Survey, Plan Preparation & Work as Executed

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Contents

1 SURVEY FOR SHOALHAVEN WATER ASSETS

1.1 Purpose and Scope

This Survey Specification details the minimum requirements when undertaking design and works as executed surveys and plan preparation for Shoalhaven Water assets. Any variation deemed necessary for individual projects will be specified at Shoalhaven Water's discretion.

1.2 Definitions

AHD – Australian Height Datum
GNSS – Global Navigation Satellite System
MGA – Map Grid of Australia Projection, based on MGA2020 coordinates.
PPE – Personal Protective Equipment
SCIMS – The Survey Control Information Management System managed in NSW by Land and Property Information (LPI)
SHW – Shoalhaven Water
WaE – Works as Executed

1.3 Quality Assurance

For all projects, implement surveying procedures in accordance with ISO 9001 for all survey activities. These must include methods to verify and extend the survey control network and to locate detail features necessary to form the long sections, route details and digital terrain models. The survey methods and equipment used must relate to the attainment of the tolerances specified in Clause 1.12 of this Specification. The procedures must include the methods employed to determine stringline position and point selection along the stringline for forming digital terrain models.

1.4 Surveyor Qualification

Use qualified surveyors to direct and be responsible for all survey work, where a qualified surveyor is:

1. A Registered Land Surveyor under the Surveying and Spatial Information Act 2002, or
2. A person who holds a Diploma in Surveying, or recognised equivalent, from a recognised tertiary institution and possess at least three (3) subsequent years practical experience in surveying, satisfactory to SHW.
3. WaE surveys that require a connection to the cadastre must be certified by a Registered Land Surveyor per 1.4.1.

1.5 Equipment

Comply with section 7.1.5 of ISO 9001 and the Surveyor General's Directions (Direction No. 5 and No. 9) in relation to survey equipment used for the works. The term, "Monitoring and measuring resources" in section 7.1.5 of ISO 9001, shall apply to all survey instruments and ancillary equipment used.

1.6 Records

Comply with section 7.5.3 of ISO 9001 in relation to survey records; and when requested make the records available to SHW, or persons nominated by SHW, to verify compliance with specified requirements.

1.7 Audits

At any time prior to completion of the Contract or the issue of a Certificate of Compliance, SHW (or persons nominated by SHW), is entitled to conduct field inspections to verify compliance with these specifications. The Survey Team is expected to cooperate during field inspections.

Should field inspections and/or examination of survey records indicate that a condition adverse to quality might exist, then SHW may conduct a quality audit. SHW will give five days written notice of impending quality audits.

1.8 General Standards

1. All surveys to be on AHD datum and MGA grid in accordance with the Surveying and Spatial Information Act 2002 - Part 2 clause 5.
2. MGA combined scale factor to be applied to all surveys.
3. All surveys are to be connected to SCIMS where practical. Connected SCIMS marks are to be placed in the SVY Control layer.
4. If no SCIMS marks are available, coordinates may be established by GNSS, however, accuracies specified in Section 1.12 must be achieved.
5. Survey Data to be supplied in:
    a) Magnet format - must be compatible with the current Shoalhaven Water version at time of engagement. Neutral files are to be included.
    b) AutoCAD format – must be compatible with the current Shoalhaven Water version at time of engagement.
    c) Other compatible formats such as ASCII,12da, .xml, .csv
6. Field notes to be provided in PDF format.
7. Survey control (including traverse lines) is to be included in the supplied data. Traverse and height adjustment details are also to be submitted.
8. Temporary survey stations are not permitted (e.g., paint marks, set ups with no mark etc.)
9. String numbers are to be recorded in the field.

1.9 Pipeline Long Section Surveys

1. All above ground features on the proposed alignment (e.g., trees, fences, road crossings, services crossings etc.) are to be plotted on the long section, with accompanying levels and text.
2. Intersecting services are to be plotted to scale on the long section. A natural surface level and chainage for the service must appear on the long section, along with text denoting service type, size, and level. (See Paragraph 1.12.3 for Accuracy)
3. Observations are to be taken at all change of grades, with a maximum interval of 20m unless otherwise specified.

4. Long section data is to be supplied as an alignment in an acceptable file type (see 1.8.5.c) and in AutoCAD with feature comments, matching Shoalhaven Water standards and compatible with the Shoalhaven Water AutoCAD version at the time of engagement.
5. MGA scale factor is to be applied to long sections and denoted on plans

1.10 Pipeline Route Surveys

1. For pipeline route surveys, determine average scale factor from traverse and SCIMS connections. Scale factor adjustment details to be included with supplied data.
2. When setting-out the proposed pipe centreline, marks will be required at each change of grade and/or direction (at the IP if curved); at maximum 100m intervals along a straight and must be inter-visible.
3. Acceptable pipe centreline marks are pegs (in ground), spikes (in bitumen), or nails (in concrete).
4. Markers (timber stakes) shall be placed. In areas that are vegetated, paddocks, roadsides (non-urban) etc. 1200mm stakes are to be used. 450mm markers can be used in urban areas.
5. All above ground features within the construction corridor are to be surveyed, for example but not limited to power poles, pits, kerbs, pavements, fences, trees, utilities etc. The corridor width will be specified with the job instruction.

1.11 Detail Surveys

Provide a minimum of two inter visible survey stations suitable for future additional survey or set out, one at the site of the survey and one at a maximum distance of 80m. Pegs may be used unless more permanent stations are requested in the job instruction.

Where a 3D model is required, it is to be included in in both the Design model and AutoCAD dwg in the appropriate layer.

