



Hunter Water Corporation A.B.N. 46 228 513 446

Standard Technical Specification for:

<p style="text-align: center;"><b>STS 903</b></p> <p style="text-align: center;"><b>WORK AS CONSTRUCTED INFORMATION</b></p>
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# Standard - STS 903 WORK AS CONSTRUCTED INFORMATION

## 1 Purpose

This standard technical specification (STS) details the preparation and submission of all work as constructed (WAC) information for Hunter Water Corporation (Hunter Water). The information is required to identify the location and provide specifications for surface fittings and linear assets.

It does not include requirements for:

- civil structural and mechanical drawings specified in STS 911
- electrical drawings specified in STS 904
- operation and maintenance manual requirements in STS 906

This specification is available from the Hunter Water website <http://www.hunterwater.com.au>.

## 2 Interpretation

For the purposes of interpretation of this standard technical specification, except where the context requires otherwise:

- 'construction drawings' are all drawings defining the physical characteristics of the works to be constructed.
- 'work as constructed (WAC) drawings' are all drawings defining the physical characteristics of the works constructed.
- 'drawings' means the drawings detailing the work involved in a particular project
- 'include' means including, but not limited to, and is used to provide clarification or examples of the type and nature of items intended
- 'standards' means applicable industry standards including the Australian Standards (AS), Australian New Zealand Standards (AS/NZS), and ISO Standards (ISO)
- 'specification' means a specification detailing the work involved in a particular project
- 'standard technical specification (STS) ' references any of Hunter Water's standard technical specifications, as implied by the text.

Headings are for the convenience of the reader and shall not be used in interpretation of this standard technical specification.

Unless otherwise stated, any expression such as 'give notice', 'submit', 'approval', or 'directed' means 'give notice to', 'submit to', 'approval by', or 'directed by' the person nominated by Hunter Water.

Approval does not imply acceptance of responsibility by Hunter Water for compliance with this STS. Unless issued in writing by Hunter Water, approval has not been granted.

### 2.1 Order of precedence

All work shall meet all stated requirements in this STS in addition to project specifications or standards specified.

Any deviation from this STS shall be approved in writing on a case by case basis by Hunter Water's Document Owner.

### **3 Roles and responsibilities**

#### **3.1 Document Owner**

The Document Owner of *STS 903 Work As Constructed Information* is Hunter Water's Manager Strategic Asset Planning.

#### **3.2 Responsibilities**

The Document Owner shall approve in writing the issue of any updated version of STS 903. Any concession to any requirement in *STS 903 Work As Constructed Information* is valid only when authorised in writing by the Document Owner.

## 4 Definitions

Where the following term, abbreviation, or expression occurs in this STS, it is defined as follows, unless the context implies otherwise:

Term, abbreviation, expression	Definition
Designer	Person or organisation creating design and drawings for manufacture of equipment or construction of a system of mechanical equipment
Hunter Water (HWC)	Hunter Water Corporation
Linear assets	The Hunter Water installed pipe network installed and maintained in segments
O&M manual	Operation and maintenance manual and all associated documents
Point assets	Assets which function as connections in the linear asset network, such as surface fittings
Routine Minor Works (RMW)	Gravity sewerage assets less than 25m long, less than 1.5m deep, diameter of 150mm or less; water services
Routine Major Works	Gravity sewerage reticulation and water assets greater than 25m long, from 150 to 299mm diameter
Complex Works	Trunk infrastructure of 300mm and greater diameter; telemetry; mechanical/electrical components; pressure sewer; wastewater pump stations; water pump station; pressure reducing valves.

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## 5 Compliance requirements

### 5.1 Standards

Civil structural and mechanical drawings shall comply with:

- this STS
- other relevant Hunter Water standards
- relevant Australian Standards.

Except where otherwise required in this specification, drawings shall comply with the current relevant standards.

Any deviation from STS 903 shall be approved in writing on a case-by-case basis by an authorised Hunter Water representative.

#### 5.1.1 Hunter Water standards

Drawings shall be prepared as per the requirements of:

- STS 911 Preparation of Civil, Structural and Mechanical Engineering Drawings, and
- STS 904 Preparation of Electrical Engineering Drawings

Operation and maintenance manuals shall be prepared as per the requirements of:

- STS 906 Operation and Maintenance Manual Requirements

Where the standards are referenced throughout this STS, they will refer to the number only.



