components and measurements that must be captured and represented according to this document.

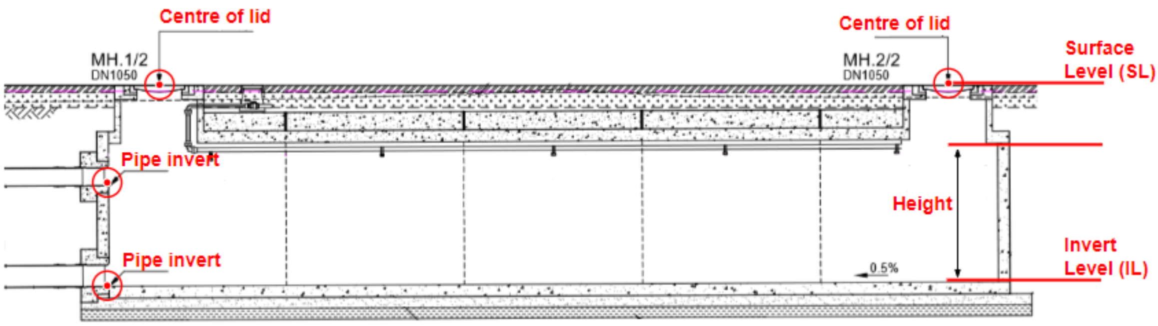


Figure 19

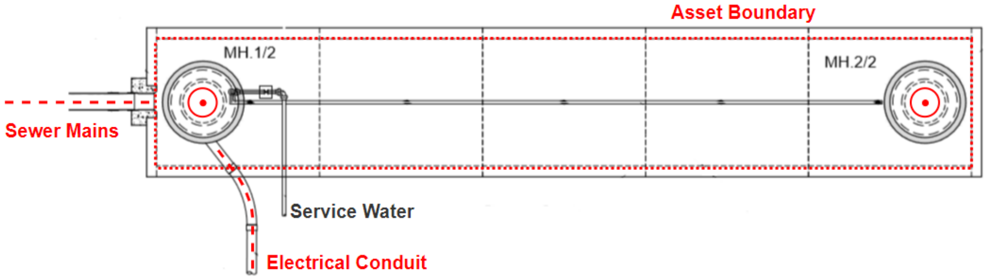


Figure 20

No.	Explanation
9.15.A	Any horizontal measurements required to map the asset boundary polygon of the structure to TW accuracy tolerances (i.e. each corner of a rectangular well, or two opposite points of a circular well to plot by diameter).
9.15.B	Absolute 3D spatial positions at the centre of each maintenance hole lid on the structure – these positions are used for the maintenance holes.
9.15.C	The RL at the invert of the tank. This is stored in the attributes/block details of the asset structure boundary polygon.
9.15.D	The height of the storage tank – from the invert to the roof (not including the maintenance hole shaft). This is stored in the attributes/block details of the asset structure boundary polygon.
9.15.D	Absolute 3D spatial position at the invert of all intersecting sewer gravity pipes, or electrical conduits. These positions and measurements must be used to map these polylines and populate required attributes/block details as per their relevant sections.

9.16 Emergency relief overflow structure accuracy requirements

An Emergency Relief Overflow Structure permits a sewer to overflow in a preferred location where the consequences of sewage overflow have a reduced impact on public or environmental health. EROS are used in situations where private fittings are low in relation to manhole lid levels and a risk of house flooding exists.

Must be pick-up asscording to **High Accuracy** quality level (Table 3): full engineering survey vertical control (**± 10 mm**) is required for the survey of local fittings and setting the control level at which the EROS begins to overflow.

9.17 Water pumps

The horizontal position of water pumps may be an estimate only such that it can be schematically represented in the plan drawing or GIS data.

No.	Explanation
7.9. A	RL of the top of the pump.