1.12 Accuracy – Adjusted Coordinates at 95% Confidence Level

Unless otherwise specified in the job instruction:

1. Survey Control
   Horizontal: 10mm
   Vertical: +/-5mm
2. Survey pegs (other than survey control)
   Horizontal: 15mm
   Vertical: +/-10mm
3. Hard features, for example but not limited to: underground services, buildings, fences, road pavement, pits, kerbs, manhole lids
   Horizontal: 30mm
   Vertical: +/- 15mm
4. Soft features, for example but not limited to: Natural surface shots, creeks, batters, fences
   Horizontal: 50mm
   Vertical: +/- 30mm

5. WaE – Gravity sewer pipe inverts
   Horizontal: 30mm
   Vertical: +/-5mm
6. WaE - Pressure pipelines (Sewer Rising Main, Water Main, REMS Main)
   Horizontal: 30mm
   Vertical: +/-15mm
7. WaE – Hard Surfaces (Pits, Manhole Lids, Buildings etc.)
   Horizontal: 30mm
   Vertical: +/-15mm
8. GNSS
   Surveys using GNSS is permissible except for WaE (height) surveys on gravity sewer mains. Where GNSS has been used the stated accuracies in section 1.12 must be achieved, and results verified by observations taken on known controls marks within a suitable distance and elevation of the job. These readings are to be recorded at the beginning and end of each GNSS session and included in the Magnet job.
9. Cadastral Surveys to be done in accordance with the Surveying and Spatial Information Regulation 2017.
10. Service Locating for all Construction and Detailed Design to be completed to Quality Level A (QLA). Quality B (QLB) may be acceptable for Concept Design. Refer to Australian Standard of Subsurface Utility Information AS5488 for Quality explanations.

1.13 Point Naming Convention

1. Shots taken with a GNSS are to have the prefix GPS.
2. Include the date of the survey e.g. The first shot taken using a Total Station on 28th October 2023 would be 231028001, and if by GNSS it would be GPS231028001

1.14 Software

1. Design Model
   a) File type to be in accordance with 1.8.5.c
   b) A code library file will be provided by Shoalhaven Water
   c) A Template will be provided by Shoalhaven Water with layers, annotation, text, and justification settings.
   d) Combined Scale Factor must be set in model.
2. Exporting to AutoCAD – Also refer to Section 2 of this document.
   a) Template file, standards file, line style file and standard dwg will be provided by Shoalhaven Water (Section 2.2). Drawing submitted must conform to the standards provided.
   b) All drawings are to be checked for standards compliance prior to submission Point annotation (number, height, and code) is to be included in the AutoCAD dwg as text, and the "*Create layer name form source layer – Suffix*" option is to be used (Export Tab)
   c) Survey Control is to be included in the AutoCAD dwg, including traverse lines.

1.15 Safety

1. Contractor to submit Safe Work Method Statement in accordance with Work Health & Safety Act 2011.
2. A Site-specific risk assessment is to be carried out by the survey team upon arrival at the job site, capturing site specific hazards and local controls. The risk assessment document and details of risk management controls used (e.g., Traffic Control Plan) are to be included with the data submission.
3. The survey team must have the appropriate PPE.

1.16 Entry On to Private Property

1. If entry onto private land is identified as part of the scoping process, the owner will be notified in writing prior to the survey.
2. The survey team will be issued with a copy of the notification correspondence which must be in their possession whilst the survey is carried out, available to present to the owner upon request.
3. If entry onto private property is not identified during the scoping, but is deemed necessary by the survey team, SHW must be contacted prior to entering the property.
4. Power of Entry
   Power of entry onto privately owned land is permissible under the Local Government Act 1993, Sections 191, 191A and 192.
5. Refusal of Entry
   The survey team will be an authorised representative of Council and is expected to treat ratepayers in a courteous manner. If entry is refused or the owner is argumentative, the survey team is to refrain from further action and notify SHW immediately.

2 PREPARATION OF CIVIL AND STRUCTURAL ENGINEERING DRAWINGS

2.1 Purpose and Scope

This Standard Technical Specification details the preparation and submission of all civil and structural engineering design drawings to Shoalhaven Water (SHW).

2.2 Information Provided

It is the user's responsibility to ensure the current Standard and associated drawing files are adhered to.

SHW will provide the current dwt & ctb files.

Information	Description	Source
Drawing Set Number	Project drawing number	SHW Project Manager
Equipment Number	SHW Equipment number	SHW Project Manager
Asset Name	SHW Asset name	SHW Project Manager
Index Number	SHW Index number	SHW Projects & Design Unit

Drawing Template & Plot Files:		
SHW _A1 Template.dws	Drawing standards file V4.2	Technical Information Package
SHW _A1 Template.dwt	Drawing template V4.2	Technical Information Package
SHW _A3 Template.dws	Drawing standards file V4.2	Technical Information Package
SHW _A3 Template.dwt	Drawing template V4.2	Technical Information Package
SHW.ctb	Standard plot style pen table	Technical Information Package
SHW_scale.ctb	A1 to A3 plot style pen table	Technical Information Package
Readme.pdf	Technical drawing notes	Technical Information Package

If required, the following information will also be provided by SHW:

Information	Source
Maintenance hole number	SHW Project Manager
Maintenance shaft number	SHW Project Manager
Line number	SHW Project Manager
Vent number	SHW Project Manager
Flow relief structure number	SHW Project Manager

2.3 Drawing Requirements

2.3.1 Standards

Drawings supplied to Shoalhaven Water shall comply with Australian Standards:

AS 1000	The international system of units (SI) and its application
AS 1100	Technical drawing - General principles
AS 1100.201	Part 201: Mechanical drawing
AS 1100.401	Part 401: Engineering survey and engineering survey design drawing
AS 1100.501	Part 501: Structural engineering drawing
AS 1101	Graphic symbols for general engineering - Hydraulic and pneumatic systems
AS 60417	Graphical symbols for use on equipment - Overview and application
WSA 03-2011-3.1	Water Supply Code of Australia – Regional NSW Edition Version 1
WSA 02-2014-3.1	Gravity Sewerage Code of Australia – Regional NSW Edition Version 1
HB7	Engineering Drawing Handbook

Complete drawings using the supplied AutoCAD template file.