## 6 Work as constructed requirements

### 6.1 Information provided by Hunter Water

The following information will be provided by the Hunter Water Asset Information Group during validation, if required:

- asset name
- plant number
- index number
- maintenance structure number

### 6.2 Information to be provided to Hunter Water

Level of survey work shall be provided under the criteria of work undertaken:

- Routine Minor Works
  - Assets captured as per section 6.6
- Routine Major Works
  - Full survey as describe below and marked drawings supplied
- Complex Works
  - Full survey as describe below and drawing compiled from WAC information.

For the purposes of survey, Hunter Water requires HWC project managers and developers undertaking Routine Major Works and Complex Works to submit the following information specific to each asset type:

Asset type	Information to be provided to Hunter Water
Low pressure sewerage	<ul style="list-style-type: none"> <li>• marked up construction plans showing distances from surface fittings to bends or tees, boundary kits, well units</li> <li>• location of electrical control panel and power lines</li> <li>• schedule of pipe materials (Schedule A)</li> </ul>
Gravity sewerage main	<ul style="list-style-type: none"> <li>• construction plans (without mark ups)</li> <li>• junction sheets</li> <li>• schedule of pipe materials (Schedule A)</li> </ul>
Sewage pump station	<ul style="list-style-type: none"> <li>• construction drawings</li> </ul>

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Sewer rising main	<ul style="list-style-type: none"> <li>marked up construction plans showing distances from surface fittings to bends</li> <li>schedule of pipe materials (Schedule A)</li> </ul>
Water/Recycled Water mains	<ul style="list-style-type: none"> <li>marked up construction plans showing distances from surface fittings to bends, tees and water services</li> <li>schedule of pipe materials (Schedule A)</li> </ul>
Water pump station	<ul style="list-style-type: none"> <li>construction drawings</li> </ul>

The information shall be provided electronically. Hardcopies are required for Complex Works. Plans and drawings may range in size from A4 to A1. A sample of the information that shall be provided (Sample CSV file) is shown in Appendix 7.

### 6.3 Surveyor qualifications and survey accuracy

Any location co-ordinates required by this specification shall be provided by:

- a registered surveyor; or
- a surveyor with the following accreditation:
  - AS/NZS ISO 9001:2008 Quality management systems – Requirements; or
- a surveyor working under a certified quality management system that satisfies:
  - AS/NZS ISO 9001:2008 Quality Management Systems
- Engineering Surveyor working under a certified quality management system that satisfies:
  - AS/NZS ISO 9001:2008 Quality Management Systems

Coordinates shall be stated in meters within the drawings. The current coordinates system being used is the Map Grid of Australia (GDA94 Zone 56) and levels in Australian Height Datum (AHD).

Survey information accuracy shall be as per the table below.

**Table 1: Drawing accuracy for survey data**

Feature	Level accuracy	Coordinate accuracy
Buried work (located by prodding or electronic detector)	± 0.05m/m depth	± 0.05m/m depth
Fencing (for pumping stations)	Not required	± 0.10m
All other features	± 0.005m	± 0.05m

### 6.4 Operation and maintenance manuals

The requirements for the provision of an operation and maintenance (O&M) manual are specified in *STS 906 Preparation of Operation and Maintenance Manuals*.

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The O&M manual also contains contract and WAC information to be provided as part of commissioning.

#### 6.4.1 Draft at pre-commissioning

Supply a draft copy of the O&M manual for review prior to equipment pre-commissioning.

#### 6.4.2 Final manual at commissioning

Supply the approved O&M manual at commissioning.

#### 6.4.3 Changes

The O&M manual will need to be updated and re-submitted should changes to assets be made during commissioning.

### 6.5 Drawing requirements

#### 6.5.1 Linear assets

##### 6.5.1.1 General

Revise the electronic version of all construction drawings in accordance with STS 911 to accurately depict the work as constructed. Check and revise all dimensions, co-ordinates, levels, materials and other drawing notations.

Provide a table of coordinates for all constructed surface fittings on the general arrangement, as shown in Table 2. This table shall describe the location and type of surface fittings.