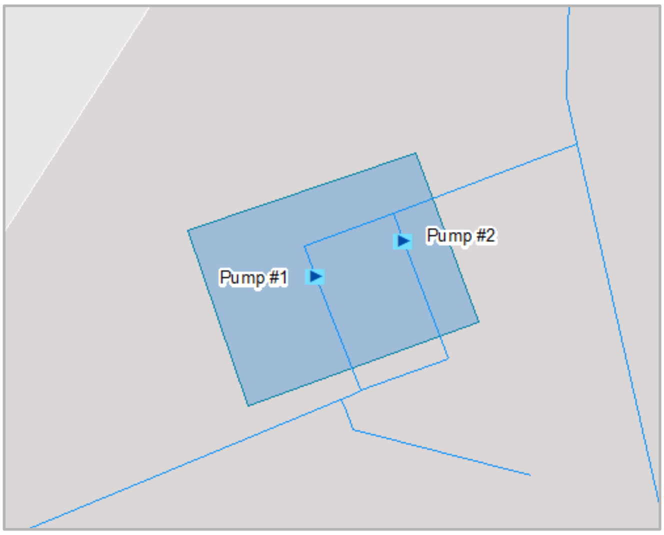


Figure 21 Water pumping station in GIS/CAD data

- The location of the pumps and the connecting pipework within the pump station building does not need to be accurately positioned but should be represented schematically to clearly show each pump and how it is connected.
- The pipework within the building does not need to be surveyed with accurate positions but must follow the same splitting rules (see section 8.6.1) and attribute requirements as normal pressurised mains.
- Pipes leading up to and around the pumping station should be surveyed with full accuracy requirements.

9.18 Eletrical & communications cabling

All underground communications or electrical cabling conduits owned by TW or within a TW facility must be surveyed and included in as constructed drawings.

No.	Explanation
9.11.A	Horizontal position at either end of suspended (above-ground) lengths of cabling.
9.11.B	Absolute 3D spatial position at the start, end and any change of direction of any underground cable conduit, measured at the crown of the conduit. Note that the conduit must be exposed to allow this survey position to be captured, either with the trench unfilled or potholed at every change in direction.

Cabling within buildings or electrical structures do not need to be accurately surveyed or represented.

9.19 Power poles

Power poles owned by TW or which directly supply power to a TW facility must be represented in drawings/GIS data as points.

No.	Explanation
9.11.A	Horizontal position at either end of suspended (above-ground) lengths of cabling.
9.11.B	Absolute 3D spatial position at the start, end and any change of direction of any underground cable conduit, measured at the crown of the conduit. Note that the conduit must be exposed to allow this survey position to be captured, either with the trench unfilled or potholed at every change in direction.

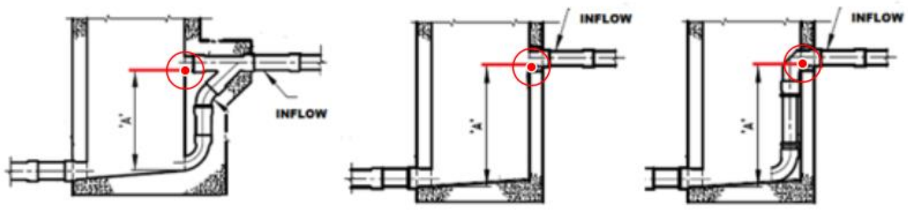
9.20 Buildings and structures

All buildings or other significant structures not otherwise specified in the above sections, including: concrete slabs or platforms or bridges, must be represented as polygons defining the footprint of the structure.

No.	Explanation
9.6. A	All horizontal measurements required to map the plan footprint of the building or other structure to standard TW accuracy tolerances (i.e. at each corner). Vertical RL measurements are not required.

9.21 Drainage pipes

Underground drainage pipework within a TW site must be surveyed with a similar methodology to sewer gravity mains.

No.	Explanation
7.9. A	Absolute 3D positions at the inverts of the pipes where they enter the maintenance hole (or other structure/well) as indicated by (⊙) below. For 'dropper' type inflows or other arrangements, the positions and inverts that are captured reflect the point at which the main enters the chamber as in the diagram below. Intruding pipework and the 'dropped' pipework does not need to be measured. 

9.22 Drainage channels

Drainage channels within a TW site must be represented in site plan drawings with at least the centre line being surveyed as per the measurements below:

No.	Explanation
9.13.A	Horizontal positions along the centre of the channel no more than 5 meters apart and at discernible changes of direction such that the general run of the channel is well represented. If necessary these measurements may be done using offsets from the side of the channel.

