



Engineering

TS 100

Requirements for Technical Drawings

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South Australia**

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Users of this Standard accept sole responsibility for interpretation and use of the information contained in this Standard. Users should independently verify the accuracy, fitness for purpose and application of information contained in this Standard.

Only the current revision of this Standard should be used which is available for download from the SA Water website.

Significant/Major Changes Incorporated in This Edition

- Drawing management updated to align with new DMS (Meridian).
- Renamed from TS95 to TS100
- Drawing numbers changed to Asset based.
- Drawing Revisioning system updated to reflect DMS control.




Document Controls

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Approvers

Role	Signature and Date
Responsible Discipline Lead Paul Hawthorne	2/05/2019 X  ----- Signer's Name Signed by: HA002410
Manager Engineering Technical Services Murat Aksoy	2/05/2019 X  ----- Signer's Name Signed by: AK003305
Senior Manager Engineering Services Richard Gray	3/05/2019 X  ----- Signer's Name Signed by: GR001964

Reviewers

Role	Name	Revision	Review Date

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1 Introduction

SA Water is responsible for operation and maintenance of an extensive amount of engineering infrastructure.

This standard has been developed to assist in the design, maintenance, construction, and management of this infrastructure. Links to Meridian user guides and contacts for appropriate administrators and coordinators can be accessed (internal to SA Water) here:

<http://intranet.sawater.sa.gov.au/BMS/Engineering/Pages/Meridian.aspx>

External users can download user guides through the Contractor Portal, or request assistance here: Meridian.Support@sawater.com.au

1.1 Purpose

The purpose of this standard is to detail minimum requirements to ensure that assets are constructed and maintained to consistent standards and attain their economic asset life.

1.2 Glossary

The following glossary items are used in this document:

Term	Description
SA Water	South Australian Water Corporation
TG	SA Water Technical Guideline
TS	SA Water Technical Standard
DMS	Drawing Management System

1.3 References

1.3.1 Australian

The following table identifies the standards, documents and/or articles that are referenced in this document:

Number	Title
AS 1000	The International System of Units (SI) and its application
AS 1100	Technical Drawing
AS 1101	Graphical Symbols for General Engineering
AS 1102	Graphical Symbols for Electrotechnology Documentation
AS 3702	Item Designation in Electrotechnology
AS 4383	Preparation of Documentation used in Electrotechnology
AS 60417	Graphical Symbols for use on Equipment

1.3.2 SA Water

The following table identifies the standards, documents and/or articles that are referenced in this document:

Number	Title
TS 112	Process and Instrumentation Diagrams (P&ID)
TS 153	Requirements for Automated Assessment

1.4 Definitions

The following definitions are applicable to this document:

Term	Description
SA Water's Representative	The SA Water representative with delegated authority under a Contract or engagement, including (as applicable): <ul style="list-style-type: none"> • Superintendent's Representative (e.g. AS 4300 & AS 2124 etc.) • SA Water Project Manager • SA Water nominated contact person
Responsible Discipline Lead	The engineering discipline expert responsible for TS 100 defined on page 3 (via SA Water's Representative)
Authorised Drawing	Any drawing that has the design or the current revision authorised with a signature, accompanied with the date and name of the signatory.
Meridian	Software used by SA Water to store, manage and disseminate drawings internally and to external parties.
Power Web	Internal tool for editors to access Meridian.
Meridian Explorer	Internal tool for viewers to access Meridian.
Contractor Portal	Tool for external users to view, download and upload drawings to Meridian.
Maximo	SA Water Asset Management tool.
Asset Based Drawing	New drawing numbering format used for drawings created in Meridian
Legacy Drawing	Any drawing created or in work before Meridian "go live" using the old numbering format.

2 Scope

This Technical Standard details the requirements for production and submission of Engineering drawings, created or modified for SA Water. This document applies to the Computer Aided Design (CAD) drawings and the drawings outputted from them.

This Technical Standard applies to but is not limited to the following drawing discipline types:

- Mechanical & Hydraulics,
- Electrical,
- Cathodic Protection
- Civil,
- Structural,
- P&ID,
- Architectural

This Technical Standard is currently **not** applicable to drawings representing the design and installation of water, wastewater and recycled water **network infrastructure** as a result of:

- Land development,
- Mains replacements and relays.
- Extension to existing network,
- Connections

Drawing requirements for **network infrastructure** are defined on the SA Water website:

<http://www.sawater.com.au/developers-and-builders/network-infrastructure-standards-introduction/consultants-and-contractors>

Please contact SA Water's Representative for specific requirements for these types of drawings

3 Compliance with Standards

All drawings shall comply where applicable with SA Water discipline specific standards, this standard and relevant Australian Standards.

Where conflict between the standards exists, the following order of priority shall apply:

1. SA Water discipline specific Technical Standard.
2. TS 100 – Requirements for Technical Drawings.
3. Drafting practices set out in the relevant Australian Standard.
4. Project specific drafting requirements. Engineering dispensation must be applied for.

3.1 SA Water Technical Standards (Discipline Specific)

SA Water is continually developing various discipline based Technical Standards, which may include specific drafting requirements. These may supplement and, in some cases, override this Technical Standard. It is the responsibility of the drafter to ensure that they are working with any relevant Technical Standards.

3.2 Australian Standards

Drawings shall comply, where applicable, with the current relevant Australian Standard including but not limited to:

- AS 1000 - The International System of Units (SI) and its application
- AS 1100 - Technical Drawing
- AS 1101 - Graphical Symbols for General Engineering
- AS 1102 - Graphical Symbols for Electrotechnology Documentation
- AS 3702 - Item Designation in Electrotechnology
- AS 4383 - Preparation of Documentation used in Electrotechnology
- AS 60417 - Graphical Symbols for use on Equipment

3.3 Typical and Standard Drawings

SA Water has created Standard and Typical drawings, that encompass some commonly installed infrastructure. Some of these drawings pre-date this technical standard. If these drawings are to be used as a base for project specific drawings, then the new drawings shall comply with this standard.

It is the responsibility of whoever is creating / modifying a drawing to ensure that the latest versions of these documents are used. PDF's are all available for download from the SA Water website and CAD versions can be requested from the CADD Coordinator at Engineering.Projects@sawater.com.au

3.4 Existing Non-Compliant Drawings

In some instances, there may be a requirement to work on or modify existing or legacy drawings that do not conform to the current standard. Drafting protocol is to maintain the standards that were applied at the time of drawing creation, unless major modifications to the content are required or a conflict with symbology (e.g. P&ID, Electrical, and Process Flow) is introduced. It is the responsibility of the drafting provider to seek clarification from the CADD Coordinator when required.

SA Water does not require that an existing drawing is migrated onto the current title block when being modified unless more than 50% of the drawing content is being modified. As this figure is subjective, advice shall be obtained from the CADD Coordinator for major drawing modifications. If a drawing is migrated into the current standard, it is expected that a new drawing number will be assigned, and the legacy number superseded.

If an existing non-conforming drawing is being used as a base for a drawing with a new drawing number, then the new drawing shall conform to the current version of TS 100.

Unclassified or missing metadata relating to the drawing must be filled in or corrected within Meridian or on the Book In transmittal.