**Table 2: Example coordinates for general arrangement**

Chainage	Easting	Northing	Fitting
547.15	345448.54	6383845.98	STOP VALVE
548.98	345448.55	6383847.81	AIR VALVE
549.58	345448.56	6383848.41	SCOUR TEE
551.97	345448.58	6383850.80	TEE-X CONNECTION
578.50	345448.43	6383877.33	STOP VALVE
600.36	345463.94	6383892.74	MANHOLE
670.95	345465.73	6383963.31	SCOUR TEE
722.04	345464.25	6384014.38	END BORE
731.00	345463.58	6384023.31	AIR VALVE
1339.71	345379.66	6384625.51	MANHOLE
1342.27	345379.20	6384627.99	HYDRANT

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Chainage	Easting	Northing	Fitting
1346.97	345378.32	6384632.64	VERTICAL BEND

Indicate measurement accuracy (e.g. GPS, measured, survey quality).

Amend the notation to indicate actual details of features noted on the construction drawing to be located, sized or determined during construction. For example:

**Table 3: Examples of WAC notes amended from construction drawings**

Construction notes	WAC notes
A drawing note indicates pipe work as being either PVC or DICL	Amend the note to identify the as-installed condition
A drawing note indicates concrete encasement of pipe work is required where cover is less than 700mm	Indicate the actual extent of encasement installed
The dimension or size on a Construction Drawing is nominal (e.g. pipe diameter)	Only correct the dimension if different size is used
Cast in-situ concrete work	Correct dimensions when the work constructed is outside the tolerances defined in <i>AS3610 Formwork for concrete</i>

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 indicate work as constructed.

On each drawing, state the month and year in which all field work was completed.

Add a WAC notation in the revision table located in the lower left corner of each drawing to indicate that it is work-as-constructed, even if no other changes have been made to the construction drawing.

Supply completed WAC drawings on CD/DVD, USB key, or by email, in .dwg and .pdf file format.

### 6.5.1.2 Sewer fitting coordinates

For the following, if not already provided in section 6.5.1.1, record each of the sewer fitting easting and northing coordinates on the WAC drawing:

- maintenance hole (MH) (access chamber)
- maintenance chamber (MC)
- maintenance shaft (MS or TMS) (access shaft)
- air valve
- detention structure
- flow meter
- flushing tank
- gate valve
- inspection chamber
- lamp hole
- odour control dosing unit
- pump out scour pit
- scour discharge point
- stop valve
- dead end
- boundary kit

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- pressure sewer air valve
- pressure sewer collection tank

**6.5.1.3 Measured location of fittings in gravity sewer mains**

Record the information below on the supplied junction sheet template in Appendix 1.

Supply junction sheets in .pdf file format.

Scanned junction sheets shall be a minimum resolution of 300 dpi.

Information required includes:

1	Fitting type
2	Orientation of the junction (J-back, RJ-left, RJ-right, sewer inlet, YJ-left, YJ-right)
3	Material
4	Depth
5	Downstream MH and MS number
6	Distance to the centre of the downstream MH or MS
7	Distances to any convenient prominent features, such as boundary fences

Include the following items on the junction sheets:

- bedding
- bulk head spacing
- cap
- change of material type
- Start/end of thrust bore or directional drill
- line junction
- drill
- horizontal and vertical bends
- junction
- start/end of concrete encasement

**6.5.1.4 Sewer vents**

Determine the following information for items which are not required to be recorded on the table of coordinates in section 6.5.1.1 and present the table on the WAC drawing.

Description	Details
Vent number	
Easting co-ordinate	
Northing co-ordinate	
Surface level (ground level)	

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Description	Details
Vent diameter at base (mm)	
Vent height (m)	
Vent material	
Vent stack type (e.g. tapered, straight walled)	

### 6.5.1.5 Sewer flow relief or emergency detention structures and pipe work

For items not required to be recorded in the table of coordinates in section 6.5.1.1, record the following information for all components of the flow relief or detention structure and pipe work. Present the table on the WAC drawing.

Description	Details
Flow relief or detention structure number	
Easting co-ordinate	
Northing co-ordinate	
Invert levels of incoming and any outgoing pipe work	
Invert level where overflow or detention structure pipe connects to gravity sewer	
Overflow outlet type (e.g. duckbill, flap valve)	
Surface level (ground level)	

### 6.5.1.6 Water or recycled water fittings co-ordinates

For information not required to be recorded on the table of coordinates in section 6.5.1.1, record the easting and northing co-ordinates for each of the water fittings on the WAC drawing.