9.23 Drainage pits and manholes

Pits or maintenance holes for drainage, stormwater or dewatering around a TasWater site should be captured as points with measurements similar to that of a sewer maintenance hole

No.	Explanation
7.14. A	The invert level (IL) of the maintenance hole is the RL measured at the invert of the outflowing pipe where it connects to the maintenance hole. This is the same as the upstream invert of the outflow pipe as described in section 9.7.
7.14.B	The surface level (SL) must be taken from the centre of the lid

10 Asset Data Schema

TasWater's spatial asset data structure is comprised of a series of asset types and their required attributes. These are listed and defined in the companion HTML page on TasWater's website, accessible **here**.

Additionally, the tables in the HTML document define allowable values where attributes have a picklist or domain assigned to them. All the types and attributes are aligned to the blocks in TasWater's ASDS template CAD file.

The section below contains supplementary details and definitions around these asset types which are referred to in the HTML document.

10.1 Water asset data schema

10.1.1 Water mains

Mains distribute water throughout the network (water supply system). They are usually pressurised with the exception of channels and water races.

There are several sub-classes of water mains listed below, each of which must be represented in a separate layer.

10.1.1.1 Raw water main

Raw water mains are pipes that transport untreated water, typically from the water source /catchment to the treatment site.

10.1.1.2 Bulk transfer main

A water main that interconnects source(s), treatment works, reservoir(s) and/or supply areas, normally without direct consumer connections.

10.1.1.3 Distribution main

A water main serving as the principal distributor within the supply area, normally without direct consumer connections.

10.1.1.4 Reticulation main

A water main that connects a distribution main with service pipes. Reticulation mains are generally sized DN100 to DN375.

10.1.1.5 Reticulation sub-main

A water main that connects a reticulation main with service pipes within discrete areas where the number of consumers is small, thereby minimising deterioration of water quality. Reticulation sub-mains are generally sized DN40 to <DN100. Reticulation sub-mains can also be referred to as rods, rider mains (connecting properties on the opposite side of a road) and loop mains (connecting properties in a cul-de-sac at the end of a road).

10.1.1.6 Scour pipe

An assembly of valves and fittings installed at low points in the network and used for dewatering a portion of pipeline for operational or maintenance purposes

10.1.1.7 Channel

Channels are open furrows that form part of the water supply network and can include aqueducts (elevated channels), races, tunnels and natural waterways that form part of the water supply network (such as creeks). They do not include hard water channels or catch drains which are used to prevent rainwater running into a reservoir.

10.1.1.8 Overflow pipe

Overflow pipes are connected to a reservoir or tank for the carriage of surplus water from the storage to a stormwater system or other watercourse

10.1.1.9 Irrigation line

Irrigation lines are water mains which are used exclusively to supply water to irrigation schemes.