2.3.2 File format

Supply all drawings in DWG and PDF file format.

2.3.3 Drawing size

Prepare A1 drawings using the drawing template supplied by SHW.

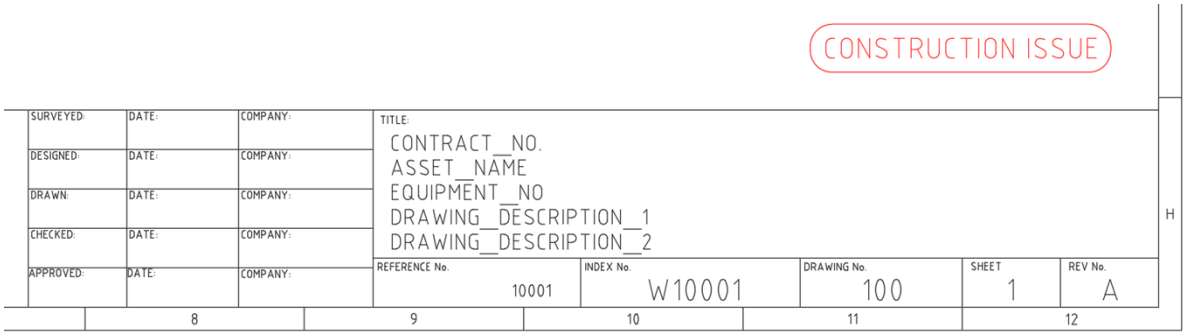
2.3.4 Copyright

Files provided by SHW for the preparation of drawings shall remain the copyright property of SHW. They shall not be changed or modified. Files submitted to SHW shall become the copyright property of SHW.

2.4 Drawing Numbers

The drawing number consists of three segments of information. The segments define a valid drawing number:

Reference number
Index number (To be issued by SHW)
Drawing Number
Revision number
eg. 10001-S10001-100_A.dwg
eg. 10001-W10001-100_A.dwg



2.5 Drawing specifications

2.5.1 Drawing environment

Create all designs in model space with co-ordinates in Map Grid of Australia (MGA2020 Zone 56) and levels in Australian Height Datum (AHD) at a scale of one to one.

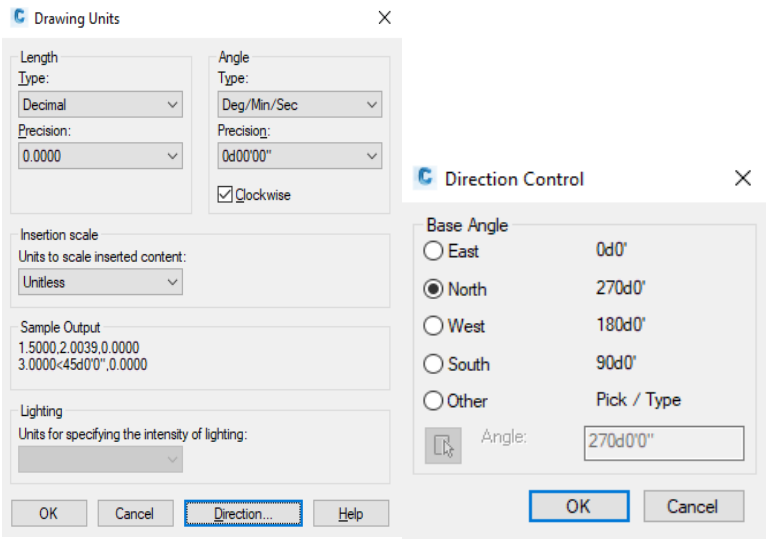
Insert dimensions, labels and annotation text in model space.

Insert the drawing frame, general notes, reference drawing list, material list, pipe work schedule and other notation in "paper space".

Arrange sections, views and details in sequential order left to right, top to bottom on the drawing sheet.

Set the AutoCAD system variable “Measurement” to “1”. (i.e., Metric)

Set Drawing units to:



2.5.2 Text styles

All text shall be in accordance with the following:

A1 Drawings & A3 Drawings					
Text height	Application	Font	Style	Width Factor	Oblique Angle
3.5mm	General notes, material lists, dimensions, etc.	ISOCP	T35	1	0
5.0mm	Sub-titles, headings, view names, and section descriptions, etc.	ISOCP	T50	1	0
5.0mm	Titles & Drawing Numbers	ISOCP	T50	1	0

A4 Drawings					
Text height	Application	Font	Style	Width Factor	Oblique Angle
2.5mm - 3.5mm	General notes, material lists, dimensions, etc.	ISOCP	T35	1	0
3.5mm - 5.0mm	Sub-titles, headings, view names, and section descriptions, etc.	ISOCP	T50	1	0
5.0mm	Titles & Drawing Numbers	ISOCP	T50	1	0

Text shall be upper case. Use lower case lettering where appropriate for abbreviations for unit of measure. Do not place text directly on linework or symbols. Text must be readable from bottom or right-hand side of the drawing.

