

**WATER TREATMENT PLANT  
OPERATIONS MANUAL STRUCTURE AND STYLE  
GUIDE**



## Document Control

This manual is a controlled document and is subject to document control processes.

The source document is maintained and updated as the current version by the Systems Specialist, who is the Document Controller for this document. The location of the source document is indicated in the footer.

Printed copies of this document are uncontrolled.

The Version number of this document is indicated in the footer. The date of this version number is also indicated in the footer.

## Amendments

Requests for amendments or revisions of the manual are made to the Document Controller, who has the responsibility of reviewing requests and implementing amendments or revisions to the document.

Amendments are documented in relevant tables overleaf.

Amendments or revisions of the manual result in a new Version number and date in the footer.

<b>Amendments</b>			
<b>Version No</b>	<b>Page No.</b>	<b>Authorised</b>	<b>Date</b>

<b>Section</b>	<b>Page</b>
<b>1 Purpose .....</b>	<b>1</b>
<b>2 Organisation and Content.....</b>	<b>2</b>
<b>3 Standard Content of Manuals .....</b>	<b>4</b>
3.1 Topic 1 - Process Theory .....	4
3.2 Topic 2 - Standard Operating Procedures.....	7
3.2.1 SOP - Operator Input for Normal (Auto) Operation.....	8
3.2.2 SOP - Abnormal (Manual) Operation.....	12
3.2.3 Equipment Operating Descriptions.....	14
<b>4 File Format and Style Guidelines.....</b>	<b>15</b>
4.1 Manual Structure .....	15
4.2 Chapter Numbers, Figure Numbers, and Table Numbers.....	17
4.3 Word Page Format .....	18
4.4 Writing Style Conventions.....	20

**Appendix 1 Sample cover, flysheet and Document Control requirements**



# 1 Purpose

---

Operations Manuals provide information on the processes involved in water treatment at all Water Treatment Plants managed by Watercare Services, and allow a clear understanding of the operation requirements by process operators. All process areas must be detailed in a coherent and structured manner in order to provide the operator with adequate information on the objective of each particular process and how to run the facility.

The manuals are to be constructed in hard (paper) format. This means that each manual must be complete and stand-alone as a document. However, where generic information is discussed or generic procedures or processes described these must be identified as such so that these 'structural' elements can be used across all water treatment manuals.

- This Style Guide is broken down into two areas:
- Organisation and Content of the Manuals (Refer Sections 2 and 3)
- Document Format (Refer Section 4)

## 2 Organisation and Content

Operations Manuals are prepared as separate volumes for each unit process area.

Each volume contains two topics, namely;

- Topic 1 – Process Theory
- Topic 2 – Standard Operating Procedures

The topics are split into Chapters. The content and level of detail required in these chapters is outlined in the remainder of this Style Guide.

A list of common process areas is provided in the table below. Section 00 contains general information about the site and the process.

**TABLE 2-1**  
 Numbering of Unit Processes

Area Number	Description	Area
00	General	Site Wide
01	PLCs, SCADA, Telemetry (RTUs etc)	System Utilities
02	Electrical- e.g. DBs, JBs, MCCs, DCS controllers & Field Cabinets (not specifically related to a process/functional area)	Preliminary Treatment
03	Services—eg Compressed Air, Ventilation, Standby Generator.	Site Wide
05	Fire & Security	Site Wide
10	Impoundment and Abstraction (Dam)	Raw Water
20	Raw Water	Raw Water
40	Water Treatment Plant Overall Site	Site Wide
49	Powdered Activated Carbon Dosing	Raw Water Dosing
51	Chemically Conditioned Water, Flashmixing & Transmission	Primary Treatment
52	Clarification & Ancillary Equipment	Primary Treatment
53	Clarified Water Transmission	Primary Treatment
54	Filtration (including membranes) & Ancillary Equipment	Secondary Treatment