4 General CAD Requirements

General CAD requirements are as follows:

- All new drawings produced for SA Water shall be presented on the current SA Water title block. All drawings shall be either A1 landscape or A3 landscape unless prior arrangements are made. The title block shall not be modified or exploded,
- Except for some Equipment Manufacturers drawing, and with prior arrangement, drawings not on a SA Water title block will not be accepted,
- Drawings shall be presented in monochrome, unless there is a specific requirement to show coloured line work. If a drawing shall be presented in colour, lighter colours such as yellow and cyan should be avoided,
- All site layouts shall contain a north arrow,
- All Site Layouts shall be in a coordinate system. The horizontal datum shall be planar based on MGA (e.g. MGA54 - GDA 94) coordinates derived from network Permanent Survey Marks. The origin shall be as near as practical to the centre of the survey area. If this is not practical, coordinates shall be based on Global Navigation Satellite System (GNSS) observations,
- All elevations shall be referenced to the Australian Height Datum (AHD),
- All drawings shall be legible when plotted / printed at A3 size,
- All drawings provided by SA Water remain the copyrighted property of SA Water and may only be used to assist in the preparation or modification of drawings to be provided under contract,
- All drawings prepared for SA Water under contract (excluding equipment manufacturer's drawings) become the copyrighted property of SA Water upon submission,
- All drawings shall be supplied in the appropriate native CAD format (see clauses 4.1 and 4.2) along with PDF renditions, authorised where required.

4.1 Acceptable 2D CAD Formats

All new 2D drawings shall be prepared and submitted in AutoCAD® release 2013 .dwg format or earlier unless approval of the SA Water CADD Coordinator is given prior to commencement of any drafting work. If another package is to be used for the preparation of 2D drawings, the native CAD file along with an AutoCAD® conversion (where available) shall be provided.

4.2 Xref's

The use of XREF's are allowed by SA Water, however they are only permitted when binding or inserting are not possible/feasible. Examples of appropriate Xref usage are drawings being used in multiple files, large survey files, high resolution images etc. Examples of inappropriate use (and rejection) are title blocks, signatures, stamps, symbols, other registered drawings etc. It is expected over time that SA Water will build a library of common site based Xrefs for use in new drawings, such as underground services, plant layouts etc. Where requested, contact the CADD Coordinator for advice on usage, creation and naming.

All Xref's need to be specified on the Book In spreadsheet and placed in the same folder as the master drawing. Regardless of the level of embedded Xref's, a flattened structure must be presented to Meridian. Do not create an E-Transmit.

All unused Xrefs must be totally removed/Detached from the drawing prior to submission.

4.2.1 New Xref's

While SA Water has no naming convention for Xref's, the filename must be reflective of the contents. Additionally, to avoid duplication, the date that the Xref is placed into the master drawing (first drawing if being placed into multiple) must be included in the filename. "X-Survey.dwg" is not an acceptable name. Rather "X-Survey-Stonyfell Tank 25-02-2019.dwg" is appropriate.

Duplication of Xrefs are not allowed and it is the responsibility of whoever is managing any drawing updates to ensure that there is not already an existing Xref that can be used. This is particularly relevant for survey drawings, site layouts and underground services.

New Xrefs must be initially booked into Meridian in the same bookin package as the parent to ensure that Meridian can build the necessary links.

4.2.2 Existing Xref's

If an existing Xref is to be updated, it is the responsibility of whoever is managing any drawing updates to ensure that any affected drawings are also updated accordingly. Visibility of all parent drawings for any given Xref is not available through the Contractor Portal, so this task will have to be performed by someone with Power Web access.

When working on existing drawings with Xrefs, the following scenarios are possible

1. **Drawing file is changed, but Xref remains unchanged.** In this instance the xref does not need to be checked back in or renamed. The Project Manager should be notified that the Xref is no longer required if it has been checked out.

2. **The Xref has changed and all parent files can be updated.** Any other drawings that also use the Xref (regardless of if they are in the project or not) have been checked and can be updated with the new Xref. In this instance, the Xref can retain its existing name and must be checked in with the parent drawing.
3. **The Xref has changed, not all parent files can be updated.** Any other drawings that also use the Xref (regardless of if they are in the project or not) still need to show the old Xref information. In this instance, the Xref must be copied and renamed using the naming convention for new Xref's. This new Xref is then referenced into the parent file that requires the it. The Parent and new Xref must be checked in together.
4. **A new drawing is created using an existing Xref.** In this instance, the three rules above, still apply.

4.3 Acceptable 3D CAD Formats

All new 3D CAD models shall be prepared and submitted in AutoCAD Inventor® release 2017 format or earlier unless approval of the SA Water CADD Coordinator is given prior to commencement of any drafting work. The Inventor project shall be supplied as a “Pack and Go” composite, containing all parts, assemblies, drawings and library items. If another package is to be used for the preparation of 3D CAD models, then the native CAD file along with a model export in .STEP, .IGES or .SAT (where available) shall be provided. Please contact the CADD Coordinator to discuss the handover of the model. PDF versions of the drawings are still to be uploaded into Meridian.

SA Water can also accept 3D data contained within a dwg file, such as surface information created in Civil3D®.

4.4 Equipment Manufacturers Drawings

Drawings of proprietary equipment (e.g. pumps, motors, valves etc.) that are not modified prior to installation are not considered Engineering Drawings and may be included in the Operations and Maintenance manuals. Generally, proprietary drawings should be available online or via a request, based on the part number. Drawings that are specific to a site or asset are considered Engineering drawings and shall be delivered to this standard.

4.5 Fabrication Drawings

Fabrication drawings such as pipe spools, structural members etc are not required to be created to this standard and shall be included in the Manufacturers Data Record.

5 Information supplied by SA Water

At the commencement of any drafting engagements, it is the responsibility of the drafting provider to ensure that current and relevant information is sourced from SA Water. This includes the following CAD information in addition to the aforementioned Technical Standards (see clause 3.1).

5.1 Drawing Templates

All new title blocks must be generated within Meridian using either Power Web for internal users, or the Contractor Portal for external users. Drawings created outside of this process will not be accepted, without prior approval.

When a new template is generated, it will be pre-populated with an Asset based drawing number and some basic information in the title block. These fields must not be altered.

5.2 Drawing Numbers

Every new drawing shall have a SA Water issued drawing number. Each drawing number can contain up to 99 sheets, however each sheet must exist as an individual file. Multiple sheets can be used in instances where the drawing set covers a single discipline over the same asset. Sheet 0 cannot be used. New drawings must only contain one sheet per file. SA Water still supports legacy drawings which contain multiple sheets with a single CAD file. All new drawing numbers and sheets must be created through Meridian. This includes any additional sheets that may be required for existing drawings, with the exception of Legacy drawings.

For all disciplines other than Electrical, spares should not be used. Instead any unused drawings and sheets must be revoked. For Electrical drawings (single line), 99 sheets must be generated, with any unused drawings being marked as "SPARE" in line 5 of the title block. Additionally, 50 mm high text shall be placed on each drawing sheet in the centre, that states "SPARE".

Unless requested SA Water does not require a drawing index unless there are designated spares in a sheet set. This typically applies to Electrical drawings, as other disciplines should not have spare drawings in a given sheet set.