2.5.3 Dimensioning

Each dimension shall be a single AutoCAD entity. The AutoCAD dimension style shall be CIV or SVY to suit display scale as defined in the drawing template file.

2.5.4 Line types

Set the AutoCAD entity's "Linetype" property to "Bylayer".

Set the AutoCAD system variables “Ltscale” and “Psltscale” to “1”. Individual elements shall have a constant Ltscale of 1.

Line types referenced in the template file shall only be accepted.

2.5.5 Entity Colour and Line Weights

Set the drawing entity's colour, line weight and plot pen thickness to:

AutoCAD entity	Property
Colour	Bylayer
Lineweight	Bylayer
Plot Style	Bycolor

2.5.6 Layering structure

Use only the layers supplied in the template file.

Complete all title block text attribute fields. Do not place company logos on the drawing. The company's name shall be detailed in the allocated area on the title block. Insert consultant's project reference number in appropriate field.

2.5.7 External References

External references shall be “Bound” to the dwg file Multiple Sheet Layouts
Multiple sheet layouts in a single file shall be accepted. Irrelevant sheet layouts are to be removed.

2.5.8 Scales

AS1100 scales shall only be used. Scales shall be as adopted from Tables 5.1 and 5.2 of AS1100 only on original sized documents.

2.5.9 Plotting of Drawings

Plotted drawings shall:
Be Colour dependant plot style using pen style table “SHW.ctb” or “SHW_scale.ctb”.
Plots are to be plotted at original size.

2.5.10 Hatching and Shading

Use hatching or shading to clarify or enhance the drawing content. It shall be “by layer” for colour, line type and weight and be consistent throughout the drawing set. Place hatching in the relevant supplied hatching layers.

2.5.11 Symbols

Use symbols where appropriate. List and define symbols on a Symbols and Abbreviations drawing towards the front of drawing set or within a plan Legend

2.5.12 Abbreviations

Use abbreviations where appropriate. List and define abbreviations on the Abbreviations and Symbols drawing or within a plan Legend

2.5.13 Images

Keep the use of images to a minimum. Place images in the defined layer and set 'imageframe' system variable to 2.

Image file names shall comply with the following:

The following files are accepted:

Extension	Description
.ecw	ECW Compressed Image Format
.jpg	JPEG File Interchange Format
.img	IMG File
.jpeg	JPEG File Interchange Format
.jp2	JPEG 2000
.j2k	JPEG 2000
.tif	Tagged Image File Format
.tiff	Tagged Image File Format
.bmp	Windows Bitmap

Insert image files using relative paths to avoid loss of data when submitted. Locate all files in the same directory as the drawing they are inserted in. Transmit all image files with the drawings when drawing files are submitted.

2.6 Modifications to Drawings

2.6.1 Drawing Revision

Drawings supplied during review stages of a design shall be given a sequential letter.

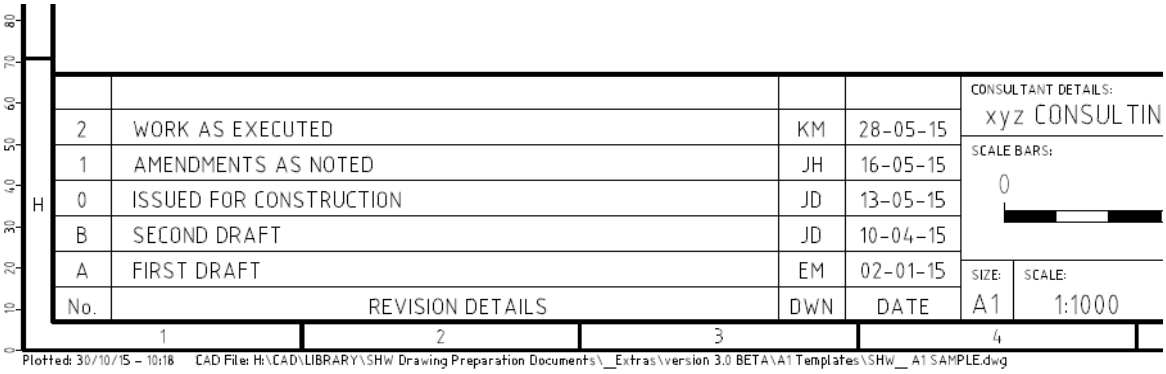
e.g., Revision A - 1st Draft, Revision B - 2nd Draft and Revision C - Client Review etc

Once a drawing has been approved for Construction it shall be given a revision status of 0 (zero). e.g., Revision 0 - Construction Issue

When an amendment is made to the drawing following construction issue, the drawings shall display the next sequential number in the title block such as a '1', '2' or '3'.

e.g., Revision 1 - Dimension Updated and Revision 2 - Work-As-Executed

The revision box of the drawing shall be updated with the revision number and description of the amendment before the drawing is re-issued. e.g.