55	Filtered Water Transmission	Secondary Treatment
56	GAC Contact & Ancillary Equipment	Secondary Treatment
57	GAC Treated Water Transmission	Secondary Treatment
58	Mixing	System Utilities
59	Chlorine contact	System Utilities
70	Alum/PACI plant	Raw Water Dosing
71	Polyelectrolyte plant	Raw Water Dosing
73	Carbon dioxide plant	Filtered Water Dosing
74	Caustic plant	Filtered Water Dosing
75	Hypochlorite plant	Filtered Water Dosing
76	Gas chlorine plant	Filtered Water Dosing
77	Lime plant	Filtered Water Dosing
78	Fluoride plant	Filtered Water Dosing
79	Sodium bisulphite plant	Filtered Water Dosing
81	Citric acid plant	Filtered Water Dosing
82	Chemical neutralisation	Systems Utilities
85	Washwater recovery	Sludge Treatment
86	Sludge dewatering	Sludge Treatment
90	Treated Water (General)	
91	Treated Water Pumping	

## **3 Standard Content of Manuals**

---

Each Operations Manual shall contain all the contents described in this section 3. The format in which the information is presented can be changed to suit the nature of the process as long as all the contents described in this section are included.

### **3.1 Topic 1 – Process Theory**

Topic 1 – Process Theory consists of Chapters described in 3.1.1 – 3.1.6

The purpose of this topic is to provide sufficient description of the operation of automated processes so as to provide all water treatment staff and process engineers with adequate information on the objective of each particular process and how this is achieved in an automatic way.

*Topic 1 - Process Theory consists of a lot of information that is contained in well-prepared Functional Descriptions. Until Operations Manuals are developed for all Water Treatment Plants, the existing Functional Descriptions shall be used to fill the place of Topic 1 in the Operations Manuals.*

#### **3.1.1 Plant Overview:**

The plant overview provides a brief description of the water treatment plant design and a brief description of how the unit process in this manual contributes to the overall operation of the plant.

#### **3.1.2 Process Overview:**

The Process Overview is to provide an introduction and overview of the process, referring to the relevant P&ID (and Process Flow Diagram if relevant) and describing the objectives of the treatment process. The narrative also describes how the unit process relates to connected processes (reference to P&IDs is a way of doing this). The section also describes any constraints that exist for the process.

#### **3.1.3 Process Theory / Process Principles**

Provide the theory and principles of the process unit in summary form. Provide references to detailed sources of information that are specific to the technology being described, and that have been used in the design of the technology.

#### **3.1.4 Design Data**

Provide the parameters used in the design of the technology. This shall include the design criteria used for selection of items of equipment in the unit process step, or refer to an appendix containing data sheets for the equipment.

### 3.1.5 Process Description

Provide a detailed description of the treatment process. The description should act as a guide for operating the unit process. Provide references to further material for generic process information if relevant. The narrative should refer to the P&ID and SFC or Process Flow Diagram to assist in the description.

The description should be broken into functional parts of the process if this can be done, and demonstrate the interrelation between the various sub-components of the unit process. Annotated control screen faceplates, photographs and schematic diagrams should be used to assist in explanations where appropriate.

### 3.1.6 Process Control

This section describes the process control system including specifying control range or target range of process parameters where appropriate.

Provide details of the following parameters that are important in controlling the quality of the treated water:

**Controlled variables:** Describe in detail the methods for controlling controlled variables.

**Measured variables:** Describe in detail the ways in which variables are measured for use in the control process.

**Monitoring Tools:** Describe the role of process sampling and monitoring equipment.

**Operating Parameters:** Provide details of the operating parameters for key equipment in the process. A sample table is provided below:

**TABLE 3-1**  
 Operating Parameters

Parameter	Unit	Minimum	Current Average	Design Average	Maximum
Flow Rate per Blower	m <sup>3</sup> /h	18836	TBA	30710	40956



## **3.2 Topic 2 - Standard Operating Procedures**

Topic 2 - Standard Operating Procedures comprises the following three standard operating procedures, which must be performed to operate each unit process:

- SOP - Operator input for Normal (Auto) Operation
- SOP - Abnormal (Manual) Operation
- Equipment Operating Descriptions

Topic 2 - Standard Operating Procedures are described in detail in Chapters 3.2.1 – 3.2.3

### **3.2.1 SOP - Operator Input for Normal (Auto) Operation**

This procedure is relevant to normal operating mode with equipment running automatically and normal operating circumstances (ie within the limits of the ranges of controlled variables).