The drawing number is formatted as Facility ID-DD-NNNNN_SS where Facility ID=Maximo Facility ID, DD=Discipline Code, NNNNN=Drawing Number and SS=Sheet Number. All drawing number requests shall be obtained using Meridian Power Web (Internal Users) or Meridian Contractor Portal (External Users).

5.3 Existing CAD files

In instances where existing CAD files are required for modification, they can only be released from SA Water via the Meridian software. While CAD files can be downloaded externally through the Contractor Portal, only an internal SA Water Power User can assign them to a project for release.

6 Drawing Requirements

6.1 Drafting Space

It is expected that drawings produced for SA Water use a combination of Model and Paper Space. The drawing itself or model shall be drawing in Model Space at a scale of 1:1, in millimetres. The title block or drawing frame shall always remain in paper space using viewports to show the model. Unscaled drawings (e.g. P&ID, Electrical Schematics, and Process Flow etc.) are exempt from this requirement and can be drawn completely in either space. The title block however shall remain in paper space.

Drawing annotations may be in either Model Space or Paper Space; however, a consistent approach shall be maintained over the drawing. If Annotations are to be located in Model Space, then they shall be scaled to suit the viewport. All dimensions should be associative.

6.2 Dimensions

Dimensions shall be in accordance with Australian Standard AS 1100. The SA Water supplied template contains the dimension style "SA Water", which shall be used.

Linear dimensions should be in millimetres and angular dimensions in decimal degrees unless industry standards for that particular drawing type differ, in which case the industry standard shall take preference.

Dimensions shall not be exploded.

6.3 Text Styles

SA Water requires that the ISOCP font is used. If a different font must be used, it shall be an AutoCAD® standard font. Generally, text should be vertical (Oblique=0), however italic text is acceptable to give emphasis. All text should have a width factor of 1, however it is permissible to reduce this to fit into the drawing.

The table below defines typical sizes for font usage throughout the drawing:

Text Height	Line Weight	Usage
3 mm	0.35 mm	General notes, labels, tables, dimensions etc.
5 mm	0.5 mm	Minor headings
7 mm	0.7 mm	Major headings

It is permissible to use smaller fonts to enable good drawing presentation. In these cases, the minimum size for A1 drawings is 2.5 mm and A3 drawings 2mm, providing that the drawing is legible when plotted / printed at A3 size. 1.8mm (A3) is permissible in Electrical Drawings.

6.4 Line Types

Line styles applied to drawings shall conform to Australian Standard AS 1100 and industry standards. Where possible all line work should use standard AutoCAD® line styles. If a custom line style is to be used, then a copy of the line type file (*.lin) shall be provided. Globally LTSCALE should be set to 1. All line properties – Colour, Line weight and Line Type shall be set to ByLayer.

6.5 Line Weights

The following AutoCAD® colours shall be used to represent the various line weights or “pen thicknesses” when plotted at full size.

AutoCAD® Colour No	Colour	Line weight
1	Red	0.5 mm
2	Yellow	0.35 mm
3	Cyan	1.4 mm
4	Green	2.0 mm
5	Blue	0.7 mm
6	Magenta	1.0 mm
7	White	0.25 mm
8	Light Grey	0.18 mm

- The SA Water supplied plot style - SA Water Mono.ctb shall be used to ensure compliance with the above requirements.

6.6 Layers

Layer naming should follow a logical approach and be descriptive but brief. Ideally the layer name should be no more than 20 characters. The same applies to any layer groups created.

Any layer beginning with SAW_ should not be deleted.

Layer 0 should not be used except for the creation of blocks.

6.7 Drawing Scales

Drawings should be scaled as per Australian Standard AS 1100. Otherwise industry accepted scales may be used. Every effort should be made to reduce the number of different scales displayed on a single drawing.

If a single scale is applied for the entire drawing, this shall be clearly indicated at the bottom of the drawing. Individual views with differing scales shall have the scale clearly indicated below the view heading.

6.8 Revisions

All revisions including As Constructed and Issued for Construction shall be recorded in the revision table. Revision clouds and adjacent revision triangles are to be used for the current revision where appropriate. Revision clouds and triangle for previous revisions shall be removed, however the details shall remain in the revision table.

6.9 Preparing CAD files for submission

CAD files shall be prepared as follows prior to submission to SA Water:

- All drawing model space items not used in the final view shall be deleted,
- All files shall be purged to remove unused items,
- All files shall be audited with "fix errors" enabled,
- All sheets shall be zoomed to extents,
- All unused Xrefs must be totally removed/Detached from the drawing,
- All superfluous non visible entities such as unassociated associative dimensions must be removed from the drawing.

6.10 Multi Sheet Drawings

While SA Water no longer accepts the development of new Multi Sheet drawing files, legacy files that contain more than one sheet are still supported. This is not to be confused with new multi sheet drawings, which are still supported, providing there is one drawing/sheet per file.

Legacy multi sheet CAD files are supported by a multi-page PDF rendition. Example a single CAD file contains 10 sheets and the associated PDF also contains 10 pages. It is the responsibility of the drafter to ensure that any changes to the CAD file, even if it is one sheet, results in a new PDF containing all relevant sheets.

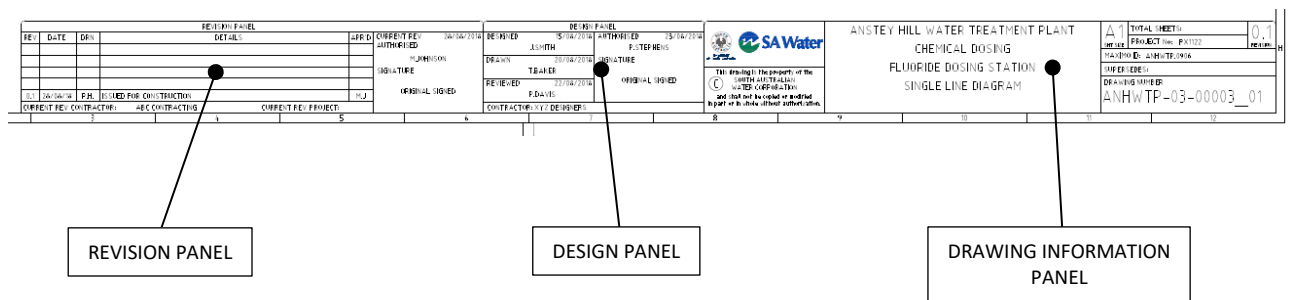
7 Drawing Sheet Information

The SA Water Drawing Sheet or Title Block is designed to capture required information throughout the life of the drawing. As the CAD file itself is a constantly evolving document, SA Water relies on plots, taken at various milestones to record the various revisions to the drawing. As this also provides an audit trail, it is a requirement that all mandatory fields are filled out prior to creating any plots that are to be submitted as a project deliverable.

In order to automate data extraction, all fields shall be entered into the existing set of attributes. To access the attribute table, simply double click on any existing fields, or on the purple text along the bottom of the sheet that reads "DOUBLE CLICK HERE TO EDIT TITLE BLOCK". This text is on a non-plot layer. The block definition must not be altered in any way.