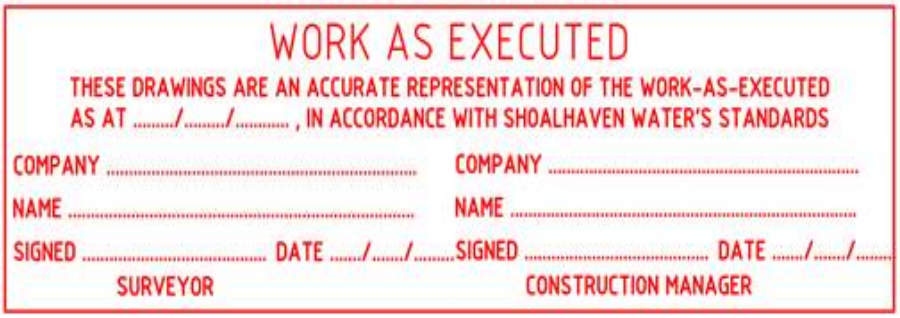
2.6.2 Highlighting revisions

Amendment triangle/s containing the revision number shall be placed adjacent to the modified section when changes to the final design drawing have been made. Revision cloud/s shall also be used to highlight modifications. These shall be placed on the appropriate layer as referenced in Appendix 1 – Layering Convention for A1 & A3 drawings.

Revision symbols and clouds shall be in “paperspace” and removed or placed on a frozen layer when drawings are revised as Work as Executed.

2.6.3 Stamps & Disclaimers

Standard stamps and disclaimers are provided and are to be used to indicate the status of each drawing. Each stamp and disclaimer reside in respective layers. Stamps are NOT to be modified or substituted.



2.6.4 Tables

Typical tables are provided in the SHW template and may be customised to suit. Tables reside in respective layers and any modified or additional tables are to reside in these layers.

2.7 Supply of Drawings

Supply draft design drawings for review in digital format. SHW may also request the .DWG files of the drawings.

Supply final design drawings and any subsequent amendments as .DWG and PDF files.

Drawings supplied to SHW shall be:

1	Edited to remove all entities in “Model” space which are not part of the final design.
2	Purged to remove all irrelevant blocks, layers, text styles.
3	Checked using relevant Drawing Standards file *.dws
4	Checked for errors using the AutoCAD “Audit” command and any encryption or passwords removed.
5	UCS set to “world” in model space
6	Model view set to “plan”.
7	Ltscale set to 1
8	PSLtscale set to 1
9	Plotted using the relevant SHW *.ctb file.
10	Default plotter set as “DWG To PDF.pc3”.
11	Saved in “zoom extents” format in paper space.
12	Viewport layer frozen off for display.
13	Viewports locked for display.
14	Spatially correct on MGA2020 coordinates and AHD

3 WORK-AS-EXECUTED (WAE) INFORMATION

3.1 General

3.1.1 Scope

This Specification details requirements for the preparation of Works as Executed (WAE) plans for water supply and sewerage works where works are to be accepted/owned by Shoalhaven Water.

These specifications are available online at https://www.shoalwater.nsw.gov.au/Building-and-renovating/Information-and-resources/Guides-resources-and-standards

3.1.2 Interpretation

"Construction Drawings" are all drawings defining the physical characteristics of the works to be constructed.

"Work As Executed Drawings" (WAE) are all drawings defining the physical characteristics of the works constructed.

3.2 Information Provided

The following information is provided by Shoalhaven Water (SHW) where required:

Information	Description	Source
Equipment Number	SHW Equipment number	SHW Project Manager
Asset Name	SHW Asset name	SHW Project Manager
Index Number	SHW Index number	SHW Projects & Design Unit
Maintenance hole number	SHW Maintenance hole number	SHW Project Manager
Maintenance shaft number	SHW Maintenance shaft number	SHW Project Manager
Line number	SHW Line number	SHW Project Manager
Vent number	SHW Vent number	SHW Project Manager
Flow relief structure number	SHW Flow relief structure number	SHW Project Manager

3.3 Survey & Accuracy

As per Part 1 Surveys for Shoalhaven Water Assets, Sections 1.4, 1.8, & 1.12.

3.4 Drawing Requirements

3.4.1 General

Revise the electronic version of all Construction Drawings in accordance with Section 2.3.2, 2.3.3, 2.5.1, 2.5.6, 2.5.9, 2.5.11 & 2.6 of this document to accurately depict the work as constructed. Check and revise all dimensions, co-ordinates, levels, materials, boundary ties and other drawing notations.

WAE detail are to be recorded on specific WAE layers in drawing files with different layers for text, dimensions, civil, pipework, mechanical, survey etc as per WAE layering table in Appendix 3.Provide a table of co-ordinates for all constructed fitting on the General Arrangement drawing.

Fitting/Node	CHAINAGE	EASTING	NORTHING	Invert R.L (m) *
E.g. - Hydrant	547.15	345448.54	6383845.98	10.20 (Top of pipe)
E.g. - 90° Bend	550.08	345449.54	6383847.98	9.00 (Top of pipe)

(**Note – Water surface fittings shall have RL provided for Top of Pipe*.)

Amend all relevant notation to indicate actual details/size of features on the Construction Drawing.

E.g.: Amend drawing notes to indicate type and class of pipes/fittings used i.e., MPVC or OPVC – Class 16, HDPE - PN16 or DICL.
A drawing note indicating concrete encasement of pipe work is required where cover is less than 700mm. Indicate the actual extent of encasement installed (chainage or coordinates).

When the dimension or size on a Construction Drawing is nominal (e.g., Pipe diameter) only correct the dimension if a different size is used. For cast in-situ concrete work, only correct dimensions when the work constructed is outside the tolerances defined in AS3610 Formwork for Concrete.

When the dimension or size on a Construction Drawing is minimum or maximum (e.g., Pipe diameter) dimensions are to be corrected to reflect the actual size used.

State the origin of all levels and co-ordinates on each drawing as well as any additional survey control marks.

When specified, modify contours to depict the work as constructed.

On each drawing state the month and year by which all fieldwork on the drawing was completed.