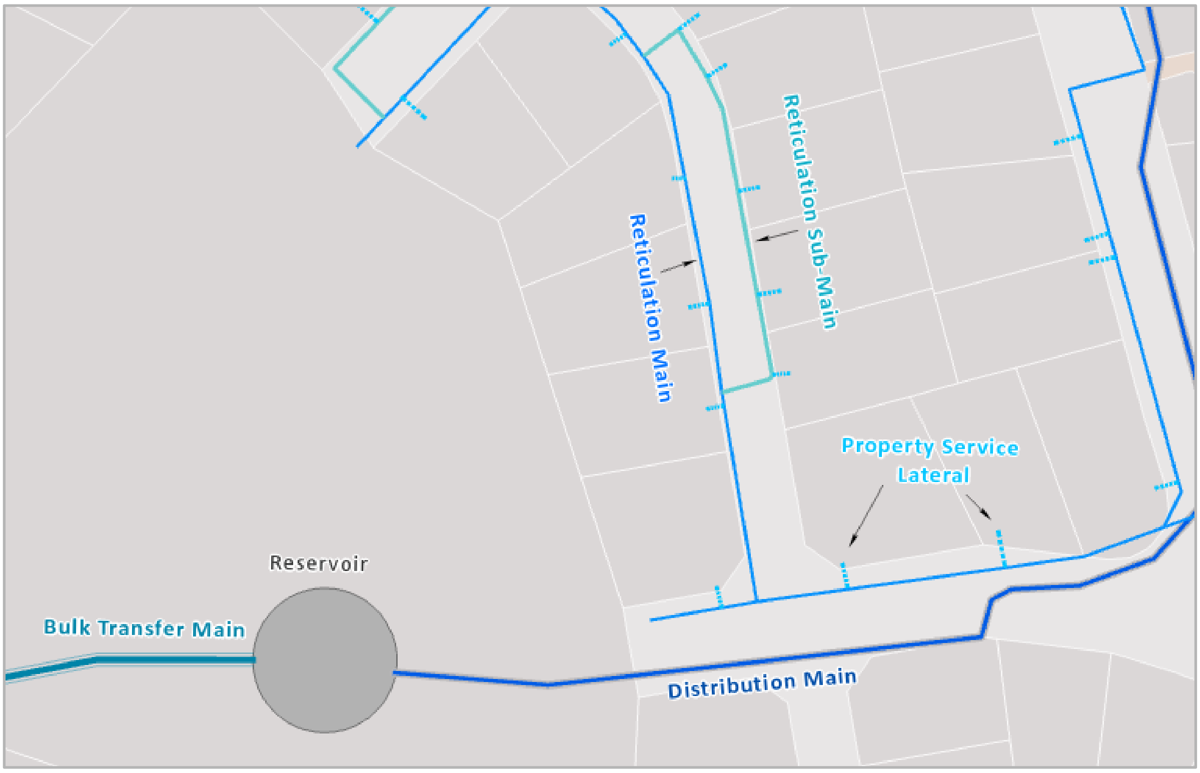


Figure 22

10.1.2 Water control valve

A valve that controls the flow of water through the pipe by reducing, relieving or maintaining the water flow. There are four functional kinds of control valves:

- A **pressure reducing valve** (PRV) automatically reduces the pressure to a predetermined value on the downstream side of the valve;
- *A* **pressure sustaining valve** (PSV) automatically maintains the pressure to a predetermined value on the upstream side of the valve;
- A **pressure relief valve** (PrelV) automatically opens to relieve pressure in the pipeline, which keeps pressure at a predetermined level. It is designed to re-set itself once excess pressure has been relieved. This includes the attached maintenance isolation valve if present (it is not created as a separate asset or GIS record);

- A **flow control valve** regulates the flow or pressure of the water. Flow can either be increased or decreased. Flow control valves are usually automated and are used for example, to control the flow of water into a reservoir.

10.1.3 Water fixture

A component of or fixture on a pipeline or channel which allows pipeline deviation, change of direction, bore, or some other function, represented as a point in drawings or GIS data.

TW does not treat most fittings as individual assets and does not require couplings, tees and other general fittings to be supplied in submissions of asset data. Only the following asset types need to be captured and represented in the drawings/GIS data:

- **Pipeline expansion joint** Joints between pipeline segments designed to allow for thermal expansion by absorbing some of the movement - generally only installed on critical lines that run over bridges or other key environments;
- **Dirt box/strainer** The dirt box is designed to protect cold water meters or valves from the damaging effects of debris and foreign matter. A dirt box if installed would be on the upstream side of the water meter/valve in an easily accessible area for cleaning/maintaining. A dirt box is also commonly known as a ‘strainer’ in smaller diameter connections. The term dirt box is generally used for meters 50mm and above whereas strainers are used on smaller sizes;
- **Chlorine diffuser** A chlorine diffuser is a static in-line device installed inside a pipe to create turbulence to ensure dosed chlorine is evenly distributed in the receiving water;
- **Cap/blank** Ends of pipes that are disused which have either been sealed at existing flanges with blanked flanges or sealed with a cap/gibault cap if the pipe was cut;
- **V notch weir** A v notch weir is simply a 'v notch' in a plate that is placed so that it obstructs an open channel flow, causing the water to flow over the v notch. It is used to meter flow of water in the channel, by measuring the head of water over the v notch crest.

10.1.4 Water hydrant

Water hydrants are a special type of in-ground connection on distribution and reticulation mains that provide access to water supply for the purpose of fighting fires and/or have an operational function such as flushing or air regulation.