The standard drawing sheet (which is generated in Meridian) has been set up to accommodate the majority of information likely to be entered. If text fields run outside of the designated areas, it is acceptable to alter the width factor of the text to ensure a better fit. At all times, the text must be legible. In order to generate a new drawing in Meridian, some key pieces of information are required. This is then used to auto populate some title block fields.

The Title Block can be divided into 3 areas, each capturing different stages of the drawing lifecycle.



7.1 Drawing Information Panel

This area contains all of the information that identifies the drawing, such as Title, number, sheet count etc. The following section is true for assets that exist in Maximo. The various fields are described as follows.

 <p>This drawing is the property of the SOUTH AUSTRALIAN WATER CORPORATION and shall not be copied or modified in part or in whole without authorization.</p>	ANSTEY HILL WATER TREATMENT PLANT CHEMICAL DOSING FLUORIDE DOSING STATION SINGLE LINE DIAGRAM			A1 <small>SHT SIZE</small>	TOTAL SHEETS: PROJECT No: PX1122	0.1 <small>REVISION</small>
				MAXIMO ID: ANHWTP.0906 SUPERSEDES: DRAWING NUMBER ANHWTP-03-00003_01		
8	9	10	11	12		

- **DRAWING NUMBER:** This is the unique identifier for the drawing. It consists of the Location ID, Discipline Code, the drawing number and sheet number. All four fields are mandatory and can only be generated within Meridian or the Contractor Portal.

Example: ANHWTP-03-00003_1 would be a valid drawing number for sheet 1 of an Electrical drawing for Anstey Hill Water Treatment Plant.

- **DRAWING TITLE:** This contains information about the drawing and its location. The first three lines are based on a Maximo Asset hierarchy and must be set in Meridian or Contractor Portal. The fourth line is the discipline and the fifth line is free text. Lines 1 and 4 are mandatory and a drawing number cannot be assigned without this information. Lines 2 & 3 are populated, if this data exists, from the Child and Grandchild locations, although once the drawing has been created, free text can be entered if it makes the drawing title clearer. Manually entering data into or modifying fields (line 1 & 4) will result in a validation error.

Note: The text fields in the title block have a width factor of 1.0 Providing legibility is maintained, this may be reduced to fit long titles.

- The first line contains the asset location of the drawing as it appears in Maximo.
- The second line is the Child Location of the asset location as it appears in Maximo. This information may not exist, or be irrelevant to the actual drawing, in which case more relevant information may be manually entered. **Note:** manually entering information here applies to the drawing title only, not the Child and Grandchild location fields in the Book In spreadsheet, which must follow a Maximo hierarchy, if one exists.
- The third line is the Grandchild Location of the asset location as it appears in Maximo. This information may not exist, or be irrelevant to the actual drawing, in which case more relevant information may be manually entered. **Note:** manually entering information here applies to the drawing title only, not the Child and Grandchild location fields in the Book In spreadsheet, which must follow a Maximo hierarchy, if one exists.
- The fourth line is used for drawing type. This includes but is not limited to the subcategories listed under each Discipline below.
- The fifth line is used for miscellaneous or extra information. Leave blank if not required.

- DISCIPLINE: This numerical code refers to the discipline that is covered by the drawing content. If you require an additional subdiscipline to be added, contact the CADD Coordinator. The subcategories are the type of drawing. The available fields are currently:
 - 01 – Other
 - 02 – Mechanical & Hydraulics
 - 03 – Electrical
 - Electrical General (& Arrangements)
 - Cable Schedules
 - LV Distribution
 - PLC
 - RTU
 - HV Distribution
 - Electrical General Arrangement
 - Electrical Site Layout
 - Network Architecture
 - Single Line Diagram
 - Equipment list
 - Block Diagram
 - Earthing Diagram
 - 04 – Cathodic Protection
 - 05 – Network/Reticulation
 - Water Network
 - Wastewater Network
 - Recycled Water Network
 - 06 – Civil
 - Civil General (& Arrangements)
 - Site Plan/GA (Including Facilities)
 - Site Services (underground)
 - Survey
 - Site Drainage
 - Fencing
 - 07 – Structural
 - Structural General (& Arrangements)
 - Condition Assessments
 - Concrete
 - Reinforcement
 - Steelwork
 - Aluminium
 - Details
 - 08 – P&ID
 - 09 – Architectural
- SHEET COUNT: This shows the total number of sheets (including spares) contained within the drawing number. This field shall only be filled out on sheet number 1 of any sheet set. For all subsequent sheets contained within a drawing number, this field shall be left blank. For single sheet drawings, this field can be left blank.

NOTE: If an existing drawing set is to have a sheet added, then only the Sheet Count on sheet 1 should be modified to reflect the new amount.

- **PROJECT NUMBER:** this is the SA Water project number for which the drawing is created. This is auto populated and should not be modified.
- **REVISION:** This displays the current revision of the drawing and shall always match the latest revision in the revision table. This is auto populated and should not be modified. Once a drawing leaves Meridian, external parties can modify this revision value to reflect internal systems, however it must be reset back to its original value before being uploaded back into Meridian. Any renditions must also match this value.
- **MAXIMO ID:** This is the Maximo ID of the infrastructure associated with the drawing. This is auto populated and should not be modified.
- **SUPERSEDES:** If the drawing is replacing or superseding an existing drawing, then this drawing number is entered here.

7.2 Design Panel

This Panel contains all of the information relating to the design of the drawing. This is generally filled in at the completion of the design. The authorised section is generally completed at the “Issued for Construction/Tender” revision. The fields are described below.

DESIGN PANEL			
DESIGNED	15/08/2018	AUTHORISED	23/08/2018
J.SMITH		P.STEPHENS	
DRAWN	20/08/2018	SIGNATURE	
T.BAKER		ORIGINAL SIGNED	
REVIEWED	22/08/2018		
P.DAVIS			
CONTRACTOR: XYZ DESIGNERS			
		7	

- **DESIGNED:** Use this box to enter the name of the designer and the date of the design.
- **DRAWN:** Use this box to enter the name of the drafter and the completion date of the drawing.
- **REVIEWED:** Use this box to enter the name of the reviewer and the date of the review.
- **AUTHORISED:** The drawing is generally authorised at the “Issued for Construction/Tender” revision. The name of the person authorising and ultimately assuming responsibility for the design is entered along with the date on which the drawing is authorised. The drawing is to be plotted with the signature field left blank. Once a signature has been applied to the PDF (refer clause 9 for valid signatures), the text “ORIGINAL SIGNED” is to be entered into the signature field and then saved.
- **CONTRACTOR:** This box contains the company name of the contractor responsible for authorising the design. “SA Water” is to be entered into this field for internal drawings.

7.3 Revision Panel

This panel contains all the relevant revisions applied to the drawing. Every revision that forms part of a project deliverable shall be authorised. SA Water no longer uses an alpha numeric revision system to denote drawing phases. The drawing phase is now set as metadata, ref to section 8.3 for more information. While the drawing is in work, Meridian uses incremental revisions. Once the drawing is published into Masters, the revision is automatically adjusted to the next whole number. This may cause a mismatch between the CAD file and the authorised rendition in Masters. Providing the revision panel is identical between the CAD file and the rendition, then the drawing is valid.

If the revision table becomes full, then additional revisions can be entered over the top of existing revisions, starting with the earliest.