Add a "WAE" notation in the Revision table located on each drawing to indicate that it is Work-As–Executed even if no other changes have been made to the Construction Drawing.

Include a signature block as shown on page 15. **Disclaimers are not to be included as part of submissions.**

Supply completed WAE drawings via digital format (e.g., Email) in AutoCAD.dwg and Adobe.pdf file format in the latest release of AutoCAD or previous two versions and/or version as specified by Shoalhaven Water.

3.4.2 Sewer Fitting Co-ordinates (Gravity & Pressure)

Record each of the sewer fitting Easting and Northing co-ordinates, boundary ties, surface level and invert/obvert level if not already provided under clause 3.4.1, on the WAE drawing.

Maintenance Hole (MH) (Access Chamber)	Flow meter	Odour Control Dosing Unit
Maintenance Shaft (MS) (Access shaft)	Flushing Point	Pump out scour pit
Air valve	Gate valve	Scour discharge point
Dead end	Inspection chamber	Stop valve
Detention structure	Lamp hole	Pressure Sewer Unit
Boundary Kits	Reflux Valve	

3.4.3 Measured Location of Fittings in Gravity Sewer Mains

Record the information below on supplied Junction Sheets (see Appendix 1). Supply Junction Sheets in excel format with the AutoCAD drawing. Scanned Junction Sheets shall be a minimum resolution of 300 dpi. Where CCTV is undertaken in accordance with the

WSAA Conduit Inspection coding and an inspection report is supplied, junction sheets are not required.

1	Fitting type
2	The orientation of the junction (Vertical Junction –VJ, RJ-left, RJ-right, SJ-left, SJ-right, MHJ and LHJ)
3	Material
4	Depth – Invert and natural surface levels.
5	Length of Junction
6	Downstream MH and MS number
7	Distance to the centre of the downstream MH or MS

Include the following items on the Junction Sheets:

Distance from downstream structure
Junction type
Junction length
Junction Depth

3.4.4 Sewer Vents

Determine the following information if not already provided under Clause 3.4.1, and present the table on WAE drawing.

Description	
Vent number	Vent diameter at base (mm)
Easting co-ordinate	Vent height (m)
Northing co-ordinate	Vent Stack Type (tapered, straight walled etc)
Vent material	Surface level (Ground level)

3.4.5 Sewer Flow Relief/emergency Detention Structures and pipe work

Record the following information if not already provided under Clause 3.4.1, of all components of the flow relief or detention structure and pipe work. Present the table on the WAE drawing:

Description	
Flow relief or detention structure number	Invert levels of incoming and any outgoing pipe work
Surface level (Ground Level)	Invert levels where overflow or detention structure pipe connects to gravity sewer
X, Y & Z co-ordinate (Easting, Northing & RL)	Overflow outlet type (duckbill, flap valve etc)

3.4.6 Water/Recycled water/Sewer Rising Mains fittings, Co-ordinates and / or Boundary Ties

Record the easting, northing co-ordinates and reduced levels if not already provided under Clause 3.4.1 of each of the water fittings on the WAE drawing. *Water surface fittings shall have RL provided for Top of Pipe.* Details are to be listed in an attribute table format in accordance with the below example:

Air valve	Double air/control valve	Pressure reducing valve
Auto inlet valve	Hydrant	Pressure sustaining valve
Ball Valve	Hydrant bend	Reflux valve
Blank hydrant	Hydrant control valve	Scour
Booster control valve	Manhole	Strainer
Borewell	Meter	Stop valve
Butterfly valve	Pitot cock valve	Water pump
Cluster box	Chlorine Dosing Unit	Tapping bands/Tee
Flushing trap	Built-in Bypass valves	Bends
Tangent Point/Deflections		

3.4.7 Measured Location of Fittings in Water/Recycled Water and Sewer Rising/Low Pressure Mains

Record the following information on the Construction drawing as the work progresses. Transfer the information to the WAE drawing.

1	Fitting type
2	Pipe sizes and materials
3	Chainage from the start of the water, recycled water or rising main
4	Distances to any convenient prominent features

Provide a copy of the original marked up Construction drawing showing all field measurements with the WAE AutoCAD drawing.

3.5 Pump Station Details

Record the easting and northing co-ordinates and associated details as shown in the list below along with any other details noted on the design plans on the WAE Plans. Details are to be listed in an attribute table format in accordance with the below example:

Detail Required Where Applicable	Easting & Northing	RL	Diameter/ Size/Area	Material
Wet Well (*ID & DN*)	Required	Required	Required	Required
Wet well fittings			Required	Required
Concrete Roof (*under side*)		Required	Required	Required
Inlet Pipe		Required	Required	Required
Floor		Required	Required	Required
Emergency Relief Structure	Required	Required	Required	Required
Emergency Relief Discharge point	Required	Required	Required	Required
Emergency Relief level (*Inside Well*)		Required	Required	Required
Discharge Bend			Required	Required
Riser pipework			Required	Required
Discharge Taper			Required	Required
Valve pit size			Required	
Valve Pit Roof	Required	Required	Required	Required
Valve Pit Floor RL		Required	Required	Required
Valve Pit fitting components		Required	Required	Required
Emergency Storage (*Centre*)	Required	Required	Required	Required
Emergency Storage Roof (*underside*)	Required	Required	Required	Required
Emergency Storage Floor	Required	Required	Required	Required
Drain Return (*both ends*)		Required	Required	Required
Top water level		Required		
Cabinet location (*centre*)	Required			
Vent stack location	Required		Required	Required
Fencing details	Required		Required	Required
Electrical conduits & Pits	Required		Required	Required
Dosing Cabinet	Required		Required	Required
Water Service route & details	Required	Required		
Permanent survey Marks	Required	Required		
Rising Main Route - Valve Pit to Site boundary	Required	Required	Required	Required
Access Opening			Required	Required
Access Road, Turning Bays	Required	Required	Required	Required
Stormwater Pits & Pipes	Required	Required	Required	Required