Fire hydrants are classified by their compliance with firefighting flow standards into the following:

- **Fire hydrant** (Fully compliant with flow at or exceeding 10 m^3/s);
- **Fire fighting point** (Non-compliant with flow still useful for firefighting at 5-10 m^3/s);
- **Operational** (Non-compliant and only useful for TasWater operational purposes such as air regulation or flushing with a flow of less than 5 m^3/s).

These types are specified by the attribute **ComplianceLevel**.

NOTE

Flow tests are done for every hydrant gifted to TW for a new development. The flow compliance can be confirmed via the developer or contractor undertaking the testing.

10.1.5 Water service pipe (lateral line)

A service pipe is a water pipe that supplies water from the reticulation main to the consumer. The portion of the service pipe under the control of TW generally terminates at the water meter (service connection point – see section 10.1.6 below), or in the case of fire services, the isolating valve of the fire protection system at the main.

Note that if a pipe connects three or more properties then it should be classified as a reticulation sub-main, rather than as a lateral line.

10.1.6 Water service connection (customer connection)

A water customer connection point represents the location of the stop tap and water meter (meter assembly) that separates the property service pipe and the customer internal pipework.

Based on the purpose of the water used from the customer connection point, the point is classified as follows:

- **Standard service connection** A standard service connection is the connection point to a property where water is used for domestic, commercial or small industrial purposes. It collectively includes the meter, stop tap and backflow prevention device (where available) for the property;
- **Fire/standard combined service** A fire/domestic combined service is a connection that combines (physically) a designated fire service (fire protection on the property) and a domestic connection for domestic water usage purposes;
- **Designated fire service** A designated fire service is a connection that certain businesses require under legislation. The connection may include a stop tap and a meter of some description with either a single or double detector check valve;
- **Capped service** This is a service which is disconnected, and for which the property service has been closed off by capping;
- **Wayside** Customer connections connected to a bulk transfer or distribution main without a service reservoir in the local reticulation.

10.1.7 Water isolation valves

Water isolation valves can be controlled to top or start the flow of water through a point along a pipeline and can be used in several different functions. There are four primary classifications of isolation valves, as follows:

- **Isolation valve**: dictates water flow along a pipe in system;
- **Scour valve**: allows water to be drained from the pipe. This includes *flushing assemblies* installed at terminations of reticulation mains (not when the flushing point is a hydrant – see 10.1.4);
- **Property isolation**: An isolation valve situated on a property lateral line or a ferrule where the property pipe taps into the water main which isolates only that service;
- **Cross connection:** A normally closed valve used to separate potable and non-potable water at cross connection points.

- **Zone valves:** Zone valves are a special type of isolation valve and are used to prevent the flow of water from one supply zone to another. These valves are normally closed.

10.1.8 Water non-return valves

A non-return valve permits the flow of water in only one direction. Non-return valves work automatically (therefore they don't require an external power source). In the simplest scenario, a single check valve can be used to restrict flow direction. More complex assemblies such as RPZDs or double check valves are used to prevent backflow at hazardous connections to the water network.

A non-return valve can have one of two functions:

- **Non-return**: used as a component in our water system to prevent the bi-directional flow of water at certain operating pressures.
- **Backflow prevention**: prevents backflow of hazardous substances from a TW connection or facility such as a sewer treatment plant or pumping station – generally an RPZD (Reduced Pressure Zone Devices) or double-check assembly. Backflow prevention at customer connections are stored in the water service connection dataset – see 10.1.6**.**

10.2 Sewer asset data schema

10.2.1 Sewer gravity main

Sewer mains transport sewage throughout the network (sewerage system). Typically, the mains rely on gravity to move the sewage to a treatment plant. These are referred to as sewer gravity mains. Sewer gravity mains are categorised as follows:

10.2.1.1 Gravity trunk main

Principal sewer of a catchment system that drains to the point of treatment - a network of pipes nominally DN375 to DN600 that connects reticulation sewers.

10.2.1.2 Gravity reticulation main

A sewer, generally DN150 to DN300, for the collection of sewage from individual properties and conveyance to trunk sewers. Note that where a reticulation sewer serves more than one property, it will be classed as a gravity main, up to the point where it separates to the individual lateral lines.

10.2.1.3 Overflow pipe

Overflow mains discharge untreated, raw sewage into local waterways or stormwater to relieve excess flows within the system.