The procedure must include the following details:

1. Key/legend to instructions and information provided in the SOP
2. Scope of the SOP
3. Define responsibilities
4. Identify relevant documents
5. Operator interface
6. System redundancy
7. Safety
8. Routine Tasks Table
9. Pre-startup procedure
10. Startup procedure
11. Shutdown procedure
12. Alarm response table
13. Troubleshooting Guide

**Details required in SOP - Operator Input for Normal (Auto) Operation are described below:**

#### **1. Key/legend**

*To be determined for water treatment plants. A standard key/legend is to be provided in Operations Manual for General Process Area 00. This section to provide any codes that are additional to the standard legend.*

#### **2. Scope of the SOP**

Define the extent of this SOP by describing the unit process boundaries in Auto mode of operation.

### 3. Define responsibilities

Define who is specifically responsible for implementing the SOP

### 4. Identify documents

Identify all documents relevant to the unit process, including P&IDs, PFDs, SFCs, schematics and drawings.

### 5. Operator interface

Provide annotated graphics to describe the operator interface (HMI) with the process unit under automatic operation. Describe options selections available to the operator for operation of the process, based on the control equipment.

### 6. System redundancy

Describe redundancy of equipment within the unit process.

### 7. Safety

Identify any safety aspects and warnings, including descriptions of all equipment interlocks and fail sequences for automatic shutdowns.

### 8. Routine Tasks Table

Provide a table of any operational tasks that are required to ensure operability of the process unit during a normal mode of operation.

The table is to identify the equipment, define the routine task and the frequency of the task as per the example below:

**TABLE 3-2**  
Routine Operating Procedures

Equipment		Key Tasks	Frequency
1	Odour Control/Safety	Check and ensure that all necessary hatches, doors, guards, and covers are closed to maintain odour control and prevent the emission of offensive odours.	Daily

### 9. Pre-startup procedure

List the prerequisites for starting the unit process in Auto mode, including all valve and equipment numbers, and assuming a normal mode of operation.

### 10. Startup Procedure

List the steps for starting the unit process in Auto mode, assuming a normal mode of operation.

### 11. Shutdown Procedure

List the steps for shutdown of the unit process from Auto mode, assuming a normal mode of operation.

Identify the failsafe position for each field device.

### 12. Alarm Response table

Provide a table of the responses required to critical alarms.

The table is to identify instrument, alarm/trip, automatic action and operator action as per the example below:

**TABLE 3-3**

Alarm Response

Instrument	Alarm/Trip	Automatic Action	Operator Action
<b>Blower Header</b>			
47-PIT-006	High Pressure	Initiate alarm.	Investigate cause. Check pressure sensor.
	Low Pressure	Initiate alarm.	Investigate cause. Check pressure sensor.

### 13. Troubleshooting Guide



Provide a table of the more common operational problems, causes, and corrective actions associated with, or anticipated for, the system. The table is to identify symptoms, probable causes and action as per the example below:

**TABLE 3-4**  
Troubleshooting

Symptoms	Probable Causes	Action
Excessive Pump Noise	Bearings faulty.	Stop pump and advise maintenance.

### **3.2.2 SOP – Abnormal (Manual) Operation**

SOPs for abnormal (manual) operation are provided for operation of the unit process, or part of the unit process, in manual mode, or any operational modes that deviate from the standard Auto operating mode. Examples include isolation of equipment for maintenance or tasks that are not of a routine nature.