- air valve
- auto inlet valve
- ball valve
- blank hydrant
- booster control valve
- bore well
- built-in bypass valves
- butterfly valve
- cluster box
- double air or control valve
- flushing tap
- hydrant
- hydrant bend
- hydrant control valve
- manhole
- pitot cock valve
- pressure reducing valve
- pressure sustaining valve
- reflux valve
- scour
- strainer
- stop valve
- water pump

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- chlorine dosing unit
- meter

### 6.5.1.7 Measured location of fittings in water or recycled water and sewer rising mains

Record the following information on the construction drawing as work progresses. Transfer the information to the WAC 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, such as boundary fences

Provide a copy of the original marked up construction drawing with the WAC AutoCAD drawing, showing all field measurements.

- bend
- blank flange
- cap
- cross
- gibault joint
- start/end of thrust bore or directional drill
- taper
- tapping
- tee
- start/end of concrete encasement

## 6.5.2 Point assets

### 6.5.2.1 General

Drawings for point assets shall comply with:

- STS 904 Standard Technical Specification – Preparation of Electrical Engineering Drawings; and
- STS 911 Standard Technical Specification – Preparation of Civil and Structural Engineering Drawings

WAC drawings shall include:

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- one full set of electrical drawings; and
- three civil drawings submitted with the O&M manual in accordance with STS 906. The three required drawings are:
  - the facility general arrangement,
  - elevations; and
  - site plan.

WAC details required on the civil drawing are the operational levels and any major variation from construction drawings made to the asset.

### **6.5.2.2 Electrical drawings**

#### **6.5.2.2.1 Draft at pre-commissioning**

Supply a draft copy of the electrical drawings for review prior to equipment pre-commissioning

#### **6.5.2.2.2 Final drawings at commissioning**

Supply the approved electrical drawings at commissioning.

### **6.5.2.3 Asset handover**

At asset handover, a WAC hard copy of the electrical drawings shall be provided to the site. If the asset handover occurs at commissioning and the electrical drawings require revision, then red line mark-up copies shall be left on site.

#### **6.5.2.3.1 Changes**

Any changes required to be made to the electrical drawings as a result of asset modifications in the commissioning process shall be rectified and resubmitted.

## **6.6 Routine Works**

### **6.6.1 Routine Minor Works**

Work as constructed resulting from a Routine Minor Works (RMW) is typically not surveyed. WAC information submitted shall therefore include a description that provides a degree of accuracy for a location.

#### **6.6.1.1 Water**

Determine the distance from the nearest known surface facility to the new water service connection. Provide material type and size of water service.

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### **6.6.1.2 Sewer**

The extent of information should include lengths, levels, grades, offsets and ties. Determine the distance from a current existing access chamber (manhole) or the tie of a known cadastral boundary.

Routine Minor Works as constructed information shall include a marked-up plan, completed junction sheets and schedules of technical data from the appendices of this STS.

### **6.6.2 Electrical**

Determine the location of control panel and electrical lines from boundary kit, well or the tie of a known cadastral boundary.

### **6.6.3 Depth**

Determine the depth for access chambers (maintenance holes), the depth of the as constructed access chamber, maintenance chamber and sewer connections.

## **6.7 WAC Checklist**

The work as constructed checklist in Appendix 2 is to be completed and provided with the WAC information.

## **6.8 Technical data**

The schedules of technical data in Appendix 3, Appendix 4, Appendix 5 and Appendix 5 are to be completed and provided with the WAC information.

## 7 Work as constructed survey and reporting

Hunter Water requires accurate work as constructed records for reference in ongoing operation and maintenance, in order to effectively manage its assets.

Work as constructed (WAC) records consist of information gathered during construction and survey measurements, including surface fittings and access chambers. Hunter Water relies on this information to accurately plot assets in its geographic information system (GIS).

### 7.1 Work package reporting

Following completion of the work the contractor will submit a WAC package to Hunter Water which may include water mains, gravity sewer mains, pressure sewer mains, pumping stations and rising mains, or a combination of each.