10.2.1.4 Outfall pipe

Outfall pipes convey treated effluent from a STP to the environment, such as a river.

10.2.1.5 Siphon

A siphon is a gravity main where a section in the middle of the siphon is lower (or higher) than its outlet. Siphons are usually used where a gravity sewer on grade (straight line between up and downstream ends) would be above ground or to convey sewage across long distances by using the significant gravity head available on the upstream end.

10.2.1.6 Scour pipe

A section of pipe leading to a scour.

10.2.1.7 Emergency Storage Pipe

A section of pipe used for the purpose of emergency sewage storage.

The following attributes must be recorded in the block information or GIS table for all types of water mains:

10.2.2 Sewer inspection openings

Inspection openings provide access to pipelines for inspection or maintenance but are too small to enable person access.

10.2.2.1 System inspection opening

System inspection openings (that are located on the sewer mains and not referring to the IOs as part of the sewer customer connection point), including lamp holes, are a fitting with provision for visual inspection and limited access to facilitate inspection/maintenance.

10.2.2.2 Maintenance shaft

Maintenance shafts are structures on a sewer between maintenance holes (MH), larger than an inspection opening, which provides equipment access but not person access to the sewer and which allows limited change of grade and/or direction.

10.2.2.3 Terminal maintenance shaft

Terminal maintenance shafts are an end of line access point to insert cleaning rods into (also referred to as “rod eyes”).

10.2.3 Gravity service pipe

A property connection sewer is *a short sewer* (less than DN300), *owned and operated by* (TW)*, which connects the main sewer and the customer sanitary drain; it includes a junction or connection on the main sewer, a property connection fitting, in some cases a vertical riser, and sufficient straight pipes to ensure the property connection fitting is within the lot to be serviced.*[2]

10.2.4 Sewer service connection (customer connection)

A sewer customer connection point is the *point of connection between the property connection sewer and the customer sanitary drain*[3]. It includes the pipework, inspection opening (IO), and any other fittings on the pipe at that point.

- In typical gravity systems, the connection point is at an IO (inspection opening), which is a capped above-ground opening that allows for maintenance access to the customer sewer lateral.
- For a pressure sewer system the connection point is between the collection tank and the customer sanitary drain.

10.2.5 Emergency relief overflow structure (EROS)

An Emergency Relief Overflow Structure permits a sewer to overflow in a preferred location where the consequences of sewage overflow have a reduced impact on public or environmental health. EROS are used in situations where private fittings are low in relation to manhole lid levels and a risk of house flooding exists. Full engineering survey vertical control (± 10 mm) is required for the survey of local fittings and setting the control level at which the EROS begins to overflow.

10.2.6 Sewer Vent

Sewer vents are components of a gravity sewer system which allow air to enter the system or gases to escape. Vent shafts are tall vertical structures, generally several meters in height such that foul air is dispersed above surrounding roof heights.

TasWater not only has dual purpose vent shafts installed, but also differentiates vent shafts that are used solely for letting air in (induct) and those used just for releasing air/gases (educt).

Induct vents are generally smaller above ground structure and are only capable of letting air into the system through a simple vent.

This function is dictated by the installation of the following components at the top of the shaft:

- Educt Cowl
- Induct Cowl
- Extractor Fan

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[2] WSA 02-2002-2.3 MRWA Edition v1.0

[3] WSA 02-2002-2.3 MRWA Edition v1.0

Some vent stacks may also have odour control systems installed at the top.

NOTE

Vents associated solely with the operation of an air valve installed to regulate air and gas build-up in pressurised systems or main are not included in this schema and do not need individual vent asset records to be created.

10.2.7 Easements

Easements are small parcels of land which are reserved so that TW and/or other utilities can access infrastructure. TW does not own easements but does maintain them in some cases. New developments or construction projects may result in the creation of a new easement.

Easements are represented in CAD/GIS as a polygon feature matching the property boundaries of the cadastral parcel(s) if possible, otherwise as indicated on development plans.