The various fields are described below.

REVISION PANEL					
REV	DATE	DRN	DETAILS	APR'D	CURRENT REV
					28/08/2018
					AUTHORISED
					M. JOHNSON
					SIGNATURE
					ORIGINAL SIGNED
0.1	28/08/18	P.H.	ISSUED FOR CONSTRUCTION	M.J	
CURRENT REV CONTRACTOR:		ABC CONTRACTING		CURRENT REV PROJECT:	
3		4		5	
				6	

- REV: This field contains the revision letter or number of the revision being described.
- DATE: The date that the revision was drafted.
- DRN: The initial of the drafter responsible for the revision.
- DETAILS: A description of or brief summary of the revision. With exception of "Issued for Construction/Tender" and "As Constructed", revisions should also be referred to on the drawing with clouds and triangles. Refer to clause 6.8 for more detail.
- APR'D: The initial of the person who has approved the revision. This field is not mandatory.
- CURRENT REV AUTHORISED: The name of the person authorising and ultimately assuming responsibility for the revision is entered along with the date on which the revision is authorised. The drawing is to be plotted with the signature field left blank. Once a signature has been applied to the PDF (refer clause 9 for valid signatures), the text "ORIGINAL SIGNED" is entered into the signature field and then saved. Note: The revision authorisation information is only valid for the current revision. Once a new revision is undertaken, the authorisation fields are entered anew.
- CURRENT REVISION CONTRACTOR: This box contains the company name of the contractor responsible for authorising the current revision. Note: The contractor information is only valid for the current revision. Once a new revision is undertaken, the contractor fields are entered anew. "SA Water" is entered into this field for internally completed revisions.

8 Drawing Development

The majority of Engineering Drawings produced for SA Water follow the same steps. These steps generally follow a similar sequence and ultimately produce a deliverable (Authorised PDF). There will always be exceptions to this, so it is important that issues are raised early to avoid re-work. Refer to Appendices A1-A4 for detailed workflows.

While drawings still have revisions, the actual status of the drawing is determined by Metadata. The status can be observed and set through the Power Web and Contractor Portal through the Book In spreadsheet. These states are:

- Concept
- Option
- Initiated
- Detail
- Issued for Tender
- Issued for Construction
- As Constructed
- Superseded
- Decommissioned (decommissioned or abandoned assets)

8.1 New Drawing Development

Meridian provides a self-service drawing number creation tool for internal Power Web users and external contractors registered through the Contractor Portal. As the drawing number is determined by the asset location and discipline, it is important to know this information up front. Additionally, new drawings must be creating inside of an existing project. Refer to section 11 for more information on projects.

It is the responsibility of whoever is creating the new drawing to ensure that there is not an existing drawing that can be used instead. Additionally, reasonable attempts must be made to ensure that any existing drawings that overlap new drawings are updated, superseded or made obsolete.

Reproduction of Existing Drawings

Where possible, drawings should be upgraded rather than reproduced. The following drawings shall not be reproduced unless absolutely required.

- P&ID
- Single Line Drawings
- Underground Services Drawings
- Hazardous Areas Drawings
- All drawings referred to in isolation procedures

If a new drawing is created to replace (whole or partially) an existing drawing, then the existing drawing shall be superseded (see section 8.4) or updated to identify the relationship between the two drawings.

8.1.1 Concept and Temporary Drawings.

Occasionally drawings may be generated as part of a concept design, options study or for assets that do not yet exist in Maximo. Meridian allows the use of a Concept or Temporary drawing number for these purposes. These drawing numbers will start with either a "CONC" or "TEMP" prefix instead of an asset location. Drawings of this type will have to have asset data assigned to them before they can be released from the project and promoted to Masters. If the drawing is never published to Masters, it will be archived with the project that it was created in.

Drawings of this nature cannot form part of a project deliverable unless requested via the formal Engineering Standards Dispensation process.

8.2 Existing Drawing Modification

Existing drawings can be located through Meridian Power Web, Explorer and the Contractor Portal. Only drawings in the Master's branch are available for viewing through Explorer and the Contractor Portal. Previous versions of the drawing such as Issued for construction are still available to Power Web users but are not published through Explorer or the Contractor Portal. Decommissioned and Superseded drawings are also available in Masters, so it is responsibility of the drawing user to determine the status of a drawing before using it.

Any modifications made to the drawing throughout its life shall be recorded as a revision. Refer to clause 6.8 for information on revision clouds and 8.3 for how revisions are applied. Each revision shall be authorised when completed and delivered to SA Water's Representative via Meridian. Refer to clause 7.3 for information on filling out the revision table.

8.3 Drawing Revisions

All drawings created and modified within meridian have their revisions managed automatically. SA Water no longer uses an alpha numeric system to denote a drawing phase. Every drawing (including legacy) now have a drawing status, which is kept as metadata. Drawings under change or in a workflow will have an incremental revision (0.1 increments), while drawings published in Masters as final version, will be a whole number. Only As Constructed drawings should be published to Masters.

A drawing will have its incremental revision applied to it when it is placed in a workflow, in anticipation of potential changes to it. As such, it must be returned to that workflow reflecting the same revision. For example, if you check a drawing out of Meridian at rev 1.1, then it must be returned as rev 1.1, not 1.2 or 2.0. While the drawing is in work, the drafter is free to apply whatever revision structure suits their workflow, as long as it is returned correctly.

Once the drawing is published into Masters, the revision is automatically adjusted to the next whole number. This may cause a mismatch between the CAD file and the authorised rendition in Masters. Providing the revision panel is identical between the CAD file and the rendition, then the drawing is valid. For example, a drawing may become an As Con (and produce a signed PDF) while in a workflow where Meridian

has assigned a revision of 1.3. When this drawing is published, Meridian will increment the record and CAD file to rev 2, however the signed PDF will still show it has been authorised at 1.3. This is normal and expected behaviour.

If a Power Web user wishes to capture a version within the revision history, then the document must be released from the workflow and then placed in a new workflow if further work is required. Any workflow can only result in a single revision being added to the revision history of that document. For internal users, this is achieved through change workflows. For external submissions through the Contractor Portal, an internal Power Web user must release the workflow. This will capture the latest submission as a revision. These incremental revisions are captured as part of the document history and will remain even though only the final version is published to Masters. This process is used to capture drawing milestones. If a drawing is not released from workflow, then every subsequent version uploaded will overwrite the previous version.

For new drawings created in Meridian, the revision attribute in the title block is mapped to the system and is controlled by Meridian. Any incorrect values will be overwritten when the workflow is finished.

For legacy drawings, there are three scenarios, based on what Meridian thinks the revision is.

1. Meridian recognises that a legacy drawing has a numeric revision equal to or greater than 1.
The revision in this instance will just increment from whatever the current revision value is. The title block will not be controlled, or queried by Meridian, so it is important that the title block value is manually updated to match the value in Meridian. For example, a legacy drawing is booked out and while the title block shows rev 1, Meridian has registered the drawing at rev 1.1. The drawing must be returned with 1.1 in the title block revision field.
2. Meridian recognises the legacy revision as an alpha value, or zero.
The above scenario will be applied, with the exception that the revision counter will begin at 0.1. Any previous alpha revisions are still valid and can remain in the revision table.
3. Meridian does not recognise that the drawing has a revision, even though it exists in the title block. If the revision in the title block is alpha, zero, or does not exist, then scenario 2 is valid.
If there is a numeric value, the drawing must have the revision set to this value before creating a project copy. Scenario 1 will then run its course.
If the revision is not set, or the error only noticed when the drawing is being modified, the value can be corrected once the drawing is published to Masters. In this case, incremental revisions are arbitrary providing they are in a logical sequence and the final published revision is higher than the previous.