The WAC package of will contain the following:

- original package (Issued for Construction Drawings; IFC) revised for any alteration determined by the survey
- survey plan delivered in NSW LandXML format.
- CSV file (hard copy and electronic) as described in clause 7.4
- notation of any fitting or feature that could not be located by survey
- notation of any sewers laid below minimum grade as defined in clause 7.2.

An example of a work package checklist is attached at Appendix 2.

### 7.2 Sewer minimum grades

For the purpose of this specification, minimum grades for gravity sewers shall be as detailed in the Gravity Sewerage Code of Australia WSA 02-2014-3.1 Hunter Water Edition Version 2.

### 7.3 Water and sewer pipelines

#### 7.3.1 General

Mark up all construction drawings to accurately depict the work as constructed. Check and revise all dimensions, co-ordinates, levels, materials and other drawing notations.

The information that follows details requirements specific to each asset type.

#### 7.3.2 Gravity sewers

- Determine the location and reduced level of:
  - all access chambers, maintenance shafts, vertical bends and dead ends.
  - the existing access chamber downstream of the new works.
- As a general rule, access chamber invert levels shall be determined at the centre of the base of a chamber (e.g. 0.08m internal drops shall be quoted by adding and subtracting 0.04m to the observed level), however, consideration may be given to actual chamber configuration.

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- The extent of external drops shall be determined by direct measurement from prolongation of the invert of the incoming line to the invert of the chamber measured at the centre line.
- Horizontal distances and gradients between consecutive bends and fittings shall be calculated from surveyed coordinates and shown on long sections.

### 7.3.3 Sewer rising mains

- Determine the location and reduced level of all surface fittings, including air valves, stop valves, scour valves, and pump out scour pits.
- Determine the location of bends, tees and tapers.
- Horizontal distances and gradients between consecutive bends and fittings shall be calculated from surveyed coordinates and shown on long sections.

### 7.3.4 Pressure sewers

- Determine the location of:
  - all surface fittings, including boundary kits, collection tanks and air valves.
  - existing fittings both sides of the connection point to the existing pressure mains.
  - electrical structures and power supply lines
- Determine the invert level of the inlet of the collection tank and show non-drainable areas on each lot
- Horizontal distances and gradients between consecutive bends and fittings shall be calculated from surveyed coordinates and shown on long sections

### 7.3.5 Water or recycled water

- Determine the location of:
  - all surface fittings, including stop valves, hydrants, air valves, scour valves, pump out scour pits and scour discharge points.
  - existing surface fittings both sides of the connection to the existing water main.
- Determine the position of existing surface fittings on any parallel water mains.
- For recycled water complete Schedule D

### 7.3.6 Location of buried fittings

Fittings that have been buried shall generally be located using measurements taken during construction and do not normally require location by survey.

The exception shall be sewer rising mains, for which survey accurate location of buried fittings (such as tees and bends) is required. For rising mains, the constructor will arrange for markers to be left on the surface to allow survey of buried fittings.

## 7.4 Survey record

At the completion of the survey, prepare a CSV file containing the coordinates and levels of all features that were required to be surveyed. The format and content of the CSV file are described in Appendix 7.

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## 7.5 Pump stations

Determine the position of all pump station structures, including concrete structures, vent pipes, electrical structures, overflow pipelines, headwalls, retaining walls and other significant features such as embankment protection and fences constructed under the contract. Locate all services including access road, rising main, power supply and water supply.

The work as constructed dimensions and levels shall be shown above the design dimensions and a line drawn through the design dimension. The information shall include:

- diameter of pump well
- downstream invert level of gravity main in collecting access chambers
- floor level of pump well
- invert level of incoming gravity main inside pump well
- invert level of overflows at the wet well, the overflow access chamber and the overflow headwall
- level at centre of collecting access chamber lid (top AC)
- slab level of pump well
- vent information type and heights.

The constructor will arrange for well hatches and valve pit covers to be unlocked.