3.6 Submission of WAE Information

Complete and submit all WAE information with Appendix 1, 2 & 4 WAE checklist as required

3.7 Appendix 1 – Line/Junction Sheet

Scheme					
Contract No			File No		
Contractor			Page No		
Street		Suburb -		Line/TM	
Pipe Diameter		Type		Class	
Chainage/MH No		to MH No -		Date Completed	

Chainage	Depth to Invert	Depth to rock	Schematic Representation	Lot Details	Comments
			show length of junction from main		
			MH -		
			Upstream MH		
			Downstream MH		
			MH -		

This line sheet represents a true and accurate and complete representation of the work as constructed.

Signature of Authorised contractors rep

…… Date…….

3.7 Appendix 2

Checklist

Clause	Requirements		Yes	No	Comments
3	Work-As-Executed (WAE) location co-ordinates certified by suitably qualified Engineering Surveyor.				
3	Co-ordinates stated in Map Grid Australia (MGA2020 Zone 56) & AHD				
4.1	Electronic version of Construction Drawing revised depicting work as executed				
4.1	Dimensions, co-ordinates, levels, materials, and other drawing notations checked and revised				
4.1	Constructed fittings table of co-ordinates provided on General Arrangement Drawing.				
4.1	Measurement accuracy certified by Registered Surveyor				
4.1	Amended notation supplied indicating actual details of features noted on the Construction Drawing located, sized, or determined during construction				
4.1	Origin of all levels, co-ordinates and additional survey control marks stated on each plan.				
4.1	Month and year by which all field work was completed stated on each drawing				
4.1	“WAE” notation added in revision table even if no other changes have been made to the Construction Drawing				
4.1	Completed WAE drawings supplied via digital format in AutoCAD.dwg and Adobe.pdf format in the latest release of AutoCAD or previous two versions				
4.2	Sewer fittings	Sewer fitting co-ordinates recorded on WAE drawing			
4.3	Gravity sewer mains	Completed junction sheets supplied in PDF format or CCTV Report with AutoCAD drawing			
4.4	Sewer vents	Completed table presented on WAE drawing			

4.5	Sewer Flow Relief/Emergency Detention Structures and pipe work	Completed table of all relief or detention structure components and pipe work presented on WAE drawing			
4.6	Water/Recycled water fitting co-ordinates	Easting and northing co-ordinates of each water fitting recorded on WAE drawing			
4.7	Measured location of fittings in Water/Recycled water and sewer mains	Information recorded on Construction drawing and transferred to WAE drawing			
		Copy of original marked up Constructed drawing showing all field measurements provided with WAE AutoCAD drawing			
6	Supplied appendix completed as required				

WAE submission complies with the requirements of Work-As-Executed (WAE) Information

Supervising Consultants Name…….....

Supervising Consultants Signature / Date….....