8.4 Obsolete and Superseded Drawings

Occasionally a drawing is no longer required, due to infrastructure being removed, or superseded by another drawing. When this occurs, the drawing is given one final revision with description stating the reason why the drawing is no longer required. In addition to this, 50 mm high text shall be placed on each drawing sheet in a prominent location (usually the centre of the drawing sheet), that states either "DRAWING OBSOLETE" OR "SUPERSEDED BY: *enter new drawing number*". The drawing status must also be updated to reflect the new state. If superseded, then

the new drawing number must also be specified. This can be done through the Contractor Portal on the Book In spreadsheet, or within Power Web.

If the drawing being made obsolete or superseded, is part of a sheet set, then the sheet allocation for the remaining drawings stay in place.

9 Plotting and Authorising Drawings

As the CAD file is an evolving document, all authorisations and signatures are applied to a plot at key milestones, which are determined by the project. All signed drawings shall be provided to SA Water, through Meridian, in PDF format. Hard copy drawings will not be accepted unless through prior arrangement with the CADD Coordinator. All signatures shall be entered in the Signature portion of the relevant area of the title block. The authorised details such as name and date shall also be completed. If a PDF is not provided, Meridian will generate a rendition of the CAD file, however unauthorised renditions will not be published to Masters. Authorisations of drawings at other stages such as Issued for Construction etc are dependent upon project requirements.

A drawing is not authorised until it contains a valid signature and the identification of whoever is signing the drawing. There are two acceptable methods of signing that SA Water recognises.

All new drawings shall have a signed PDF stored in Meridian. Valid design signatures are required on all drawings at IFC, the next uploaded drawing and when significant design changes are made.

9.1 Digital Signatures

Digital Signatures are the preferred method and by far the easiest and most secure way to sign a drawing. They can be applied by most PDF authoring software.

An important distinction between digital signatures and electronic signatures is that the latter are not validated for authenticity. An electronic signature is simply an electronic representation of somebody's autograph; a digital signature contains a unique digital ID to verify its authenticity. As the PDF should be locked to prevent any changes, it is important that the drawing is presented in the correct orientation.

Most PDF authoring software can create and validate signatures from self-signed certificates, which is acceptable for certification that occurs within organizations or among trusted parties. SA Water also allows the use of commercially available certificates that can be purchased from third party providers, however this is not a requirement.

The digital signature shall contain an image of the authoriser's signature, name, date and other details as necessary.

9.2 Wet Pen Signing

SA Water no longer accepts wet pen signatures on scanned PDF's. If there is a requirement to submit scanned drawings, then this must be dealt with via the formal Engineering Standards Dispensation process.

9.3 Plotting

Drawings to be plotted should use "SA Water Mono.ctb" file to ensure that all line weights are set. If plotting to PDF format, then the DWG To PDF.pc3 should be used. This ensures that the drawing is in the correct orientation and that layer information is exported to the PDF.

9.4 Authorising Revisions to Existing Drawings

In many instances an existing drawing on an old title block shall be modified. Some old title blocks do not have sufficient fields to properly capture a revision authorisation. In this instance and providing there is no requirement to migrate the drawing into the current Title Block, a block shall be inserted into the CAD file: "Revision Authorise Block.dwg". It is preferable that it is located near the pre-existing revision section of the title block if the drawing allows. The revision details are to be entered in the pre-existing revision table. Ref section 3.4 for guidance on when to continue to use an existing title block or to update to current.

10 Submission of Files to SA Water

SA Water uses Meridian for drawing management. Unless alternative arrangements are made with the CADD Coordinator, or Project Manager, Meridian Power Web (internal users) or Meridian Contractor Portal (external users) is to be used for all drawing submissions and requests / downloads. Once a drawing leaves Meridian control, it is the responsibility of whoever has checked the drawing out to maintain correct version control and backups. Drawings can only be downloaded and uploaded to an active project location. Ref section 11 for more information on Projects. As drawings get assigned to a named external contractor, only that user can upload the drawings back into the system. If someone else wishes to upload the drawings, then contact must be made with the SA Water Project Manager or Meridian.Support@sawater.com.au to get the drawings re-assigned. **Note:** This does not apply to new legacy drawings being uploaded for the first time.

10.1 Drawing Formats

To ensure a smooth transition to Meridian, SA Water is accepting new drawings that were in work as of 01/09/2018 as legacy drawings. These drawings can still comply with the previous filename and title block format but must be uploaded into Meridian through the Power Web or Contractor Portal. Drawing submissions will no longer be accepted by Engineering.Projects@sawater.com.au

For projects in work, where there may be a mixture of legacy type drawings and asset-based drawings, please contact the CADD Coordinator, or the Project Manager for advice.

10.2 File Names for Legacy Format Drawings

Note: The following naming conventions apply only legacy drawings that do not already exist in Meridian. For existing drawings, refer to Section 10.3 – File Names for Existing Drawings.

10.2.1 Single Sheet CAD Files

The following format is to be used for single sheet CAD files: YYYY-NNNNN-SS.dwg where Y=Year, N=Drawing Number and S=Sheet Number. All fields shall be used, with zeros substituting missing digits (e.g. 2015-00123-01.dwg is a valid drawing filename; 15-123-1.dwg is not).

10.2.2 Multiple Sheet CAD Files

The following format is to be used for multiple sheet CAD files: YYYY-NNNNN.dwg where Y=Year and N=Drawing Number. All fields shall be used, with zeros substituting missing digits (e.g. 2015-00123.dwg is a valid drawing filename; 15-123.dwg is not).

10.2.3 Authorised PDF's

The PDF filename must be identical to the associated CAD file, as per the naming convention in Sections 10.2.1 & 10.2.2.

10.3 File Names for Existing Drawings

All existing drawings obtained from Meridian must not have their filename changed or altered in any way. This includes new asset-based drawings and legacy-based drawings.

If a PDF rendition is generated from an existing CAD file, then it must be named identically to the CAD file except for the file extension.

11 Projects

Drawings can be viewed, and uncontrolled copies made from the Masters branch. Drawings can only be created or modified from an active project. Projects can only be created and managed internally to SA Water. External contractors can only download and upload drawings to a project folder. External contractors may have to request access to a project folder through the Contracto Portal if they do not have permission to view it. If a user has been requested to work on a project that does not yet exist in Meridian, then this must be raised with the SA Water Project Manager for action.