## 8 Document control

**Document Controller:** Manager Strategic Asset Planning

Version	Date	Author	Details of change	Approval date	Approved by	Next scheduled review
1.0	Feb 2014	R Payne	Full revision Update to new format Add O&M Information	Feb 2014	S Horvath	Feb 2016
2.0	March 2018	M Nugent	Addition of WAC specification	March 2018	S Horvath	March 2020

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### Appendix 1. Junction sheet

		SHEET No. _____				
<b>JUNCTION SHEET</b>						
STREET		WORK ORDER NO.				
SUBURB		LINE NO.				
PIPE SIZE		INDEX NO.				
TYPE OF PIPE		CONTRACT NO.				
SHOW AVERAGE DEPTH FROM SURFACE TO ROCK AT POINTS INDICATED	ROCK	UPSTREAM AC NO.	○	LOT NO.	DEPTH OF JUNCTION	
	SHOW ENCASEMENT ON DIAGRAM	DEPTH OF AC				
	TYPE OF BEDDING					
		DOWNSTREAM AC NO.				
		DEPTH OF AC	○			
	DISTANCE BETWEEN AC METRES					
			GANGER/OVERSEER			
			DATE			

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**Appendix 2. Work as constructed checklist**

Section	Requirement	Yes	No	Comments
6.3	WAC location co-ordinates determined by surveyor 6.3			
6.3	Co-ordinates stated in Map Grid Australia (GDA94 zone 56)			
6.3	Levels in Australian Height Datum (PM or SSM)			
6.5.1.1	Electronic version of construction drawing revised, depicting work as constructed			
6.5.1.1	Dimensions, co-ordinates, levels, materials and other drawing notations checked and revised			
6.5.1.1	Constructed surface fittings table of co-ordinates provided on general arrangement drawing			
6.5.1.1	Measurement accuracy indicated (e.g. GPS, measured, survey quality)			
6.5.1.1	Amended notation supplied indicating actual details of features noted on the construction drawing located, sized or determined during construction			
6.5.1.1	Origin of all levels, co-ordinates and additional survey control marks stated on each drawing			
6.5.1.1	Contours modified to depict work as constructed			
6.5.1.1	Month and year by which all field work was completed stated on each drawing			
6.5.1.1	'WAC' notation added in revision table even if no other changes have been made to the construction drawing			
6.5.1.1	Completed WAC drawings supplied on CD/DVD in .dwg and .pdf			
6.5.1.1	Signed A3 hard copy prints of drawings provided			
6.5.1.2	Sewer fittings	Sewer fitting co-ordinates recorded on WAC drawing		
6.5.1.3	Gravity sewer mains	Completed junction sheets supplied in hard copy and .pdf with the AutoCAD drawing		
		Junction sheets scanned at 300 dpi		
6.5.1.4	Sewer vents	Completed table presented on WAC drawing		
6.5.1.5	Sewer flow relief and emergency detention structures and pipe work	Completed table of all flow relief or detention structure components and pipe work presented on WAC drawing		

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Standard Technical Specification – STS 903 Work as Constructed Information

Section	Requirement	Yes	No	Comments
6.5.1.6	Water or recycled water fitting co-ordinates			Easting and northing co-ordinates of each water fitting recorded on WAC drawing
6.5.1.7	Measured location of fittings in water, recycled water and sewer mains			Information recorded on construction drawing and transferred to WAC drawing
				Copy of original marked up construction drawing showing all field measurements provided with WAC AutoCAD drawing
6.8	Supplied Schedules A, B and C completed			

WAC submission complies with the requirements of *STS 903 Work as Constructed Information*

Contractor name \_\_\_\_\_  
 Contractor signature \_\_\_\_\_  
 Date \_\_\_\_\_



**Appendix 3. Schedule A – Water, Recycled Water and Sewer pipes**

Contractor			Contract No			Date Works Complete			
Ref Drawing	Pipe Material	Pipe Lining	Structured Wall	Series (if applicable)	Pressure Class (PN)	Stiffness Class (SN)	Joint System	Manufacturer	Supplier
Note 1	Note 2	Note 3	Note 4			Note 5	Note 6		
Note 1	Drawing number or other reference if applicable								
Note 2	DI (Ductile Iron) CI (Cast Iron) S (Steel) PVC-U PVC-M PVC-O PE (Polyethylene) PP (Polypropylene) GRP ABS Cu RC VC								
Note 3	If applicable - CL (Cement Lined) FBPE (Fusion Bonded Polyethylene) PL (Plastic lined - e.g.: plastiliner for concrete pipes)								
Note 4	If applicable - Profile, Sandwich								
Note 5	Required for PVC non-pressure pipe (e.g.: SN6, SN8) and all GRP (e.g.: SN5000 or SN10000)								
Note 6	RRJ (Rubber ring joint) W (Welded) RRJL (Rubber ring joint with locking segments e.g.: 'Tyton-Lok') MC (Mechanical coupling) EF (Electrofusion welded) LJ (Lead joint) SCJ (Solvent cement joint)								
Hunter Water Use Only	Hunter Water Representative					Project/Task No.		SWIMS Reference	