The procedure must include the following details:

1. Purpose and scope of the procedure
2. Define responsibilities
3. Communication requirements
4. Identify documents
5. Operator interface
6. System redundancy
7. Safety
8. Isolation procedures
9. Control System Response
10. Pre-startup and startup procedures for remote manual startup
11. Pre-startup and startup procedures for local manual startup procedures
12. Troubleshooting

**Details required in SOP - Abnormal (Manual) Operation are described below:**

#### **1. Purpose and scope of the procedure**

Describe the purpose of this SOP and define the extent of the SOP in situations where it could be ambiguous.

#### **2. Define responsibilities**

Define who is specifically responsible for implementing the SOP.

#### **3. Communication requirements**

Define any requirements to communicate any issues relating to undertaking the abnormal SOP, such as informing operating staff of equipment isolations, informing the Central Control Room of resulting restrictions in water treatment plant output.

#### **4. Identify documents**

Identify all documents relevant to the unit process, including P&IDs, PFDs, SFCs, schematics and drawings.

#### **5. Operator interface**

Describe options selections available to the operator for operation of the process in abnormal operating mode(s), based on the control equipment. Alternatively, provide this information within the written procedures.

#### **6. System redundancy**

Describe redundancy of equipment within the unit process when operating in an abnormal or manual mode.

#### **7. Safety**

Identify any safety aspects and warnings in manual or abnormal modes of operation. Identify any specific hazards over and above those that exist in auto mode of operation.

#### **8. Isolation Procedures**

List the prerequisites and steps for isolating equipment within the unit process. Provide details of any isolation schemes that exist for multiple devices or grouped process units.

#### **9. Control System Response**

Describe the response from control system for specific equipment when the equipment is in the abnormal mode that is the subject of the SOP.

#### **10. Pre-startup and startup procedures for remote manual startup**

List the prerequisites and steps for starting the unit process in remote manual mode, including all valve and equipment numbers.

#### **11. Pre-startup and startup procedures for local manual startup procedures**

List the prerequisites and steps for starting the unit process in local manual mode, including all valve and equipment numbers.

## 12. Troubleshooting

Provide a table of the more common operational problems, causes, and corrective actions associated with, or anticipated for, operating the system in manual mode or any abnormal mode. When relevant, refer to Contingency Plans or other documents where the information for troubleshooting / corrective actions required is contained.

### 3.2.3 Equipment Operating Descriptions

This procedure describes the operation of a single equipment item within the unit process. Separate equipment operating descriptions for identical equipment items are not shown. The introduction to the equipment operating description includes:

- Purpose of the procedure
- Describes the purpose of the item of equipment
- Identifies the physical location of the item of equipment
- Briefly describes the general controls of the item of equipment
- Identifies the physical lockout system for the item of equipment
- Identifies appropriate references/figures
- Identifies any safety aspects or warnings that should be considered

**Pre – Startup Procedures:** List of prerequisites for starting the system, including all valve and equipment numbers, and assuming a manual mode of operation.

**Startup Procedures:** List of the procedures for starting the individual piece of, including all valve and equipment numbers, and assuming a manual mode of operation.

**Shutdown Procedures:** List of prerequisites and steps for stopping the individual piece of equipment, including all valve and equipment numbers, and assuming a manual mode of operation.

## 4 File Format and Style Guidelines

---

Operations manuals are designed to function as hard copy manuals.

Style guidelines are used to provide consistent organisation throughout the manual.

### 4.1 Manual Structure

#### Cover and Flysheet

Operations Manuals shall have a cover page containing the name of the manual, and a flysheet with the manual name, document control details and header and footer that are common to all of the manual.

A sample cover and flysheet is provided in Appendix 1, annotated with requirements for these pages.

#### Document Control:

The wording of document control requirements is presented in Appendix 1 of this Style Guide.