3.8 Appendix 3

DICIPLINE	LAYER NAME	COLOUR	LINETYPE	LINEWEIGHT	PLOT	DESCRIPTION
	WAE_CADASTRAL	10	Continuous	LineWeight025	TRUE	WAE CHANGES TO CADASTRAL DESIGN (LOT NUMBERS, EASEMENTS, ETC)
	WAE_CIV_FSL	10	Continuous	LineWeight025	TRUE	WAE CHANGES TO FINISHED SURFACE LEVEL DESIGN (BATTERS, CONTOURS, ETC)
	WAE_CIV_RD	10	Continuous	LineWeight025	TRUE	WAE CHANGES TO ROAD DESIGN (PAVEMENT, KERB, FOOTPATH, ROAD NAME, ETC)
	WAE_LS	10	Continuous	LineWeight035	TRUE	WAE CHANGES TO LONG SECTION DESIGN
	WAE_S_AIR	10	Compressed_Air_Below_G	LineWeight025	TRUE	WAE CHANGES TO SERVEICES - COMPRESSED AIR DESIGN
	WAE_S_DRAIN	10	Drain_Below_G	LineWeight025	TRUE	WAE CHANGES TO SERVEICES - DRAIN DESIGN
	WAE_S_POWER	10	Electrical_Above_G	LineWeight025	TRUE	WAE CHANGES TO SERVEICES - POWER DESIGN
	WAE_S_RECLAIMED_WATER_FITTING	10	Continuous	LineWeight035	TRUE	WAE CHANGES TO SERVEICES - RECLAIMED WATER MAIN DESIGN
	WAE_S_RECLAIMED_WATER_MAIN	10	REMS_Below_G	LineWeight035	TRUE	WAE CHANGES TO SERVEICES - RECLAIMED WATER MAIN DESIGN
	WAE_S_SEWER_FITTING_MH	10	Continuous	LineWeight035	TRUE	WAE CHANGES TO SERVEICES - SEWER MAINTENANCE HOLE, LAMPHOLE, FITTING, STOP, SCOUR, ETC
	WAE_S_SEWER_MAIN_EFFLUENT	10	Sewer_Below_G	LineWeight035	TRUE	WAE CHANGES TO SERVEICES - SEWER EFFLUENT TRANSFER MAIN DESIGN
	WAE_S_SEWER_MAIN_GRAVITY	10	Sewer_Below_G	LineWeight035	TRUE	WAE CHANGES TO SERVEICES - GRAVITY SEWER MAIN DESIGN
	WAE_S_SEWER_MAIN_PRESSURE	10	Sewer_Rising_Main	LineWeight035	TRUE	WAE CHANGES TO SERVEICES - PRESSURE SEWER SYSTEM MAIN DESIGN
	WAE_S_WATER_FITTING	10	Continuous	LineWeight035	TRUE	WAE CHANGES TO SERVEICES - WATER FITTING DESIGN (STOP, SCOUR, TAPER, ETC)
	WAE_S_WATER_MAIN	10	Water_Below_G	LineWeight035	TRUE	WAE CHANGES TO SERVEICES - WATER MAIN DESIGN
	WAE_STR_BUILDING	10	Continuous	LineWeight025	TRUE	WAE CHANGES TO STRUCTURAL - BUILDING AND MASONRY DESIGN
	WAE_STR_CONCRETE	10	Continuous	LineWeight025	TRUE	WAE CHANGES TO STRUCTURAL - CONCRETE DESIGN (PUMPING STATION WELL, VALVE PIT, ETC)
	WAE_STR_PIPEWORK	10	Continuous	LineWeight025	TRUE	WAE CHANGES TO STRUCTURAL - PIPEWORK DESIGN
WAE	WAE_STR_STEELWORK	10	Continuous	LineWeight025	TRUE	WAE CHANGES TO STRUCTURAL - STEELWORK DESIGN
	WAE_STR_TIMBER	10	Continuous	LineWeight025	TRUE	WAE CHANGES TO STRUCTURAL - TIMBER DESIGN
	WAE_SVY_DRAIN	10	Drain_Below_G	LineWeight025	TRUE	WAE SURVEY - DRAIN
	WAE_SVY_ELECTRICITY	10	Electrical_Below_G	LineWeight025	TRUE	WAE SURVEY - ELECTRICITY
	WAE_SVY_FSL	10	Continuous	LineWeight025	TRUE	WAE SURVEY - FINISHED SURFACE LEVEL
	WAE_SVY_MISC	10	Continuous	LineWeight025	TRUE	WAE SURVEY - MISCELLANEOUS
	WAE_SVY_POINT	10	Continuous	LineWeight025	TRUE	WAE SURVEY - POINT COLLECTED IN THE FIELD
	WAE_SVY_POINT_CODE	10	Continuous	LineWeight025	TRUE	WAE SURVEY - POINT CODES IN THE FIELD
	WAE_SVY_POINT_HEIGHT	10	Continuous	LineWeight025	TRUE	WAE SURVEY - POINT HEIGHT COLLECTED IN THE FIELD
	WAE_SVY_RD	10	Continuous	LineWeight025	TRUE	WAE SURVEY - ROAD, DRIVEWAY ETC
	WAE_SVY_RD_KERB	10	Continuous	LineWeight025	TRUE	WAE SURVEY - KERB
	WAE_SVY_REMS	10	REMS_Below_G	LineWeight035	TRUE	WAE SURVEY - RECLAIMED WATER
	WAE_SVY_SEWER	10	Sewer_Below_G	LineWeight035	TRUE	WAE SURVEY -SEWER
	WAE_SVY_STORMWATER	10	Stormwater_Below_G	LineWeight025	TRUE	WAE SURVEY - STORMWATER
	WAE_SVY_TELE	10	Telephone_Below_G	LineWeight025	TRUE	WAE SURVEY - TELEPHONE, COMS
	WAE_SVY_WATER	10	Water_Below_G	LineWeight035	TRUE	WAE SURVEY - WATER
	WAEother	10	Continuous	LineWeight025	TRUE	only to be used where WAE changes to the design DO NOT RELATE TO OTHER RELEVANT WAE LAYERS

3.9 Appendix 4 – Wastewater Pump Station

Detail Required	Easting	Northing	RL	Diameter Size or Area	Material
Wet Well (ID & ED)			Required	Required	Required
Wet well fittings				Required	Required
Conc Roof (underside)			Required	Required	Required
Inlet Pipe			Required	Required	Required
Floor			Required	Required	Required
Emergency Relief Structure	Required	Required	Required	Required	Required
Emergency Relief Discharge point	Required	Required	Required	Required	Required
Emergency Relief level Inside Well			Required	Required	Required
Discharge Bend			Required	Required	Required
Riser pipework			Required	Required	Required
Discharge Taper			Required	Required	Required
Valve pit (VP) size				Required	
Valve Pit Roof	Required	Required	Required	Required	Required
VP Floor RL			Required	Required	
VP fitting diameter & components			Required	Required	Required
Emergency Storage (Centre)	Required	Required	Required	Required	Required
Emergency Storage Roof (Underside)	Required	Required	Required	Required	Required
Emergency Storage Floor	Required	Required	Required	Required	Required
Drain Return IL (both ends)			Required	Required	Required
Top water level			Required		
Cabinet location centre	Required	Required			
Vent stack location	Required	Required		Required	Required
Fencing details	Required	Required		Required	Required
Electrical conduits & Pits	Required	Required	Required	Required	Required
Dosing Cabinet	Required	Required			
Water Service route & details	Required	Required	Required	Required	Required
Permanent survey Marks	Required	Required	Required		
Rising Main Route – Valve Pit to Site boundary	Required	Required	Required	Required	Required
Access Opening	Required	Required		Required	Required
Access Rd & Turning Bay	Required	Required	Required	Required	Required