11.1 Capital Delivery

For information on Programs / Project / Output structures, lifecycle and management, contact the Capital Planning and Delivery Meridian coordinator. It is important that project folder duplication is avoided. Before creating a new project folder for a project or output, it is the responsibility of that person to ensure that there is not already a project folder in existence, or that they are creating the project folder in the correct location, with the correct name and structure. The Capital Delivery folders are structured by Delivery Program for Outputs and Major Projects for standalone projects

12 Minor Works

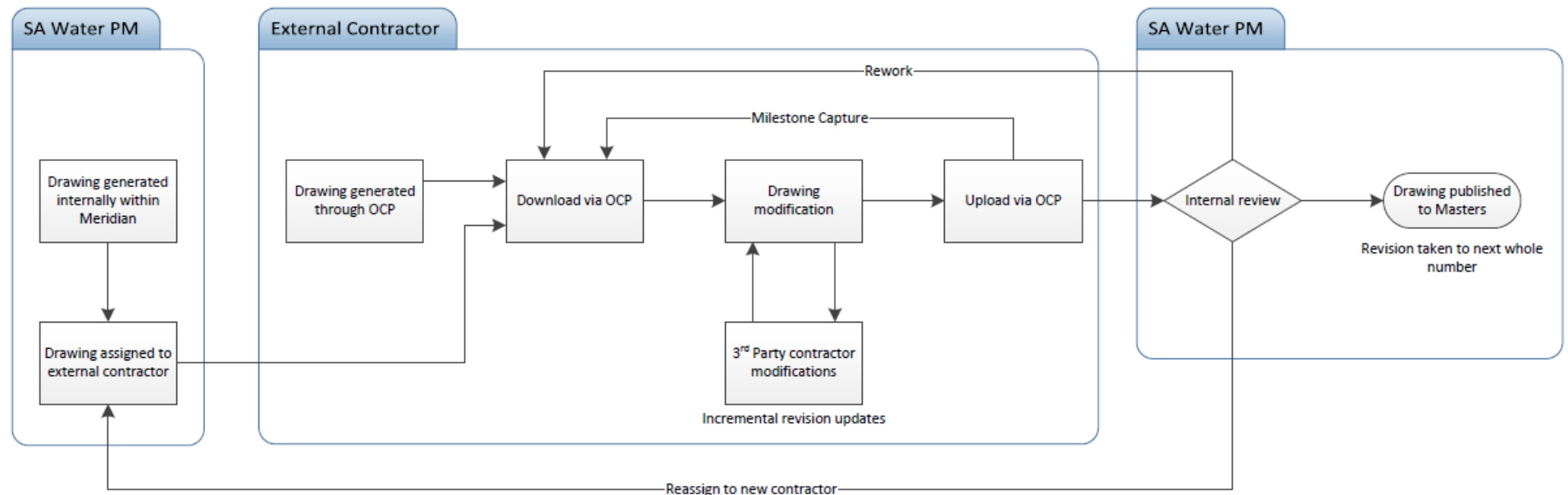
This branch is dedicated to business units that need a space to compile their own projects that may not be associated with Capital Projects. This may include personal workspaces, minor works and eventually network type drawings. To get a business unit added to this list, contact the CADD Coordinator. It is the responsibility of the business unit to manage their space. Capital projects can exist in this space as well, but this needs to be coordinated with the Capital Planning Delivery Meridian Administrator.

12.1 Workshops.

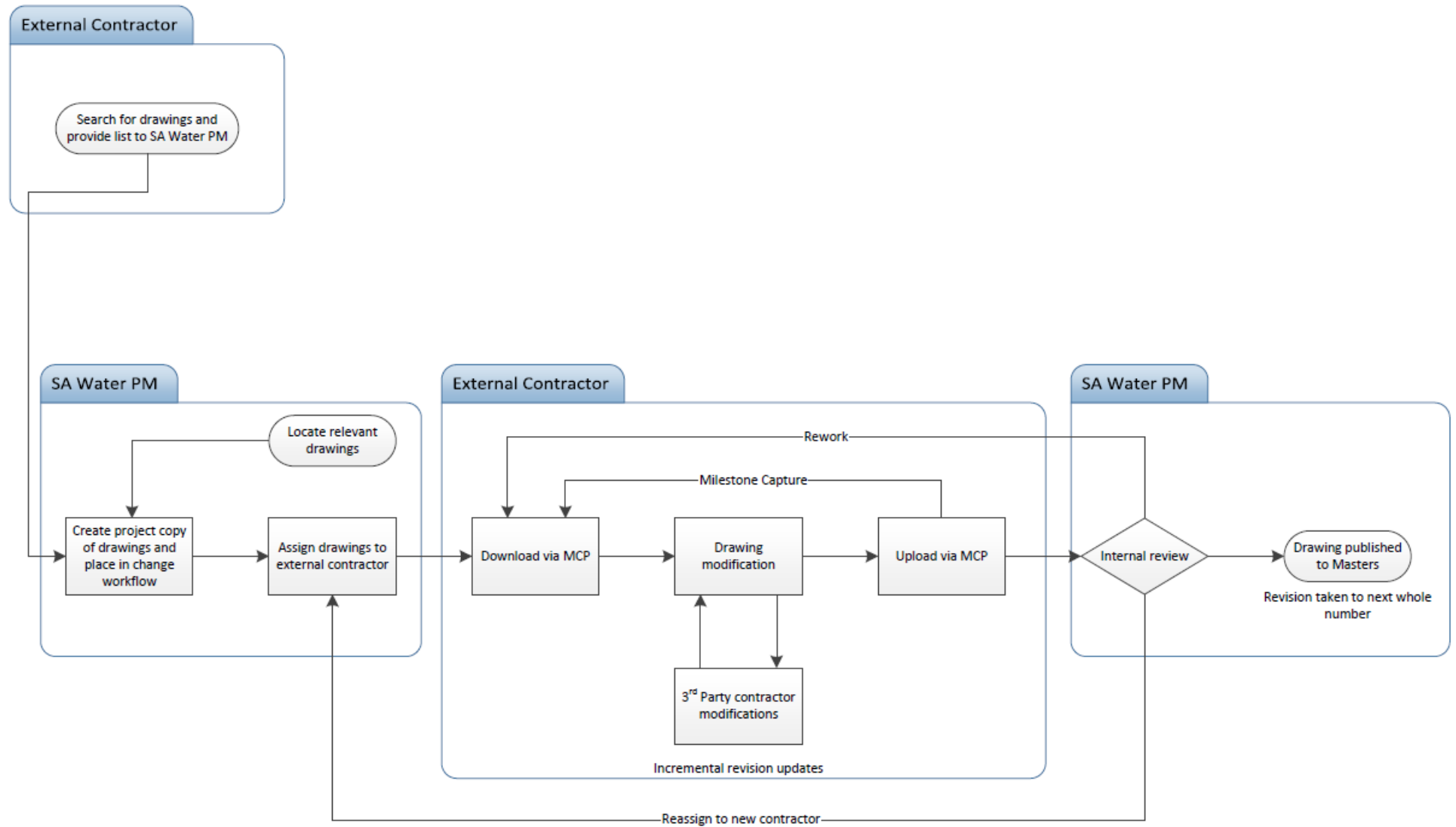
This branch is dedicated to workshops that need a space to compile their own projects that may not be associated with Capital Projects. This may include personal workspaces, minor works and eventually network type drawings. To get a workshop added to this list, contact the CADD Coordinator. It is the responsibility of the workshop to manage their space. Capital projects can exist in this space as well, but this needs to be coordinated with the Capital Planning Delivery Meridian Administrator.