10.2.8 Instrumentation

IoT sensors and other kinds of measuring devices that are installed by TasWater, either permanently or temporarily, to remotely monitor things like flow, water levels, or product quality in the network or even groundwater pressure around dam sites. The following types of instruments are currently recorded geographically by TW:

- **Groundwater monitoring points**: Tubing taping into an aquifer or potential aquifer for observation or detect of flow at dam sites.
- **Pressure monitor**: A device attached to a valve on a water main which measures and remotely logs pressure fluctuations going through that point of the water network.
- **Level sensor:** A device which can monitor and remotely log water level within a well or maintenance hole.
- **Chlorine sensor:** Chlorine sensor installed in-line on a water main to measure and remotely log chlorine levels at a point in the distribution network.
- **Rain Gauge:** A device used to capture and measure local rainfall.

11 Appendix

Table 4 on the following page provides a guide of nominal diameters for different pipe materials.

Table 4

Material	Valid Nominal Diameters
	Polyvinyl chloride
PVC, oPVC, uPVC	15 20 25 32 40 50 65 80 100 125 150 175 200 225 250 300 350 375 400 450 500 600
mPVC	100 150 200 225 250 300 375 450 500 600
	Steel
MSCL	100 150 200 225 250 300 350 375 400 450 500 600 750
SS	6 8 10 15 20 25 32 40 50 65 90 100 125 150 200 250 300 350 400 450 500 550 600 650 700 750
GWI	50 65 80 100 125 150
	Ductile iron
DI, DICL	80 100 150 200 225 250 300 375 450 500 600 750
	Polyethylene
PE80b, PE100	16 20 25 32 40 50 63 75 80 100 110 125 140 150 160 180 200 225 250 280 300 315 355 375 560 630 710 800 900 1000 1200 1400 1600 1800 2000
	Glass reinforced plastic
GRP	100 150 200 225 250 300 350 375 400 450 500 525 600 675 750
	Copper
CU	50 65 80 100 125 150 200 225
	Grey cast iron
CICL	80 100 150 200 225 250 300 375 450 500 600
	Asbestos cement
AC	80 100 150 200 225 250 300 375 450 525 600 675 750
	Reinforced concrete
RC	150 225 300 375 450 525 600 675 750 825 900 1050 1200 1350 1500 1650 1800

NOTE

This chart has been compiled from vendor brochures and online sources and is intended as a guide only – the accuracy and precision of measurements is not assured.

11.1 Valve, hydrant and meter diameters

Diameters of valves, hydrants and meters must comply with the allowable diameters listed in Table 7.

Nominal diameters of valves are usually imprinted on the valve itself. Where the diameter is recorded in inches, convert that number to millimetres and assign the closest DN value from the allowable values as listed in the ASDS data structure HTML.

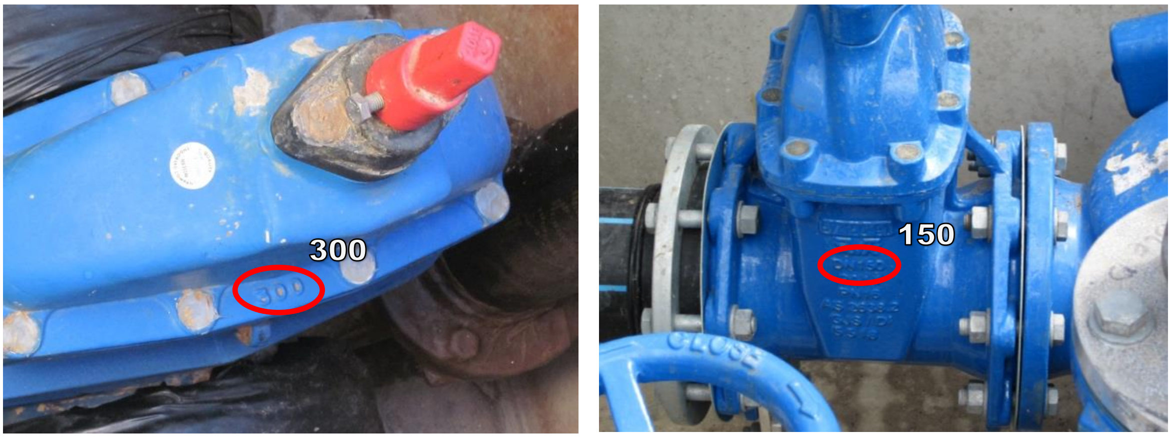

Figure 23: Examples of nominal diameters found on valves.