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**Appendix 4. Schedule B – Water and Sewer pipe rehabilitation**

Contractor				Contract No			Date Works Complete		
Ref/Drawing/MHs	Host Material	Pipe	Replacement Pipe System	Material Class	Pressure (PN)	Class	Technology	Junction/Lateral Sealing Method	Liner Trade Name
Note 1	Note 2		Note 3	Note 4			Note 5	Note 6	
Note 1	Drawing number, upstream and downstream MH or MS numbers or other reference if applicable								
Note 2	DI (Ductile Iron) CI (Cast Iron) S (Steel) PVC-U PVC-M PVC-O PE (Polyethylene) PP (Polypropylene) GRP ABS Cu RC VC								
Note 3	PE (Polyethylene) ERIF (Epoxy Resin Impregnated Felt) PRIF (Polyester Resin Impregnated Felt) EP (Epoxy – sprayed or spread)								
Note 4	If applicable – generally for PE only e.g.: 80B								
Note 5	PC (Pipe Cracking) SL (Slip Lining) CIPL (Cured-in-place liner) CF (Close Fit Liner) SW (Spiral Wound) SWL (Swage Lining) PJ (Pipe Jacking) PEAT (Pipe Eating)								
Note 6	None PU (Polyurethane Grout) CF (Cementitious Fully grouted annulus) EP (Epoxy) THJL (Top Hat Junction Liner) FJL (Full Junction Liner)								
Hunter Water use only	Hunter Water Representative					Project/Task No.		SWIMS ref.	

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**Appendix 5. Schedule C – Pipe fittings and miscellaneous**

<b>Contractor</b>			<b>Contract number</b>			<b>Date works complete</b>	
<b>Item</b>	<b>Ref. drawing</b>	<b>Materials</b>	<b>Pressure class (PN)</b>	<b>Supplier</b>	<b>Manufacturer</b>		
Air valves							
Bends							
Cement							
Concrete							
Gate valves							
Gibault joints							
Hydrant box							
Hydrants							
Junctions							
Pre-cast manholes							
Reflux valves							
Services valves							
Sluice valves							
Stainless steel ladders							
Stop valves							
SV box							
Tapping bands							
Vent shafts							
Hunter Water use only	Hunter Water Representative			Project/Task No.		SWIMS ref.	

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**Appendix 6. Schedule D – Recycled Water Inspection Report**

**RECYCLED WATER INSPECTION REPORT  
“SUBDIVISION MAIN TOP METER”**

<b>Subdivision Location:</b>	Contract No:
<b>Contractor:</b>	Phone No:
<b>Subdivision of ___ lots(s) into ___ lots.</b>	Stage ___ of ___
<b>No. of lots inspected on this sheet: _____</b>	

Inspect Results		Lot Numbers		
<b>For each Drilling (Drinking Water and Recycled Water)</b>		___	___	___
Drilling saddle/main tap approved material and colour	Yes / No	___	___	___
Drilling completed in accordance with standard	Yes / No	___	___	___
		___	___	___
<b>For each Drinking Water and Recycled Water Property Service</b>		___	___	___
Service pipe, PE Adapter, copper riser approved material/colour	Yes / No	___	___	___
Separation/exclusion of other services achieved	Yes / No	___	___	___
Hydrostatic water test to 1500kpa	Yes / No	___	___	___
Cross connection Control – Flow Test	Yes / No	___	___	___
Identification tape affixed	Yes / No	___	___	___
Sand barrier and backfilling to standard	Yes / No	___	___	___
Stakes/Tape marking both services	Yes / No	___	___	___
		___	___	___
<b>Inspector</b>		___	___	___
Locking Device installed on each recycled water meter tap	Yes / No	___	___	___
Completed Tag attached to each recycled water meter tap	Yes / No	___	___	___
Protective Bag placed around recycled water meter tap, lock and tag	Yes / No	___	___	___