Appendix A Workflows for Internal and External users

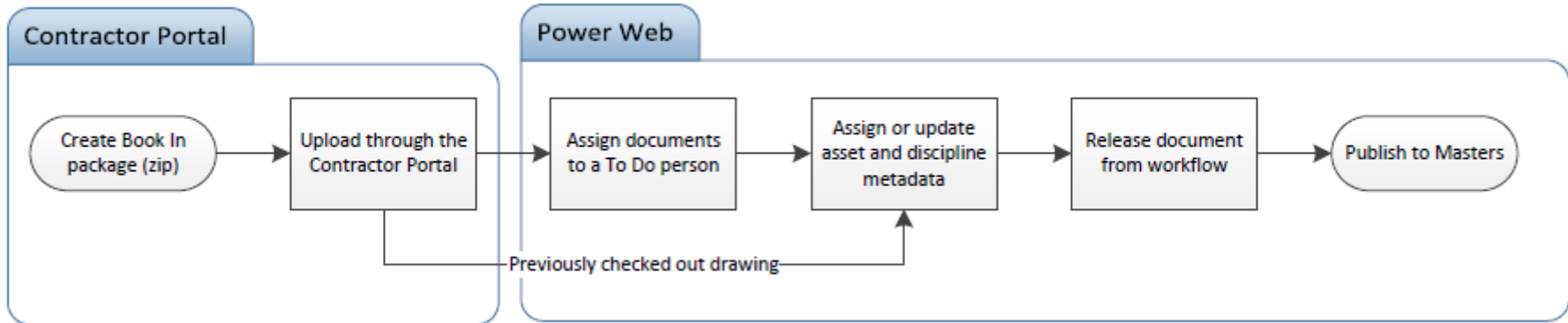
A1 Drawing Creation Workflow for External Contractors



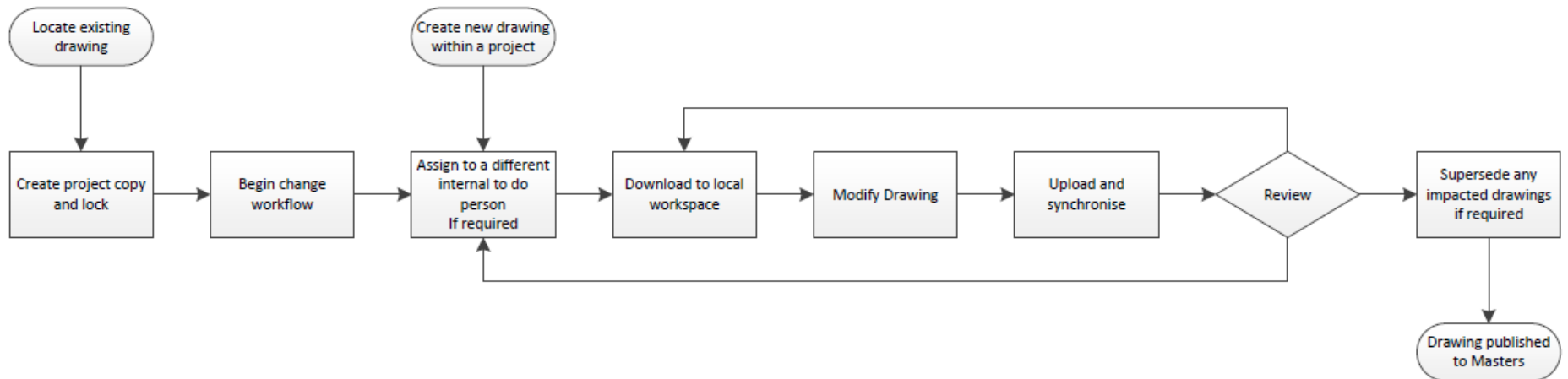
A2 Drawing Modification Workflow for External Contractors



A3 Uploading Drawings Through Contractor Portal



A4 Drawing Creation and Modification Workflow for Internal Power Web Users



Appendix B Process for SA Water Project Managers

The following outlines the responsibilities of SA Water Project Managers and highlights common issues and checks that should be undertaken both at project commencement and close out.

Before engaging contractors to use Meridian, Project Managers must ensure that:

1. A valid project exists in the structure defined by the Capital Delivery team.
2. A valid asset exists in Maximo. A hierarchy is not required, just a location and Maximo ID. An enhancement is underway to allow the creation of Concept and Temporary drawings that are not associated to an asset, however until this is rolled out, these drawings can be created using the legacy title block and legacy drawing number.
3. If starting work on an asset that is due to be decommissioned, all new drawings are created against the new asset location ID. Ref item 2 above.
4. New drawings are only created if we do not already have existing drawings, or it is not feasible to use them. Any existing drawings must be either updated or superseded to reflect new/modified infrastructure.
5. Contractors (at the user level) have Contractor Portal access to your project. Contractors can request access to additional projects through the Portal.
6. Anyone undertaking modifications to existing drawings, has the drawing checked out to them. The contractor may also require access to Xrefs, if they exist. Refer to **QRG – Working with Xrefs** for more information.

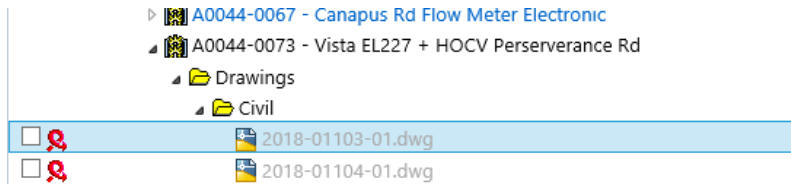
While the project is in work, it is the responsibility of the project manager to ensure that key milestones are captured as revisions. At a minimum the Issued for Construction and As Constructed revisions must be retained as separate versions. To ensure that any given revision is not overwritten by the next issue, the drawing must be released from the workflow to save that version and then put back into a workflow.

Before requesting signing of the Practical completion Checklist, the following tasks must be undertaken:

1. Ensure that any legacy drawings (except for Xrefs), have a valid asset location assigned to them. Unclassified will not be accepted without prior arrangement with the CADD Coordinator.

Document	Rendition	Title Blocks	Asset Information	Drawing Information	Links to External Sy
Asset Details					
Classification	Facilities				
Product	Water				
Type	Water Storage Tank				
Location	TANK VISTA EL227 PERSEVERANCE ROAD				
Child Location					
Grandchild Location					

2. Ensure that any legacy drawings (except for Xrefs), have a valid discipline assigned to them. Unclassified or Other will not be accepted without prior arrangement with the CADD Coordinator.



3. All drawings are removed from any workflows.
4. CAD files are viewed (in PowerWeb) in addition the PDF's to ensure that all Xrefs's are linked and any extraneous features have been removed from the file. Refer to **QRG - Checking CAD file Integrity** for more information.
5. Any unused drawings/sheets have been revoked or marked as spare. For Electrical sets where 99 sheets may have been requested, but not all of them used, the unused drawings are valid drawings that must be marked as SPARE in both the drawing and title. Do not revoke them. Any other unused sheets or drawings should be revoked. Revoked sheets can still be used in the future if required. Refer to QRG - Create New Drawings and Drawing Numbers in PowerWeb for more information.