Revisions shall be named using consecutive alpha characters and include the word "Draft" until the document is accepted by Watercare as meeting all requirements. The first revision supplied to Watercare after acceptance of draft versions shall be named "Version 1".

#### Table of Contents

Operations Manuals shall have a Table of Contents, with page numbers provided for every chapter of the manual. Appendices shall be named in a list. The table of contents headings hyperlink the page number to the relevant section, when the number is clicked with a mouse.

#### Headers

Headers are used to identify the document and chapter within the manual. Headers contain the words "Watercare Services Limited" and manual name and are left -justified. The Unit Process and Chapter name are provided right -justified.

**Sample header:**

**Footers**

Footers are used to identify the document page number, revision status and controlled document status.

Revision status and date are left –justified. The date of revision is manually input. The Microsoft Word date stamp feature is not used.

The words “CONTROLLED DOCUMENT” and “DESTROY UNBOUND COPIES AFTER USE” are centred. The page number is right –justified.

**Sample footer:**

**Page Numbers**

Pages from the flysheet to the sheet with the Table of Contents are numbered with Roman numerals, ie i, ii, iii, iv.

Pages after the Table of Contents are numbered consecutively to the end of the document, but excluding appendices. Page numbers are noted as "Page X of Y".

## 4.2 Chapter Numbers, Figure Numbers, and Table Numbers

### Chapter Numbers

The manual is broken out into discrete chapters. Chapters headings are all linked from the Table of Contents.

Chapter headings are used as follows:

Heading 1 - Topic

Example: **1. Process Theory**

Heading 2 - Section Title

Example: **1.5 Process Control**

Heading 3 – Main Section Chapters

Example: **1.5.4 Controlled Variables**

Heading 4 – Subsections

Example: 1.5.4.1 Free Available Chlorine

### Figure Numbers

Figure numbers consist of the word “Figure” and two numbers separated by a hyphen, for example **FIGURE 2-7**

The number before the hyphen is the Section in which the figure appears. The second number is a consecutive number in the section. In the example above, the figure is the 7th figure in section 2.

### Table Numbers

Tables follow the same rules as figures except that the word “Table” is used in place of the word “Figure”.

## 4.3 Word Page Format

Text files are produced in Microsoft Word for Windows, Version 2000 or subsequent versions.

For portrait pages the justification is set to the left. The inside margin is set at 2.17cm, outside margin 2.54cm, top margin at 2.54cm, and bottom margin at 2.54cm.

For landscape pages the inside margin is set at 2.54cm, outside margin at 2.54cm, top margin at 3.17cm, and the bottom margin at 2.54cm. The pages are set up with mirror margins.

### Body Text

All body text is Book Antiqua, 11-point font, left justified, with 8-point spacing after the paragraph.

### Drawings, Photos and Images

Standard formats are JPG for photos, GIF for diagrams and Autocad Release 13 or later DWG files for drawings.

### Heading System

The heading system is designed to work onscreen and in a hard copy.

**Heading 1** – Contents page header format.

- Font – arial, bold, initial caps, 22pt
- Paragraph spacing – space after, 30pt
- Border – Bottom (single solid line,  $\frac{3}{4}$ ; line width)

**Heading 2** – Section Title.

- Font – arial, bold, initial caps, 22pt
- Paragraph spacing – space after, 24pt
- Border – Bottom (single solid line,  $\frac{1}{2}$ ; line width)
- Outline Numbered – level 2
- Indent – hanging 2.54cm



### **Heading 3 – Main Section Chapters.**

- Font – arial, bold, initial caps, 14pt
- Paragraph spacing – space before 4pt, after 8pt
- Outline Numbered – level 3
- Indent – hanging 2.54cm

### **Heading 4 – Subsections.**

- Font – arial, bold, initial caps, 12pt
- Paragraph spacing – space before 4pt, after 8pt
- Outline Numbered – level 4
- Indent – hanging 2.54cm
- Tabs – 2.86cm, 3.81cm

### **Heading 5 – Further subsections.**

- Font – arial narrow, bold, initial caps, 12pt
- Paragraph spacing – space before 4pt, after 8pt

## **Hyperlinks**

Hyperlinks are used to jump to a location within the current document from the contents page. Each page number on the contents page is hyperlinked to its respective page in the document. A hyperlink is represented by blue text and/or the number being underlined (as in the case for the tables and figures) which, when the reader clicks on the text, the document jumps to the respective page location.