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

<b>INSPECTED BY:</b>	<b>INSPECTION DATE:</b>
_____ (Print Name)	_____ (Signature)
_____ (Signature)	____/____/____

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## Appendix 7. Surveyed assets file format

### CSV file format for surveyed data

COLUMN	DESCRIPTION	Example
1	Contract number	2008-1105
2	Chainage (if applicable)	123.45
3	X co-ordinate	384003.902
4	Y co-ordinate	6356577.499
5	Surface level	25.326
6	Invert level (if applicable)	23.325
7	Asset type (see table below)	WMA
8	Fitting type (see table below)	DE
9	Surface fitting ID (if applicable)	DE1
10	Existing surface fitting	Y/N
11	Description (if applicable)	Dead end

### Asset type aberrations in survey file

ASSET TYPE	DESCRIPTION
RECW	Recycled Water
SWC	Storm Water
SEW	Sewer
WMA	Water
SUR	Survey Information

**Fitting type aberrations in survey file**

<b>FITTING TYPE</b>	<b>DESCRIPTION</b>
<b>AC</b>	Access chamber or maintenance hole
<b>AS</b>	Access shaft
<b>AV</b>	Air valve
<b>DE</b>	Dead end
<b>GV</b>	Gate valve
<b>HB</b>	Horizontal bend
<b>Hydrant</b>	Hydrant
<b>Meter</b>	Meter
<b>MS</b>	Maintenance shaft
<b>MC</b>	Maintenance chamber
<b>OFLW</b>	Overflow
<b>PRV</b>	Pressure reducing valve
<b>RV</b>	Reflux valve
<b>Scour</b>	Scour
<b>SV</b>	Stop or scour valve
<b>TMS</b>	Terminal maintenance shaft
<b>VENT</b>	Vent
<b>VB</b>	Vertical bend
<b>PM</b>	Permanent Mark
<b>TRCH</b>	Trench
<b>CHK</b>	Check Shot
<b>SSM</b>	State Survey Mark

**Example of survey CSV file**

2008-1105,1.000,364343.220,6377358.581,8.464,,WMA,Hydrant,,Y,  
 2008-1105,40.000,364343.220,6377355.108,8.495,,WMA,SV,,Y,  
 2008-1105,50.200,364338.727,6377325.108,9.067,,WMA,SV,,N,  
 2008-1105,55.600,364300.044,6377305.206,9.851,,WMA,Hydrant,,Y,  
 2008-1105,,364369.243,6377374.183,9.839,7.265,SEW,DE,DE1,N,  
 2008-1105,65.360,364336.657,6377312.934,10.069,,WMA,SV,,N,  
 2008-1105,,364360.715,6377341.896,,,SEW,AC,379G,Y,,(NLS)  
 2008-1105,,364360.715,6377341.896,,,SEW,AC,379G,Y,,(NLS)  
 2008-1105,,364365.754,6377642.56,6.0,,WMA,Trench,,,,,  
 2008-1105,,364366.754,6377643.56,6.0,,SUR,SSM,,,,,

Contract number	Chainage	X co-ordinate	Y co-ordinate	Surface level	Invert level	Asset type	Fitting type	Surface fitting ID	Existing surface fitting	Description
2008-1105	1	364343.22	6377358.581	8.464		WMA	Hydrant		Y	
2008-1105	40	364343.22	6377355.108	8.495		WMA	SV		Y	
2008-1105	50.2	364338.727	6377325.108	9.067		WMA	SV		N	
2008-1105	55.6	364300.044	6377305.206	9.851		WMA	Hydrant		Y	
2008-1105		364369.243	6377374.183	9.839	7.265	SEW	DE	DE1	N	
2008-1105	65.36	364336.657	6377312.934	10.069		WMA	SV		N	
2008-1105		364360.715	6377341.896			SEW	AC	379G	Y	
2008-1105		364365.754	6377642.56	6.0		WMA	Trench			
2008-1105		364366.754	6377643.56	6.0		SUR	SSM			