## 4.4 Writing Style Conventions

In writing, use short sentences in the active voice. Avoid use of passive voice such as “is to be set” or future tense such as “will be available” when referring to operating equipment.

Avoid writing that sounds like a specification due to use of words such as ‘shall’. Go from general descriptions to specific descriptions when describing the operation of equipment. Use transitions (such as “first” and “next”) to indicate the sequence of events. Attempt to avoid using cumbersome names of stringed modifiers, and be reader friendly.

The conventions used in preparing the operations manual are as follows:

- The steps in a procedure are numbered.
- Initial capitalisation is used for the names of specific buildings, processes, and rooms. For example, “The primary sludge pumps are located in the Primary Sludge Pump Building.”
- Full capitalisation is used to quote instrument and equipment settings. For example, turning a switch is described like this: “Select the auto/man selector switch to AUTO”.
- Selecting a DCS panel button is described in square brackets like this: “Select Screen X to [START]”
- Field based instructions are in Courier New 8.5 pt Font.
- DCS based instructions are in Book Antiqua Italics 8.5 pt Font.
- DCS based automatic sequences are in Book Antiqua 8.5 pt Font.
- Provide a name for a specific item of equipment, along with the equipment tag number. Do not use the equipment tag number alone.
- The full name of a piece of equipment is provided before using an acronym or abbreviation. For example, “The return activated sludge (RAS) pumps are Flygt submersible pumps. The RAS pumps can be locally controlled.”
- One-digit numbers are spelt out unless they are units of measurement, or describe an item number. Numbers of more than one digit are not spelt out. For example, “... three pumps are ... ” or “... 12 filters are ...” The numbers are **not** put in parentheses.

- When referring to different areas of the document, the word “Refer” is used, **not** “See”.

### **Format for cautions, warnings and notes**

The SOP’s also include all necessary cautions, warnings and notes. These shall be presented in accordance with the following font, bold and colour examples:

**Cautions: where failure to follow proper procedures may cause equipment damage or process upsets.**

**Warnings: where failure to follow proper procedures may cause injury or death.**

**Notes:** identifies information that is especially important for successful operation of the process.

# Appendix 1

---

**ARDMORE WATER TREATMENT PLANT**

**OPERATIONS MANUAL**

**JULY 2006**





WATERCARE SERVICES LIMITED  
and manual name required in  
header

Unit process and chapter name  
required on right of header

Provide name of Water  
Treatment Plant

# ARDMORE WATER TREATMENT PLANT

## OPERATIONS MANUAL

All Operations Manuals  
are to include this line

### FILTRATION

Unit Process Area or concise  
descriptor of the Unit Processes  
covered in the manual

This text and table all  
required for document  
control purposes

*This manual is a controlled document and is subject to document control processes. The source document is maintained and updated by the Document Controller. When you print this document the copy is an uncontrolled copy.*

Copy # \_\_\_\_\_ of \_\_\_\_\_

Issued to \_\_\_\_\_

Location \_\_\_\_\_

Authorised by  
Document Controller \_\_\_\_\_ Date \_\_\_\_\_

Revision #  
required in footer

<b>Master Distribution List</b>		
<b>Held By</b>	<b>Location</b>	<b>Copy No.</b>
<b>Total Copies</b>		



<b>Amendments</b>			
<b>Section</b>	<b>Page No.</b>	<b>Authorised</b>	<b>Date</b>

<b>Re-issues</b>		
<b>Version No.</b>	<b>Date Issued</b>	<b>Authorised By</b>